CITY OF ANN ARBOR, MICHIGAN

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May 7, 2024

VIA ELECTRONIC CASE FILING

Ms. Lisa Felice, Executive Secretary
Michigan Public Service Commission
7109 W. Saginaw Highway
Lansing, MI 48917

RE: MPSC Case No. U-21291

Dear Ms. Felice,

Attached please find the **Exhibit List and Exhibits of the City of Ann Arbor** for the above referenced case.

Please contact me if you have any questions.

Sincerely,

Valerie Jackson
Assistant City Attorney,
City of Ann Arbor

cc: Parties of Record

City of Ann Arbor
Exhibit List
Case No. U-21291

Exhibit	Title	Witness
AA-1	Curriculum Vitae of Robert C. Ackley	Robert C. Ackley
AA-2	OnBoard Learning Management System Transcript	Robert C. Ackley
AA-3	Methane Detection Project Report	Robert C. Ackley
AA-4	DTE Gas Leak Detection website	Robert C. Ackley
AA-5	Photograph taken 11/15/2023	Robert C. Ackley
AA-6	Article: "Natural Gas Leaks and Tree Death: A First-Look Case-Control Study of Urban Trees in Chelsea, MA USA"	Robert C. Ackley
AA-7	March 2023 Correspondence	Skye Stewart
AA-9	Curriculum Vitae of Dr. Melissa Stults	Dr. Melissa Stults
AA-10	A^2ZERO Carbon Neutrality Plan	Dr. Melissa Stults
AA-11	University of Michigan Board of Regents Minutes, May 2021	Dr. Melissa Stults
AA-12	University of Michigan Priorities & Progress Web Page	Dr. Melissa Stults
AA-13	Ann Arbor City Council Resolution, R-23-101	Dr. Melissa Stults
AA-14	Fitch Ratings Rating Action Commentary (March 21, 2024)	Dr. Melissa Stults
AA-15	Revised Direct Testimony of Bente Villadsen, Case No. U-20940	Dr. Melissa Stults
AA-16	Fitch Ratings Rating Action Commentary (Nov. 7, 2022)	Dr. Melissa Stults
AA-17	Direct Testimony of Bente Villadsen, Case No. U-20642	Dr. Melissa Stults
AA-18	Fitch Ratings Rating Action Commentary (Oct. 27, 2020)	Dr. Melissa Stults
AA-19	DTE Business Update (Apr. 2-3, 2024)	Dr. Melissa Stults
AA-20	DTE Business Update (Apr. 3-4, 2023)	Dr. Melissa Stults
AA-21	DTE Energy Business Update (Jan. 10-12, 2022)	Dr. Melissa Stults
AA-22	DTE Energy Business Update (Sep. 20-21, 2021)	Dr. Melissa Stults
AA-23	Discovery Response AADG-1.8a in Case No. U-21384	Dr. Melissa Stults
AA-24	Discovery Response AADG-1.7a in Case No. U-21384	Dr. Melissa Stults
AA-25	Discovery Response AADG-1.7b in Case No. U-21384	Dr. Melissa Stults
AA-26	Discovery Response MNSCDG-5.10a	Dr. Melissa Stults
AA-27	Discovery Response AADG-1.6a-c	Dr. Melissa Stults

AA-28	Case 20-G-0131, State of New York Public Service Commission, Order Adopting Gas System Planning Process (May 12, 2022) (excerpts	Dr. Melissa Stults
AA-29	D.P.U. 20-80-B, Massachusetts Department of Public Utilities, Order on Regulatory Principles and Framework (Dec. 6, 2023) (excerpts)	Dr. Melissa Stults
AA-30	Discovery Response AADG-3.18	Dr. Melissa Stults
AA-31	U-21291 AADG-3.3 Ann Arbor Project List 2023-2024 (Attachment to Discovery Response AADG-3.3)	Dr. Melissa Stults
AA-32	Discovery Response AADG-3.9	Dr. Melissa Stults
AA-33	Discovery Response AADG-3.10	Dr. Melissa Stults
AA-34	Discovery Response AADG-3.15	Dr. Melissa Stults
AA-35	CleanVision Natural Gas Balance 2023 Annual Impact Report (filed in Case No. U-20839)	Dr. Melissa Stults

Robert C. Ackley
Gas Safety Inc.
16 Brook Lane
Southborough, Massachusetts 01772
robert.c.ackley@gmail.com
508-344-9321
Curriculum Vitae
March 8, 2024

Position

Sole Stockholder, Gas Safety Inc. (Gassafetyusa.com), 2006-present. Gas Safety inc. (GSI) works with utility operators, researchers, municipalities, legal teams and others concerning natural gas pipeline sysems and the detection, measurement and implications of fugitive methane regarding safety from explosion and the impacts of fugitive emissions on the environment.

Gas Safety inc has led the country in the use of Cavity Ringdown Spectrometers (CRDS) that are over one thousand times more sensitive than traditional gas detecting equipment that can accurately measure methane, carbon dioxide and water in the atmosphere in parts per billion. Working with Silicon Valley startup Piccaro, Inc. researchers Nathan Phillips of Boston University and Rob Jackson of Duke University, Bob helped develop the use of CRDS technology in the gas utility industry to monitor gas pipelines for leaks. GSI has utilized CRDS technology to document and measure methane emissions around the country on shale plays, transmission pipelines, compressor stations, gas distribution systems and in buildings.

Bob collaborated with the Doctoral candidate Margaret Hendrick Phd and Boston University Professor Nathan Phillips Phd to measure 100 gas leaks using chambers to ascertain flux of individual leaks. This research identified that just ***7% of any leak population is responsible for 50% of all emissions.***

Bob working on leaks of Significant Environmental Impact (SEI Leaks) or Super emitters with Massachusetts non profit HEET, identifies the Leak Extent Method where the larger the leak migration area or footprint, the greater the flux of the leaking pipe. Utility Operators in the Northeast and around the country are now using this method to identify SEI leaks where the leaks' migration area is measured by square feet. Utility operators now have a reasonable and inexpensive method to identify SEI leaks.

Prior to starting Gas Safety Inc., Bob led training and compliance for gas leak survey contractors that both implemented and conducted Department of Transportation mandated safety compliance gas pipeline leakage surveys. Bob trained employees for all aspects of investigating public odor complaints, gas leaks classification, conducting pipeline patrolling, conducting pipeline leakage surveys, conducting atmospheric corrosion inspections and making buildings safe in emergencies in preparation of Operator Qualification required Department of Transportation sanctioned exams.

Positions

2006-Present
President
Gas Safety inc

Southboro, Ma

2000-2006
Vice President
Omark Consultants
Boylston, MA
Training & Safety

1985-2000
DHS inc
Springfield, MA
Safety & Training

1979-1985
Surveys & Analysis
Shrewsbury, MA
Pipeline Safety Consultant

Department of Transportation Qualifications:

Conducting Odor Complaints Investigations / Making Buildings Safe
Gas Leak Classification
Abnormal Operating Conditions
Conducting Pipeline Leakage Surveys
Patrolling Transmission Pipelines
Inspecting for Atmospheric Corrosion

Graduate coursework: Graduate College for Financial Planning Denver, Colorado, 1992

Undergraduate coursework: Quinsigamond College, Worcester, MA, 1977-80

Undergraduate coursework Assumption College Worcester, MA 1986

Publications

A simple method to measure methane emissions from indoor gas leaks

Dominic Nicholas; Robert Ackley; Nathan G. Phillip
Published: November 30, 2023

https://doi.org/10.1371/journal.pone.0295055

Home is Where the Pipeline Ends: Characterization of Volatile Organic Compounds Present in Natural Gas at the Point of the Residential End User
Drew Michanowicz, Archana Dayalu, Curtis L. Nordagard, Jonathan J. Buonocore, Molly W. Fairchild, Robert Ackley, Jessica Schiff, Abbie Liu, Nathan G. Phillips, Audrey Schulman, Zeyneb Magavi, John D.

Spengler
https://pubs.acs.org/doi/10.1021/acs.est.1c08298

Natural gas leaks and tree death: A first-look case-control study of urban trees in Chelsea, MA USA
Schollaert, C., Ackley, R. C., DeSantis, A., Polka, E., & Scammell, M. K. (2020). Natural gas leaks and tree death: A first-look case-control study of urban trees in Chelsea, MA USA. *Environmental Pollution*, *263*.

An Enhanced Procedure for Urban Mobile leak Detection
Tim Keyes, Gale Ridge, Martha Klein, Nathan Phillips, Robert Ackley, Yufeng Yang
DOI://doi.org/10.1016/j.heliyon.2020.e04876

Characterization of Methane Plumes downwind of natural gas compressor stations in Pennsylvania and New York

Fugitive Methane Emissions from Leak-Prone Natural Gas Distribution Infrastructure in Urban Environments ☆
Margaret F. Hendrick[a, ,], Robert Ackley[b,], Bahare Sanaie-Movahed[a, 1, ,], Xiaojing Tang[a,], Nathan G. Phillips[a]

doi:10.1016/j.envpol.2016.01.094

Natural Gas Pipeline Replacement Programs Reduce Methane Leaks and Improve Consumer Safety

Morgan E. Gallagher†‡, Adrian Down§, Robert C. Ackley ∥, Kaiguang Zhao ⊥, Nathan Phillips#, and Robert B. Jackson*†▽

Natural gas pipeline leaks across Washington, D.C.*Environmental Science & Technology* 48:2051-2058, doi:10.1021/es404474x. Jackson, RB, A Down, NG Phillips, RC Ackley, CW Cook, DL Plata, K Zhao. 2014.4.

Mapping urban pipeline leaks: methane leaks across Boston. *Environmental Pollution* 173:1-4, doi:10.1016/j.envpol.2012.11.003.Phillips NG, R Ackley, ER Crosson, A Down, LR Hutyra, M Brondfield, JD Karr, K Zhao, RB Jackson. 2013.

Crosson E, Phillips N, Hutyra L, Turnbull J, Sweeney C, Ackley R, Tan S (2011)
Identification of Methane Emissions in an Urban Setting. NOAA Research Abstract, ESRL Global Monitoring Ann. Conf., May 17-18.

Gas Safety Inc. Projects

2023
Indoor Methane Emissions Study

Ann Arbor, Michigan
Cavity Ringdown Spectrometer Survey

HEET
SHared Action Plan
Super Emitter Project

Newton Tree Conservancy
Tree Planting

2022

District of Columbia Phase II
Philadelphia Methane study Phase II

Collaboration with Harvard TH Chan School of Public Health on gas contaminants study

2021

District of Columbia Methane Study

Philadelphia, PA Methane Study

Collaboration with Non profit Home Energy Efficiency Team (HEET) working Department of Transportation TAG grant on gas leaks of significant environmental impact.

Collaboration with Harvard TH Chan School of Public Health on gas contaminants study

2020

Cavity Ringdown Spectrometer Survey Reading Massachusetts

Collaboration with Non profit Home Energy Efficiency Team (HEET) working Department of Transportation TAG grant on gas leaks of significant environmental impact.

Collaboration with Harvard TH Chan School of Public Health on gas contaminants study

2019

Collaboration with Non profit Home Energy Efficiency Team (HEET) working Department of Transportation TAG grant on gas leaks of significant environmental impact.

Bob Ackley identifies Leak Extent Method or LEM to identify pipeline leaks that emit highest volumes of methane now being adopted nationwide

Collaboration with CRESH study leaking methane's impact on trees Chelsea, MA

Town of Weston, MA Comprehensive Cavity Ringdown Spectrometer Survey & Gas Leak Identification

2018

Collaboration with T.H. Chan School of Public health Drone Project

Town of Acton Gas Pipeline Survey Project

Collaboration with HEET High Volume Leak Study

2017

Emissions Study
Town of Wellesley, MA Cavity Ringdown Spectrometer Survey

2016

Collaboration with Non profits Home Energy Efficiency Team (HEET), Mothers Out Front, Boston University Professor Nathan Phillips and Local gas operators to define environmentally sensitive leaks as required by Mass Statute

https://malegislature.gov/Bills/188/House/H2950

Collaboration with Non profit Home Energy Efficiency Team (HEET) Grant working on gas leak audits throughout Massachusetts service area

Greenfield Mass Cavity Ringdown Spectrometer (CRDS) Survey

GSI conducted CRDS survey of all roadways in Greenfield, Massachusetts for local nonprofit Greening Greenfield

2015

Sierra Club Hartford CT Cavity Ringdown Spectrometer (CRDS) Survey

Natural Gas Leak Study in Collaboration with Boston University Professor Nathan Phillips

GSI conducts CRDS survey of all roadways in Hartford, CT for Greater Hartford Sierra Club

Emerald Necklace Conservancy (ENC) Gas leak Survey

GSI conducts gas leak survey for Emerald Necklace Conservancy (ENC) to identify natural gas leaks on the Emerald Necklace Park system throughout greater Boston and identify gas leaks that have migrated within the root zones of ENC trees.

Metropolitan Area Planning Council, Department of Transportation, Technical Assistance Grant (TAG)

GSI collaborated with quasi governmental agency MAPC and nonprofit HEET to analyze best practices for communities to coordinate with local utilities on pipeline repair and replacement programs.

https://primis.phmsa.dot.gov/tag/PrjHome.rdm?prj=693&s=4CB8DF138D3941EAB943C81A895509E1&

=1&nocache=8894

http://www.mapc.org/mapc-heet-release-report-gas-leaks

http://fixourpipes.org/

Montgomery County, MD Gas Leak Survey & Training

Montgomery County, MD engaged Gas Safety Inc. (GSI) to train MC DOT arborists to identify trees damaged by natural gas pipeline leakage and to collect gas leak/ tree damage data in selected areas.

Madison County, NY Compressor Station Monitoring

GSI establishes a methane CH4 baseline using cavity ringdown spectrometer technology to document ambient methane in locus of proposed permitted natural gas compressor station in Georgetown, NY

Methane Survey Cambridge Massachusetts – Sommerville, Massachusetts

Collaboration with Home Energy Efficiency Team & Nathan Phillips Boston University

2014

GSI conducts CRDS survey of all public roadways in the communities of Cambridge, Ma, and Sommerville, Ma in collaboration with heetma.org and Nathan Phillips of Boston University to compare industry supplied data with our independent analysis led by HEET.

https://www.heetma.org/wp-content/uploads/2014/11/Squeaky-Leak-Report-Public1.pdf

Natural Gas Pipeline Replacement Research Project

2014-2015

GSI research collaboration with Morgan Gallagher Duke University, Professor Rob Jackson Phd. Stanford University, Professor Nathan Phillips Phd. Boston University, Adrian Downes Phd. Kaiguang Zhao Phd. comparing pipeline systems natural gas leak across Cincinatti, OH, Manhattan, NY, Boston, MA and Durham, NC. GSI conducted city wide cavity ringdown spectrometer surveys to compare CH4 natural gas levels in Cincinnati, OH and Durham, NC where major replacement of the natural gas system occurred over the last 20 years to eliminate leak prone pipelines, with systems that have not been replaced in Boston and the Manhattan borough of NYC. This work led to Published paper in 2015 “Natural Gas Pipeline Replacement Programs Reduce methane Leaks and Improve Public Safety” in Environmental Science and Technology August 2015.

Damascus Citizens for Sustainability Pennsylvania / New York 2011-Ongoing

Manhattan Emissions Study

http://www.damascuscitizensforsustainability.org/wp-content/uploads/2016/01/GAM.NY_.2015.pdf

NY / PA Methane Baseline studies

GSI heads project Damasacus Citizens for Sustainability (DCS), Narrowsburg, NY, to establish methane baseline levels in selected communities across Pennsylvania and New York. GSI and DCS worked throughout PA to establish methane baseline levels with CRDS technology and compare with Southern Tier NY state border communities.

http://www.damascuscitizensforsustainability.org/wp-content/uploads/2014/08/DelawareNY-Baseline-Report-FINAL-Jan2014.pdf

www.damascuscitizensforsustainability.org/wp-content/uploads/2012/11/Damascus-Baseline-Report-FINAL.pdf

http://www.damascuscitizensforsustainability.org/wp-content/uploads/2014/12/Hancock4.pdf

City of Fitchburg Technical Assistance Grant (TAG)

October 2013-October 2014

GSI conducts CRDS survey of public roadways in Fitchburg, Massachusetts

https://primis.phmsa.dot.gov/tag/PrjHome.rdm?prj=530&btn=Search

Research Project CH4 Measurements Manhattan, NY

Adjunct Faculty Boston University Earth & Environment 2013 spring semester, natural gas working group.

2012-2015

A rapid method for measuring area methane emissions: an application in Manhattan, New York, USA

GSI collaborated with Professor Mark Arend Phd, City College of NY and Bryce Payne Jr. Phd. on method to measure methane flux from the borough of Manhattan, NY

Research Project: Natural Gas Pipeline Leaks Across Washington, DC

2012-2014

GSI collaboration with Professor Rob Jackson Phd of Stanford, University and professor Nathan Phillips Phd. of Boston University that mapped natural gas leak throughout the District of Columbia utilizing cavity ringdown spectrometer technology (CRDS). Published Environmental Science & Technology June 2014.

Research Project: Mapping Urban Pipeline Leaks – Methane leaks Across Boston, Ma

2011-2012

GSI collaboration with Professor Rob Jackson Phd of Stanford, University and professor Nathan Phillips Phd. of Boston University that mapped natural gas leak throughout Boston, Massachusetts utilizing cavity ringdown spectrometer technology (CRDS). Published Environmental Pollution December 2012.

2011

Silver Spring Maryland Gas Leak Tree Project

Assist citizens in Silver Spring, Maryland with natural gas leak problems.

Commonwealth Avenue Mall Association Tree Protection

GSI conducts a natural gas leak survey identifying trees damaged by natural gas leaks along Boston's premier street. The survey leads to the replacement of the leaking gas line protecting over 100 significant trees.

Invited Speaker, “Natural Gas: Energy, Economics, Environment”, Boston University, Sept. 27,
Invited Speaker, Ecological Society of America Oral Session: Natural Gas: Energy, Environment Economics. Approved for August, 2012, Portland, Oregon.

Adjunct Faculty Boston University Earth & Environment 2013 spring semester, natural gas working group.

Invited Speaker HEET Home Energy Efficiency Team Cambridge, Massachusetts September 30, 2014 Methane Program

Expert Witness / Investigations

GSI started in 2006 and was engaged as an expert witness / investigator regarding two gas related cases in early 2007 that were both settled out of court.

GSI has been retained on several other explosion incident cases that have all been settled out of court.

Areas of Expertise

Incident Investigation
Discovery Preparation
Operator Qualification
Odor Complaint / Leak Investigation Procedures
Gas leak Classification
Government Compliance
Equipment & Equipment Testing Techniques and Requirements
Atmospheric Corrosion
Meter Protection
Gas Distribution System Materials
Vegetation / Environmental Damage
Methane Detection & Quantification

Equipment Available

Picarro ch4/co2/h2o mobile analyzer
Picarro g4301 ch4/co2/h2o backpack analyzer
Dafarol a600 Flame Ionization Detectors Mobile & Portable
Bascom-Turner Combustible gas indicators

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OnBoard Learning Management System
Gas Safety Inc - Transcript

Run By Bob Ackley on 3/25/2024 6:05:22 PM

Ackley, Bob (backley)

	Task Code	Task	Status	Date Taken	Expires	Proctor/Evaluator	Media	Is Qualified
⊟	70	CT-70-Basic Abnormal Operating Conditions and Properties of Natural Gas	Passed	04/26/2023	04/26/2026		Online	Yes
	NGA-WE-70	NGA-WE-70-Properties of Natural Gas and Abnormal Operating Conditions	Passed	04/26/2023	04/26/2026			
⊟	NGA-CT-06B	NGA-CT-06B-Inspecting for Atmospheric Corrosion, Excluding Measurement of Wall Loss	Passed	03/09/2024	04/26/2026	Barnhart, Michael D	Online	Yes
	NGA-PE-06A/06B	NGA-PE-06A/06B-Visually Evaluating Severity of Atmospheric Corrosion	Passed	03/09/2024	03/09/2027	Barnhart, Michael D		
	NGA-WE-06	NGA-WE-06-Inspecting for Atmospheric Corrosion	Passed	04/26/2023	04/26/2026			
⊟	NGA-CT-18A.1	NGA-CT-18A.1-Conducting Gas Leakage Surveys (Flame Ionization)	Passed	03/09/2024	04/26/2026	Barnhart, Michael D	Online	Yes
	NGA-PE-18A.1	NGA-PE-18A.1-Leak Survey (Flame Ionization)	Passed	03/09/2024	03/09/2027	Barnhart, Michael D		
	NGA-WE-18A	NGA-WE-18A-Conducting Gas Leakage Surveys	Passed	04/26/2023	04/26/2026			
⊟	NGA-CT-18A.4	NGA-CT-18A.4-Conducting Gas Leakage Surveys (Catalytic/Semiconductor)	Passed	03/09/2024	04/26/2026	Barnhart, Michael D	Online	Yes
	NGA-PE-18A.4	NGA-PE-18A.4-Leak Survey (Catalytic/Semiconductor)	Passed	03/09/2024	03/09/2027	Barnhart, Michael D		
	NGA-WE-18A	NGA-WE-18A-Conducting Gas Leakage Surveys	Passed	04/26/2023	04/26/2026			
⊟	NGA-CT-19A	NGA-CT-19A-Patrolling and Inspecting Right of Ways, Pipeline Markers and Exposed Above Ground Mains	Passed	04/26/2023	04/26/2026		Online	Yes
	NGA-WE-19A	NGA-WE-19A-Patrolling and Inspecting Right of Ways, Pipeline Markers and Exposed Above Ground Mains	Passed	04/26/2023	04/26/2026			
⊟	NGA-CT-20A	NGA-CT-20A-Investigating Leak and Odor Complaints (Inside and Outside)	Passed	04/26/2023	04/26/2026		Online	Yes
	NGA-PE-20B	NGA-PE-20B-Investigating Leak and Odor Complaints (Outside)	Passed	03/09/2024	03/09/2027	Barnhart, Michael D		
	NGA-PE-20C	NGA-PE-20C-Investigating Leak and Odor Complaints (Inside)	Passed	03/09/2024	03/09/2027	Barnhart, Michael D		
	NGA-PE-88	NGA-PE-88-Operation of a Combustible Gas Indicator	Passed	03/09/2024	03/09/2027	Barnhart, Michael D		
	NGA-WE-20A	NGA-WE-20A-Investigating Leak and Odor Complaints (Inside and Outside)	Passed	04/26/2023	04/26/2026			
⊟	NGA-CT-20D.1	NGA-CT-20D.1-Leak Classification (Grades 1, 2, and 3)	Passed	04/26/2023	04/26/2026		Online	Yes
	NGA-WE-20D.1	NGA-WE-20D.1-Leak Classification (Grades 1, 2, and 3)	Passed	04/26/2023	04/26/2026			
⊟	NGA-CT-20D.2	NGA-CT-20D.2-Leak Classification (Grades 1, 2A, 2, and 3)	Passed	03/09/2024	03/09/2027	Barnhart, Michael D	Online	Yes
	NGA-PE-20D.2	NGA-PE-20D.2-Leak Classification (Grades 1, 2A, 2, and 3)	Passed	03/09/2024	03/09/2027	Barnhart, Michael D		

	Task Code	Task	Status	Date Taken	Expires	Proctor/Evaluator	Media	Is Qualified
	NGA-CT-23/24	NGA-CT-23/24-Inspecting the Condition of Exposed Pipe	Passed	04/26/2023	04/26/2026		Online	Yes
	NGA-WE-23/24	NGA-WE-23/24-Inspecting the Condition of Exposed Pipe	Passed	04/26/2023	04/26/2026			
	NGA-CT-88	NGA-CT-88-Operating a Combustible Gas Indicator	Passed	03/09/2024	03/09/2027	Barnhart, Michael D	Online	Yes
	NGA-PE-88	NGA-PE-88-Operation of a Combustible Gas Indicator	Passed	03/09/2024	03/09/2027	Barnhart, Michael D		

Gas Safety Inc
16 Brook Lane
Southborough, Massachusetts 01772
www.gassafetyusa.com
508-344-9321

Missy Stults
Ann Arbor MI
Office of sustainability
Mayor's Office

RE: Methane Detection Project Report

Draft Report

Pursuant to a contract between the City of Ann Arbor, Michigan (Ann Arbor) and Gas Safety Inc. (GSI), GSI conducted a cavity ringdown spectrometer (CRDS) methane (CH4) survey of the 307 miles of public roadways within Ann Arbor. A Picarro G2301 3 gas (CH4, CO2 & H2O) mobile analyzer that was tested with NOAA certified test gas before and after completion of the survey to insure proper operation, was used to drive each side of every accessible roadway in Ann Arbor to determine the prevalence of fugitive methane emissions from the natural gas system that serves Ann Arbor.

The CRDS detects methane in parts per billion each second and tags each reading with a GPS coordinate and time stamp to allow for mapping of methane emissions over any location. These fugitive methane emissions can be from many sources such as sewer gas, landfills, ruminant animals, car exhaust, decaying matter, and other sources, but predominantly, these fugitive emissions are emanating from leaks on the natural gas system. One hundred sixty five (165) elevated methane locations were identified in the survey.

Once the mobile CRDS survey was completed, testing at 50 selected elevated methane locations was conducted using a Picarro G4301 Scouter portable CRDS analyzer tested with NOAA certified test gas before and after completion of the survey to ensure proper operation to pinpoint the source of the CH4 emissions that are typically within 200 feet of the location indicated by the CRDS mobile analyzer.

Six-inch test holes were placed in the ground with a plunger bar to sample the subsurface air for the presence of natural gas with an industry standard Bascom-Turner combustible gas indicator calibrated on November 1, 2023 and December 1, 2023. Any emissions from manholes, catch basins, or other instances where gas was detected were documented.

Each verified leak was documented on a GSI leak report (see Exhibit E, Gas Leak Reports) where each leak was graded for safety (see Exhibit A, Gas Safety Inc. Uniform Leak Classification Recommendations), leak migration area was determined by industry standard bar hole testing (see section on, Leak Extent Method below), and any gas that had migrated to the root zones of trees was noted.

Super Emitters

A peer-reviewed scientific paper published in 2016 concluded that seven percent of any leak population would emit fifty percent of all emissions.[1] **<u>That means that identifying and repairing just 7% of any leak population will reduce total emissions by 50%</u>**.

Leak Extent Method

Whenever a gas leak is detected or monitored, the leak's migration area must be determined to ascertain the possibility of gas migration to any confined spaces where gas could accumulate to explosive levels and ignite. Leaks that emanate from subsurface pipelines, as opposed to above ground piping, are tested by inserting plunger bar holes into the soil and recording combustible gas indicator readings and documenting those readings on a field sketch. Once a gas leak's migration area is determined, the leak grade can also be determined.

The Leak Extent Method (LEM)[2] is a simple method that has been proven to be reliable to rank flux rates in leaks. The simple premise is **<u>the larger the leak footprint or migration area the higher the flux rate.</u>**

The LEM was tested against several other methods including sustained barhole readings, gas detecting cameras, cavity ringdown spectrometer, and a flux measuring tool. The LEM was found to be the easiest and cheapest method to consistently rank a leak's flux compared to other leaks in the same leak population.

To determine the leak extent of any gas leak using the LEM, we draw a rectangular box around the leak and record the square footage of the leak's migration area or footprint. Of course there will be exceptions and outliers. In some cases there will be small footprints that have very high emissions due to leaks at valves, near other utility substructures and surface water drains, or other open pathways, while some large footprints could have low flux due to extensive non pervious surfaces that can push gas great distances. For more information see Appendix C, Leak Extent Method.

Of the 50 leaks that were tested in Ann Arbor, there were 10 leaks with over 1,000 square foot

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[1]Margaret F. Hendrick, *et al.*, *Fugitive methane emissions from leak-prone natural gas distribution infrastructure in urban environments*, Environmental Pollution (June 2016).

[2] The Leak Extent Method is currently being used by all the major gas utilities in the State of Massachusetts to identify significant leaks under a Shared Action Plan.

migration, with the largest footprint being 3,885 square feet.

Damage to Trees and Other Vegetation Caused by Leaking Gas

The fact that leaking gas in the root zones of trees and other vegetation is deleterious to the trees and vegetation is common knowledge in the gas industry. For example, a recent study published in Science Direct[3] found dead and dying trees had 30 times the odds of being exposed to detectable levels of soil methane relative to the control healthy trees sampled. The authors of the study concluded that the results "support[ed] the hypothesis that fugitive emissions from natural gas distribution infrastructure negatively impact urban vegetation health."

The problem of natural gas damaging trees and other vegetation is certainly not new information as evidenced by an article published in the Journal of Arboriculture in 1977,[4] which provided a scientific explanation for the death of trees in the vicinity of gas leaks. As explained in the article, "extremely low oxygen concentration is regarded as the most important cause of death of the trees," and "[m]ethane consuming bacteria multiply in methane contaminated soil using up the oxygen and giving off carbon dioxide," whereas in "normal soil in which there is no natural gas, there are few or no methane consuming bacteria."

Moreover, the same 1977 article indicates that natural gas companies have been fully aware that natural gas leaks cause damage to vegetation for several decades. The article highlighted a company that had been detecting gas leaks for over 25 years by the effects of gas on vegetation, a spokesperson for which noted, "our business functions as a result of this fact that vegetation IS affected by this [natural] gas."

Typical symptoms of tree decline are consistent with root failure: thinning crown, die back, and early leaf drop. Where vegetation abnormalities are observed, testing for the presence of natural gas is recommended. This can be done by taking combustible gas indicator (CGI) readings, which are done by inserting a probe into a plunger bar hole (commonly referred as a barhole test) and drawing an air sample into the combustible gas indicator to record percent gas in air readings. When gas is detected, the process is repeated to identify the migration area of the leak to facilitate grading of the leak. Leak grading can only be performed by a Department of Transportation operator qualified inspector. Any gas readings or suspicions of a gas leak should be immediately reported to the local fire department and gas company.

Any gas leak detected within the root zone of any tree should be repaired as soon as reasonably possible (no more than six months after discovery to account for the possibility of

[3] Claire Schollaert, et al., Natural Gas Leaks and Tree Death: A first-look case-control study of urban trees in Chelsea, MA USA, Science Direct (August 2020).
[4] Spencer H. Davis, Jr., The Effect of Natural Gas on Trees and Other Vegetation, Journal of Arboriculture 3(8) (August 1977).

frost or other extenuating circumstances). A consulting arborist should inspect each gas-affected tree to make sure that the tree is not deemed hazardous, which would require immediate removal.

Results and Recommendations

In our study of the 50 selected locations in Ann Arbor, thirty trees were discovered to have gas in the root zone/drip line of the tree. The gas leaks in the locations corresponding to these trees should be repaired as soon as possible to prevent any damage or further damage to the subsurface root system of the trees. If the gas leaks are repaired in a timely manner, the trees have a better chance of recovering.

The verified gas leak data is compiled in Exhibit B, Verified CH4 Emission Locations and Exhibit C, Verified CH4 Emissions Locations Notes. None of the verified gas leaks presented any immediate explosion hazard to the community.

Copies of the individual Gas Leak Report field sketches are in Exhibit E, Gas Leak Reports**.**

The majority of the leaks detected appear to be corrosion-related leaks from steel gas mains and services of which many are installed under sidewalks along the roadways. There was one slight 4 ppm reading emanating from a sewer manhole and three locations where 4-10 ppm CH4 were emanating from catch basin storm water drains that may be from leaks from gas pipelines, decaying matter, or other substances deposited in the catch basins.

The GPS locations of the untested locations with elevated methane emissions are in Exhibit D, Elevated Methane Locations to be Tested.

Please feel free to contact us at any time regarding this report.

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Exhibits

Exhibit A - Gas Safety Inc Uniform Leak Classification Recommendations

Gas leaks upon detection have traditionally been classified into three categories with each category requiring different repair requirements and timelines. Gas operators around the country have gotten away for years with a very vague leak classification system.
Many hazardous leaks occur from excavation damage that rupture pipelines and can cause very hazardous conditions to many buildings in a short period of time. Cast iron mains, especially small diameter, are known to crack from earth movements caused by frost, truck traffic, nearby excavation that can undermine the pipe, earthquakes, etc. There are many more leaks due to mechanical joint connection failures, corrosion of steel pipes, weld failures, and other pipeline failures that are often very slow-leaking and mostly nonhazardous but can be deemed hazardous if the leaking gas can accumulate to explosive levels in a confined space, such as a home or building, manhole or vault, or any place gas could accumulate to explosive levels (approximately 4.5% to 15% gas in air mixture).

Current Leak Classification

Current leak classification varies from gas company to gas company but follows basic principles:

Grade 1

Any leak that is an existing hazard to persons or property requires continuous action until the hazard no longer exists.[5]

Grade 2

Any leak that is non hazardous to persons or property at the time of detection but represents a potential future hazard.

Grade 2 leaks are typically repaired within 15 months and monitored at 6 month intervals

Grade 3

Any leak that is non hazardous to persons or property at the time of detection and expected to remain non hazardous

Gas Safety Inc Recommended Gas Leak Classification

Grade 1: Repair or continuous action until the hazard no longer exists

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[5] *Note that damage to vegetation is not considered.*

Any leak that a qualified person on the scene determines is an existing hazard to persons or property.

Additionally:

- Any gas reading inside a building
- Any gas reading within 15 feet of any outside building wall
- Any gas reading of 1% or greater in any manhole or confined space
- Any leak deemed by the local fire department of sufficient magnitude to be a public nuisance

Grade 2: **Repair within 6 months not to exceed 9 months**

Any leak that is non hazardous to persons or property at the time of detection but represents a potential future hazard.

Additionally:

- Any leak within 40 feet of any outside building wall
- Any leak with a migration area of 500 square feet or more (super emitter)
- Any leak that migrates to private property
- Any leak that migrates to the root zone of any tree
- Any leak deemed by the local fire department of sufficient magnitude to justify scheduled repair

Grade 3: Monitored annually

Any leak that is non hazardous to persons or property and expected to remain non hazardous to persons or property.

Public Notification of Gas Leaks

The public should be notified about gas leaks and better informed about gas safety in general.

Gas operators should be required to inform in writing all residents whose property abuts a gas leak in writing of the location of the gas leak, potential hazards of the leak, expected repair timeline or monitoring of the leak, and any trees or vegetation affected by the leak.

All gas leaks should be reported on a live gas leak map that shows the location and status of all active leaks.

Combined Dig Safe 811 and Scratch & Sniff cards should be required to be sent annually to every resident within any gas distribution system with instructions to call 911 when any gas odor is detected and to call 811 before any excavations.

As outlined by the American Gas Association, evidence of gas leaks includes blowing dirt and bubbling water in addition to odors. Dead or dying trees and vegetation should be added as signs of a potential gas leak and should merit a call to 911.

Exhibit B - Verified CH4 Emissions Locations

DATE	#	Street	Suf	block	block	Grade	SQ FT	Trees	LAT	LONG
12/6/23	3317	Alton	Ct			2	25	0	42°18'44.29"N	83°41'40.10"W
11/14/23	806	Amherst	Rd			3	51	1	42°17'50.84"N	83°44'15.81"W
11/17/23	1260	Barrister	Rd			3	na	0	42°17'31.03"N	83°41'21.87"W
11/14/23	221	Barton	Dr			3	3600	0	42°18'8.05"N	83°44'28.68"W
11/14/23		Barton	Dr	Brede		3	270	0	42°18'8.16"N	83°44'24.05"W
11/14/23	1335	Bird	Rd			3	3500	0	42°18'29.05"N	83°45'47.28"W
11/14/23	3022	Bluett	Rd	Bunker Hill		3	90	1	42°18'37.34"N	83°42'6.40"W
11/13/23		Cambridge	Rd	Martin		3	50	0	42°16'13.75"N	83°43'42.56"W
11/15/23	2750	Canterbury	Dr			3	325	2	42°15'6.51"N	83°42'16.50"W
11/15/23	2851	Canterbury	Dr	Hampshire		3	100	0	42°15'7.19"N	83°42'6.16"W
11/14/23	1715	Chandler	Rd			3	90	0	42°17'53.45"N	83°44'17.15"W
11/14/23	1717	Chandler	Rd			3	1050	2	42°17'53.91"N	83°44'16.96"W
11/14/23		Chandler	RD	Amherst		3	36	1	42°17'51.09"N	83°44'18.05"W
11/14/23		Chandler	RD	Barton		3	360	1	42°18'2.61"N	83°44'15.62"W
11/17/23	3640	Chatham	Wy			3	25	1	42°17'41.97"N	83°41'20.46"W
11/15/23	2810	Cranbrook	Rd			3	420	1	42°14'47.22"N	83°42'20.15"W
11/13/23	1914	Day	St			2	3885	5	42°16'16.90"N	83°43'24.85"W
11/15/23		Delaware	Dr	Mershon		3	25	0	42°15'13.43"N	83°46'0.86"W
11/17/23	1919	Green	Rd	Green Brier Road		3	25	0	42°17'58.54"N	83°41'33.00"W
11/17/23	3562	Green Brier	BL			3	25	1	42°17'54.05"N	83°41'25.88"W
11/15/23	2071	Greenview	DR			3	na	0	42°15'19.75"N	83°45'48.70"W
11/13/23	1710	Ives	Ln			3	1	0	42°15'52.04"N	83°43'28.09"W
11/17/23		Larchmont	Dr	Barrister		3	na	0	42°17'35.52"N	83°41'21.07"W
11/14/23		Manor	Dr	Bredefield		3	120	2	42°18'16.73"N	83°44'16.95"W
11/13/23	1038	Martin	Pl			3	1000	1	42°16'9.53"N	83°43'42.87"W
11/13/23	1048	Martin	Pl			3	150	1	42°16'8.85"N	83°43'42.89"W
11/15/23		MCComb	St	Butternut	Street	3	25	0	42°14'36.15"N	83°42'17.62"W

11/14/23	2354	Newport	Rd			3	1400	1	42°18'22.43"N	83°45'57.68"W
11/13/23	1001	Oakland	Av	Arch		3	1100	2	42°16'13.08"N	83°44'16.01"W
11/13/23	258	Orchard Hills	Dr			3	875	0	42°16'39.93"N	83°42'53.79"W
11/13/23	2719	Overidge	Dr			3	25	0	42°15'43.55"N	83°42'20.95"W
11/13/23	2735	Overidge	Dr			3	60	0	42°15'43.66"N	83°42'18.70"W
11/17/23	3515	Paisley	Ct			3	na	1	42°17'29.15"N	83°41'29.31"W
11/14/23		Pontiac	Tr	Starwick		3	90	1	42°18'3.90"N	83°44'7.80"W
11/15/23	3090	Rosedale	St			3	45	0	42°14'37.40"N	83°42'4.98"W
11/15/23	3180	Rosedale	St			3	75	1	42°14'32.81"N	83°42'5.00"W
11/14/23	3205	Rumsey	Dr	Georgetown		3	400	2	42°18'54.73"N	83°41'55.78"W
11/15/23	2885	Sharon	Dr			3	2200	1	42°14'23.62"N	83°42'20.31"W
11/15/23	2986	Sharon	Dr			3	1575	0	42°14'23.80"N	83°42'2.60"W
11/15/23	2989	Sharon	Dr	Platt		3	1350	0	42°14'23.84"N	83°42'1.22"W
11/15/23		Sharon	Dr	McComb		3	20	0	42°14'23.68"N	83°42'17.68"W
11/15/23		Sharon	Dr	Nordman Road		3	25	0	42°14'23.69"N	83°42'14.27"W
11/15/23	2230	South Seventh	St			3	1	0	42°15'12.75"N	83°45'44.73"W
11/14/23	821	Starwick	Rd	Pontiac Trail		3	1	0	42°18'4.08"N	83°44'4.26"W
11/14/23	2265	Stellar	St	Cloverdale		3	675	1	42°18'20.85"N	83°44'11.46"W
11/15/23	2846	Verle	St			3	45	0	42°14'16.46"N	83°42'23.27"W
11/15/23	2850	Verle	St			3	45	0	42°14'16.48"N	83°42'22.50"W
11/15/23		Westfield	Av	Avondale		3	45	1	42°15'39.88"N	83°46'1.69"W
11/15/23		Westfield	Av	West Stadium		3	na	0	42°15'51.01"N	83°46'1.90"W

Exhibit C - Verified CH4 Emission Locations Notes

DATE	#	Street	Suf	Notes	DBH	SPECIES	
12/6/23	3317	Alton	Ct	25% in lawn			called in 12/6/23 11:58
11/14/23	806	Amherst	Rd	25% in plant bed	8	UNK	
11/17/23	1260	Barrister	Rd	2-8 ppm by light pole near driveway			
11/14/23	221	Barton	Dr	95% at curb			
11/14/23		Barton	Dr	50% at curb			
11/14/23	1335	Bird	Rd	20% at curb possible pourus main multiple leaks			
11/14/23	3022	Bluett	Rd	40% by curb	14	UNK	empty tree pit
11/13/23		Cambridge	Rd	70% near fire hydrant			
11/15/23	2750	Canterbury	Dr	30% by curb	30, 30	maple	
11/15/23	2851	Canterbury	Dr	90% by fire hydrant			
11/14/23	1715	Chandler	Rd	15% by driveway			
11/14/23	1717	Chandler	Rd	50% in grass near removed tree	4	UNK	ing, recent planting , rem
11/14/23		Chandler	RD	40% at curb	28	UNK	
11/14/23		Chandler	RD	70% by driveway	9	UNK	
11/17/23	3640	Chatham	Wy	60% gas detected 1' west of tree	14	Honey Locust	
11/15/23	2810	Cranbrook	Rd	90% by stump	34	UNK	Called in 12/4/23
11/13/23	1914	Day	St	45% by driveway	30,30,8,2, 2	UNK	alled in to DET 12:10 PM
11/15/23		Delaware	Dr	5% at handicapped ramp			
11/17/23	1919	Green	Rd	25' south of wooden pole 15% in grass			
11/17/23	3562	Green Brier	BL	90% east side of tree	16	ELM	
11/15/23	2071	Greenview	DR	3.5 ppm by vented sewer manhole possible sewer gas			
11/13/23	1710	Ives	Ln	10 ppm strong odor at catch basin			
11/17/23		Larchmont	Dr	Slight read 4 ppm from catch basin may not be pipeline gas			
11/14/23		Manor	Dr	50% by curb	24, 36	Maples	
11/13/23	1038	Martin	Pl	11% by curb	6	unk	
11/13/23	1048	Martin	Pl	40% by driveway	14	Maple	

11/15/23		MCComb	St	35% at curb			
11/14/23	2354	Newport	Rd	40% at curb	40	NK double trur	
11/13/23	1001	Oakland	Av	70% near curb	2, 20	UNK	
11/13/23	258	Orchard Hills	Dr	70% by driveway			
11/13/23	2719	Overidge	Dr	30% 10' west of mailbox			
11/13/23	2735	Overidge	Dr	40% near curb			
11/17/23	3515	Paisley	Ct	slight repeat read 5ppm near tree			
11/14/23		Pontiac	Tr	45% by curb	old stump	UNK	
11/15/23	3090	Rosedale	St	40% at curb			
11/15/23	3180	Rosedale	St	40% at curb near tree	36	Chinese Elm	
11/14/23	3205	Rumsey	Dr	50% by sidewalk	10, 12	unk	
11/15/23	2885	Sharon	Dr	70% in vegetation burn by driveway 20% across street by tree	24	London Plane	
11/15/23	2986	Sharon	Dr	60% at vegetation burn			
11/15/23	2989	Sharon	Dr	30% at curb in vegetation burn			
11/15/23		Sharon	Dr	10% at patch in street			
11/15/23		Sharon	Dr	5% by patch in street			
11/15/23	2230	South Seventh	St	15% in street by patch			
11/14/23	821	Starwick	Rd	10 ppm at catch basin possible not pipeline gas			
11/14/23	2265	Stellar	St	75% at curb	36	London Plane	private tree
11/15/23	2846	Verle	St	20% by driveway			
11/15/23	2850	Verle	St	20% by driveway			
11/15/23		Westfield	Av	15% at curb by tree	9	Honey Locust	
11/15/23		Westfield	Av	open DET jobsite did not test			
11/17/23	3510	Windemere	Dr	5% in grass			

Exhibit D - Elevated Methane Locations to be Tested

Date	St #	Street	St Suf	Block	Block	LAT	LONG
11/9/23		Alhambra Drive	Drive	Sue PKWY		42°15'54.68"N	83°46'22.03"W
11/9/23		Alhambra Drive	Drive	Coronada		42°15'54.13"N	83°46'15.25"W
11/14/23		Andover	Road	Burgundy		42°17'25.67"N	83°41'46.77"W
11/9/23		Arbordale	Road	Lenox St		42°16'15.35"N	83°46'15.16"W
11/7/23		Arella	BLVD	Pauline BLVD		42°16'3.53"N	83°45'58.66"W
11/9/23		Avondale	Ave	Runneymeade BLVD		42°15'39.95"N	83°46'15.47"W
11/14/23		Barclay	Court	Fox Hunt Road		42°17'6.44"N	83°41'28.68"W
11/14/23		Bardstown	Trail	Windemere Drive		42°17'23.86"N	83°41'24.56"W
11/9/23		Barrington	Place	Weldon BLVD		42°15'35.72"N	83°46'24.08"W
11/12/23		Barton	Drive	Pontiac Trail		42°18'1.98"N	83°44'10.76"W
11/12/23		Barton	Drive	Willow Lane		42°17'48.15"N	83°43'51.23"W
11/10/23		Bellwood	Ave	Norwood St		42°14'52.65"N	83°41'46.81"W
11/10/23		Bellwood	Ave	Oakwood Ave		42°14'57.16"N	83°41'46.95"W
11/12/23		Cambridge	Road	Lincoln Ave		42°16'13.98"N	83°43'47.15"W
11/10/23		Camelot	Road	Kimberly		42°15'13.82"N	83°43'2.40"W
11/14/23		Charter	Place	Bardstown Trail		42°17'19.05"N	83°41'22.61"W
11/14/23		Charter	Place	Windemere Drive		42°17'21.51"N	83°41'19.90"W
11/12/23		Church	Street	Hill Street		42°16'18.69"N	83°44'4.58"W
11/12/23		Church	Street	Roosevelt St		42°16'8.65"N	83°44'3.88"W
11/9/23		Coronada	Drive	Las Vegas Drive		42°15'51.36"N	83°46'11.84"W
11/9/23		Coronada	Drive	Sue PKWY		42°15'51.08"N	83°46'23.22"W
11/6/23		Dellwood	Drive	Hollywood Drive		42°17'21.86"N	83°47'13.80"W
11/6/23		Dexter	Ave	Dellwood Drive		42°17'16.85"N	83°47'14.31"W
11/6/23		Dexter	Ave	N. Maple		42°17'6.78"N	83°46'46.29"W
11/10/23		Dorchester	Road	Towner Road		42°15'8.79"N	83°42'34.91"W
11/9/23		Dunmore	Road	Waverly Road		42°15'30.58"N	83°46'22.74"W
11/11/23		East Hoover	Ave	Sybil		42°16'10.47"N	83°44'31.81"W
11/11/23		East Stadium	BLVD	Baldwin Ave		42°15'39.41"N	83°43'33.05"W
11/11/23		East Stadium	BLVD	Brockman BLVD		42°15'39.79"N	83°43'12.33"W
11/11/23		East Stadium	BLVD	Ferdon		42°15'39.29"N	83°43'27.85"W
11/10/23		Eli	Road	Lillian Road		42°14'59.71"N	83°41'12.42"W
11/10/23		Fernwood	Ave	Oakwood Ave		42°14'58.53"N	42°14'58.53"N
11/11/23		Geddes	Ave	Rock Creek Rd		42°16'23.34"N	83°42'47.92"W
11/11/23		Geddes Heights	Road	Geddes Ave		42°16'35.65"N	83°43'31.87"W

11/9/23		Glenleven	Road	Greenview Drive		42°15'37.04"N	83°45'51.62"W
11/9/23		Granada	Ave	Palomar Drive		42°15'46.94"N	83°46'11.34"W
11/14/23		Green	Road	Hubbard Road		42°17'40.25"N	83°41'32.85"W
11/14/23		Green	Road	Vintage Valley Rd		42°17'33.70"N	83°41'32.96"W
11/9/23		Greenview	Drive	S. Seventh St		42°15'16.71"N	83°45'47.39"W
11/9/23		Hanover	Road	Waverly Road		42°15'27.17"N	83°46'13.64"W
11/12/23		Harbal	Drive	Broadway St		42°17'44.81"N	83°43'45.60"W
11/11/23		Harding	Road	Morton Ave		42°15'46.11"N	83°43'21.36"W
11/11/23		Harvard	Place	Geddes Ave		42°16'33.64"N	83°43'18.77"W
11/11/23		Henry	Street	Ferndale Pl		42°15'41.76"N	83°44'3.10"W
11/11/23		Highland	Road	Awixa Road		42°16'37.04"N	83°43'4.41"W
11/11/23		Highland	Lane	Highland Road		42°16'35.04"N	83°43'14.79"W
11/11/23		Hunting Valley	Road	Foxcroft Rd		42°16'1.28"N	83°42'6.59"W
11/12/23		Indianola	Ave	Chandler RD		42°17'47.41"N	83°44'18.13"W
11/6/23		Jackson	Ave	Pleasant Pl		42°16'51.41"N	83°46'28.77"W
11/7/23		Jewett	Ave	Page Ave		42°15'14.06"N	83°43'51.58"W
11/12/23		Jones	Drive	Broadway St		42°17'32.07"N	83°44'5.78"W
11/14/23		MacGregor	Lane	Chatham Way		42°17'39.03"N	83°41'26.51"W
11/7/23		Madison	Place	W. Madison		42°16'23.62"N	83°45'35.26"W
11/10/23		Manchester	Road	Medford		42°15'26.99"N	83°42'38.45"W
11/10/23		Maplewood	Ave	Edgewood Ave		42°15'3.57"N	83°41'51.58"W
11/10/23		Maplewood	Ave	Norwood Ave		83°42'39.68"W	83°41'51.26"W
11/9/23		Maywood	Ave	West Stadium BLVD		42°15'47.73"N	83°45'57.83"W
11/12/23		Murfin	Ave	Hubbard Road		42°17'41.15"N	83°43'9.08"W
11/10/23		Needham	Road	Medford Road		42°15'26.60"N	83°42'52.35"W
11/9/23		Normandy	Road	Greenview Drive		42°15'33.35"N	83°45'56.88"W
11/12/23		Norway	Road	Fair Oaks PKWY		42°16'5.52"N	83°43'27.08"W
11/12/23		Oakland	Ave	Monroe St		42°16'21.64"N	83°44'22.08"W
11/10/23		Oakwood	Street	Yost BLVD		42°15'1.08"N	83°41'21.20"W
11/12/23		Olivia	Ave	Alley		42°16'17.25"N	83°43'53.53"W
11/11/23		Orchard Hills	Drive	Awixa Road		42°16'35.20"N	83°42'53.77"W
11/10/23		Packard	Street	Nordman RD		42°14'41.84"N	83°42'19.40"W
11/10/23		Packard	Street	Pittsview Rd		42°14'42.94"N	83°41'29.96"W
11/10/23		Packard	Street	Rosewood St		42°15'21.47"N	83°43'35.65"W
11/12/23		Packard	Street	South Fifth Ave		42°16'32.44"N	83°44'47.36"W
11/10/23		Parkwood	Ave	Edgewood Drive	Oakwood	42°15'3.28"N	83°41'42.26"W
11/10/23		Parkwood	Ave	Fernwood		42°15'15.46"N	83°41'31.25"W
11/10/23		Parkwood	Ave	Norwood St		42°14'50.84"N	83°41'42.38"W

11/10/23		Parkwood	Ave	Pittsfield BLVD	Edgewoo d	42°15'9.73"N	83°41'41.66"W
11/10/23		Parkwood	Ave	Pittsfield BLVD		42°15'11.35"N	83°41'39.67"W
11/10/23		Parkwood	Ave	Pittsfield BLVD	Fernwoo d	42°15'13.93"N	83°41'39.33"W
11/9/23		Phoenix	Drive	Varsity Dr		42°13'56.18"N	83°43'41.85"W
11/10/23		Pittsfield	Blvd	Edgewood Dr		42°15'7.17"N	83°41'34.80"W
11/10/23		Pittsfield	Blvd	Norwood St		42°14'51.79"N	83°41'34.10"W
11/10/23		Pittsfield	Blvd	Richard St		42°15'2.05"N	83°41'33.20"W
11/12/23		Plymouth	Road	Bishop St		42°17'57.18"N	83°42'59.64"W
11/12/23		Plymouth	Road	Huron PKWY		42°18'9.81"N	83°42'15.15"W
11/12/23		Plymouth	Road	Jones	Gordon	42°17'37.86"N	83°44'3.84"W
11/12/23		Plymouth	Road	Prairies St		42°18'9.81"N	83°42'7.88"W
11/9/23		Research Park	Drive	State St		42°13'54.92"N	83°44'19.56"W
11/9/23		Research Park	Drive	State St		42°13'55.28"N	83°44'12.55"W
11/11/23		Rock Creek	Drive	Huntington Dr		42°16'33.38"N	83°42'45.48"W
11/9/23		Saxon	Street	Waltham Drive		42°15'28.02"N	83°46'36.81"W
11/6/23		Sequoia	PKWY	North Maple Road		42°17'37.43"N	83°46'54.78"W
11/12/23		Shadford	Road	Brockman BLVD		42°15'43.18"N	83°43'14.02"W
11/7/23		Soule	BLVD	West Liberty		42°16'36.36"N	83°45'51.05"W
11/7/23		South Ashley	Street	West Madison		42°16'26.71"N	83°44'58.36"W
11/11/23		South Fifth	Street	John St		42°16'22.97"N	83°44'47.03"W
11/7/23		South Main	Street	East Madison		42°16'31.02"N	83°44'55.59"W
11/12/23		South Main	Street	East William St		42°16'40.61"N	83°44'55.31"W
11/7/23		South Revanna	BLVD	West Washington		42°16'51.54"N	83°45'56.21"W
11/7/23		South Seventh	Street	W. Huron		42°16'52.38"N	83°45'30.96"W
11/7/23		South Seventh	Street	Potter Ave		42°16'0.11"N	83°45'29.64"W
11/7/23		South State	Street	Monroe St		42°16'24.17"N	83°44'26.93"W
11/10/23		State	Street	Stimson St		42°15'36.96"N	83°44'25.40"W
11/14/23		Sturbridge	Court	Bardstown Trail		42°17'22.05"N	83°41'26.97"W
11/14/23		Sulgrave	Place	Barrister Road		42°17'32.53"N	83°41'22.05"W
11/12/23		Tappan	Ave	Oakland Av		42°16'14.48"N	83°44'11.95"W
11/11/23		Vinewood	Road	Berkshire Road		42°16'12.74"N	83°43'12.62"W
11/12/23		Washtenaw	Ave	Brockman BLVD		42°15'57.88"N	83°43'11.04"W
11/12/23		Washtenaw	Ave	Manchester Road		42°15'32.87"N	83°42'37.21"W
11/12/23		Washtenaw	Ave	Platt Road		42°15'27.88"N	83°42'3.07"W
11/12/23		Washtenaw	Ave	Tuomy		42°15'51.64"N	83°43'4.36"W
11/12/23		Washtenaw	Ave	Vinewood BLVD		42°16'13.58"N	83°43'32.13"W
11/9/23		Weldon	BLVD	Glastonbury Road		42°15'36.10"N	83°46'18.60"W

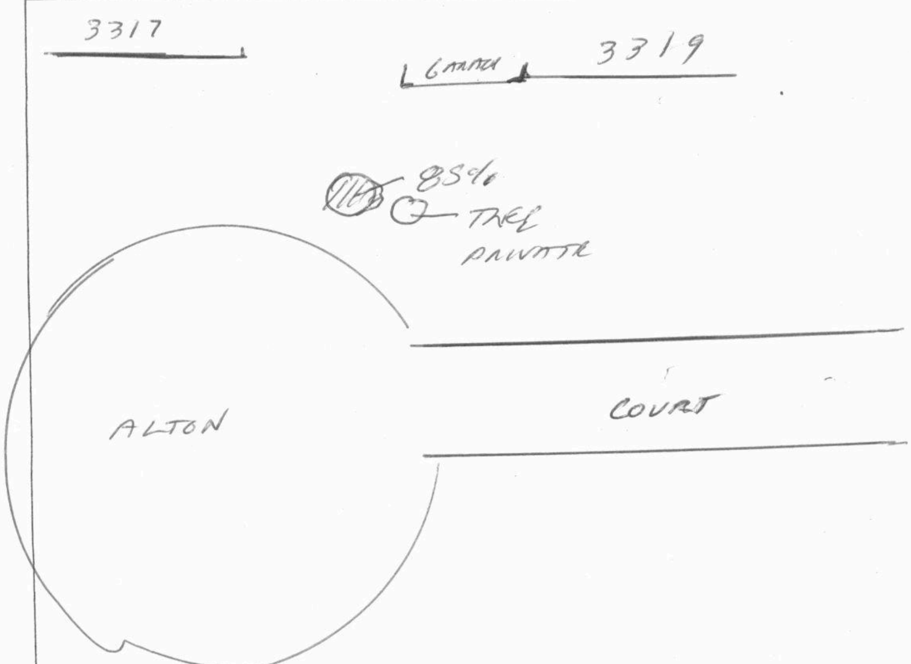
11/12/23		Wells	Street	South Forest St		42°16'0.92"N	83°43'57.53"W
11/11/23		White	Street	Arch Street		42°16'7.22"N	83°44'21.52"W
11/10/23		Whitewood	Street	Oakwood Street		42°14'54.38"N	83°41'27.41"W
11/12/23		Woodstock	Road	Copley Ave		42°15'47.66"N	83°43'15.11"W
11/14/23		Wynnstone	Drive	Fairmount Drive		42°17'25.88"N	83°41'8.58"W
11/10/23		Yorkshire	Road	Dorchester Road		42°15'9.68"N	83°42'44.37"W

Exhibit E - Gas Leak Reports

Gas Safety Incorporated
16 Brook Lane
Southborough, Massachusetts 01772
GasSafetyUSA.com
508-344-9321

Date 12-6-23 **Survey Type** AA **Grade** 2
Address 3317 ALTON COURT
City / Town ANN ARBOR MI

Sketch:



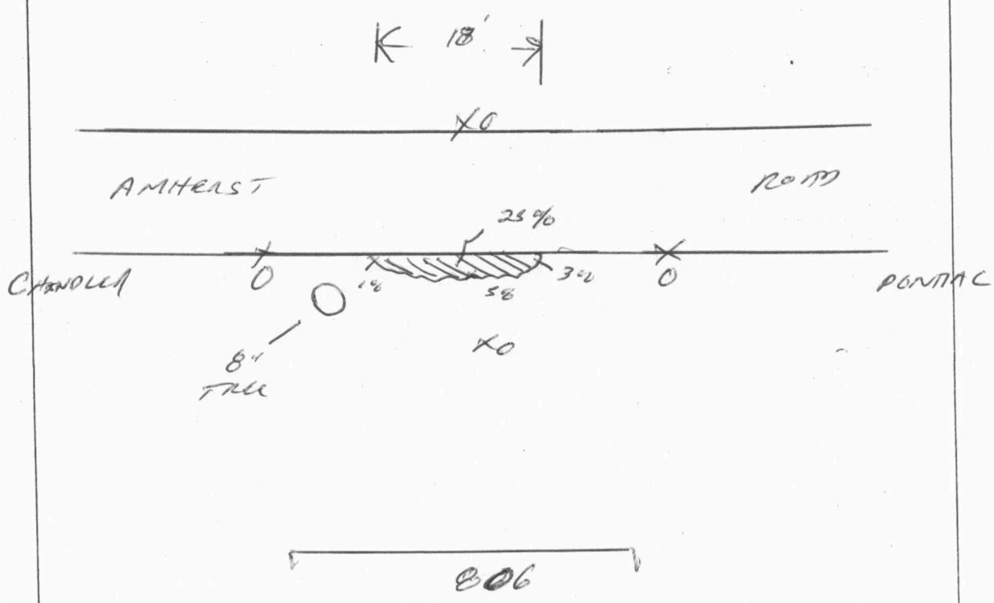
Comments 85% IN VEGETATION DUAN
KATRINE
CALLED IN 11:58

Surveyed By: B. Ackley

Gas Safety Incorporated
16 Brook Lane
Southborough, Massachusetts 01772
GasSafetyUSA.com
508-344-9321

Date 11-14-23 **Survey Type** AA2 **Grade** 3
Address 806 AMHERST ROAD
City / Town ANN ARBOR MI

Sketch:



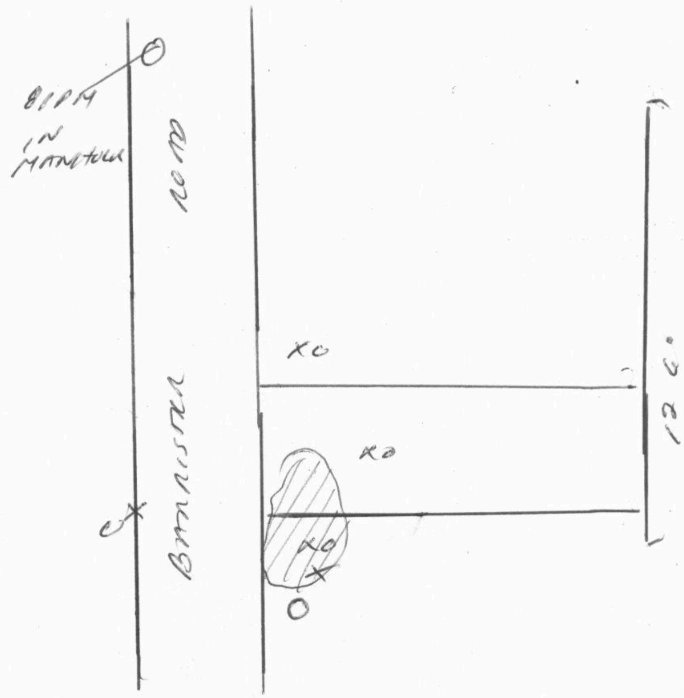
Comments
18 x 3 = 57 SQ FT
8" TREE GAS IN ROOT ZONE

Surveyed By: B Ackley

Gas Safety Incorporated
16 Brook Lane
Southborough, Massachusetts 01772
GasSafetyUSA.com
508-344-9321

Date 11-17-22 **Survey Type** AA **Grade** 3
Address 1260 BARRISTER ROAD
City / Town ANN ARBOR MI

Sketch:



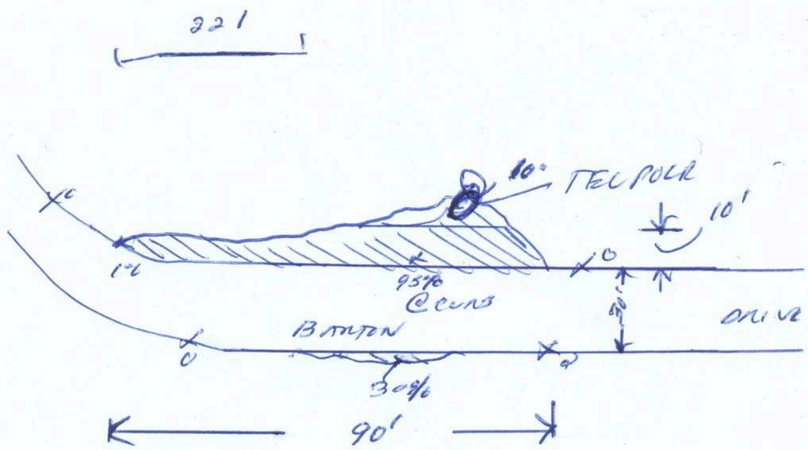
Comments
2-8 PPM BY LIGHT POLE TO DRIVEWAY
POSSIBLE WAFTING FROM ELECTRIC POLE

Surveyed By: B. ACKLEY

Gas Safety Incorporated
16 Brook Lane
Southborough, Massachusetts 01772
GasSafetyUSA.com
508-344-9321

Date 11-14-23 **Survey Type** AA2 **Grade** 3
Address 221 BARTON DRIVE
City / Town ANN ARBOR MI

Sketch:



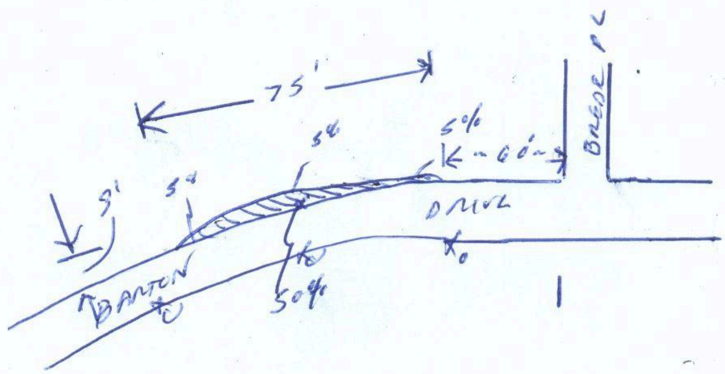
Comments LEAK EXTENT 90 X 40 = 3600 SQ FT

Surveyed By: B. ACKLEY

Gas Safety Incorporated
16 Brook Lane
Southborough, Massachusetts 01772
GasSafetyUSA.com
508-344-9321

Date 11-14-23 **Survey Type** AA2 **Grade** 3
Address BARTON DRIVE WEST OF BREDE PLACE
City / Town ANN ARBOR MI

Sketch:

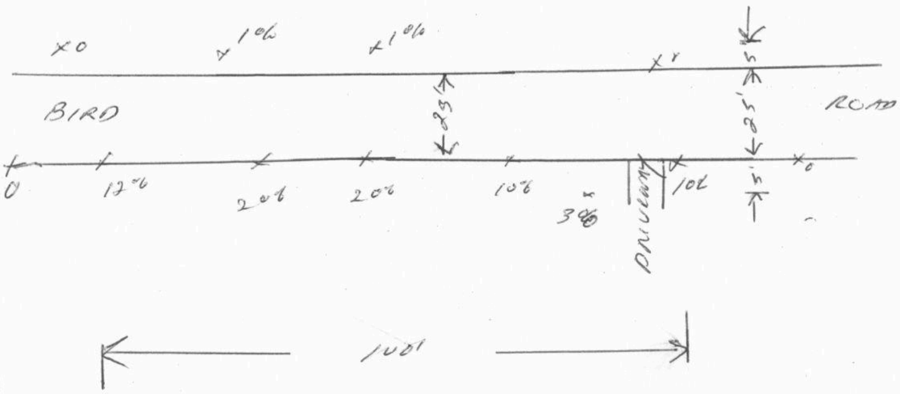


Comments LEAK EXTENT 90X3 = 270 SQ FT

Surveyed By: B. Ackley

Gas Safety Incorporated
16 Brook Lane
Southborough, Massachusetts 01772
GasSafetyUSA.com
508-344-9321

Date 11-14-23 **Survey Type** AA 2 **Grade** 3
Address 1335 BIRD ROAD
City / Town ANN ARBOR MI
Sketch:



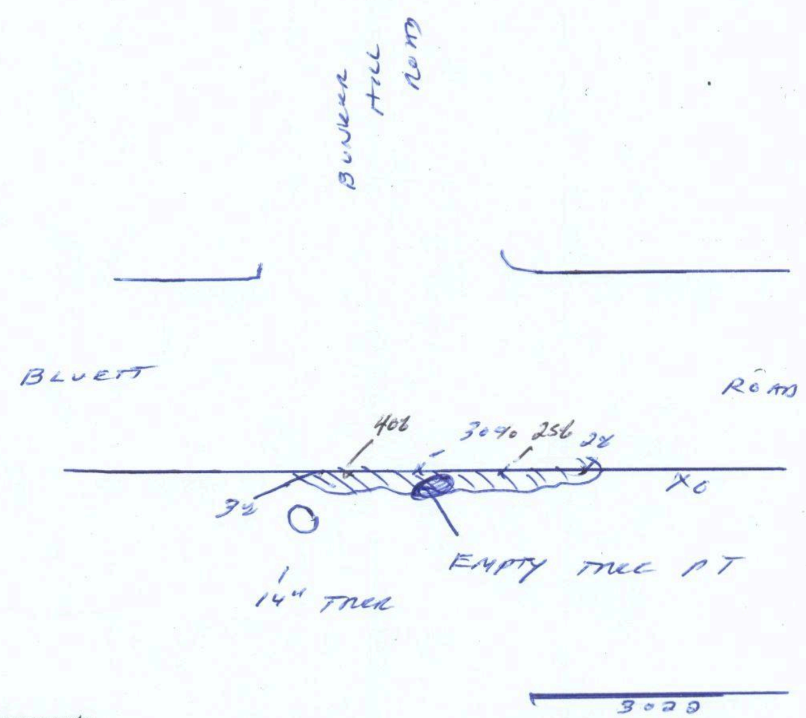
Comments 1335
100 x 35 = 3500 SQ FT

Surveyed By: B. Ackley

Gas Safety Incorporated
16 Brook Lane
Southborough, Massachusetts 01772
GasSafetyUSA.com
508-344-9321

Date 11-14-23 **Survey Type** AA2 **Grade** 3
Address 3022 BLUETT ROAD
City / Town ANN ARBOR MI

Sketch:



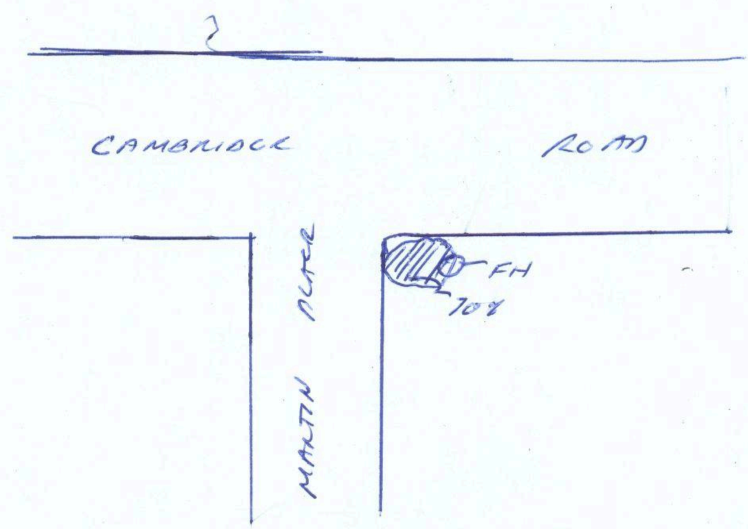
Comments
30 X 3 = 90 SQ FT

Surveyed By: B. ACKLEY

Gas Safety Incorporated
16 Brook Lane
Southborough, Massachusetts 01772
GasSafetyUSA.com
508-344-9321

Date 11-13-23 **Survey Type** AA2 **Grade** 3
Address CAMBRIDGE ROAD @ MARTIN PLACE
City / Town ANN ARBOR MI

Sketch:



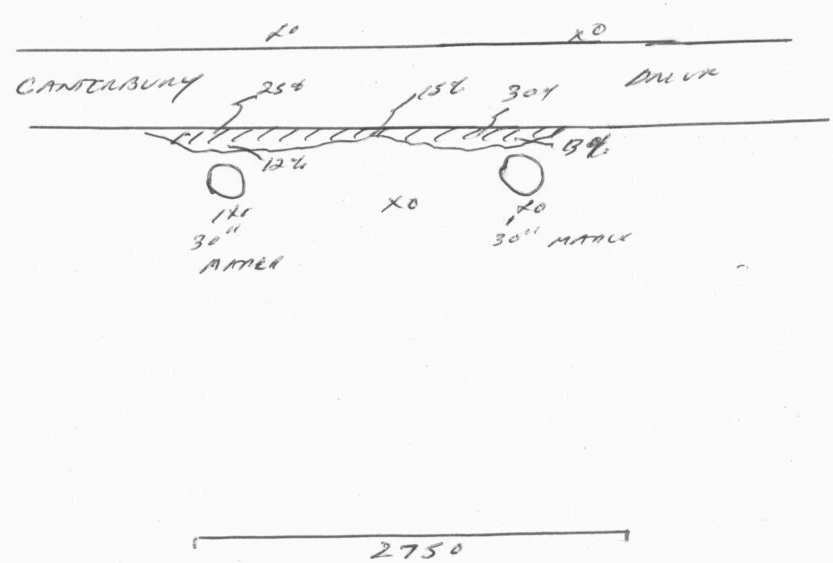
Comments 10 x 5 = 50 SQ FT
70% in vegetation burn by hydrant

Surveyed By: B. Ackley

Gas Safety Incorporated
16 Brook Lane
Southborough, Massachusetts 01772
GasSafetyUSA.com
508-344-9321

Date 11-15-23 **Survey Type** AA2 **Grade** 3
Address 2750 CANTERBURY DRIVE
City / Town ANN ARBOR MI

Sketch:



Comments
POSSIBLE MULTIPLE LEAKS HERE LOTS OF ROOTS
STRONG GAS ODOR

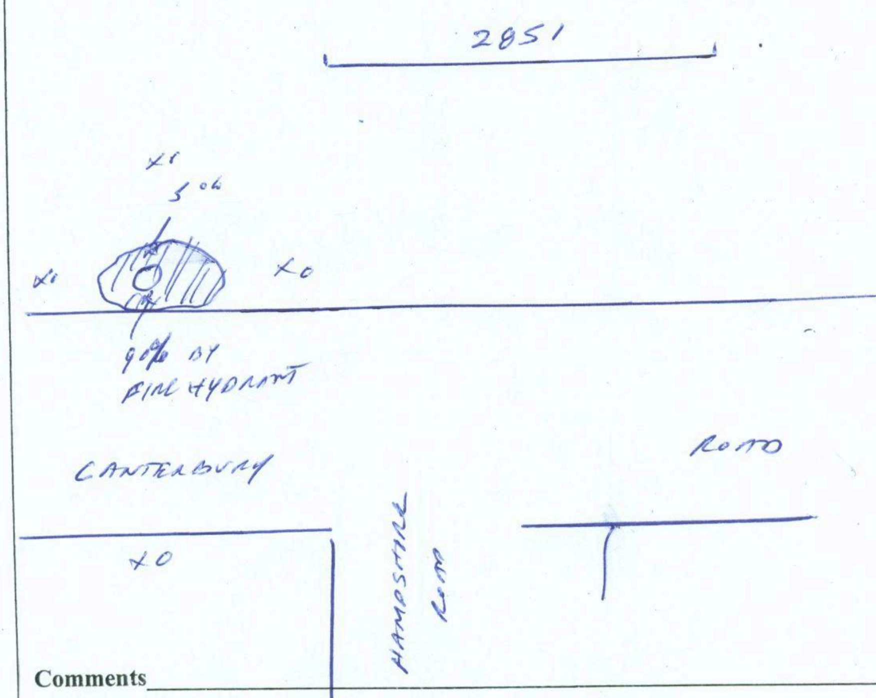
LEAK EXTENT 65x5 = 325 SQ FT

Surveyed By: A. ACKLEY

Gas Safety Incorporated
16 Brook Lane
Southborough, Massachusetts 01772
GasSafetyUSA.com
508-344-9321

Date 11-15-23 **Survey Type** AA 2 **Grade** 3
Address 2851 CANTERBURY ROAD
City / Town ANN ARBOR MI

Sketch:



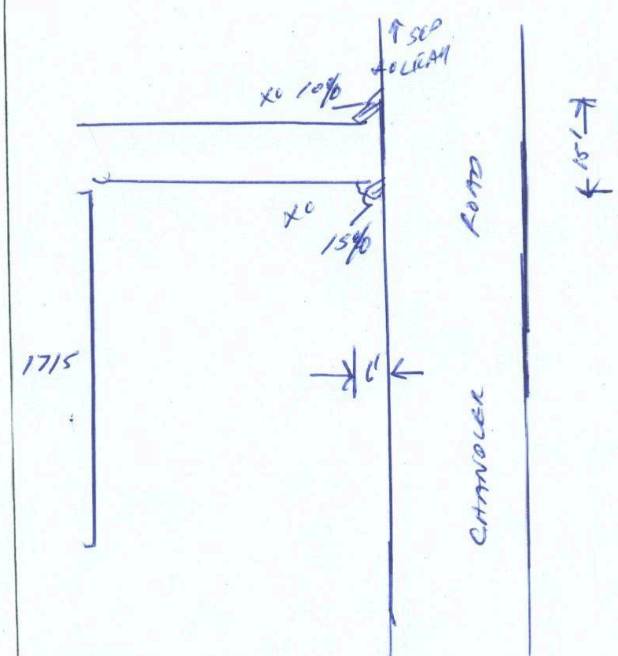
Comments

Surveyed By: B. ACKLEY

Gas Safety Incorporated
16 Brook Lane
Southborough, Massachusetts 01772
GasSafetyUSA.com
508-344-9321

Date 11-14-23 **Survey Type** AA2 **Grade** 3
Address 1715 CHANDLER ROAD
City / Town ANN ARBOR MI

Sketch:

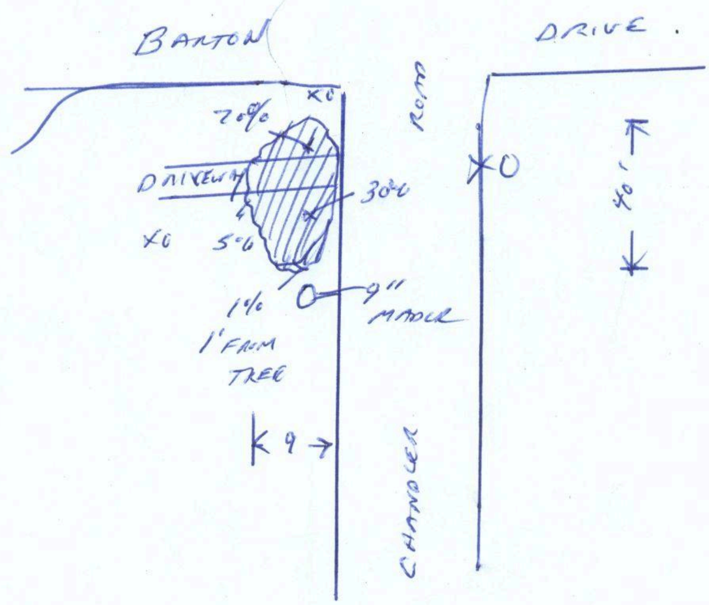


Comments
LEAK EXTENT 6 X 15 = 90

Surveyed By: B ACKLEY

Gas Safety Incorporated
16 Brook Lane
Southborough, Massachusetts 01772
GasSafetyUSA.com
508-344-9321

Date 11-14-23 **Survey Type** AA2 **Grade** 3
Address CHANDLER ROAD @ BARTON DRIVE
City / Town ANN ARBOR MI
Sketch:



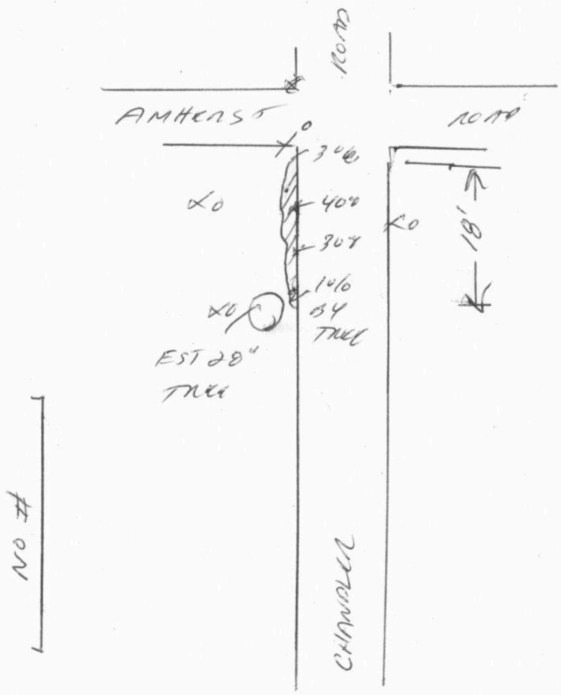
Comments LEAK EXTENT 40 x 9 = 360

9" MAPLE GAS IN ROOT ZONE

Surveyed By: B. Ackley

Gas Safety Incorporated
16 Brook Lane
Southborough, Massachusetts 01772
GasSafetyUSA.com
508-344-9321

Date 11-14-23 **Survey Type** AA2 **Grade** 3
Address CHANDLER ROAD @ AMHERST AVE
City / Town ANN ARBOR MI
Sketch:



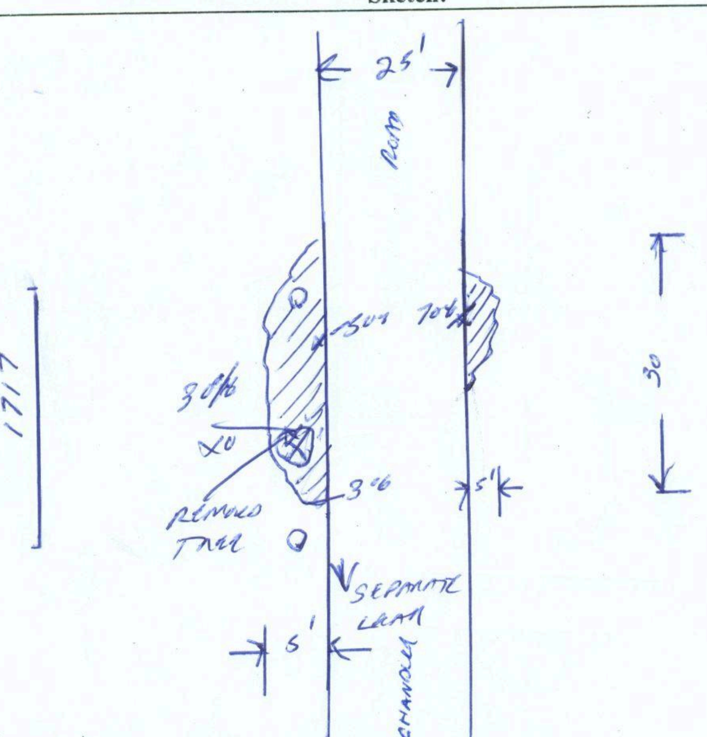
Comments LEAK EXTENT 18 x 2 = 36 SQ FT
GAS IN ROOT ZONE OF ESTIMATED 28" TREE

Surveyed By: B. Ackley

Gas Safety Incorporated
16 Brook Lane
Southborough, Massachusetts 01772
GasSafetyUSA.com
508-344-9321

Date 11-14-23 **Survey Type** AA2 **Grade** 3
Address 1717 CHANDLER ROAD
City / Town ANN ARBOR MI

Sketch:



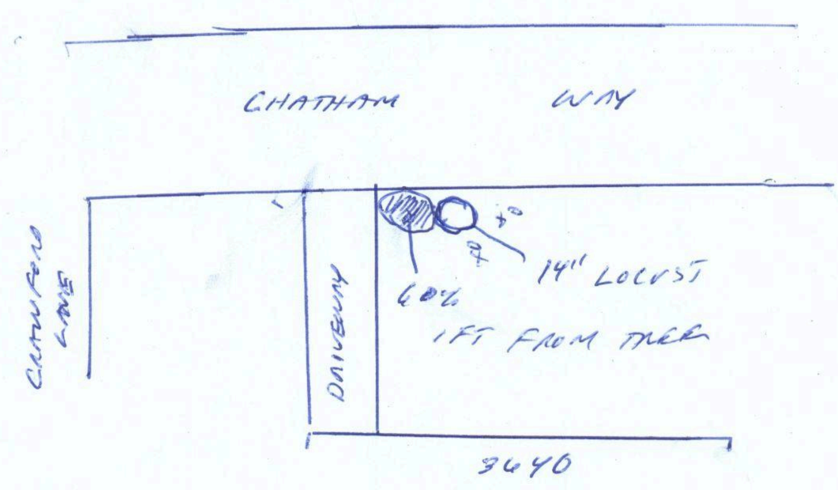
Comments LEAK EXTEN 30 X 35 = 1050 SQ FT
REMOVED TREE NEW PLANTING & RECENT PLANTING

Surveyed By: B. Ackley

Gas Safety Incorporated
16 Brook Lane
Southborough, Massachusetts 01772
GasSafetyUSA.com
508-344-9321

Date 11-16-23 **Survey Type** AA **Grade** 3
Address 3640 CHATHAM WAY
City / Town ANN ARBOR MI

Sketch:



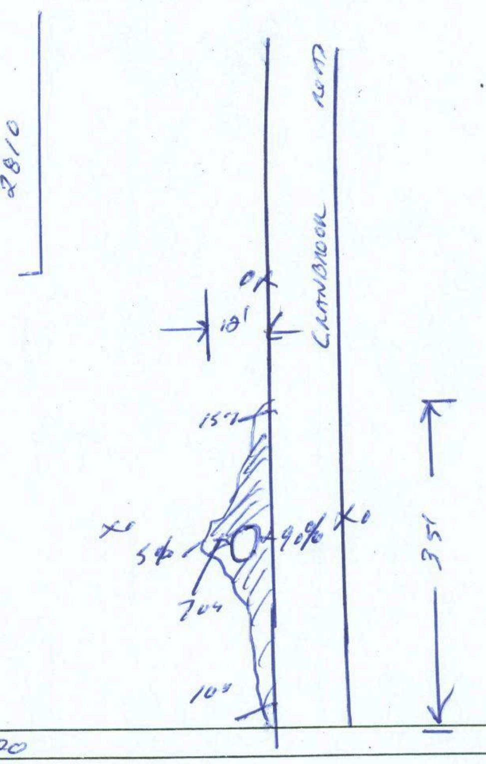
Comments 60% GAS BY BASE OF EST 14" TREE
SMALL MIGRATION AREA WITH ROOTS

Surveyed By: B. Ackley

Gas Safety Incorporated
16 Brook Lane
Southborough, Massachusetts 01772
GasSafetyUSA.com
508-344-9321

Date 11-15-23 **Survey Type** AA2 **Grade** 3
Address 2810 CRANBROOK ROAD
City / Town ANN ARBOR MI

Sketch:



Comments
35 x 12 = 420
STRONG ODOR

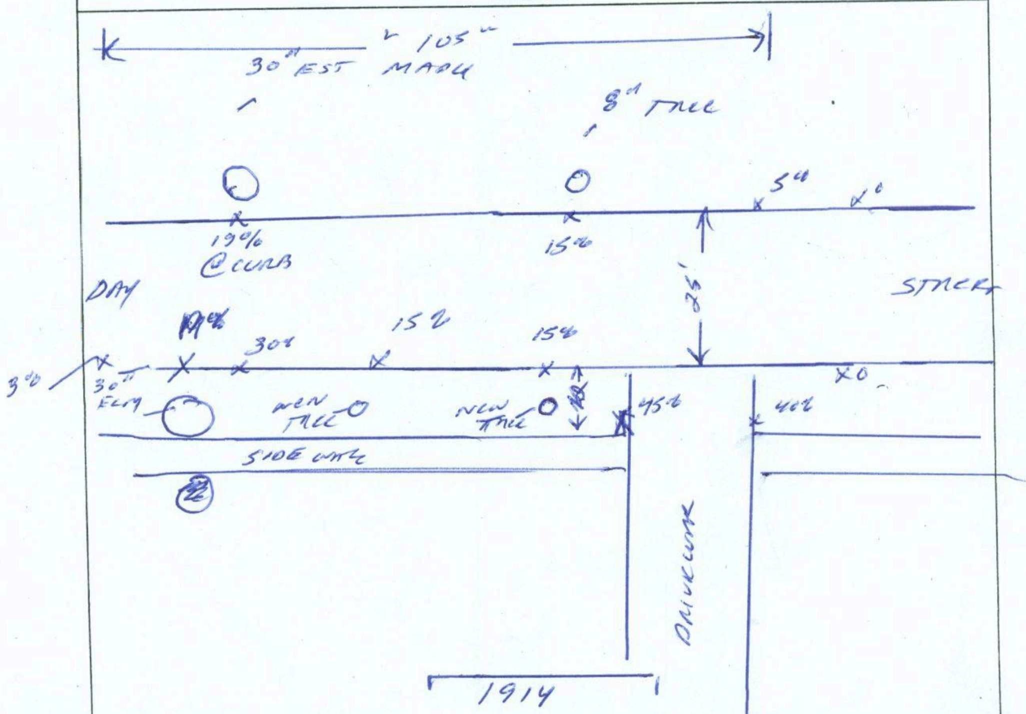
12/4/23 ANTHONY 1:04 PM

Surveyed By: B. ACKLEY

Gas Safety Incorporated
16 Brook Lane
Southborough, Massachusetts 01772
GasSafetyUSA.com
508-344-9321

Date 11-13-24 **Survey Type** AA2 **Grade** 2
Address 1914 DAY STREET
City / Town ANN ARBOR MI

Sketch:



Comments LEAK EXTENT 105 X 37 = 3885

POSSIBLE MULTIPLE LEAKS HERE
LARGE TREE REMOVED 2 NEW PLANTINGS
5 AFFECTED TREES

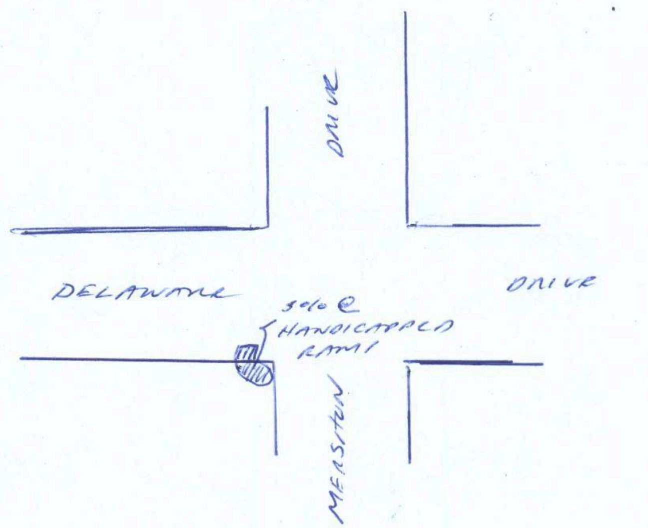
Surveyed By: B. ACKLEY

CALLED IN 1216

Gas Safety Incorporated
16 Brook Lane
Southborough, Massachusetts 01772
GasSafetyUSA.com
508-344-9321

Date 11-15-23 **Survey Type** AA 2 **Grade** 3
Address DELAWARE DRIVE @ MEASHON DRIVE
City / Town ANN ABOR MI

Sketch:



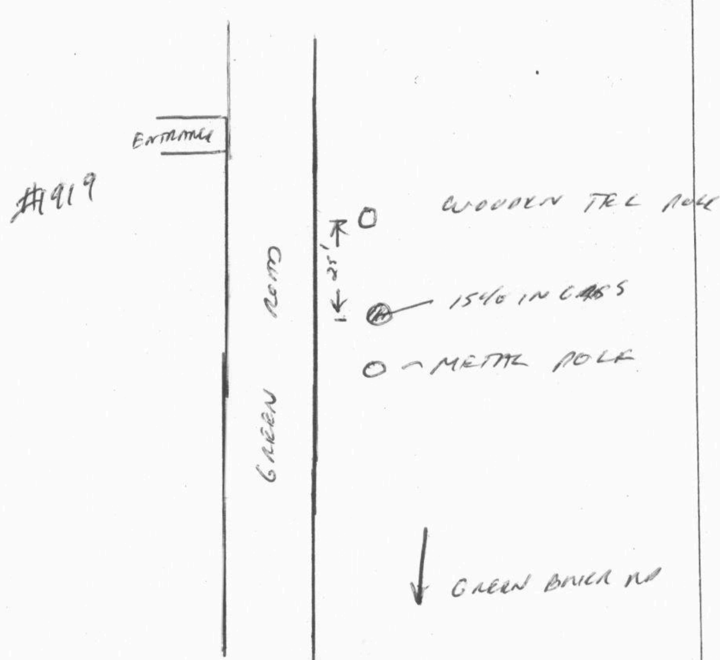
Comments
5x5 = 25 SQFT
ODOR @ CATCH BASIN

Surveyed By: B. Ackley

Gas Safety Incorporated
16 Brook Lane
Southborough, Massachusetts 01772
GasSafetyUSA.com
508-344-9321

Date 11-17-23 **Survey Type** AA **Grade** ____
Address 919 GREEN ROAD NORTH OF GREEN BRIER LN
City / Town ANN ARBOR MI

Sketch:



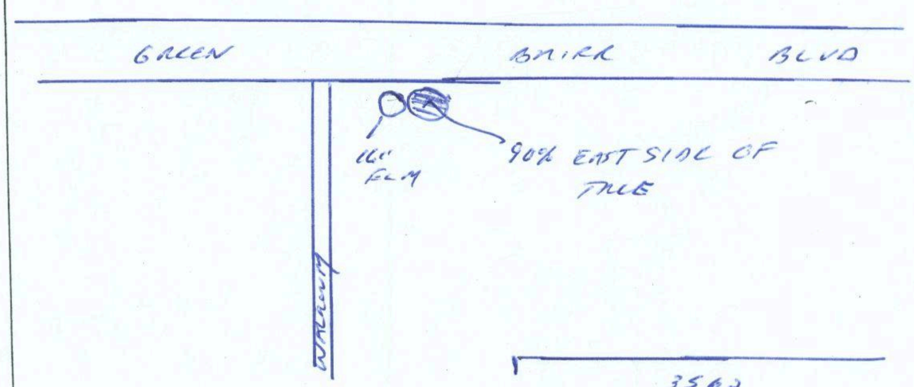
Comments
5x5 25 SQ FT

Surveyed By: B. Ackley

Gas Safety Incorporated
16 Brook Lane
Southborough, Massachusetts 01772
GasSafetyUSA.com
508-344-9321

Date 11-16-23 **Survey Type** AA **Grade** 3
Address 3562 GREEN BRIER BLVD
City / Town ANN ARBOR MI

Sketch:



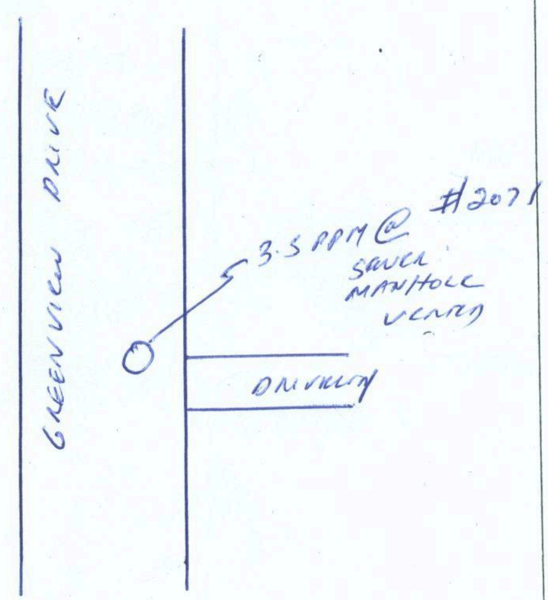
Comments
23 SQ FT 90% GAS RECORDED 3' EAST OF EST 16" ELM TREE

Surveyed By: B. Ackley

Gas Safety Incorporated
16 Brook Lane
Southborough, Massachusetts 01772
GasSafetyUSA.com
508-344-9321

Date 11-15-23 **Survey Type** AA2 **Grade** 3
Address 2071 GREENVIEW ~~ROAD~~ DRIVE
City / Town ANN ARBOR MI

Sketch:



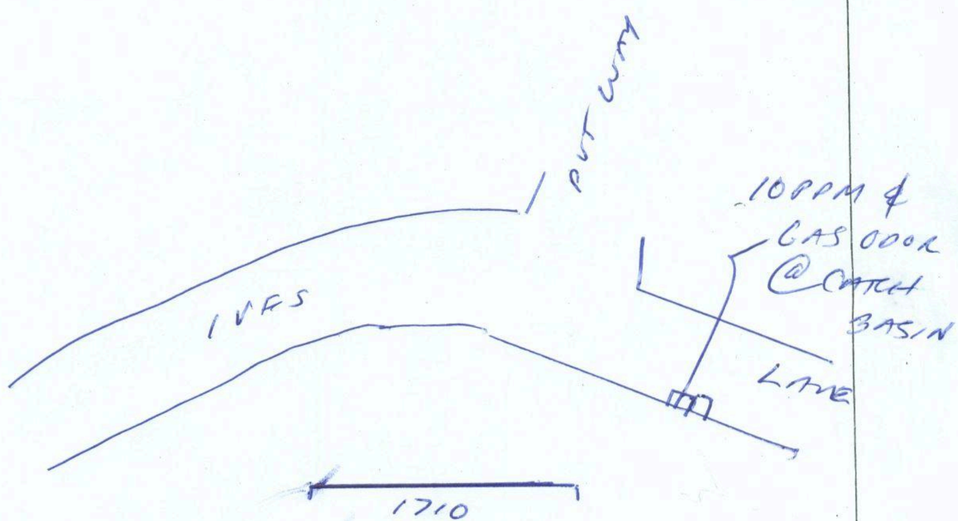
Comments 3.5 PPM IN SEWER MANHOLE

Surveyed By: B. Ackley

Gas Safety Incorporated
16 Brook Lane
Southborough, Massachusetts 01772
GasSafetyUSA.com
508-344-9321

Date 11-13-23 **Survey Type** AA2 **Grade** 3
Address 1710 IVES LANE
City / Town ANN ARBOR MA

Sketch:



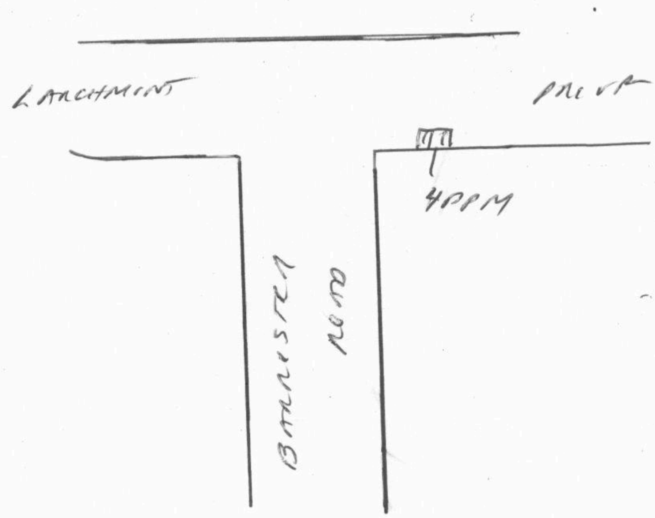
Comments

Surveyed By: B. Ackley

Gas Safety Incorporated
16 Brook Lane
Southborough, Massachusetts 01772
GasSafetyUSA.com
508-344-9321

Date 11-17-23 **Survey Type** AA **Grade**
Address LARCHMONT DRIVE BY BARRISTER ROAD
City / Town ANN ARBOR MI

Sketch:



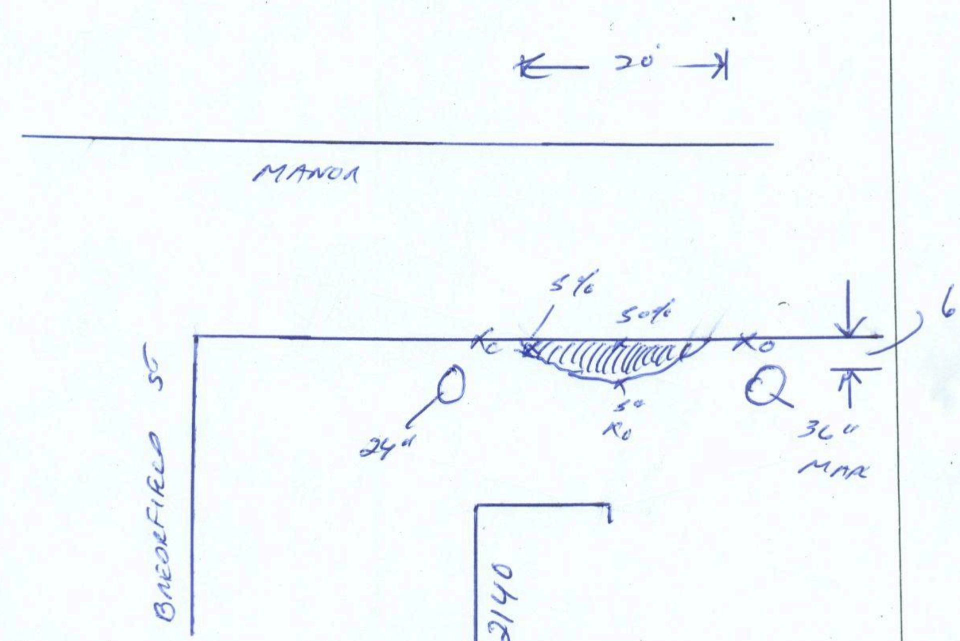
Comments REPEAT READ FROM CATCH BASIN

Surveyed By: B. ACKLEY

Gas Safety Incorporated
16 Brook Lane
Southborough, Massachusetts 01772
GasSafetyUSA.com
508-344-9321

Date 11-14-23 **Survey Type** AA2 **Grade** 3
Address MANOR DRIVE BY BREDEFIELD STREET
City / Town ANN ARBOR MI

Sketch:



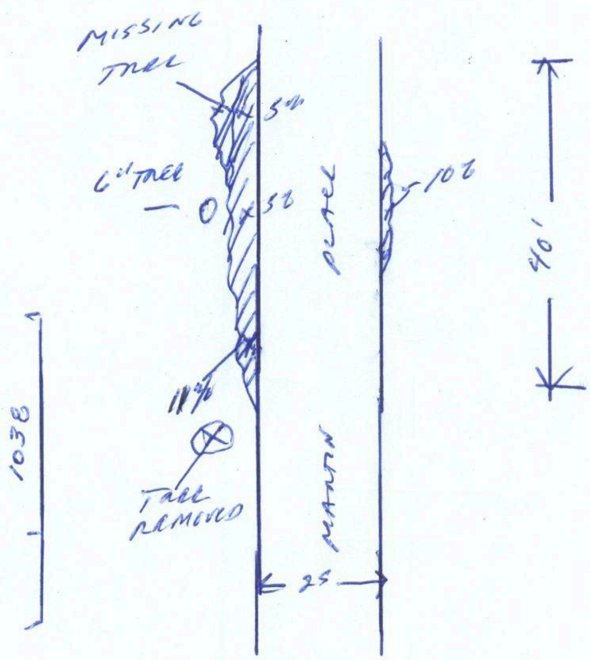
Comments
LEAK EXTENT 20 x 6 = 120 SQ FT
2 TREES GAS IN ROOT ZONES

Surveyed By: B. ACKLEY

Gas Safety Incorporated
16 Brook Lane
Southborough, Massachusetts 01772
GasSafetyUSA.com
508-344-9321

Date 11-15-23 **Survey Type** AA2 **Grade** 3
Address 1038 ~~Baldwin~~ Martin Place
City / Town Ann Arbor MI

Sketch:



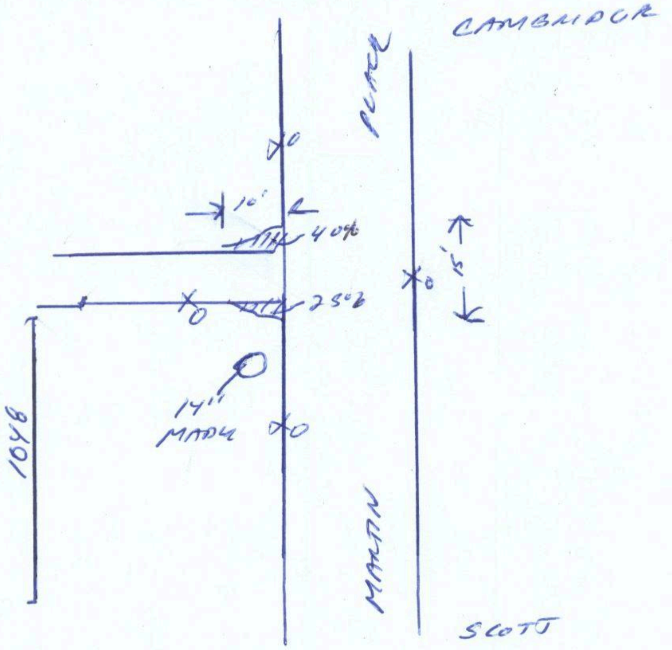
Comments 25 x 40 = ~~900~~ 1000 SQ FT

Surveyed By: B. Ackley

Gas Safety Incorporated
16 Brook Lane
Southborough, Massachusetts 01772
GasSafetyUSA.com
508-344-9321

Date 11-13-23 **Survey Type** AA 2 **Grade** 3
Address 1048 MARTIN PLACE
City / Town ANN ARBOR MI

Sketch:



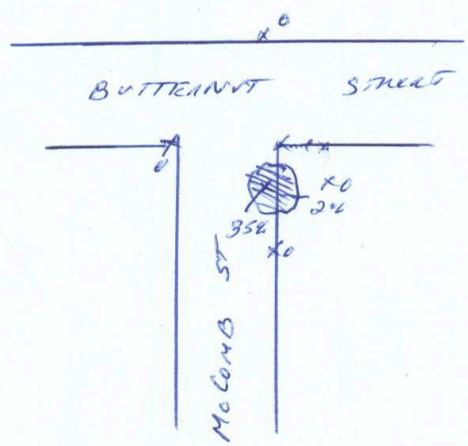
Comments
10 X 15 = 150 SQ FT
GAS IN ROOT ZONE OF 14" MAPLE

Surveyed By: B. ACKLEY

Gas Safety Incorporated
16 Brook Lane
Southborough, Massachusetts 01772
GasSafetyUSA.com
508-344-9321

Date 11-15-21 **Survey Type** AA **Grade** 3
Address McComb Street @ Butternut Street
City / Town Ann Arbor MI

Sketch:



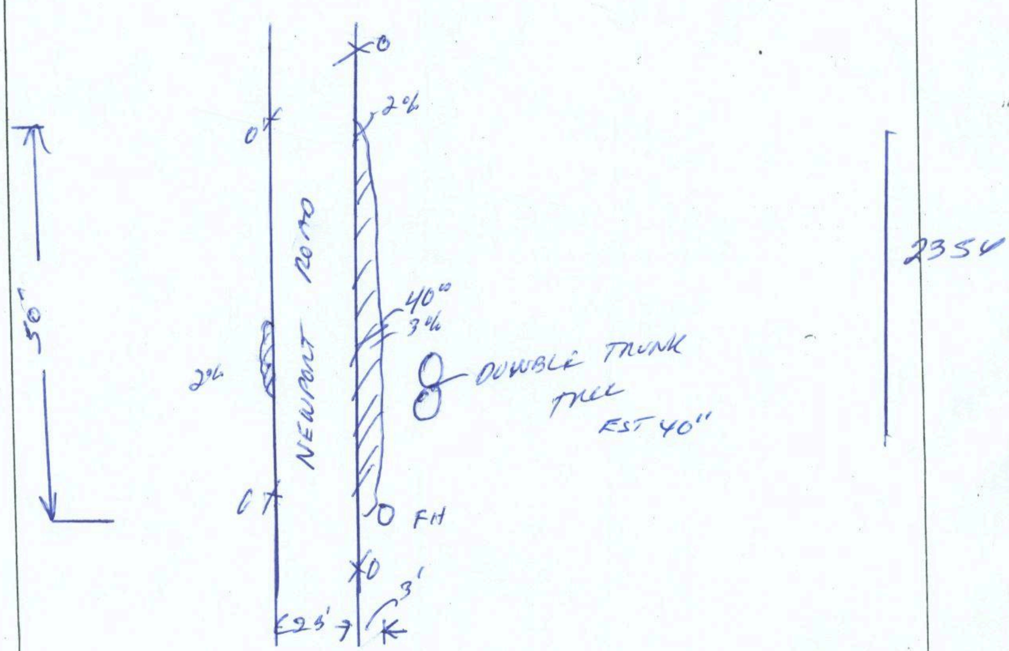
Comments
LEAK EXTENT 5x5 = 25 SQ FT

Surveyed By: B. Ackley

Gas Safety Incorporated
16 Brook Lane
Southborough, Massachusetts 01772
GasSafetyUSA.com
508-344-9321

Date 11-14-23 **Survey Type** AA 2 **Grade** 3
Address 2354 NEWPORT ROAD
City / Town ANN ARBOR MI

Sketch:



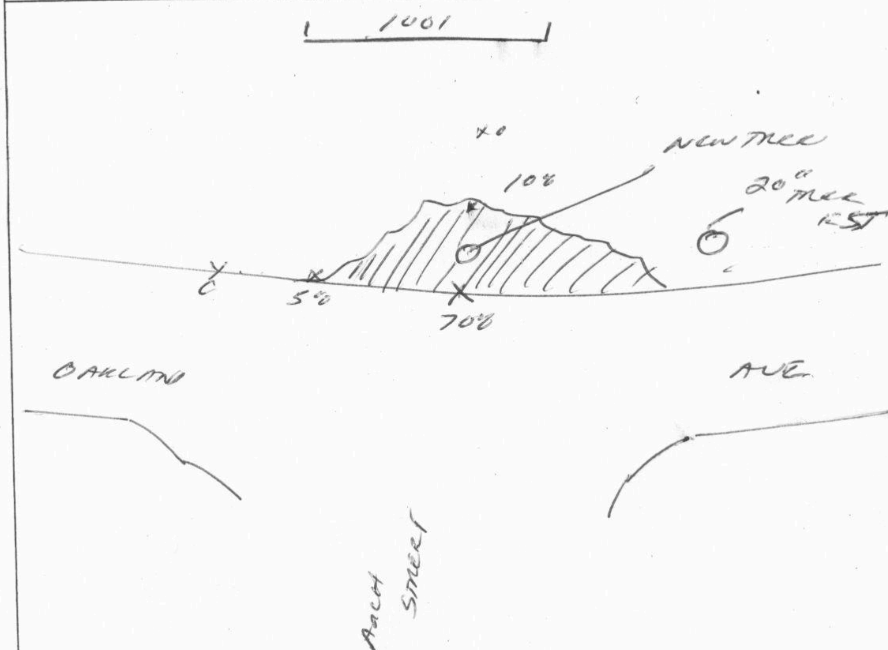
Comments 50 x 28 = 1400 - STRONG ODOR

Surveyed By: B. ACKLEY

Gas Safety Incorporated
16 Brook Lane
Southborough, Massachusetts 01772
GasSafetyUSA.com
508-344-9321

Date 11-13-23 **Survey Type** AA2 **Grade** 2
Address 1001 OAKLAND AVE @ ARCH STREET
City / Town ANN ARBOR MI

Sketch:



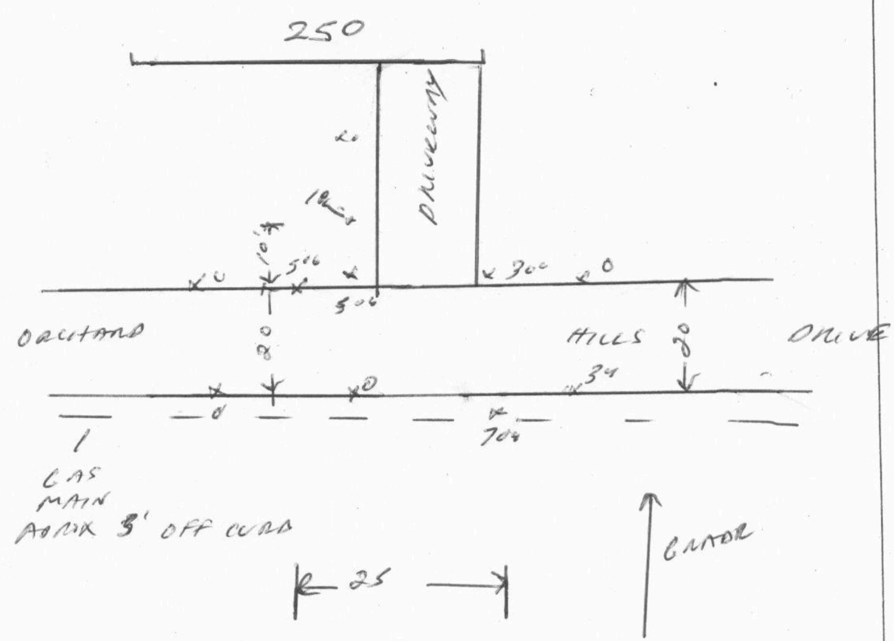
Comments NEW TREE IN GAS 20" TREE GAS IN ROOT ZONE/DRIPLINE
20 X 55 = 1100 SQ FT
1:31 ALLISON

Surveyed By: B. Ackley

Gas Safety Incorporated
16 Brook Lane
Southborough, Massachusetts 01772
GasSafetyUSA.com
508-344-9321

Date 11-13-23 **Survey Type** AA **Grade**
Address 250 ORCHARD HILLS DRIVE
City / Town ANN ARBOR MI

Sketch:



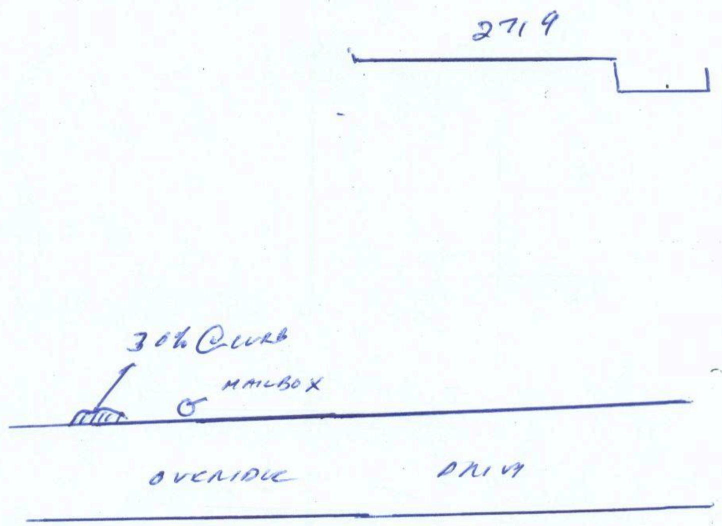
Comments
LEAK EXTENT 35 X 25 = 875
POSSIBLE SERVICE LEAK TO # 250 - UPHILL GRADE

Surveyed By: B. Ackley

Gas Safety Incorporated
16 Brook Lane
Southborough, Massachusetts 01772
GasSafetyUSA.com
508-344-9321

Date 11-13-23 **Survey Type** AA2 **Grade** 3
Address 2719 OVERRIDGE DRIVE
City / Town ANN ARBOR MI

Sketch:



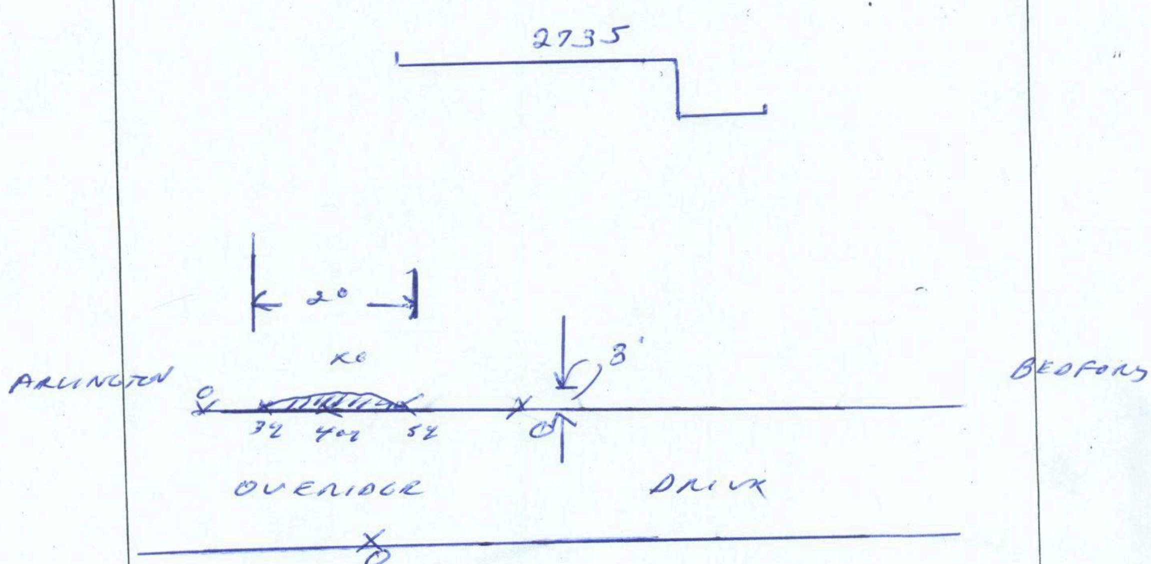
Comments
30% GAS @ 10' WEST OF MAILBOX

Surveyed By: B. Ackley

Gas Safety Incorporated
16 Brook Lane
Southborough, Massachusetts 01772
GasSafetyUSA.com
508-344-9321

Date 11-13-23 **Survey Type** AA 2 **Grade** 3
Address 2735 ~~ARLINGTON~~ ~~BLVD~~ OVERIDGE DRIVE
City / Town ANN ARBOR MI

Sketch:



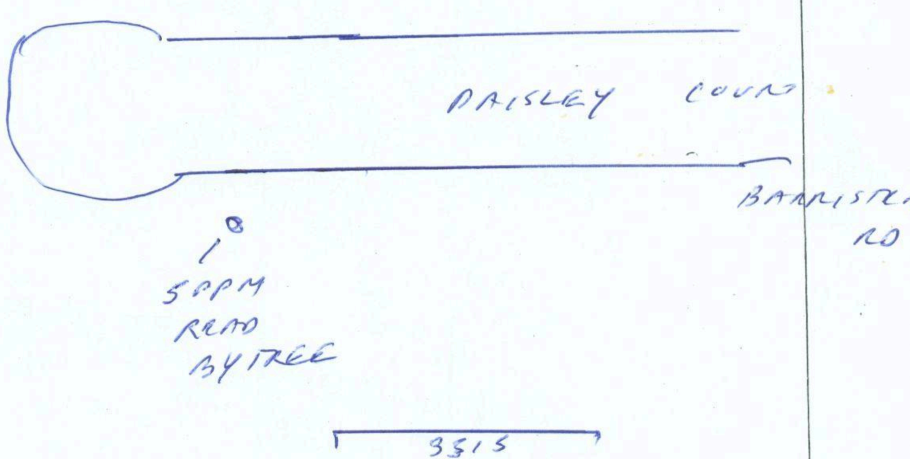
Comments
20 x 3 = 60 SQ FT

Surveyed By: B. ACKLEY

Gas Safety Incorporated
16 Brook Lane
Southborough, Massachusetts 01772
GasSafetyUSA.com
508-344-9321

Date 11-17-23 **Survey Type** AA **Grade** 3
Address 3515 PAISLEY COURT
City / Town ANN ARBOR MI

Sketch:



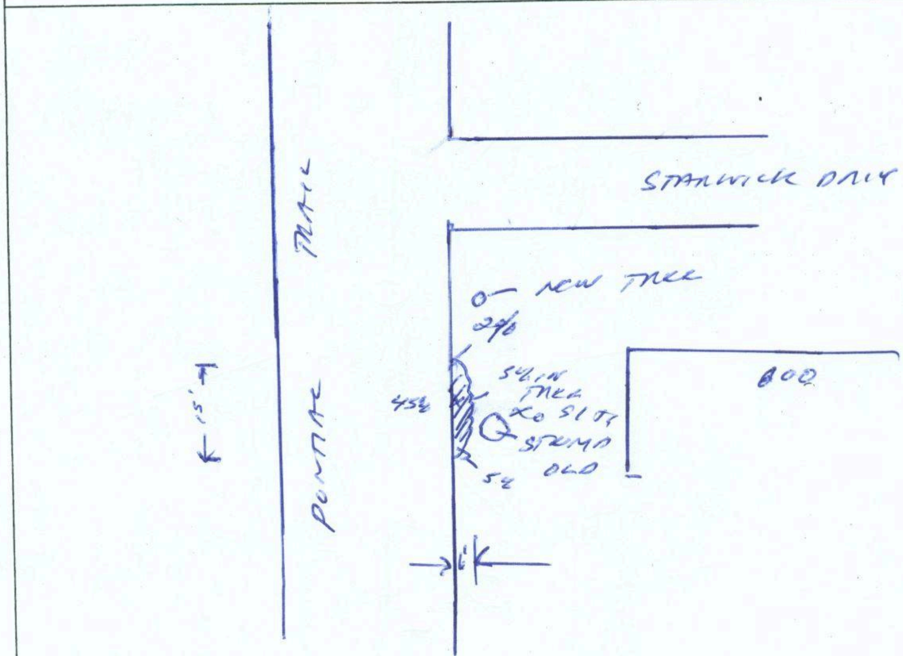
Comments SLIGHT REPEAT READ HERE
5PPM IN GRASS

Surveyed By: B. ACKLEY

Gas Safety Incorporated
16 Brook Lane
Southborough, Massachusetts 01772
GasSafetyUSA.com
508-344-9321

Date 11-14-23 **Survey Type** AA2 **Grade** 3
Address PONTIAC TRAIL BY STANWICK DRIVE
City / Town ANN ARBOR MI

Sketch:



Comments LEAK EXTENT 15X6 = 90 SQ.FT

Surveyed By: B. Ackley

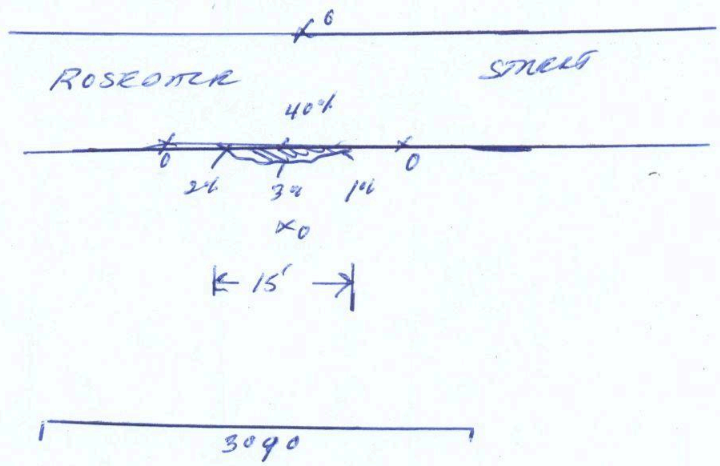
Gas Safety Incorporated
16 Brook Lane
Southborough, Massachusetts 01772
GasSafetyUSA.com
508-344-9321

Date 11-15-23 **Survey Type** AA **Grade** ______

Address 3090 ROSEDALE STREET

City / Town ANN ARBOR MI

Sketch:



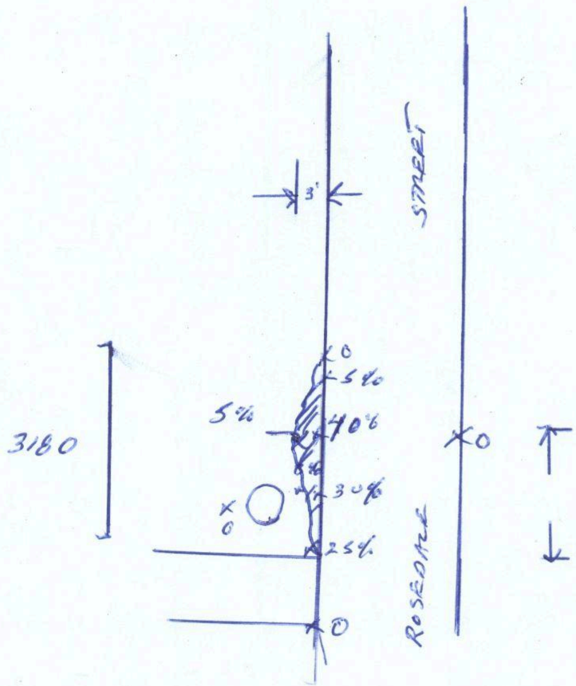
Comments LEAK EXTENT 15 x 3 = 45 SQ. FT

Surveyed By: B. Ackley

Gas Safety Incorporated
16 Brook Lane
Southborough, Massachusetts 01772
GasSafetyUSA.com
508-344-9321

Date 11-15-23 **Survey Type** AA **Grade** 3
Address 3180 ROSEDALE STREET
City / Town ANN ARBOR MI

Sketch:



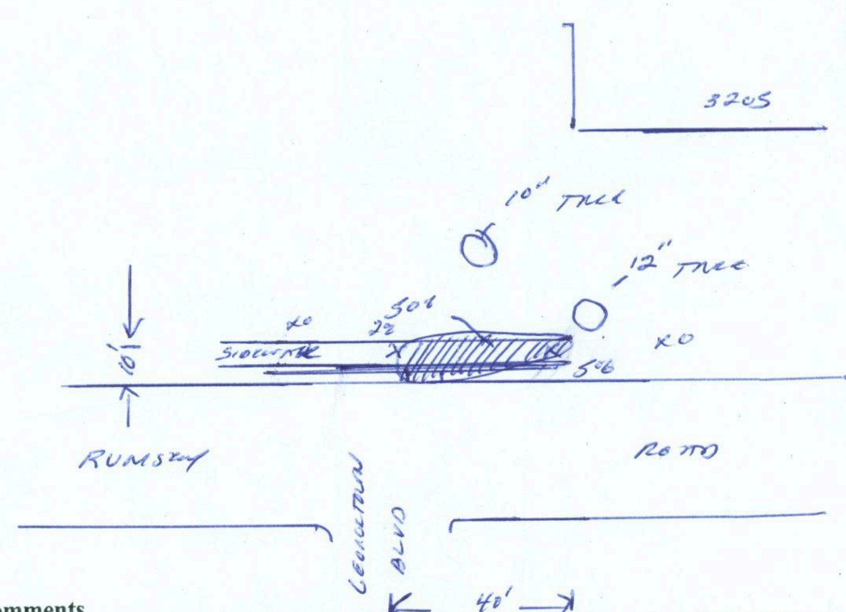
Comments
25 X 3 = 75 SQFT
36" ELM

Surveyed By: B. ACKLEY

Gas Safety Incorporated
16 Brook Lane
Southborough, Massachusetts 01772
GasSafetyUSA.com
508-344-9321

Date 11-17-23 **Survey Type** AA3 **Grade** 3
Address 3205 RUMSEY DRIVE
City / Town ANN ARBOR MI

Sketch:



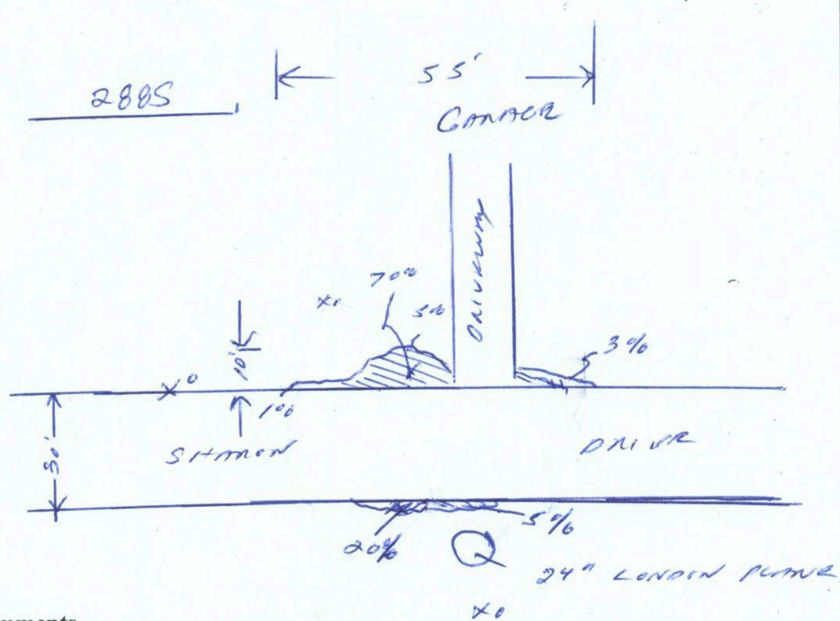
Comments
LEAK EXTENT 10X40 = 400
2 TREES GAS IN ROOT ZONE / DRIPLINE

Surveyed By: B. ACKLEY

Gas Safety Incorporated
16 Brook Lane
Southborough, Massachusetts 01772
GasSafetyUSA.com
508-344-9321

Date 11-15-23 **Survey Type** 11-15-23 **Grade** 3
Address 2885 SHARON DRIVE
City / Town ANN ARBOR MI

Sketch:



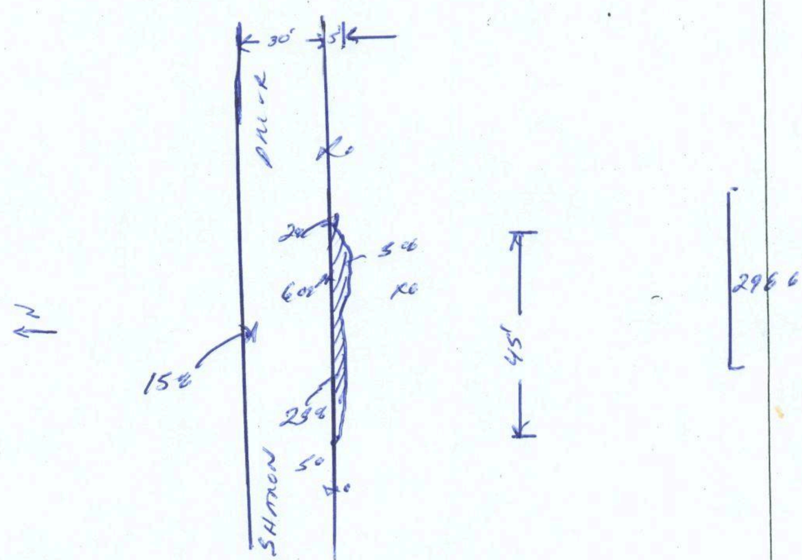
Comments
LEAK EXTENT 55 x 40 = 2200 SQ FT
GAS IN ROOT ZONE OF LONDON PLANE TREE

Surveyed By: B. Ackley

Gas Safety Incorporated
16 Brook Lane
Southborough, Massachusetts 01772
GasSafetyUSA.com
508-344-9321

Date 11-15-23 **Survey Type** AA **Grade** 3
Address 2986 SHARON DRIVE
City / Town ANN ARBOR MI

Sketch:



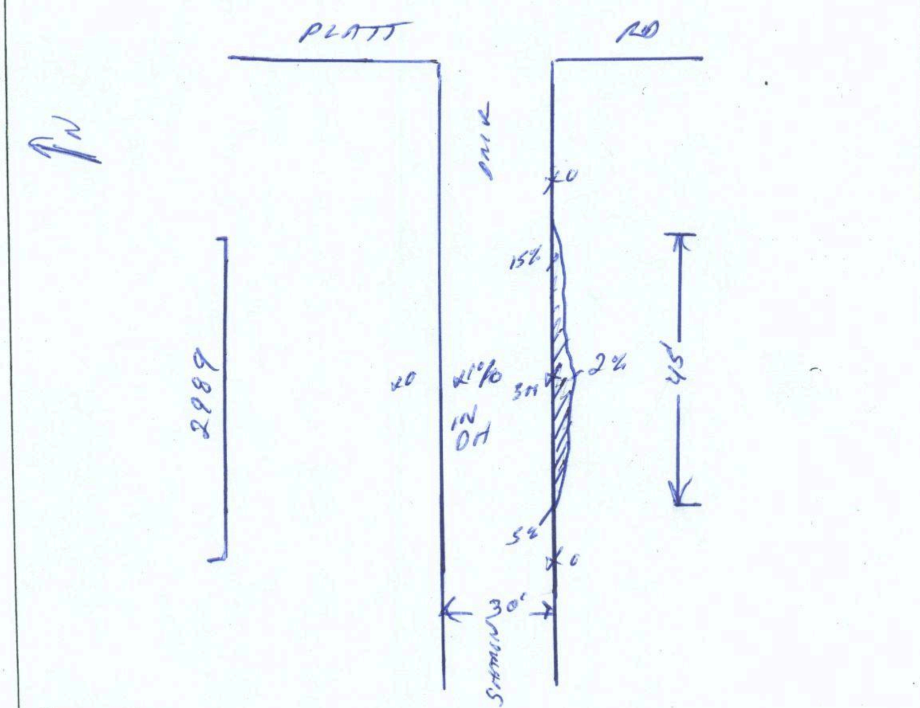
Comments
43 x 35 = 1575

Surveyed By: B. Ackley

Gas Safety Incorporated
16 Brook Lane
Southborough, Massachusetts 01772
GasSafetyUSA.com
508-344-9321

Date 11-15-23 **Survey Type** AA **Grade** ______
Address 2989 SHARON DRIVE
City / Town ANN ARBOR MI

Sketch:



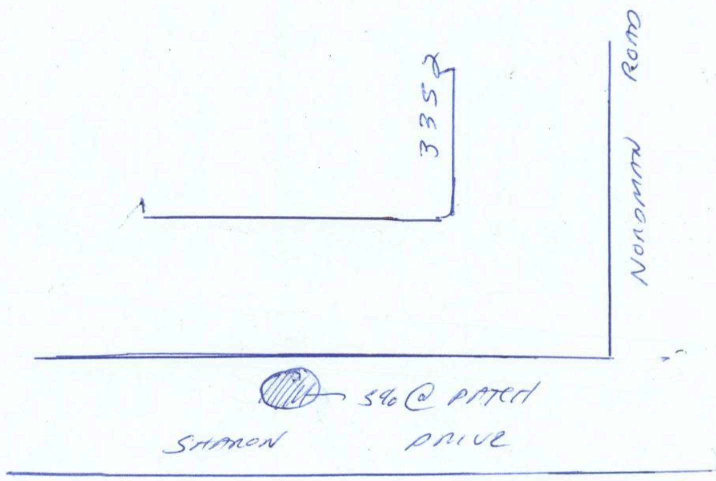
Comments OLD DRILL HOLES & PATCHES ON. WEST SIDE OF STREET ONLY 1% IN DRILL HOLE
LEAK EXTENT 30 X 45 = 1350

Surveyed By: B. ACKLEY

Gas Safety Incorporated
16 Brook Lane
Southborough, Massachusetts 01772
GasSafetyUSA.com
508-344-9321

Date 11-15-23 **Survey Type** AA **Grade** ____
Address SHARON DRIVE WEST OF NORDMAN ROAD
City / Town ANN ARBOR MI

Sketch:



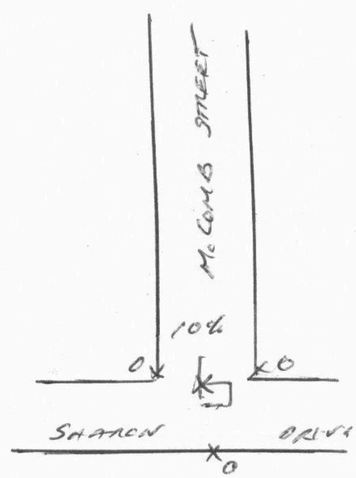
Comments 25 SQ FT 5X5

Surveyed By: B. Ackley

Gas Safety Incorporated
16 Brook Lane
Southborough, Massachusetts 01772
GasSafetyUSA.com
508-344-9321

Date 11-15-21 **Survey Type** AA* **Grade** 3
Address SHARON DRIVE @ McCOMB STREET.
City / Town ANN ARBOR MI

Sketch:



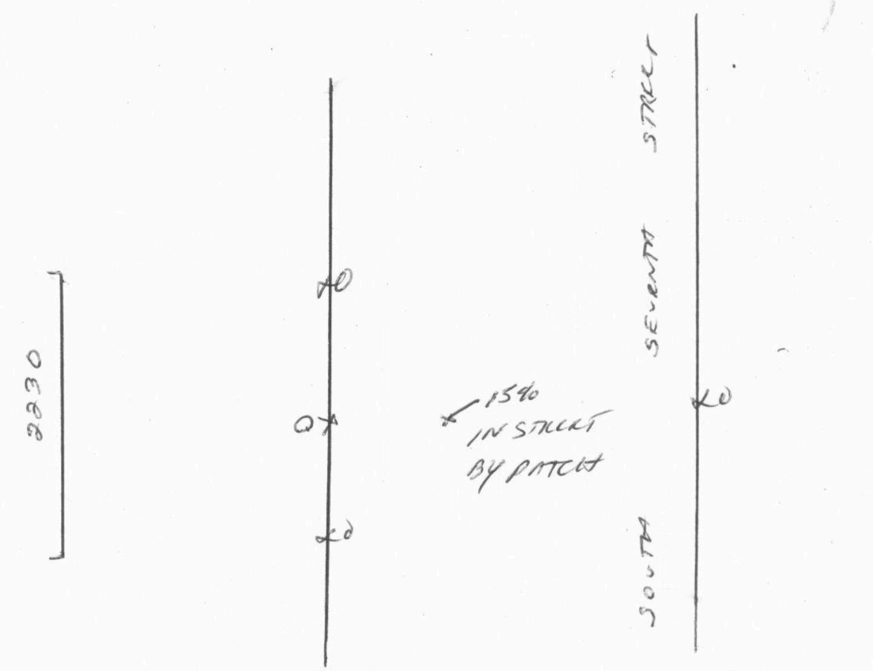
Comments
10% @ PATCH ~~X~~ 20 SQFT

Surveyed By: B. ACKLEY

Gas Safety Incorporated
16 Brook Lane
Southborough, Massachusetts 01772
GasSafetyUSA.com
508-344-9321

Date 11-15-22 **Survey Type** AA2 **Grade** 3
Address 2230 S. SEVENTH STREET
City / Town ANN ARBOR MI

Sketch:



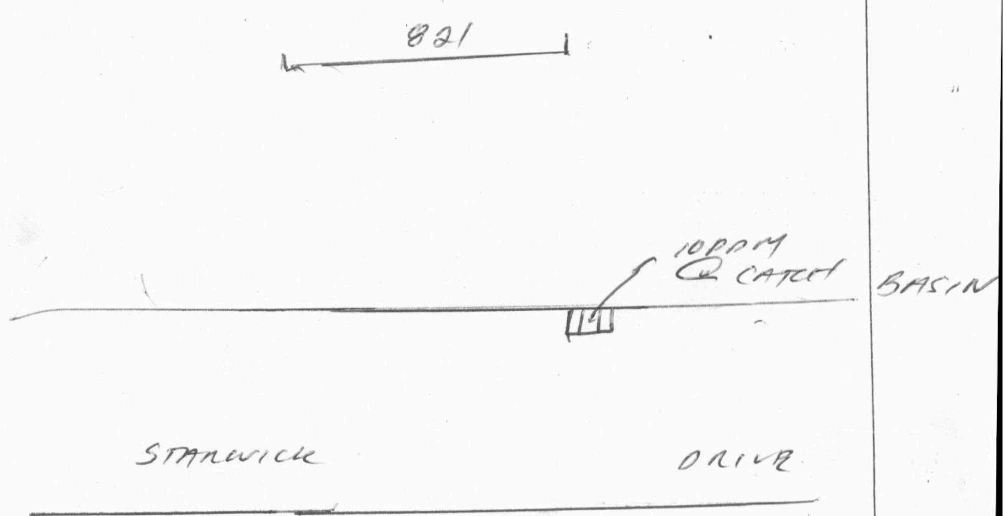
Comments OLD GAS REPAIR STILL SLIGHT LEAK HERE

Surveyed By: B. ACKLEY

Gas Safety Incorporated
16 Brook Lane
Southborough, Massachusetts 01772
GasSafetyUSA.com
508-344-9321

Date 11-14-23 **Survey Type** AA2 **Grade** 2
Address 821 STARWICK DRIVE
City / Town ANN ARBOR MI

Sketch:



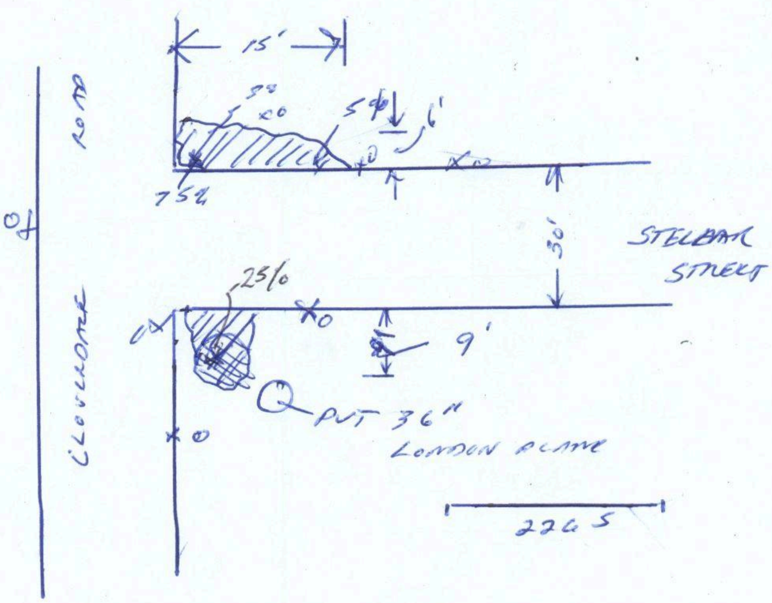
Comments

Surveyed By: B. Ackley

Gas Safety Incorporated
16 Brook Lane
Southborough, Massachusetts 01772
GasSafetyUSA.com
508-344-9321

Date 11-14-23 **Survey Type** AA² **Grade** 3
Address 2265 STELLAR STREET
City / Town ANN ARBOR MI

Sketch:

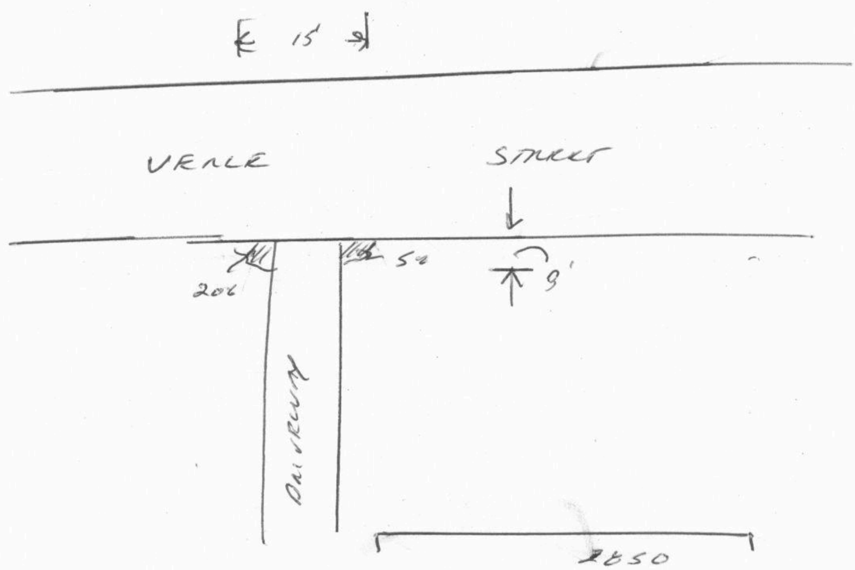


Comments LEAK EXTEN 45 X 15 = 675 SQ FT
EST 32" LONDON PLANE GAS IN ROOT ZONE

Surveyed By: B. ACKLEY

Gas Safety Incorporated
16 Brook Lane
Southborough, Massachusetts 01772
GasSafetyUSA.com
508-344-9321

Date 11-15-23 **Survey Type** AA **Grade** 3
Address 2850 VERLE AVE
City / Town ANN ARBOR MI
Sketch:



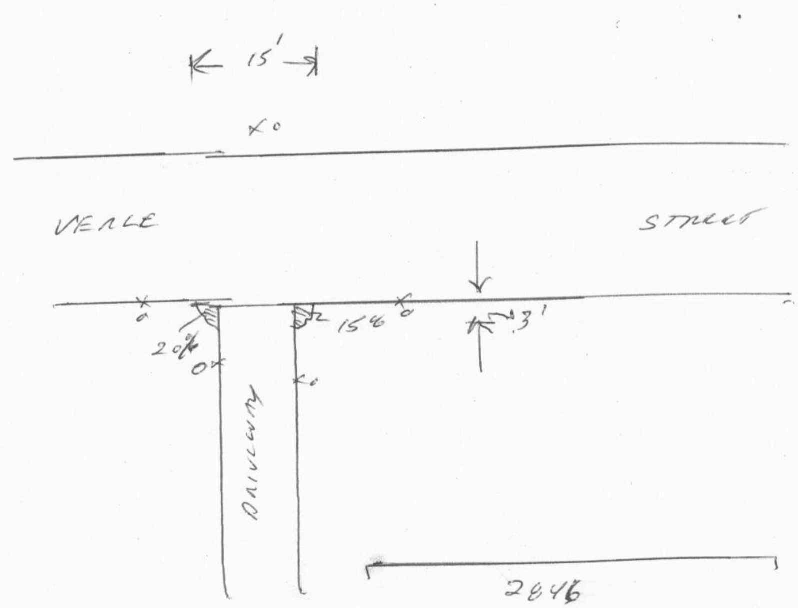
Comments
15 x 3 = 45 SQ FT

Surveyed By: B. ACKLEY

Gas Safety Incorporated
16 Brook Lane
Southborough, Massachusetts 01772
GasSafetyUSA.com
508-344-9321

Date 11-15-23 **Survey Type** AA2 **Grade** 3
Address 2846 VEALE AVE
City / Town ANN ARBOR MI

Sketch:



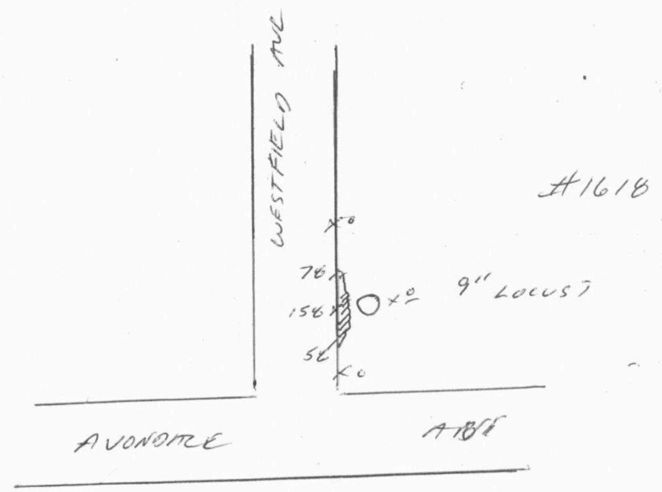
Comments
LEAK EXTENT 15 X 3 = 45 SQ FT .

Surveyed By: B. ACKLEY

Gas Safety Incorporated
16 Brook Lane
Southborough, Massachusetts 01772
GasSafetyUSA.com
508-344-9321

Date 11-15-23 **Survey Type** AA2 **Grade** 3
Address WESTFIELD AVE BY AVONDALE AVE
City / Town ANN ARBOR MI

Sketch:



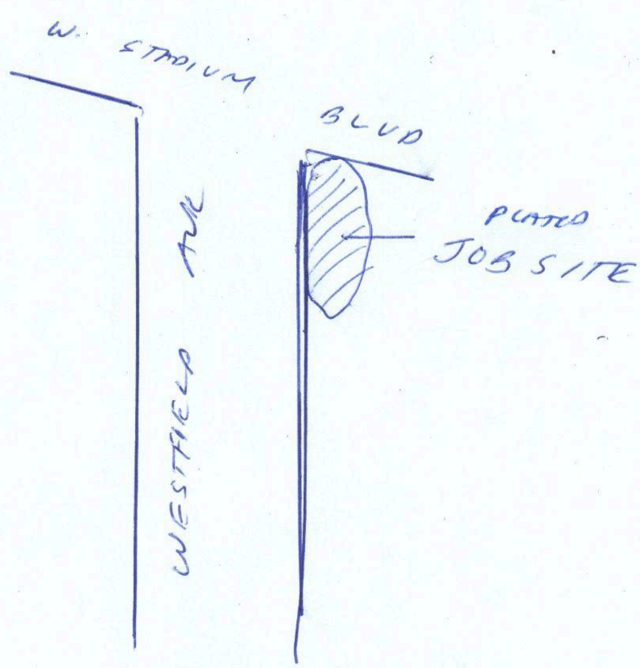
Comments
15x3 = 45 SQ FT

Surveyed By: B. ACKLEY

Gas Safety Incorporated
16 Brook Lane
Southborough, Massachusetts 01772
GasSafetyUSA.com
508-344-9321

Date 11-15-23 **Survey Type** AA2 **Grade** 3
Address WESTFIELD AVE @ W. STADIUM BLVD
City / Town ANN ARBOR MI

Sketch:



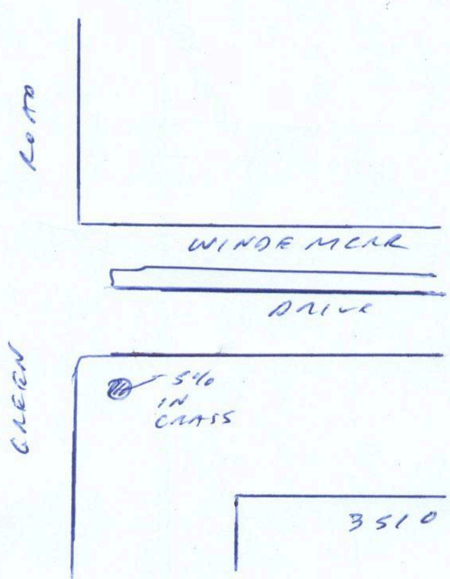
Comments OPEN JOBSITE DID NOT TEST

Surveyed By: B. Ackley

Gas Safety Incorporated
16 Brook Lane
Southborough, Massachusetts 01772
GasSafetyUSA.com
508-344-9321

Date 11-17-23 **Survey Type** AA **Grade** ______
Address 3510 WINDEMERE DRIVE
City / Town ANN ARBOR MA

Sketch:



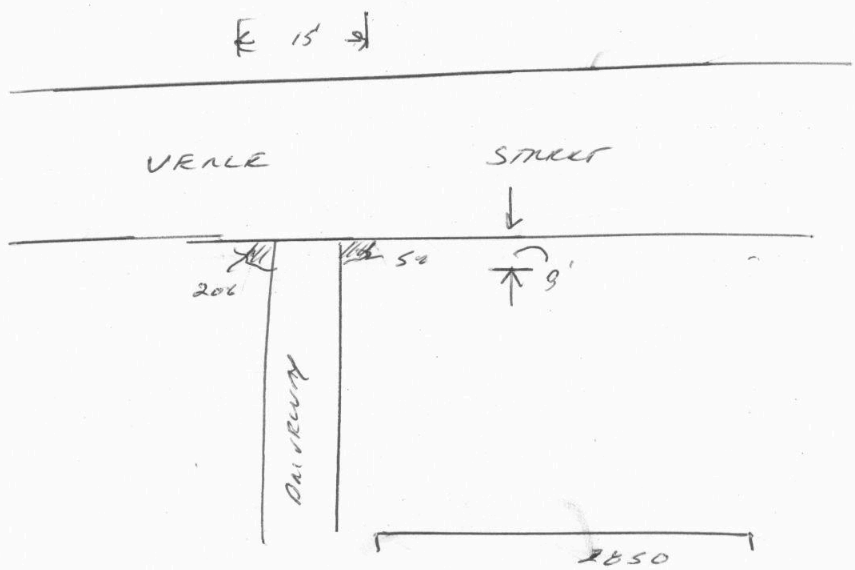
Comments ______

Surveyed By: B. ACKLEY

Gas Safety Incorporated
16 Brook Lane
Southborough, Massachusetts 01772
GasSafetyUSA.com
508-344-9321

Date 11-15-23 **Survey Type** AA **Grade** 3
Address 2850 VERLE AVE
City / Town ANN ARBOR MI

Sketch:



Comments
15x3=45 SQ FT

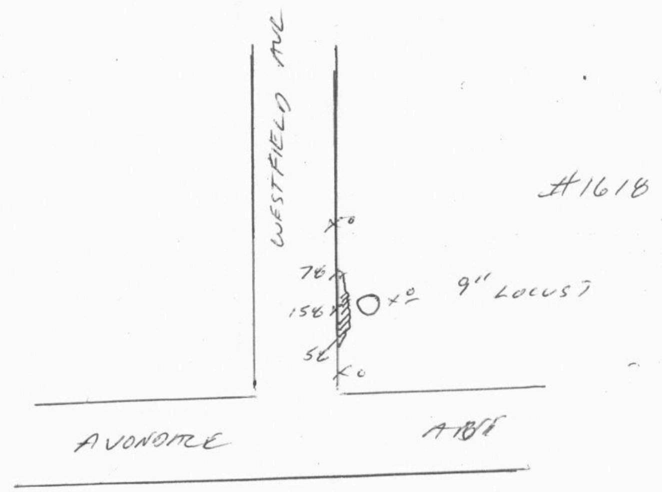
Surveyed By: B. ACKLEY

CR

Gas Safety Incorporated
16 Brook Lane
Southborough, Massachusetts 01772
GasSafetyUSA.com
508-344-9321

Date 11-15-23 **Survey Type** AA 2 **Grade** 3
Address WESTFIELD AVE BY AVONDALE AVE
City / Town ANN ARBOR MI

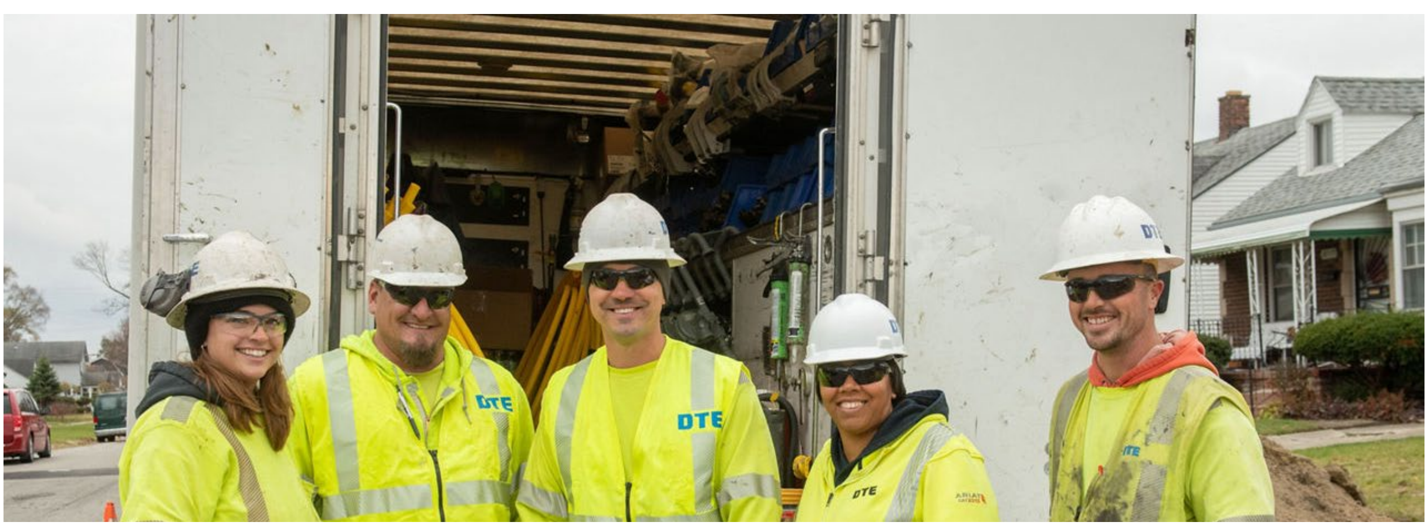
Sketch:



Comments 15x3 = 45 SQ FT

Surveyed By: B. ACKLEY

Natural Gas Leaks

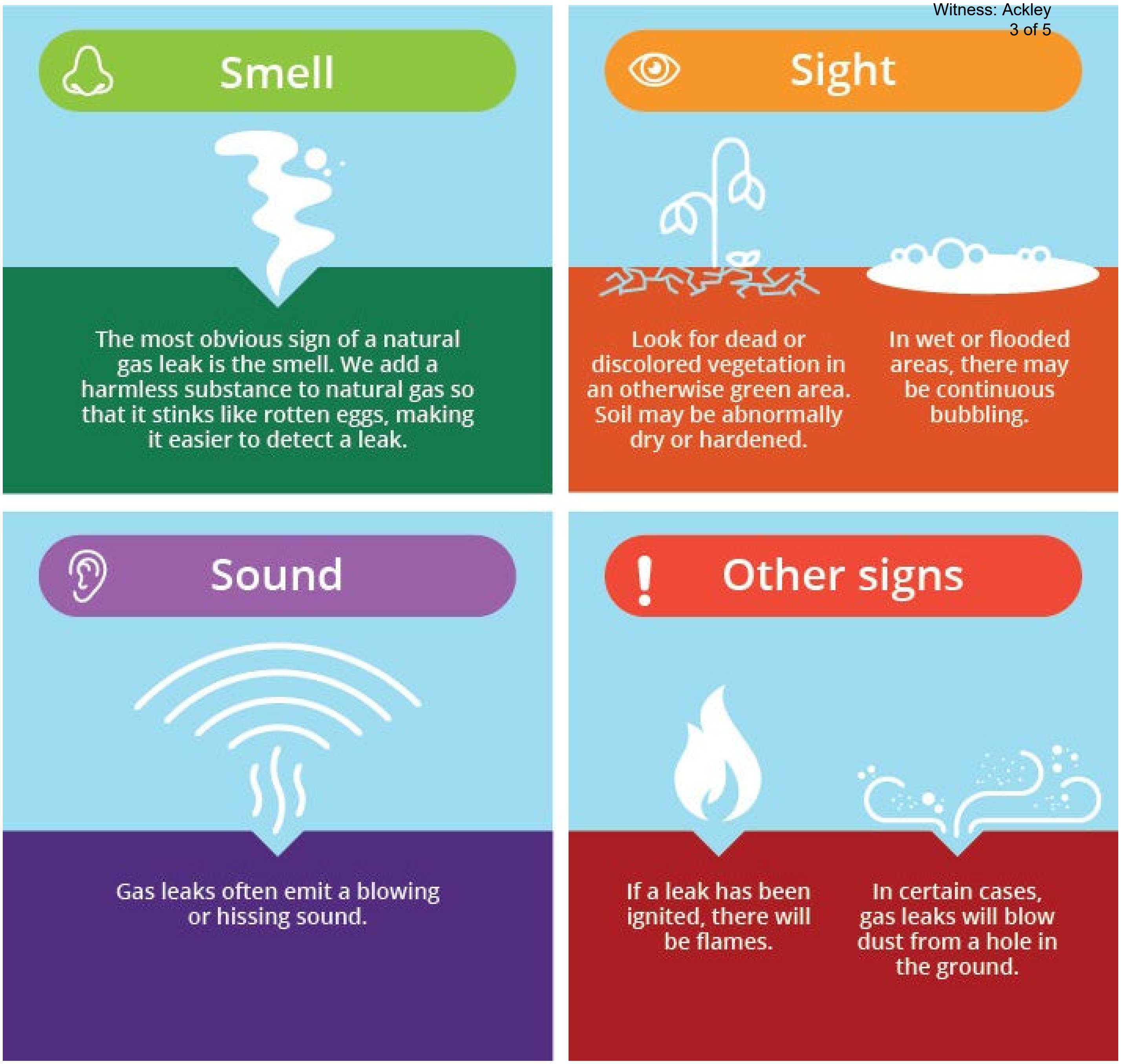


Know the Danger Signs of a Leak and More

Natural gas leaks are dangerous. It's important that you know how to recognize and report a gas emergency.

Do you smell gas? Call 9-1-1 and (800) 947-5000.
Usted huele gas? Llame al 9-1-1 y (800) 947-5000.
هل تشم رائحة غاز؟ اتصل بالرقم 911 والرقم (800) 947-5000.

How to Detect a Gas Leak



The 1-2-3's of a Gas Leak

1. Spot the signs of a gas leak - by smell, sight, sound or other.
2. Leave the area immediately. Go to an outside location where you can no longer smell natural gas.
3. Call 911 before calling our dedicated natural gas leak hotline at 800.947.5000.

We have emergency services available 24 hours a day, seven days a week.

What Not to Do During a Leak

- Do not attempt to locate the leak.
- Do not start up or shut down any machinery, vehicles or equipment in or near the area.
- Do not smoke, light matches or use a lighter. Avoid the use of all open flames.
- Do not use any electrical devices near the affected leak area, including appliances, doorbells, garage door openers, light switches, landlines and mobile phones.
- Do not re-enter the building until DTE Gas says it is safe to do so.

Do Not Rely on Sense of Smell Alone

DTE encourages you to use smell, sight, sound and other indicators to determine the presence of natural gas.

Do not rely on sense of smell alone to detect a gas leak. Some people may not be able to smell the odor because they have a diminished sense of smell, nasal fatigue (normal, temporary inability to distinguish an odor after prolonged exposure to it), or because the odor is being hidden by other odors such as candles or air fresheners present in the area.

The Centers for Disease Control and Prevention has identified the loss of smell as a potential symptom of exposure to the virus that causes COVID-19. Using tobacco, alcohol, medications or narcotics also can lessen your ability to smell odorized gas.

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journal homepage: www.elsevier.com/locate/envpol

Natural gas leaks and tree death: A first-look case-control study of urban trees in Chelsea, MA USA☆

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[a] Boston University, School of Public Health, Department of Environmental Health, 715 Albany St., T4W, Boston, MA, 02118, USA
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Urban tree canopy
Tree pit soil

ABSTRACT

Urban vegetation is associated with numerous public health benefits; however, urban tree canopies may be threatened by fugitive methane exposure from leaky natural gas distribution systems. Despite anecdotal evidence of the harmful impacts of natural gas leaks on urban tree decline, the relationship between soil gas exposure and tree health has not been formally quantified in an urban setting. We conducted a case-control study to compare soil natural gas exposure in sidewalk tree pits of healthy and dead or dying trees in Chelsea, Massachusetts, during summer 2019. We measured soil concentrations of methane and oxygen at four points around the trunks of 84 case and 97 control trees. We determined that case trees had 30 times the odds of being exposed to detectable levels of soil methane relative to the control trees sampled (95% CI = 3.93, 229). Among tree pits with elevated soil gas, we also found that methane concentrations were highest on the side of the tree pit closest to the street. These results contribute evidence to support the widespread belief that soil methane exposure can negatively impact urban tree health. They also suggest that fugitive methane leakage from urban natural gas distribution systems beneath the street surface may be responsible for elevated soil gas concentrations in sidewalk tree pits and subsequent tree death.

1. Introduction

Urban vegetation, in particular tree canopy, is known to have multiple public health benefits, including improving air quality and associated respiratory outcomes among residents, moderating ambient temperature through shading and mitigating urban heat island effects, and improving human physical and mental health by promoting physical activity, reducing stress, and facilitating positive social interactions (Ulmer et al., 2016; Nowak et al., 2006; Donovan and Butry, 2009; Tyrväinen et al., 2005; Kweon et al., 1998). Higher percentages of urban tree canopy cover are also associated with increased perceptions of personal safety (Mouratidis, 2019). Despite broad and general acceptance of these benefits and major investments in urban tree planting over the last several decades, urban tree canopy in the United States is declining (Nowak and Greenfield, 2012; Roman, 2014). Among the many causes of urban tree death (e.g., drought, excess moisture, construction/development), asphyxia from natural gas has received attention from the tree industry, extension agents, and activists (Fraedrich nd, Extension, 2019; Taliesen, 2019). To date, there have been only individual case studies and anecdotal evidence of tree death near natural gas leaks, particularly in urban environments. In an effort to contribute to understanding of tree health in proximity to gas leaks, we conducted a formal assessment of tree death and fugitive natural gas exposure in a densely populated urban community in Massachusetts, USA.

Despite its reputation as a fuel source that emits relatively low levels of carbon dioxide, natural gas is primarily made up of methane (CH_4) which is also a potent greenhouse gas (Brandt et al., 2014; Howarth et al., 2011). Natural gas leaks, which can cause explosive hazards, occur throughout the gas extraction and distribution processes, posing as the largest source of anthropogenic

☆ This paper has been recommended for acceptance by Jörg Rinklebe

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https://doi.org/10.1016/j.envpol.2020.114464
0269-7491/

methane emissions in the United States (Jackson et al., 2014).

Fugitive methane emissions, caused by leaks in the distribution infrastructure, are of particular concern in Massachusetts which has one of the oldest natural gas pipeline systems in the United States. Over eleven percent of the pipeline distribution network in Massachusetts is made up of leak-prone materials such as cast iron, wrought iron, and bare steel relative to an average of only 0.9% for the rest of the country where older pipes have been replaced with improved manufactured or lined steel pipes (PHMSA, 2018; Gallagher et al., 2015). The material of these aged pipes subject them to corrosion and pose a high risk of rupture and leaks (Gallagher et al., 2015). Previous studies have documented the abundance of natural gas leaks in east coast cities, including Boston and the District of Columbia, where the average density of leaks was found to be 4.2 and 3.9 leaks per mile of road, respectively (Phillips et al., 2013; Jackson et al., 2014). In Boston, researchers found 3356 leaks across the 785 miles of road surveyed, with ambient methane concentrations exceeding up to 15 times background concentrations (Phillips et al., 2013). Ambient methane concentrations were even higher in the District of Columbia, where the maximum concentration measured reached up to 45 times background levels (Jackson et al., 2014). The density and magnitude of natural gas leaks found in these two major east coast cities highlight the severity of this leaky infrastructure in densely populated urban areas.

Beyond explosive risks and global warming impacts associated with fugitive methane emissions, leaky natural gas infrastructure also decreases the efficiency of gas distribution, which can increase utility costs for consumers (Phillips et al., 2013). Methane emissions are also known to negatively impact soil and vegetation health (Davis, 1977, Flower et al, 1981). Although methane is not directly toxic to plant matter, methane-rich soil can induce anaerobic soil conditions that are harmful for tree root systems (Adamse et al., 1972; Smith et al., 2005; Steven et al., 2006; Costello et al., 1991; Kozlowski, 1985). Previous studies, which experimentally injected natural gas into soil in controlled settings and monitored changes in soil chemistry, found an inverse relationship between methane and soil oxygen, which is characteristic of direct oxygen displacement; however, these studies also observed declines in soil oxygen concentrations to levels greater than the amount of methane introduced, which the authors concluded was indicative of further oxygen consumption by methanotrophs (methane-oxidizing bacteria) (Adamse et al., 1972; Smith et al., 2005; Steven et al., 2006). Elevated methane-oxidizing methanotroph counts, along with decreased oxygen levels, have also been documented in studies of soil cover over methane-producing landfills (Whalen et al., 1990; Nozhevnikova et al., 2003). These anaerobic soil conditions can limit respiration and growth in tree roots, which may be particularly damaging during early development (Costello et al., 1991). Root stress resulting from anaerobic soil conditions can also decrease tree root resilience to other factors such as pests and fungi, which contribute to overall tree decline and death (Costello et al., 1991; Kozlowski, 1985). These impacts may be of particular concern to urban vegetation which often lies in close proximity to subsurface natural gas distribution infrastructure.

This study quantifies the relationships between subsurface exposure to natural gas and street tree deaths in Chelsea, Massachusetts. Using a case-control study design, we compared measured soil methane concentrations in sidewalk tree pits of healthy and dying or dead trees throughout the city to determine the odds of soil gas exposure among dead or dying trees. Our hypothesis was that soil gas concentrations would be higher among the tree pits of dead or dying trees compared with soil gas concentrations in the tree pits of healthy trees. We also sought to determine if elevated soil gas concentrations in tree pits could be attributed to urban natural gas distribution systems.

2. Materials and methods

2.1. Study area

We conducted our study in the City of Chelsea, MA. Chelsea is one of the most densely populated and diverse cities in the nation, with more than 35 languages spoken among approximately ~40,000 residents, 78.9% of whom identify as ethnic/racial minorities (RWJF, 2017, U.S. Census Bureau, 2018). Twenty-four percent of residents live below the federal poverty level (compared to the state's 10.5%) (Healthy Chelsea, 2019). Despite its characterization as an environmental justice community (Mass.gov, 2010), for over 15 years the City has been awarded Tree City USA status by the Arbor Day Foundation (Arbor Day Foundation). Tree City USA status is accomplished by meeting the four core standards of urban forestry: an active tree board, a tree care ordinance, an annual urban forest budget of at least $2 per capita, and observance of Arbor Day (Arbor Day Foundation). In 2016 the City contracted arborists to conduct a thorough inventory of Chelsea's trees using risk assessment methods defined by the International Society of Arboriculture, which considers multiple factors including trunk condition, root health, foliage condition, canopy, branch structure, and presence of pests (Davey Resource Group, 2016; Smiley et al., 2011). Each tree is rated as Dead, Critical, Poor, Fair, Good, Very Good, or Excellent for each factor and general health is determined by the most commonly assigned rating across all factors (Smiley et al., 2011). This inventory resulted in records, maps, and unique identification numbers for approximately 4000 trees, including both street trees (i.e. trees planted in sidewalk tree pits that line the streets) and park trees. This inventory is publicly available via the OpenTreeMap app (OpenTreeMap Cloud, 2019). We divided the City into seven geographic regions that could each conveniently be printed on single-page, zoomed-in maps for the field team, and identified cases and controls from six of the seven regions. We focused primarily on residential and commercial land use zones in order to minimize the impacts of other potentially harmful ambient or soil exposures thought to be associated with industrial zones. The majority of Chelsea street trees are also planted in the residential and commercial zones. However, the maps we used were not perfectly aligned with zoning usages, nor did they include zoning uses when the field team ascertained cases and controls.

2.2. Case definition and ascertainment

We defined cases as dead trees (or very close to dead, if not technically absent of all life). Cases were selected by one of our team members upon visual inspection of every tree in each region during July 2019 and noting if the tree appeared to be dead. OpenTreeMap was used to identify the unique tree ID and examine its history (i.e., the 2016 inventory). Dead trees with any record of improper pruning, human-caused physical damage, interference with overhead utility lines, or any other condition that may indicate a non-gas related cause of death were removed from the sample. Cases were then confirmed separately by an arborist certified by the Massachusetts Arborist Association in 2011 (Massachusetts Certified Arborist ID Number: 2408).

2.3. Control definition and ascertainment

Control trees were selected from the 2016 tree inventory from the same six regions. Trees were deemed controls if their 2016 health assessment indicated that they were in 'Good' or 'Very good' condition, if tree failure potential was 'Improbable', and if there were no additional assessor notes indicating poor health or damage. Control trees were selected to accomplish a comparable distribution of tree diameter breast height (DBH) and genus diversity relative to the cases. We essentially sought to match controls to cases, but not on an individual basis. We also mapped all sample trees using ArcGIS Pro 2.1.0 to ensure cases and controls were sufficiently spatially distributed throughout the study area. The certified arborist confirmed the health status of all control trees identified from the 2016 tree inventory.

2.4. Exposure: soil methane and oxygen sampling

Methane and oxygen concentrations were measured separately from the ascertainment of cases and control by different members of our research team. We chose to measure subsurface methane concentrations as opposed to ambient methane because we had previously conducted an exploratory study in Chelsea, MA of ambient methane measurements collected using a mobile Picarro G2301 Cavity Ring-Down Spectrometer and did not find an association between ambient methane and tree health. We hypothesized soil gas may be a more reliable measure of a tree's exposure to methane. Previous studies which examined at the impact of methane on vegetation health have also used soil gas concentrations as their exposure metric (Smith et al., 2005; Steven et al., 2006). At each tree pit, gas was measured approximately 15–25 cm below the soil surface at four points (sampling holes) around the tree trunk. Each sampling hole was 20–25 cm from the tree trunk (Jim, 1998; Kargar et al., 2015). Fig. 1 diagrams the sampling schema in each tree pit. We used a plunger bar to puncture holes into the root zone of the tree pit then immediately inserted a Bascom-Turner Gas Sentry multi-gas detector into the hole to obtain a methane gas measurement. The limit of detection of the multi-gas detector was 0.01%. Methane measurements were

Fig. 1. Diagram of the protocol for sampling methane and oxygen concentrations in sidewalk tree pits. The black dots represent the two adjacent holes, one for the methane sample and one of oxygen sample, that were created at each of the four locations around the tree trunk.

taken on all four sides of the tree using this method. Because elevated soil methane is known to be associated with anaerobic soil conditions, we created four new holes directly next to the original holes to collect measured oxygen concentrations from each side of the tree (Adamse et al., 1972; Smith et al., 2005; Steven et al., 2006). Leaks with subsurface methane concentrations greater than 4% and within 1.5 m from a building foundation were immediately reported to the utility company. Such leaks are characterized as a "probable hazard to person or property … and require repair as immediately as possible and continuous action until the conditions are no longer hazardous" according to Massachusetts state law, which is informed by guidance from the Gas Piping Technology Committee (Mass. Gen. Laws ch. 164, § 144).

2.5. Statistical analysis

In all analyses, oxygen and methane measurements below the limit of detection were converted to the limit of detection and divided by the square root of two. We averaged the four methane and oxygen measurements from each pit and used within-pit means to calculate the mean methane and oxygen concentrations in the case and control groups. We calculated the minimum methane and oxygen concentrations by taking the lowest concentration measured at any point within the tree pits (i.e. not based on the average of the four measurements across the pit). Similarly, we calculated the maximum methane and oxygen concentrations across the case and control groups by taking the highest concentrations measured at any of the four points in each pit. Concentrations are reported as percent gas content.

We calculated an odds ratio to predict odds of tree death based on exposure to soil methane in tree pits. We defined exposed trees as those in tree pits where at least one of the four methane measurements was greater than the limit of detection of the instrument. Unexposed trees were defined as those trees in pits where all four soil methane measurements were below the limit of detection. We generated histograms showing the distributions of methane concentrations in each hole position across the exposed trees. We conducted a one-way ANOVA with Tukey HSD post hoc comparisons to test for differences in mean methane concentrations between tree pits in different zoning regions. A two sample *t*-test was used to assess the difference in mean oxygen levels between case and control trees. Finally, we conducted a multiple linear regression adjusting for case status and zoning region to evaluate the relationship between soil methane and oxygen concentrations measured in each tree pit. All statistical analyses were carried out in R 3.6.1.

3. Results

Our final sample consisted of 84 dead or dying case trees and 97 healthy control trees, distributed across residential and commercial zones throughout the city (Fig. 2). The case group consisted of 17 unique tree genera with Acer, Prunus, and Amelanchier (Maple, Cherry, and Serviceberry trees) being the most common genera represented. The control group was made up of 16 unique genera with Quercus (Oak), Acer (Maple), and Zelkova being the most common genera. The average trunk diameter was 16.0 cm in case trees and 10.7 cm in control trees (Table 1).

Of the 84 case trees, 20 were exposed to CH_4 above the limit of detection of the multi-gas sensor. Of the 97 control trees sampled, only one was exposed to CH_4 via tree pit soil. Based on these exposure frequencies, we determined that case trees had 30 times the odds of being exposed to CH_4 relative to the control trees sampled, with a minimum odds of nearly four times and a max of over 200 times more likely (Table 2). In the tree pits where methane

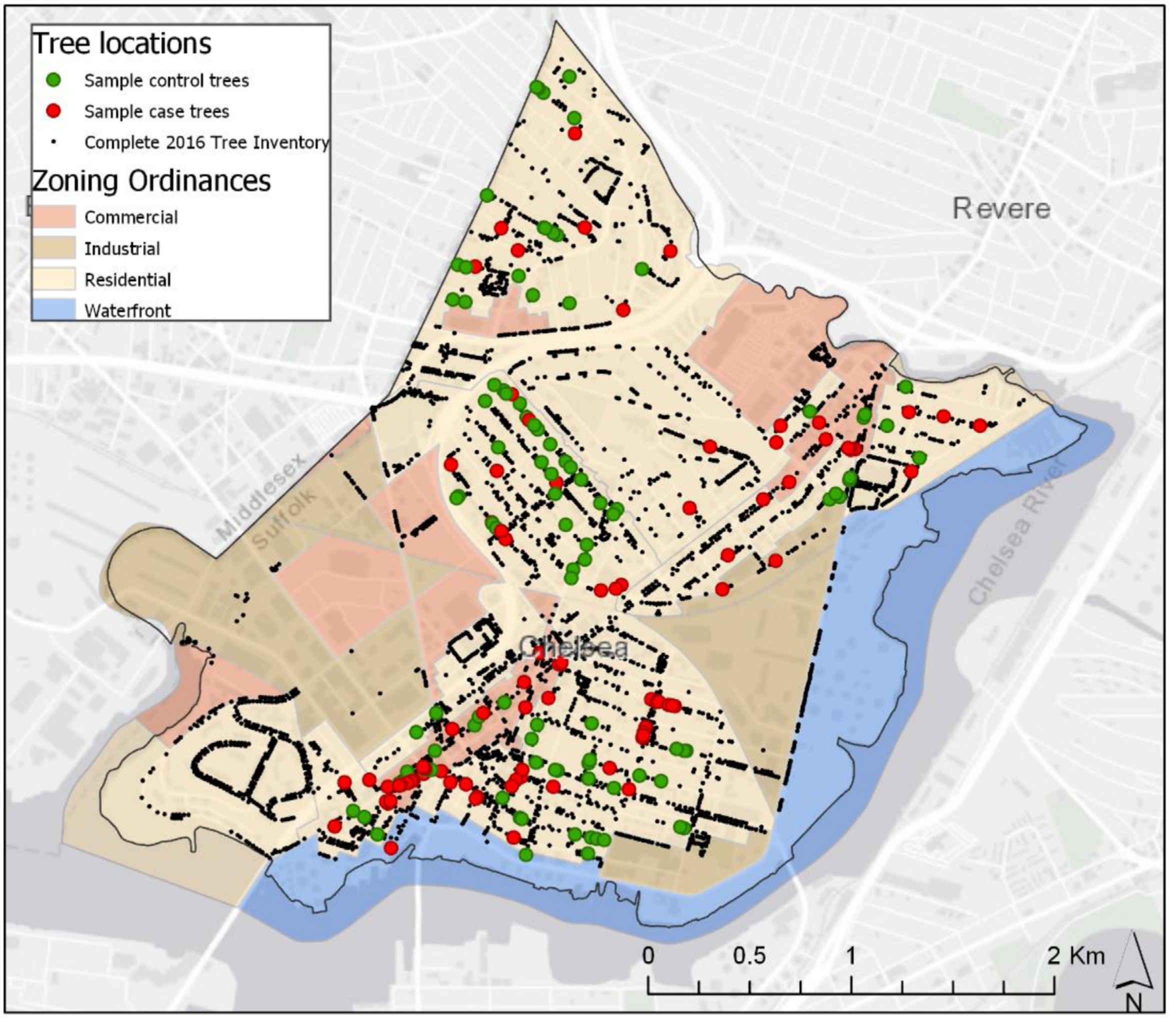

Fig. 2. Map of spatial distribution of case and control trees overlaid on top of Chelsea zoning ordinances.

was detected, the average methane concentration was highest in the sample location closest to the street (Table 3). Fig. 3 shows the distribution of methane concentrations across all four sampling holes in the tree pits of exposed trees. There was a significant difference in methane concentrations across the four zoning regions [$F(180) = 4.171$, $p = 0.0427$], with a Tukey HSD post hoc comparison indicating that tree pits in commercial zones ($M = 3.14$, $SD = 9.24$) had significantly higher soil methane levels than in residential zones ($M = 0.244$, $SD = 1.21$), on average.

Mean oxygen concentration measured in case tree pits was significantly lower than the mean oxygen concentration measured in control tree pits [$t(141) = 2.10$, $p = 0.037$]. Our multiple linear regression result, adjusting for case status and zoning region, indicated a significant negative association between soil methane concentrations and corresponding soil oxygen concentrations [$\beta = -0.52$, $R^2 = 0.24$, $p > 0.0001$].

Table 1
Characteristics of case and control trees and exposure means in each group.

	Case (n = 84)	Controls (n = 97)
Unique Genus Count	17	16
Mean 2016 DBH (cm) (min, max)	16.0 (5.0, 64.5)	10.7 (5.0, 30.5)
Land Use Type		
Residential	31.2%	49.1%
Commercial	11.5%	5.8%
Industrial	0.6%	0.6%
Waterfront	0.6%	0.6%
Mean CH_4 soil content (%) (min, max)	1.55% (0, 58)	0.08% (0, 31)
Mean O_2 soil content (%) (min, max)	15.8% (0.5, 21.1)	16.9% (4.3, 21.2)

4. Discussion

In this study, we found that trees exposed to detectable levels of soil methane had higher odds of being dead or dying relative to unexposed trees. We also found the greatest soil methane concentrations on the side of the tree pit closest to the street, nearest to where natural gas distribution pipelines are located. These results suggest that elevated soil methane may contribute to urban street tree decline and that the fugitive methane may be the result of leaking pipeline infrastructure beneath the street surface. We found that case tree pits had significantly lower mean oxygen

Table 2
Odds of tree death among trees in pits with measured natural gas.

	Cases	Controls	Odds Ratio (p-value, 95% CI)
Exposed	20	91	OR = 30.0 (p = 0.001, CI = [3.93, 229])
Unexposed	64	1	

Table 3
Descriptive statistics of soil CH_4 content by sample hole in exposed trees.

	Hole 1 (street side)	Hole 2	Hole 3	Hole 4
Mean % CH_4 (Min, Max)	2.45% (0.00, 47.0)	1.09% (0.00, 31.0)	1.37% (0.00, 33.0)	1.65% (0.00, 58.0)

concentrations than controls as well as a significant negative association between soil methane and soil oxygen levels. Despite the fact that these results are based on a limited sample size, they may point to a potential mechanism for vegetation decline that has been cited in previous studies related to direct oxygen displacement by methane and the proliferation of methane-oxidizing methanotrophs that thrive in methane-rich soil, both which contribute to anaerobic soil conditions (Adamse et al., 1972; Smith et al., 2005; Steven et al., 2006; Whalen et al., 1990; Nozhevnikova et al., 2003).

While measuring soil oxygen and methane concentrations we called the utility company to report 3/21 tree pits that we identified as most hazardous based on the Massachusetts Department of Public Utilities-mandated uniform leak classification system. Leaks are graded on a scale from 1 to 3 based on explosive potential, where a Grade 1 leak is considered a hazard to humans or property and requires immediate repair and surveillance (Mass. Gen. Laws ch. 164, § 144). Grade 2 and 3 leaks are considered non-hazardous at the time of evaluation and are flagged for reevaluation after 6 and 12 months, respectively (Mass. Gen. Laws ch. 164, § 144). These grades do not represent leak severity in terms of any other factors besides explosive potential; thus, they do not account for severity of hazards to climate and vegetation (Hendrick et al., 2016). Under this classification system, 85% of the leaks we detected would not be classified as Grade 1, despite associated tree decline. The current reporting and repair processes may not be sufficiently protective of urban vegetation.

Beyond the loss of the human health benefits of urban vegetation cited above, this street tree damage has financial implications for municipalities. The City of Chelsea spends approximately \$50,000/year on tree removals throughout the city and approximately \$500 to replant a single tree (Maltez, Personal Communication, 2019). While not all trees removed each year are due to methane exposure-related decline, our results indicate that fugitive natural gas could be an important contributor to urban tree death and that these deaths could have notable ecological, human health, and economic impacts.

One limitation of this study was that we were unable to look retrospectively at leaks and repairs due to imprecise geolocated leak and repair locations by utility companies (i.e. companies often report the street address nearest to the leak instead of the exact coordinates of the leak beneath the street surface). This lack of knowledge of previous leaks and repairs may have contributed to exposure misclassification if we were unaware of a recently repaired leak near a case tree and did not detect soil methane in the tree pit as a result. Additional limitations stem from our small sample size and limited information on individual tree histories;

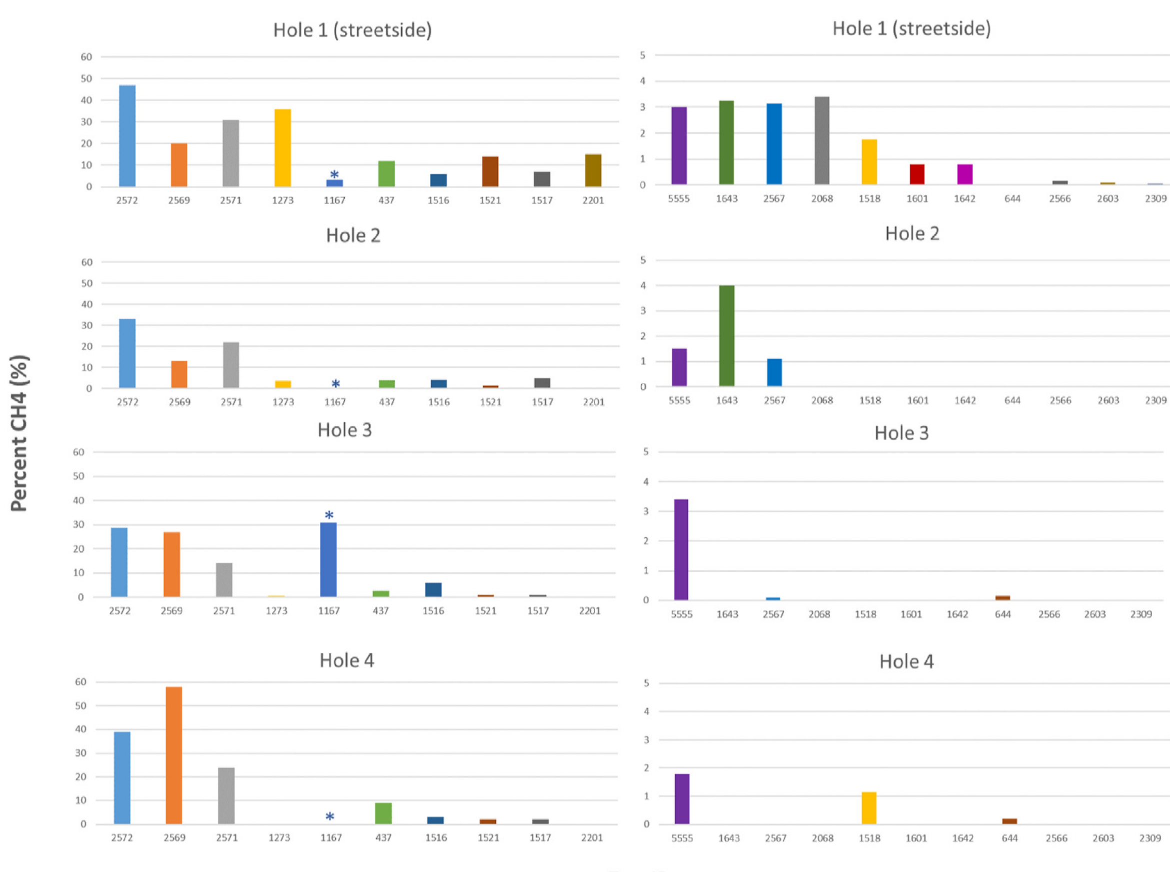

Fig. 3. Distribution of CH_4 content by sampling hole in all exposed trees (n = 21). The * indicates the exposed control tree.

however, we attempted to address this by creating case and control groups with similar distributions of trunk diameter, number of unique tree genera, frequencies of those genera, and land-use categories. We also tried to control for other factors which are often attributed to urban tree decline, such as age, vandalism, over or under pruning, and poor species selection by excluding trees in the inventory with record of these stressors or stressors that were obvious upon visual inspection; however, it is still possible that some of these factors were not recorded in the inventory and that other factors, such as lack of water, pests, or too deep or too shallow planting, could have contributed to tree decline in the case group. Despite these limitations, our study demonstrated a significant association between soil methane exposure in tree pits and street tree decline.

5. Conclusion

Our study quantifies the association between subsurface methane exposure and likelihood of street tree death. We found that exposure to elevated soil methane concentrations was associated with significant increased odds of tree death, supporting the hypothesis that fugitive emissions from natural gas distribution infrastructure negatively impact urban vegetation health. Additional research on urban tree pit soil conditions, including studies of methanotroph populations in these environments, could contribute to a better understanding of the mechanisms leading to tree decline in close proximity to leaky natural gas infrastructure.

Funding

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Declaration of competing interest

The authors declare that they have no known competing financial interests or personal relationships that could have appeared to influence the work reported in this paper.

Acknowledgements

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Appendix A. Supplementary data

Supplementary data to this article can be found online at https://doi.org/10.1016/j.envpol.2020.114464.

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From: Ponsock, Amy
Sent: Wednesday, March 15, 2023 4:05 PM
To: 'Sheryl Payne' <cheryl.payne@dteenergy.com>
Cc: 'Ronald Paradoski' <ron.paradoski@dteenergy.com>; Nollar, Brian <BNollar@a2gov.org>
Subject: RE: DTE Damage at 2010 Winewood Ave - Ann Arbor DTE Claim # 22-10-26-00435

Resending. Sheryl's email address bounced back to me.

Please note that I responded to the Thaler and Burwood area as stated in the letter. The subject line indicates 2010 Winewood.,

From: Ponsock, Amy
Sent: Wednesday, March 15, 2023 3:47 PM
To: Sheryl Payne <cheryl.payne@dteenergy.com>
Cc: Ronald Paradoski <ron.paradoski@dteenergy.com>; Nollar, Brian <BNollar@a2gov.org>
Subject: RE: DTE Damage at 2010 Winewood Ave - Ann Arbor DTE Claim # 22-10-26-00435

Sheryl –

I've asked our Right-of-Way inspector to go out and look at the area. The only work in that area in this timeframe was from DTE's gas main replacement project. Right-of-way permits, ROW21-0752 and ROW21-0745, were obtained from the City and Corby Energy Services was the underground contractor. The DTE gas replacement team should have more information.

From: Sheryl Payne <cheryl.payne@dteenergy.com>
Sent: Tuesday, March 14, 2023 9:18 AM
To: Ponsock, Amy <APonsock@a2gov.org>
Cc: Ronald Paradoski <ron.paradoski@dteenergy.com>
Subject: DTE Damage at 2010 Winewood Ave - Ann Arbor DTE Claim # 22-10-26-00435

Good Morning Amy,

I received your information from Brandon R. Faron at DTE . He stated that you handle a lot of the permitting within the City of Ann Arbor and may be able to help me.

I am trying to find the contractor that did sidewalk repairs at the corner of Thaler & Burwood in Ann Arbor. There was damage to DTE underground wiring while the repair work was being done around the 26th of October 2022

Please let me know if you have an information regarding the Contractor.

Thank-you

Sheryl Payne

Property Damage Recovery Specialists

248-709-0593

Cheryl.payne@dteenergy.com

MISSY STULTS, PHD

URBAN CLIMATE CHANGE EXPERT

I am an urban sustainability and climate change practitioner with over 15 years experience helping make local communities more resilient and livable.

Contact Information

734-794-6430

301 E. Huron Street
Ann Arbor, MI 48104

mstults@a2gov.or

LinkedIn: https://www.linkedin.com/in/melissa-stults-959a348/

RECENT PROFESSIONAL HISTORY

SUSTAINABILITY AND INNOVATIONS DIRECTOR

CITY OF ANN ARBOR, MI | JUL 2018 - PRESENT

- Design, manage, and implement the community's transition to carbon neutrality in a just and equitable manner by the year 2030.
- Manage 11 full time staff, multiple interns, and temporary employees
- Build and foster a coalition of community stakeholders to support the City's carbon neutrality and resilience work.
- Develop policies, programs, and initiatives to achieve goal.

NETWORK FOUNDER AND MANAGER

SCIENCE TO ACTION NETWORK | JAN 2017 - JUL 2018

- Founder and manager of a network of networks,composed of over 80 nonprofits, academic institutions, professional societies,for-profits, and former federal employees, focused on saving and advancing evidence-based decision-making as it pertains to climate action, environmental protection, and the production and use of science.
- Responsible for network fundraising, coordination, training, and recruitment.

PROGRAM OFFICER

THE CLIMATE RESILIENCE FUND| FEB 2016 - JUL 2018

- One of two staff working to launch a new philanthropy to invest in climate resilience initiatives in the United States. Includes actively seeking investments from existing foundations and venture capitalists, organizing a philanthropic working group on climate change adaptation, and building strategic partnerships with foundations, federal agencies, nonprofits, and for profit.

CLIMATE AND SUSTAINABILITY CONSULTANT

STULTS CONSULTING | FEB 2013 - JUL 2018

- Assisted The Kresge Foundation with designing and implementing evaluations of select grantees.
- Led development of a climate curriculum for The Kresge Foundation’s partners, grantees, staff, and the public.
- Conducted evaluation for how professional societies integrate climate change into member engagement.

Professional Service

- Board Member, American Society of Adaptation Professionals
- Board Member, Southern Climate Impacts and Planning Program
- Member, Sierra Club Adaptation Strategy Development Working Group
- Advisory Board Member, Notre Dame Global Adaptation Index
- Advisory Board Member, Resilient Communities for America
- Advisory Board Member, Adaptation International
- Member, National Disaster Resilience Competition Advisory Committee
- Co-Editor in Chief, Michigan Journal of Sustainability
- Member, Advisory Panel for the United Nations Strategy for Disaster Reduction

Public Service

- Board Member, Ann Arbor YMCA
- Member, Washtenaw County Environmental Commission
- Committee Member, Michigan Environmental Rules Review Committee
- Member, City of Ann Arbor Climate Action Partnership Committee
- Commissioner, City of Ann Arbor Transportation Commission
- Commissioner, City of Ann Arbor Parks Advisory Commission
- Commissioner, City of Ann Arbor Environmental Commission
- Co-Chair, Ann Arbor Dog Park Sub-Committee
- Alumni Council Member, University of New England

CLIMATE AND SUSTAINABILITY CONSULTANT (CONT)

STULTS CONSULTING | FEB 2013 - JUL 2018

- Led development of a climate and socio-economic vulnerability assessment tool for Great Lakes and Mid-Atlantic communities.
- Assisted the City of Aspen, CO, Upper Snake River Tribe Foundation, Miami, OK, 1854 Ceded Territory, Jamestown S'Klallam Tribe, and North Olympic Peninsula Resource Conservation and Development District in the creation of a climate adaptation strategy.
- Co-developed a planning process that led to community-wide sustainability plan for the City of San Antonio.
- Co-developer of research protocol to assess the state of community-based adaptation activities in the United States in partnership with Abt Associates.
- Co-creator of the adaptation certification criteria for the New York State Climate Smart Communities program.
- Co-developed and delivered workshops in the San Francisco Bay area and New Orleans for communities recognized in the Rockefeller Foundation 100 Resilient™ Cities program.
- Co-developed agendas and support material and co-led a series of Climate Leadership Academies focused on climate adaptation activities for U.S. local government stakeholders.
- Organized and facilitated workshop to help Schneider Electric develop a new suite of climate and sustainability services for local government clients.

EDUCATIONAL BACKGROUND

DOCTORATE, URBAN RESILIENCE

UNIVERSITY OF MICHIGAN| OCT 2016

MASTERS, CLIMATE AND SOCIETY

COLUMBIA UNIVERSITY| AUG 2005

BACHELORS, MARINE BIOLOGY & ENV. SCIENCES

UNIVERSITY OF NEW ENGLAND| MAY 2004

SAMPLE PUBLICATIONS

- Stults,M. 2017. Integrating climate change into hazard mitigation planning: Opportunities and examples in practice. Climate Risk.
- Stults,M. & Woodruff, S.C. 2016.Looking under the hood of local adaptation plans: shedding light on the actions prioritized to build local resilience to climate change. Mitigation and Adaptation Strategies for Global Change.
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- Meerow, S., Newell, J., & Stults, M. 2016. Defining Urban Resilience: A Review. Landscape and Urban Planning. 147: 38-49.
- Meerow, S. & Stults, M. 2016. Comparing conceptualizations of urban climate resilience in theory and practice. Sustainability. 8(7): 701.

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ANN ARBOR'S

LIVING CARBON NEUTRALITY PLAN

APRIL 2020

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WELCOME LETTER

Friends –

Even during the COVID-19 global pandemic, we face no greater threat than climate change.

It already affects us locally in the significant increase in precipitation falling on our community compared to previous years. We feel it in increasing temperatures and greater weather volatility. We see it in the spread of disease and infection. We know it's in disruptions to our supply chains, our agricultural systems, and our Great Lakes. We anticipate it in regard to the movement of people from vulnerable regions to areas with less susceptibility to climate disruption.

These existing and future changes will cause significant impacts to our public health, safety, general welfare, local economy, transportation networks, natural environments, and our overall quality of life. We cannot solve this crisis on our own, but in an era of national retreat, state and local communities must do their part. It is because of this that the Ann Arbor City Council unanimously declared a climate emergency and directed the City to immediately begin crafting an aggressive and living strategy to achieve community-wide carbon neutrality by 2030.

We recognize that this is an ambitious goal, but we know that Ann Arborites have the passion, intellect, creativity, and the compassion necessary to see it met. To be clear, achieving carbon neutrality within a decade will necessitate that we all work together. It will necessitate collaboration, innovation, and disruption. If we are to achieve our goal, Ann Arbor 2030 must be vastly different from Ann Arbor 2020.

As the following pages describe, carbon neutrality means that we must adopt new land use strategies and break our dependence on internal combustion engine vehicles. It means that we must power our homes, businesses, vehicles, and recreational sites with 100% renewable energy. It means that we must change the way we interact with materials and resources. It means that we must reinvest in our relationships with our vulnerable neighbors, elders, and youth. We must rethink an Ann Arbor that is open and accessible to all.

Every person -- every home owner, renter, student, visitor, community member, business owner, worker, youth, and elected leader has a significant role to play in achieving community-wide carbon neutrality. This living A^{2}Zero Carbon Neutrality Plan tells us what we need to do and begins to detail how we get there. Over the coming months and years, the City of Ann Arbor and our 60+ partner organizations will work with community members and stakeholders to get the job done. We hope that you will join us because together, we can achieve a rapid and equitable transition to community-wide carbon neutrality.

Sincerely,

Christopher Taylor
Mayor

EXECUTIVE SUMMARY

The global climate is changing and nowhere are the effects felt more acutely than at the local level. Moreover, the growing economic, social, political, environmental, and cultural impacts associated with a changing climate are causing immediate and long-term damages to our society, public health, safety, and our overall quality of life.

In light of these realities, on November 4th, 2019, Ann Arbor City Council unanimously adopted a Climate Emergency Declaration, stating that climate change is one of the most important issues of our time and that responding to the climate crisis necessitates a mobilization on par with those activated during times of disaster. In passing the resolution, the Council also committed to charting a path for how the entire Ann Arbor community could achieve carbon neutrality by the year 2030.

This is an ambitious goal, but one that aligns with the values and sentiments of Ann Arborites. Ann Arbor is a community of great strength, leadership, intellect, compassion, and ability. It is only by unlocking the full potential in all of these areas that we will be able to achieve carbon neutrality within the next decade.

This document outlines the path needed to achieve a just transition to carbon neutrality, community-wide, by the year 2030. This was created with input from thousands of Ann Arborites over the course of an intensive four month planning process. The result is this living A^{2}Zero Carbon Neutrality Plan which centers around six core strategies and one catch-all strategy:

1. Power our electrical grid with 100% renewable energy
2. Switch our appliances and vehicles from gasoline, diesel, propane, coal, and natural gas to electric
3. Significantly improve the energy efficiency in our homes, businesses, schools, places of worship, recreational sites, and government facilities
4. Reduce the miles we travel in our vehicles by at least 50%
5. Change the way we use, reuse, and dispose of materials
6. Enhance the resilience of our people and our place
7. Other

Forty-four actions have been identified to fully implement these seven strategies. Each of these actions is outlined in the following pages. Combined, these actions get us to carbon neutrality, based on our current greenhouse gas emissions profile. By necessity, this Plan is considered living since many things, can and likely will, change in the coming years.

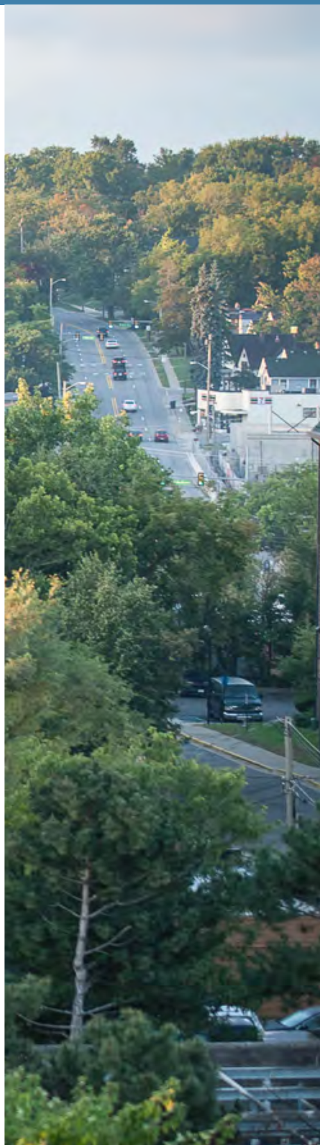
To achieve carbon neutrality, the entire Ann Arbor community must eliminate 2.1 million metric tons of carbon dioxide equivalent emissions annually – this is the quantity of greenhouse gas emissions we emitted, as an entire community, in 2018. Although the City recognizes the importance of upstream and embedded emissions, this figure does not include emissions associated with the production of the goods and services Ann Arborites use. As the science and policy around carbon neutrality grows, we will continue to look for and contribute to methodologies to calculate community-wide upstream and embedded emissions in future inventories.

For now, this Plan focuses on eliminating the 2.1 million metric tons of carbon dioxide equivalent that primarily come from natural gas, electricity, gasoline, coal, and diesel used by residents, visitors, students, and businesses in Ann Arbor. Importantly, the seven overarching strategies proposed in this Plan are intrinsically linked. This means that care was taken to understand how given actions work together to achieve carbon neutrality. This also means that removing one action from consideration has a more significant impact than is denoted on any one given actions' summary page. As such, caution should be taken before removing any given action from consideration without fully understanding how it interacts with and informs other actions proposed in this Plan.

Where available, cost estimates are also provided for each action in the Plan. These cost estimates integrate soft, physical, and human capital costs associated with various actions. All costs estimated are incremental, meaning that the dollars allocated for each action are additional to resources, if relevant, already supporting a given action. In our analysis, the value of externalities was often calculated for information purposes. We did not, however, include those values in each individual cost calculation.

Additionally, we have identified an array of co-benefits associated with each action in the Plan. In total, 10 co-benefits were identified, including:

- **Supports local economy**
- **Improves public health**
- **Produces local energy**
- **Cost savings accrued**
- **Improves air quality**
- **Supports biodiversity preservation**
- **Creates jobs and/or develops workforce**
- **Benefits the most vulnerable**
- **Improves local resilience**
- **Scalable or transferable to other communities**



Combined, the seven overarching strategies and accompanying 44 actions outlined in this Plan are projected to reduce emissions by 2.1 million metric tons of carbon dioxide equivalent and cost just over $1 billion additional dollars over the next ten years (Figure ES-1; ES-2; and ES-3). As we move forward with implementation, we will make tough decisions about how to fund and finance the actions outlined in this Plan.

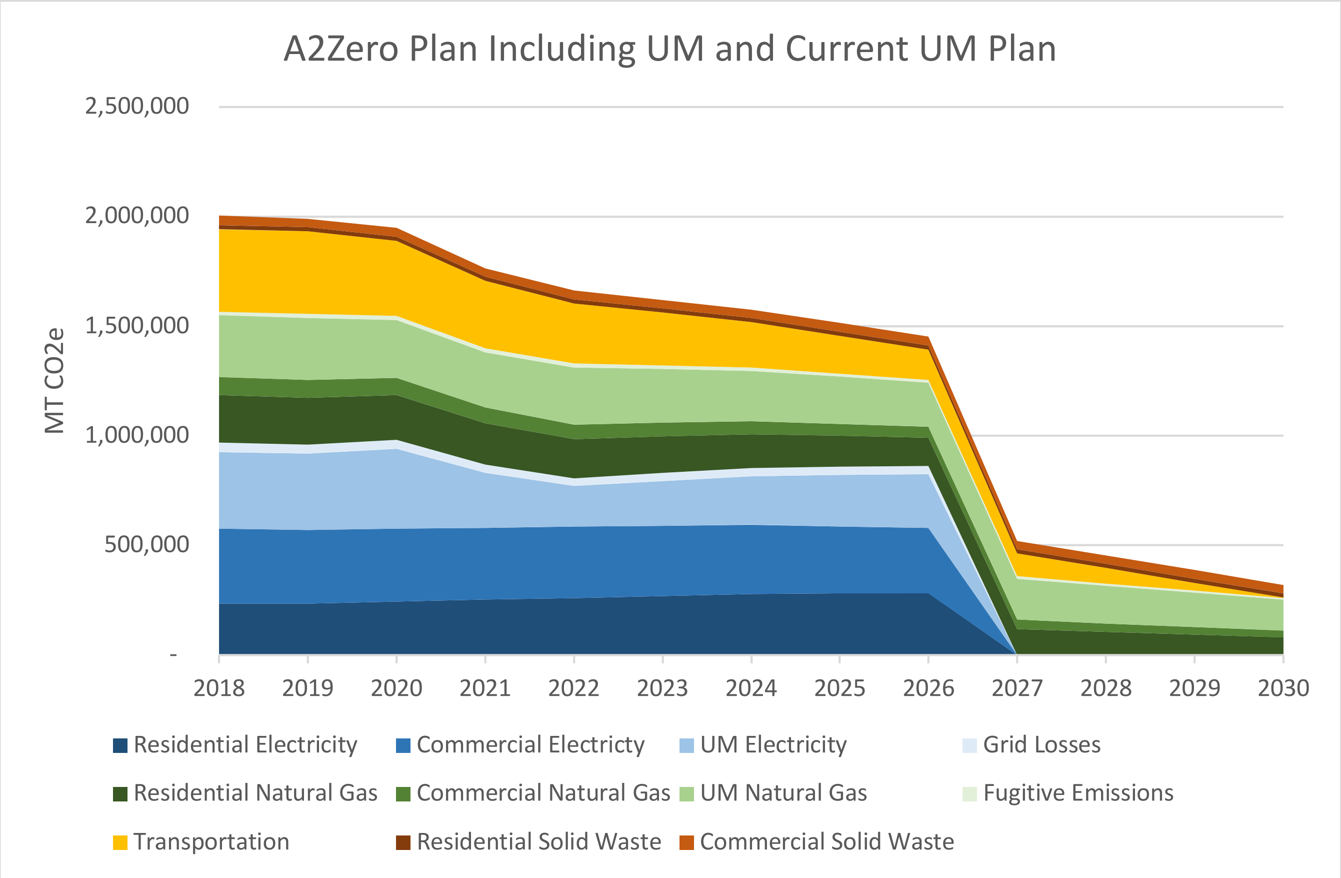


Figure 1: A "Win Scenario" outlining one possible path towards achieving carbon neutrality by 2030. The actions outlined in this Plan are centered on achieving this "win scenario". This "win scenario" assumes that the University of Michigan mirrors the actions of the City.

However, the University is currently undertaking their own carbon neutrality planning process so these assumptions will change once more information is available. Overall, this Plan is considered living and iterative, meaning that changes to this "win scenario" will be necessary over time.

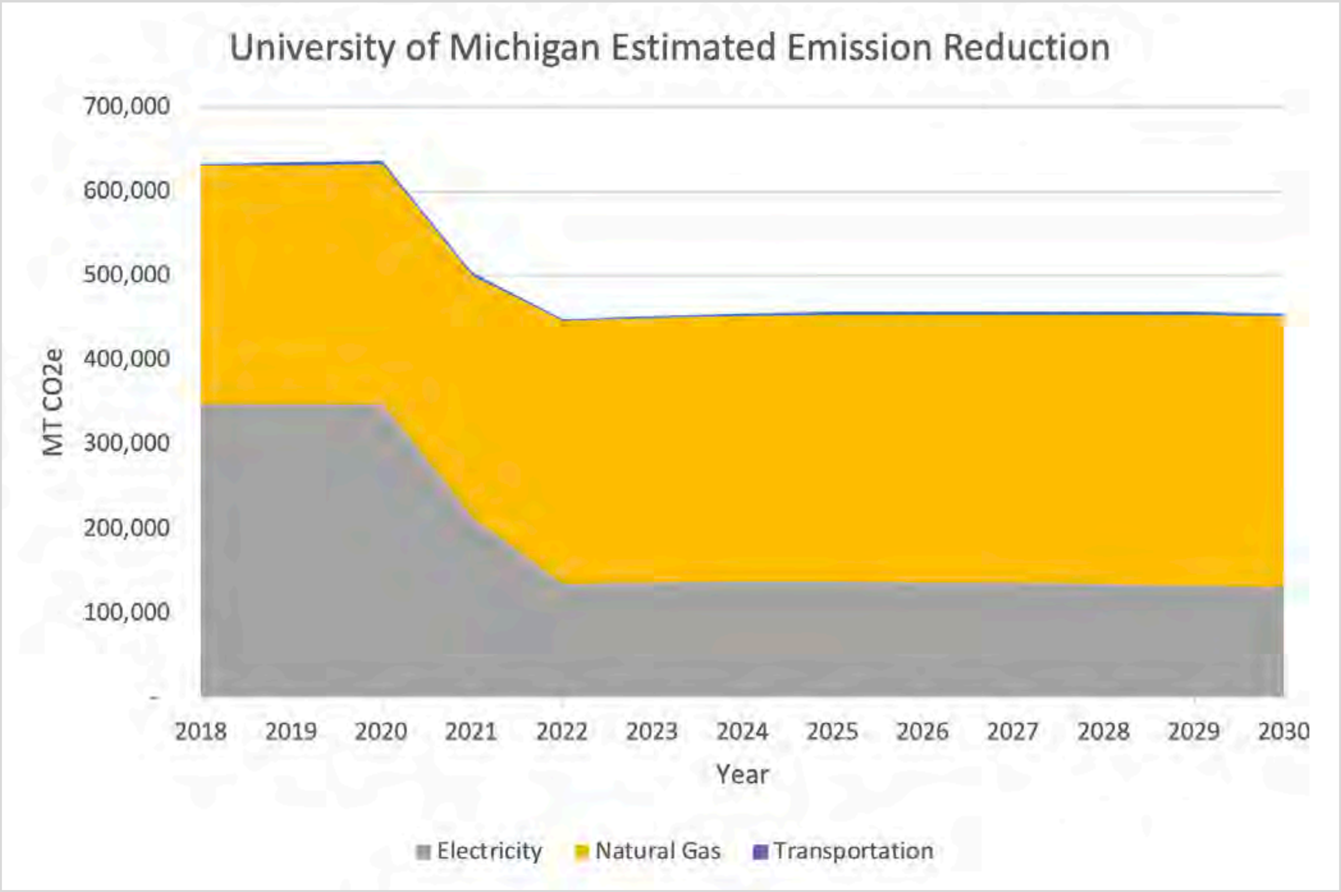


Figure 2: Summary of the University of Michigan's current strategies to reduce their emissions over the next two years. The University of Michigan is currently developing recommendations to achieve carbon neutrality by an undetermined date. Since the University's Plan was not finalized by the time the City's Plan was drafted, their participation in the actions outlined in this Plan was modeled. An update will be provided to this Plan once the University has formally adopted a path towards carbon neutrality. For now, this graph shows the University's currently projected emissions reduction activities.

One of the most pressing first steps in implementing this strategy is ensuring we have the human capital needed to immediately begin taking action. Models run as part of this analysis showed that a minimum staffing of 15 full time equivalent employees are needed, combined with a varying number of consultants, to fully implement this Plan. Not surprisingly, the more physical staff that are focused on the Plan, the more likely the Plan is to succeed. As such, decisions will need to be made not only about how best to fund the actions outlined in this Plan, but how best to build the human capital needed to design and support implementation of the Plan. Guiding this work as a living A²Zero Investment Plan, A²Zero Prioritization Framework, and an A²Zero Governance Model.

Achieving a just transition to carbon neutrality, community-wide, by the year 2030 is audacious, ambitious, and inspirational. This Plan outlines a concrete path for how we can immediately make progress towards that goal. Time is of the essence if Ann Arbor is to seriously achieve this goal. From the engagement we've already seen with A²Zero, we know City employees, partner organizations, technical advisors, neighborhoods associations, businesses, and members of the public stand ready to take this audacious goal and turn it into a reality. The time to start is now.

ACTION SUMMARY TABLE

STRATEGY 1	Total Costs	GHG Reduction	%total emissions	$/ton	Co-Benefits
Community Choice Aggregation	$3,245,000	784,000	35.8%	$4	AIR; $$; EQU; SCALE
Bulk Purchase of Renewables	$605,000	85,000	3.9%	$7	LOCAL; NRG; AIR; JOBS; RES; $$; SCALE
Community Solar Program	$205,000	11,500	0.5%	$18	LOCAL; NRG; AIR; JOBS; RES; $$; EQU; SCALE
Landfill Solar Project	$80,000	23,000	1%	$3.5	LOCAL; NRG; AIR; SCALE
STRATEGY 2	**Total Costs**	**GHG Reduction**	**%total emissions**	**$/ton**	**Co-Benefits**
Home & Business Electrification	$7,100,000	362,200	16.5%	$ 20	LOCAL; AIR; JOBS; HEALTH; SCALE
Bus Electrification	$86,000,000	13,800	0.6%	$ 5,839	LOCAL; AIR; RES; HEALTH; EQU
Bulk Purchase EVs	$700,000	122,900	5.6%	$6	AIR; JOBS; RES; HEALTH; $$; SCALE
Private EV Fleets	$123,000	Not Calculated			AIR; RES; $$; HEALTH; SCALE
City EV Fleet	$4,000,000	1,100	0.05%	$3,636	AIR; JOBS; RES; HEALTH; $$; SCALE
EV Infrastructure	$42,000,000	Not Calculated			AIR; JOBS; HEALTH; SCALE
STRATEGY 3	**Total Costs**	**GHG Reduction**	**%total emissions**	**$/ton**	**Co-Benefits**
Bulk Purchase of Energy Efficiency	$950,000	242,500	11.1%	$ 4	LOCAL; AIR; JOBS; HEALTH; $$; EQU; SCALE
Building Code Requirements	$1,935,000	48,300	2.2%	$ 40	LOCAL; JOBS; RES; $$; EQU; SCALE
LED Lighting	$3,140,000	2,600	.1%	$1,208	AIR; $$
Benchmarking	$2,370,000	Not Calculated			JOBS; $$; SCALE
Loan Loss Reserve	$1,578,000	Not Calculated			LOCAL; JOBS; RES; HEALTH; $$; EQU; SCALE
Energy Concierge & Community Education	$820,000	Not Calculated			JOBS; $$; EQU; SCALE
Net Zero Energy Affordable Housing	$800,000	400	0.0%	$2,000	LOCAL; NRG; AIR; JOBS; RES; HEALTH; $$; EQU
Green Rental Housing Program	$530,000	Not Calculated			LOCAL; AIR; JOBS; RES; HEALTH; $$; EQU; SCALE
Green Business Challenge	$700,000	Not Calculated			LOCAL; NRG; AIR; JOBS; RES; $$; SCALE
Aging in Place Efficiently	$155,000	Not Calculated			LOCAL; JOBS; RES; HEALTH; $$; EQU
Weatherization Expansion	$1,550,000	Not Calculated			LOCAL; JOBS; RES; HEALTH; $$; EQU

KEY					
EQU	Benefits the most vulnerable	RES	Improves local resilience	LOCAL	Produces local energy
COST	Cost savings accrued	HEALTH	Improves public health	ENV	Supports biodiversity preservation
$$	Supports local economy	SCALE	Scalable or transferable to other communities		
AIR	Improves air quality	JOBS	Creates jobs and/or develops workforce		

ACTION SUMMARY TABLE

STRATEGY 4	Total Costs	GHG Reduction	%total emissions	$/ton	Co-Benefits
Non-Motorized Plan	$2,400,000	60,400	2.8%	$40	AIR; RES; HEALTH; $$; EQU
Local and Regional Transit	$656,780,000	93,200	4.3%	$7047	LOCAL; AIR; JOBS; RES; HEALTH; $$; EQU
Park and Ride	$170,000,000	28,400	1.3%	$5,986	AIR; EQU; SCALE
Increase Housing Diversity	$250,000	2,200	0.1%	$114	LOCAL; AIR; RES; SCALE
Mixed-Use Zoning	$365,000	Not Calculated			LOCAL; AIR; RES; HEALTH
Parking Rates	$4,500,000	Not Calculated			LOCAL; AIR
STRATEGY 5	**Total Costs**	**GHG Reduction**	**%total emissions**	**$/ton**	**Co-Benefits**
Year Round Composting	$26,000,000	400	0.0%	$65,000	LOCAL; NAT; JOBS; SCALE
Commercial Recycling	$18,400,000	5,600	0.3%	$3,286	JOBS; SCALE
Sustainable Material Use and Reuse	$270,000	Not Calculated			LOCAL; ERS: HEALTH; $$; NAT; EQU
Circular Economy	$270,000	Not Calculated			LOCAL; JOBS; RES; HEALTH; $$; NAT
Plant-Based Diets	$208,400	Not Calculated			HEALTH; NAT
Refrigerant Recycling	$179,400	Not Calculated			JOBS; HEALTH
STRATEGY 6	**Total Costs**	**GHG Reduction**	**%total emissions**	**$/ton**	**Co-Benefits**
Resilience Hubs	$5,025,000	2,500	0.1%	$2,010	LOCAL; NRG; RES; HEALTH; EQU; SCALE
Neighborhood & Youth Ambassadors	$350,000	Not Calculated			LOCAL; JOBS; RES; HEALTH; EQU; SCALE
Tree Canopy	$1,160,000	450	0.0%	$2,578	AIR; RES; HEALTH; NAT; EQU; SCALE
Neighborhood Asset Mapping	$300,000	Not Calculated			LOCAL; RES: EQU; SCALE
Emergency Kits	$350,000	Not Calculated			RES; HEALTH; EQU; SCALE
Sensors and Data Monitoring	$300,000	Not Calculated			RES; HEALTH; $$; NAT; EQU; SCALE
STRATEGY 7	**Total Costs**	**GHG Reduction**	**%total emissions**	**$/ton**	**Co-Benefits**
Equity Programs	$200,000	Not Calculated			LOCAL; RES; EQU
SA2T Grant Program	$1,000,000	Not Calculated			LOCAL; RES
Internal Carbon Tax	$75,000	Not Calculated			LOCAL; NRG; RES; $$; SCALE
Offsets	$9,440 ,000	298,500	13.6%	$32	SCALE
Total	**$1,056,408,800**	**2,188,950**	**100.0%**		

Figure 3: Summary of Strategies, Actions, Cost, and Co-Benefits for Proposed Actions in the A²Zero Plan. Estimates incorporate engagement with the University of Michigan.

INTRODUCTION

In November 2019, Ann Arbor City Council passed Resolution 19-2103: A Resolution in Support of Creating a plan to Achieve Ann Arbor Community-Wide Carbon Neutrality by 2030. In this Resolution, City Council called on the City to work with the public to create a living plan for achieving carbon neutrality, and to present that plan by Earth Day 2020.

To initiate this work, the Office of Sustainability and Innovations launched A²Zero: the City's carbon neutrality planning and implementation initiative. From the outset, A²Zero was designed to be iterative, transparent, failure-positive, and grounded in justice and equity. A²Zero was crafted so as to have extensive and broad public input and engagement, to be technically robust, to be visionary, and to be inclusive.

Achieving a just transition to carbon neutrality, community-wide, by 2030 will necessitate action from all members of our community. It will necessitate some subtle as well as some significant changes to our community. Not everyone will be excited about every change. But we know the goal – carbon neutrality – is a scientific imperative and one that Ann Arborites are ready to embrace.

But what does carbon neutrality mean? Simply defined, carbon neutrality is reducing the emissions our community puts into the air down to zero, through actions that minimize output and/or by purchasing greenhouse gas emissions offsets. Ann Arbor regularly conducts a greenhouse gas emissions inventory to track our emissions. From this, we know that community-wide emissions, as of 2018, were 2.1 million metrics tons (Figure 4). This means that we have to devise a plan to reduce emissions by 2.1 million metric tons over the next 10 years.

Simultaneously, we need to ensure that we continue preparing our community for the impacts of climate change that are already here, as well as those projected to come. For example, we already know that:

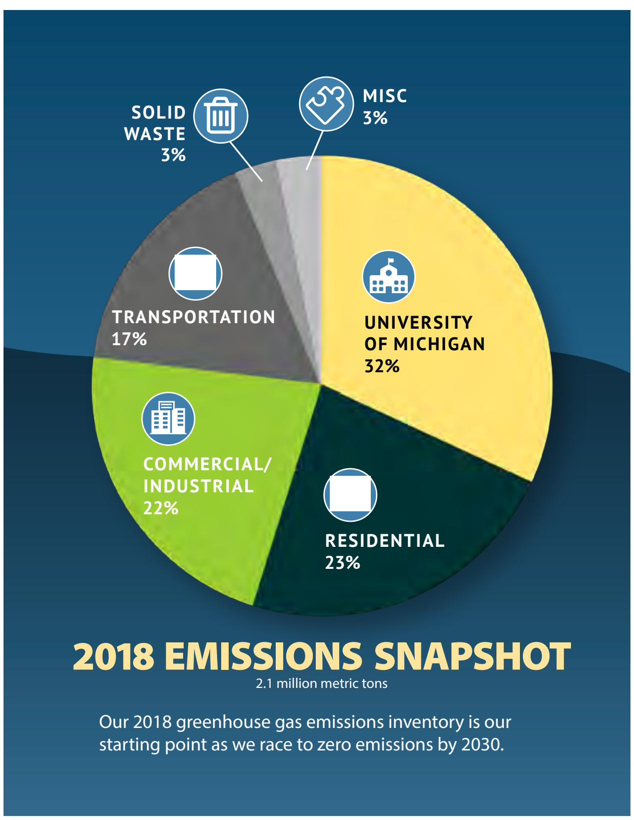


Figure 4: 2018 Greenhouse Gas Emissions by Sector.

- The average annual temperature in Ann Arbor has already increased nearly 1°F since the 1900s. And temperatures are expected to rise by 3-7°F more by 2050.
- Ann Arbor is projected to have 12-36 more days per year above 90°F by 2050 and 30-42 more by end of the century.
- Average annual precipitation has increased by 44% since the 1950s and continues to rise.
- The total amount of rain falling during extreme events has increased by 37% since 1981.

Given these realities, A²Zero was designed to develop actions that change how we manage the unavoidable impacts of climate change by ensuring we invest in the resilience of our people and place, while avoiding the unmanageable impacts of climate change by doubling down on our efforts to reduce greenhouse gas emissions in an effective and timely manner. And, at the core of all of this work is equity; ensuring that our work does not disproportionately burden our low-income, minority, and frontline populations (Figure 5). This is A²Zero.

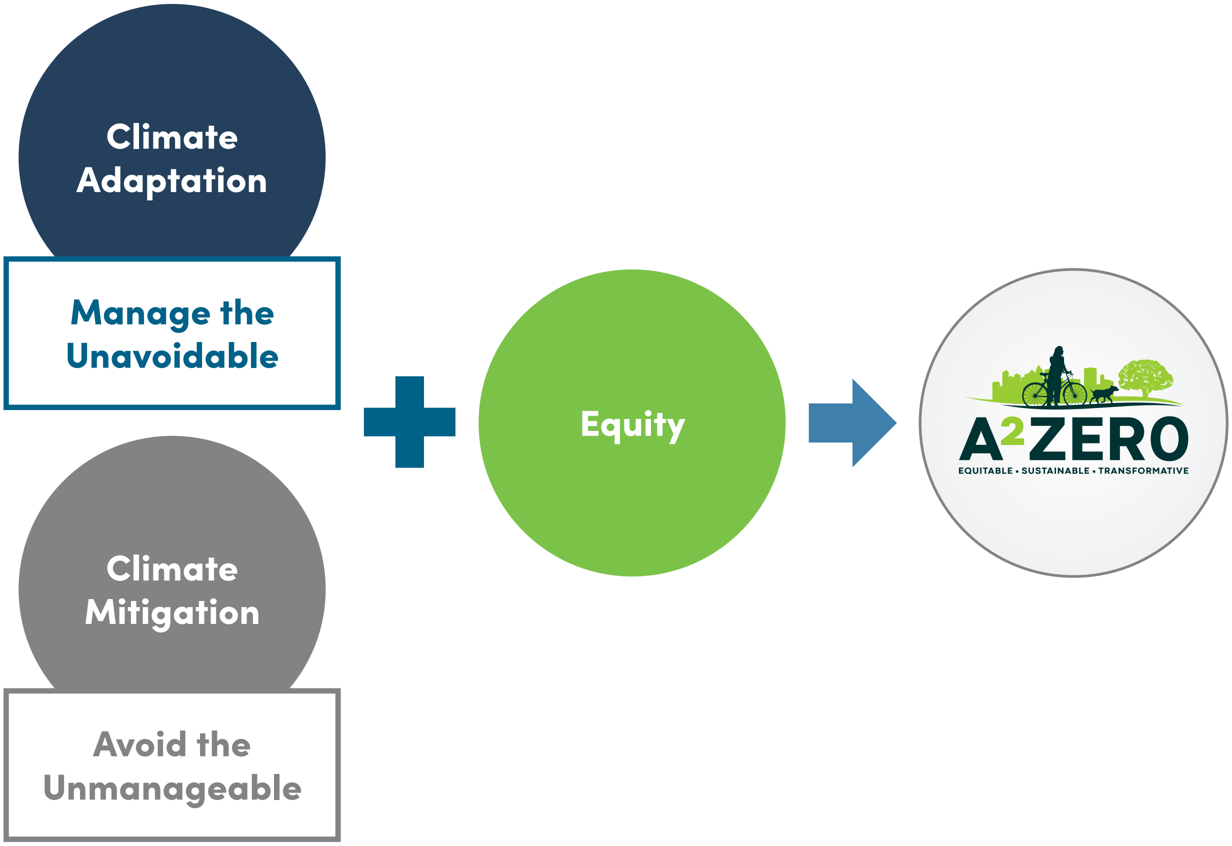


Figure 5: The Core Components of A^{2}Zero.

A^{2}ZERO VALUES

Three overarching values are fundamental to and guide the A^{2}Zero initiative: Equity, Sustainability, and Transformation. The table below highlights what each of these values mean and what characteristics were applied to integrate these values into the A^{2}Zero.

	Equity / Equitable	Sustainability / Sustainable	Transformation / Transformative
Definition	Ensuring everyone gets what they need to succeed based on where they are and where they need to go.	Capable of enduring, able to be sustained in perpetuity. Meeting the needs of the present without jeopardizing the ability of future generations to meet their own needs.	Causing a major change to something or someone, especially in a way that makes it or them better.
Characteristics	• Transparent • Community-Led • Inclusive • Prioritizes Frontline Populations	• Living / Iterative • Holistic	• Failure-Positive • Diversified • Accessible to All

A^{2}ZERO MISSION

The A^{2}Zero mission is the same as the City of Ann Arbor's mission: deliver exceptional services that sustain and enhance a vibrant, safe, and diverse community.

A²ZERO VISION

A²Zero strives toward one unifying vision: Together, creating and implementing a just transition to carbon neutrality, community-wide, by the year 2030. This vision guides all things related to A²Zero.

A²ZERO STRATEGY

Combing the A²Zero values, mission, and vision allowed us to land on seven overarching strategies that are essential to and make up the backbone of the A²Zero Carbon Neutrality Plan:

1. Power our electrical grid with 100% renewable energy
2. Switch our appliances and vehicles from gasoline, diesel, propane, coal, and natural gas to electric
3. Significantly improve the energy efficiency in our homes, businesses, schools, places of worship, recreational sites, and government facilities
4. Reduce the miles we travel in our vehicles by at least 50%
5. Change the way we use, reuse, and dispose of materials
6. Enhance the resilience of our people and our place
7. Other

Public input, guidance from technical advisory committees and peer communities, combined with staff expertise determined that 44 specific actions were needed to fully achieve the seven strategies outlined above. The majority of this Plan outlines these specific actions and how we, as a community, can immediately get started working towards carbon neutrality.

A^2ZERO PLANNING PROCESS

Ann Arbor has been working on climate action since the early 2000s. A^2Zero builds upon nearly two decades of planning, action, and local leadership. The City initiated A^2Zero on November 13th, 2019 with a deadline of plan completion by mid-March 2020 – an incredibly accelerated, four-month creation period. What's unique about this Plan is the urgency and speed with which this Plan was created. In this four month period, the Ann Arbor Office of Sustainability and Innovations mobilized dozens of community partners and volunteers, thousands of members of the public, dozens of technical advisors, and peer communities to provide input into this Plan.

THE PROCESS

82 working days:

- 3 Public surveys
- Over 60 public events
- 2 large town halls
- Over 80 technical advisors
- 66 partner organizations

Figure 6: The A^2Zero Planning Process. The process involved three phases, four main sources of input (including technical documents and the peer reviewed literature), over 60 public events, more than 80 technical advisors, three public surveys, and support from over 60 organizations.

This reminder of this section provides detail on the planning processes undertaken to arrive at this living A^2Zero Carbon Neutrality Plan.

A^2ZERO'S FIVE PILLARS OF PLANNING

To complete a holistic, comprehensive, and realistic carbon neutrality plan, the Office of Sustainability and Innovations designed a planning process that rests on five pillars:

1. Public Engagement
2. Technical Advisory Committees
3. Partner Support
4. Staff Expertise
5. Peer Learning and Literature Review

PUBLIC ENGAGEMENT

Public engagement is at the heart of A²Zero. Three primary means of public engagement were undertaken in order to create this Plan: 1) public events; 2) public surveys; and 3) regular communication via traditional means and social media. In terms of public events, staff in the Office of Sustainability and Innovations hosted 68 public events between November 13th, 2019 and March 12th, 2020 (Appendix 1). Public events focused on engaging underrepresented constituencies and leveraging partner networks to reach as wide of a swath of the community as possible. Partner organizations also encouraged to their members to take the three surveys as part of the planning process. Finally, the City leveraged its social media channels and partner networks to let people know about events, opportunities for feedback, and to share general information about the A²Zero initiative.

Three public surveys were administered as part of A²Zero:

Survey 1: Gathered ideas from the public about what they would like to see in the City's carbon neutrality work.

Survey 2: Collected feedback on which ideas the public supported to reduce greenhouse gas emissions as well as how the City should fund carbon neutrality efforts.

Survey 3: Focused on identifying what stakeholders need to support implementation of the final carbon neutrality strategy.

TECHNICAL ADVISORY COMMITTEES

Technical advisory committees (TACs) were established to ensure that experts within the community could help identify what would technically be needed to achieve carbon neutrality. Four TACs were established: 1) energy; 2) mobility; 3) resource reduction; and 4) adaptation and resilience. Over 80 individuals volunteered their time as technical advisors on at least one of the four committees. Technical advisors helped identify potential actions, evaluate actions (including those recommended by the public), and create a prioritized list of candidate strategies for potential inclusion in the final Plan (see Appendix 2 for TAC meetings).

PARTNER ORGANIZATIONS

To support outreach and engagement, as well as the eventual implementation of the A²Zero, the Office of Sustainability and Innovations sought partner organizations. Partner organizations had to agree to co-host a carbon neutrality event with the Office, share information about the initiative with their membership/networks, and to share their logo on partner messaging materials. As of early March 2020, 67 organizations had signed up to be partners of A²Zero, including:

The National Wildlife Federation; The Neutral Zone; Community Action Network; Citizens Climate Lobby - Ann Arbor; The Ecology Center; The Ann Arbor 2030 District; Interfaith Council for Peace and Justice; Michigan Environmental Council; Washtenaw 350; Ann Arbor Area Elders Climate Action Chapter; The American Institute of Architects Huron Valley Chapter; The University of Michigan; Washtenaw Climate Reality; Building Matters Ann Arbor; Michigan League of Conservation Voters; Sierra Club Huron Valley Group; A2 Climate Mobilization; Leslie Science and Nature Center; The Hands on Museum; Michigan Climate Action Network; Ann Arbor/Ypsilanti Regional Chamber; Ann Arbor Housing Commission; THRIVE Collaborative; Michigan Interfaith Power and Light; Washtenaw County Democrats; American Society of Adaptation Professionals; Washtenaw Bicycling and Walking Coalition; Colonial Square Cooperative; Walker Miller Energy Services; United Way of Washtenaw County; Lean and Green Michigan; Washtenaw Housing Alliance; Citizens Climate Lobby - UM Chapter; Forest Hills Cooperative; Ann Arbor Meals on Wheels; International Brotherhood of Electrical Workers Local 252; Ann Arbor Center for Independent Living; UM College Democrats; Students for Clean Energy; Great Lakes Renewable Energy Association; UM Climate Action Movement; Washtenaw Area Apartment Association; Washtenaw County; The Ride;

Every month, from December – March, a partner messaging kit was developed and circulated to make it easy for partners to share updates about A²Zero with their networks.

Ann Arbor SPARK; National Association for the Advancement of Colored People-Ann Arbor Chapter; Ann Arbor Public Schools; Ann Arbor Indivisible; University of Michigan President's Commission on Carbon Neutrality; Washtenaw County Food Policy Council; Huron Valley Democratic Socialists of America; Bee Safe Ann Arbor; City of Ypsilanti; Ann Arbor Summer Festival; Ann Arbor District Library; Pesticide-Free Ann Arbor; Slow Food Huron Valley; Common Cycle; Earth Sciences; Natural Resources Defense Council; Ann Arbor Main Street Association; Washtenaw Optimal Wellness; Downtown Development Authority; Mindful City Ann Arbor; and The Old Fourth Ward.

STAFF EXPERTISE

Staff expertise and research and analysis of published carbon neutrality literature, including Project Drawdown, were an integral component of planning. This included reviewing historical planning initiatives within the City, identifying existing successful initiatives, and reaching out to staff across the City to round out planning and engagement aspects of A^{2}Zero.

PEER LEARNING AND LITERATURE REVIEW

A key piece of our work was reaching out to and learning from peer communities working on carbon neutrality. This involved reading other community plans, talking to peer community liaisons, and researching key recommendations on community carbon neutrality from peer reviewed and technical sources.

OTHER

In addition to the aforementioned activities, the Office of Sustainability and Innovations also:

- Created a website to track activities around A^{2}Zero: www.A2Zero.org
- Created a listserv where stakeholders could continue to learn about A^{2}Zero
- Created a meeting-in-a-box kit that included materials so individuals could host their own A^{2}Zero events

  The meeting-in-a-box toolkit includes the following:

  - Guide on how to host your own A^{2}Zero meeting
  - A^{2}Zero slide deck with talking points, including discussion questions
  - A terminology sheet
  - A^{2}Zero overview sheet with is a 1-page document that summarizes the A^{2}Zero process and provides a snapshot of the initiative
  - Climate Change Overview – which is a 1 page document that introduces folk to the existing and projected climate change impacts in Ann Arbor
  - Sign-In sheet to track the individuals attending an event
  - Links to relevant A^{2}Zero surveys
  - Event results form to gather feedback about the event
  - Trivia questions to help make events more interactive and fun
  - Photo release form in case anyone was taking photos they intended to share
- Hired a communications firm to create a brand for the City's carbon neutrality work, through which A^{2}Zero emerged.

- Worked with Elevate Energy to assess the greenhouse gas reduction potential and costs associated with each action included in the final Plan.
- Created a 1-page fact sheet about A²Zero and the City's carbon neutrality work.
- Created a 1-page document summarizing the different sectors included in the City's carbon neutrality planning.
- Sent 11,000 backpack fliers to all K-5th grade students in Ann Arbor Public Schools.
- Developed A²Zero flyer for Ann Arbor Meals on Wheels to distribute to home bound residents.
- Developed flyer for all partners to display advertising the February 22nd Town Hall and the final A²Zero survey.

All of these activities were integral to creating A²Zero. In the end, this Plan was made by the community, for the community

THE LIVING CARBON NEUTRALITY PLAN

The remainder of this document highlights the actions that are part of the City's living A^2Zero Carbon Neutrality Plan.

These actions are organized around the seven overarching strategies:

1. Power our electrical grid with 100% renewable energy
2. Switch our appliances and vehicles from gasoline, diesel, propane, coal, and natural gas to electric
3. Significantly improve the energy efficiency in our homes, businesses, schools, places of worship, recreational sites, and government facilities
4. Reduce the miles we travel in our vehicles by at least 50%
5. Change the way we use, reuse, and dispose of materials
6. Enhance the resilience of our people and our place
7. Other

STRATEGY 1:

Power Our Electrical Grid with 100% Renewable Energy

This strategy focuses on ensuring that all of the electricity used within our community is powered with renewable energy such as solar, geothermal, and wind. To achieve this strategy, four specific actions are proposed:

1. Implement Community Choice Aggregation
2. Support Onsite Renewables and Battery Storage
3. Develop Community Solar Program
4. Launch Landfill Solar Project

Combined, these four actions are projected to reduce community-wide greenhouse gas emissions by 41% and cost just over $4,100,000.

1. IMPLEMENT COMMUNITY CHOICE AGGREGATION

Community Choice Aggregation (CCA) program is an agreement among stakeholders to allow local governments to procure power on behalf of their residents, businesses, and municipal accounts from an alternative supplier while receiving transmission and distribution services from their existing utility providers. CCA allows communities to have more control over the production of their energy, including integrating community values such as 100% renewable energy into their purchasing decisions. Generally, a CCA is an opt-out program meaning that it allows economies of scale to be achieved which leads to close to or actual cost parity to existing electricity costs. In order to implement a CCA, the State will need to enact legislation to allow for CCA.

Vision for Implementing Community Choice Aggregation

Community Choice Aggregation legislation has been enabled by the State and Ann Arbor administers its first bulk buy of 100% new renewable energy by 2027. Through an opt-out structure and little change in energy rates, all residents and commercial entities, including the University of Michigan, participate.

Party Responsible for Implementation

Office of Sustainability and Innovations

Collaborators / Project Co-Designers

- State legislature
- Other Michigan municipalities
- Michigan Municipal Association on Utility Issues (MI-MAUI)
- Michigan nonprofits focused on energy choice

Assumptions

- 100% of residential customers participate in the CCA
- 100% of commercial and industrial enterprises participate in the CCA
- 100% of any municipal operations not yet powered by renewable energy are included in the CCA
- Capacity of program accounts for changes in consumption due to (a) reductions in consumption achieved through widespread energy efficiency improvements, (b) increases in consumption related to switching from fossil fuel powered heating and vehicles to renewable energy, and (c) projected growth rates
- Renewable energy credits from the sources procured through the program are retired, and the energy sources offset fossil fuel generation

Equity Impacts

CCA provides clean, renewable energy for the whole community. This is a particularly useful option for residents who may not have the ability to otherwise install renewable energy systems at their residence, whether due to renting or to cost. A CCA program would provide renewable energy to those who may not otherwise be able to access this resource.

Indicators of Success / Goals

By 2030, 100% of our community's electrical needs are met with renewable energy sources, thanks in large-part to the CCA.

Target Demographic

Entire community

Timeline and Initial Actions

2020
The City begins working on recommendations for what to include in a CCA program.

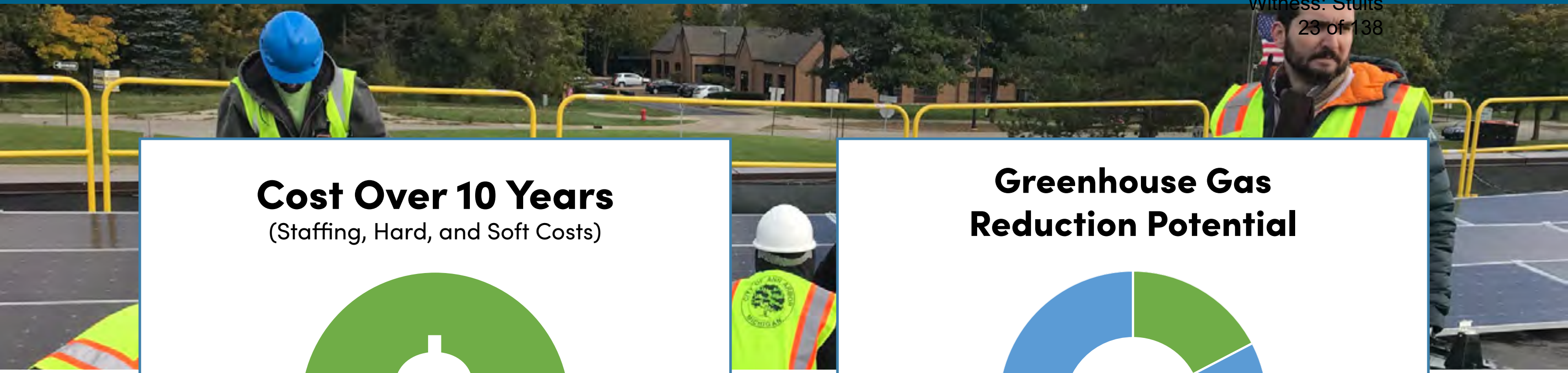
2021
The City begins working with legislators to develop CCA legislation. Public education begins. about CCA

2024
The City begins planning the startup of the CCA program, undertaking feasibility studies, public engagement, and business model planning.

2025
CCA is enabled in Michigan through the passing of state legislation.

2026
Ann Arbor public vote to allow a local CCA purchase.

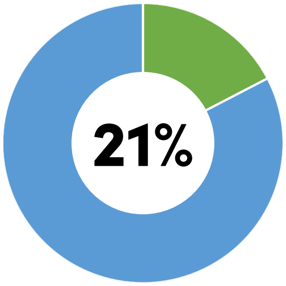
2027
CCA program launches in Ann Arbor and continues.



Cost Over 10 Years
(Staffing, Hard, and Soft Costs)

$3,245,000

Greenhouse Gas Reduction Potential



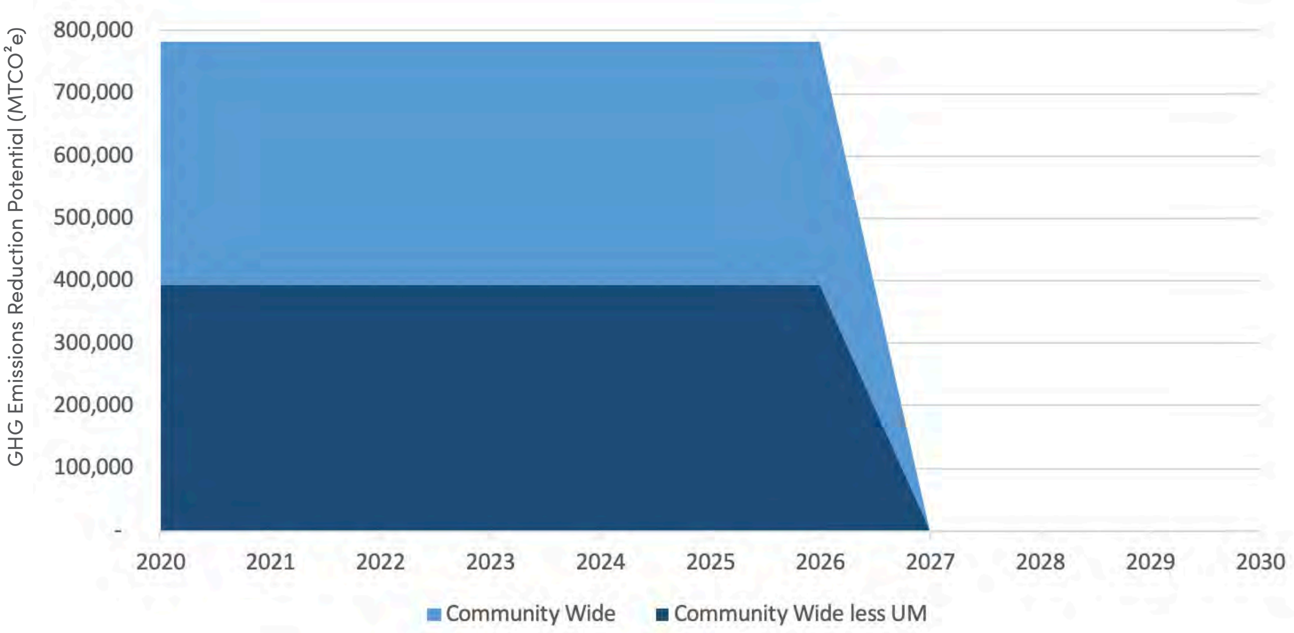
462,100 metric tons carbon dioxide equivalent (21% community-wide emissions)

If the University of Michigan participants, an additional 321,900 metric tons carbon dioxide equivalent could be reduced, resulting in a total of 784,000 metric tons carbon dioxide equivalent (~36% community wide emissions).

By 2027, the Implement **Community Choice Aggregation** strategy will have achieved all of its potential greenhouse gas emissions reductions.

The figure below shows the total emissions reduction potential of Community Choice Aggregation (in light blue) assuming the community and University participate in the program. The dark blue shows the impact of Community Choice Aggregation if only the community (not the University) participates in the program.

IMPLEMENT COMMUNITY CHOICE AGGREGATION



2. SUPPORT ONSITE RENEWABLE ENERGY GENERATION WITH BATTERY STORAGE (BULK BUYS)

Renewable energy systems like geothermal, solar, and energy storage pay for themselves over their lifetime, but the upfront costs of installation can be a barrier for many people. To help reach our A²Zero goals, the City proposes establishing a bulk purchase program that enables residents and businesses to procure onsite renewables for a discounted price by achieving economies of scale.

Vision for Supporting Onsite Renewable Energy Generation with Battery Storage

By 2030, through the provision of bulk buys and discount programs, 78MW of local renewable energy is being generated on viable buildings, parcels of land, and carports. At least ¼ of these installations also have some form of battery storage, which is helping enhance the resilience of our local community and economy.[1]

Party Responsible for Implementation

Office of Sustainability and Innovations' Solarize Coordinator, with support from the OSI team

Collaborators / Project Co-Designers

- City of Ann Arbor Building, Rental, and Inspection Services
- Renewable energy contractors and installers
- Michigan Saves
- Potentially local banks

Assumptions

- 78MW of local renewable energy generation is achieved by 2030
- Pricing discounts of 5%, 10%, and potentially 15% are offered through the program
- The capacity generated through this initiative is not included in the CCA

Equity Impacts

Nonprofit organizations and public institutions may benefit from this program, but the benefits flow primarily to property owners.

Indicators of Success / Goals

78MW of new, local, onsite renewable energy generation is installed in Ann Arbor by the year 2030.

Target Demographic

Individuals who can install renewable energy on the buildings they own or operate, including homeowners, businesses, schools, and institutions

[1] In administering this program, OSI will also be looking to tie in energy efficiency support and electrification support so that each household or business receives a package of support as opposed to multiple different programmatic offerings.

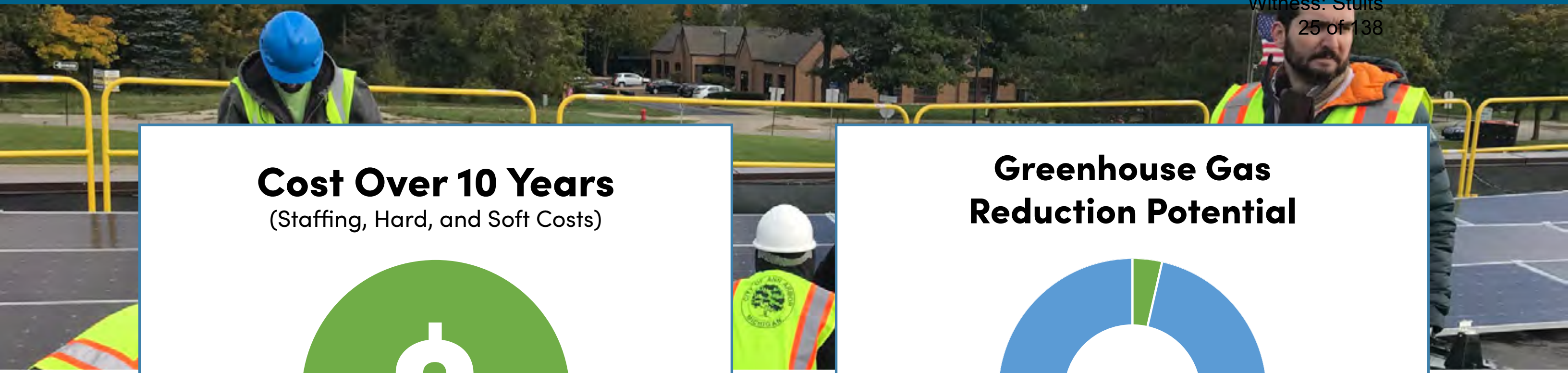
Timeline and Initial Actions

2020

Pilot test group buy in residential sector. Coordinate program with contractors. Conduct public outreach.

2020

Revise program based on lessons learned. Scale and continue to administer until at least 2030 (or until the program stops generating demand).



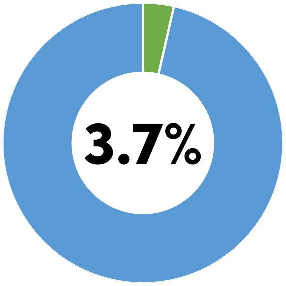
Cost Over 10 Years
(Staffing, Hard, and Soft Costs)

Estimated

$605,000

($540,000 in staffing and $65,000 in stipends to community residents)

Greenhouse Gas Reduction Potential



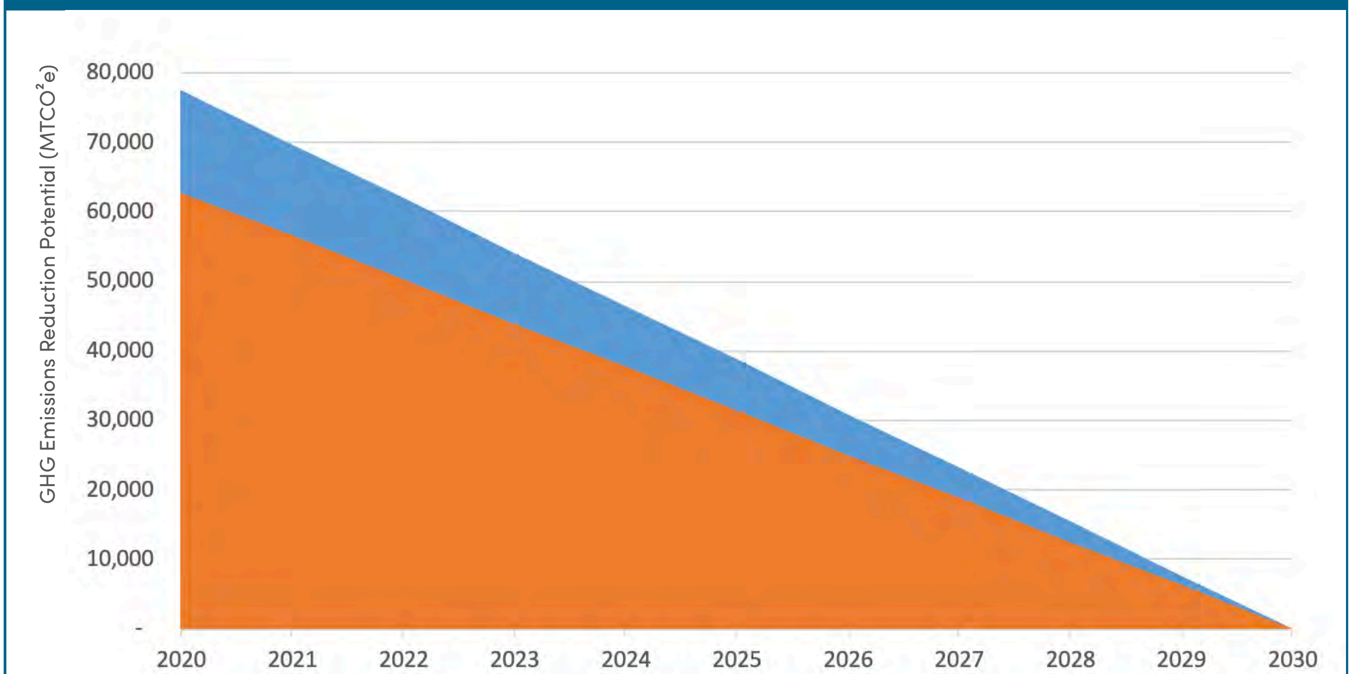
81,000 metric tons carbon dioxide equivalent (3.7% of community-wide emissions).

If the University of Michigan participates in this action, an additional 4,000 metric tons carbon dioxide equivalent could be reduced, resulting in a total of 85,000 metric tons carbon dioxide equivalent (3.9% community-wide emissions).

By 2030, the Support **Onsite Renewable Energy Generation with Battery Storage (Bulk Buys)** strategy will have achieved all of its potential greenhouse gas emissions reductions.

The figure below shows the total emissions reduction potential of onsite renewable energy generation (in light blue) assuming the community and University participate in the program. The orange shows the impact of onsite renewable energy generation if only the community (not the University) participates in the program.

SUPPORT ONSITE RENEWABLE ENERGY GENERATION WITH BATTERY STORAGE (BULK BUYS)



3. DEVELOP COMMUNITY SOLAR PROGRAM

Not all residents and businesses are able to install solar on their property. This may be because of inadequate solar exposure, not owning one's home, or financial barriers associated with renewable energy. To provide options to all who want to invest in solar locally, the City of Ann Arbor, in partnership with our utility, will create and support a robust community solar program which allows solar installations on public properties. Community solar programs allow residents and business to purchase solar panels from an existing solar farm and receive an on-bill credit as if those panels were actually on their roof. State legislation is needed to enable community solar programs but the City is already working with state legislators to move this idea forward.

Vision for Developing Community Solar Program

By 2030, 11 MW of community solar has been established locally. As our community builds demand for community solar, the landfill solar site in opened for public subscriptions and the City's demand for renewable energy is moved to create even more local renewable energy generation.

Party Responsible for Implementation

Office of Sustainability and Innovations

Collaborators / Project Co-Designers

- DTE Energy
- State of Michigan
- Partner organizations

Assumptions

- Community solar is enabled at the state
- Demand for community solar reaches at least 11MW by 2030
- On-bill financing is possible

Equity Impacts

Community solar primarily benefits those without the ability to install their own renewable energy projects.

Indicators of Success / Goals

By 2030, 11MW of new renewable energy has been created and is subscribed through a community solar program.

Target Demographic

Those who face barriers to installing solar on the buildings they inhabit, including renters, low-income residents, and those with shaded or obstructed roofs

Timeline and Initial Actions

2021

Enabling legislation passed and City works with DTE Energy to create local pilot community solar program.

2022

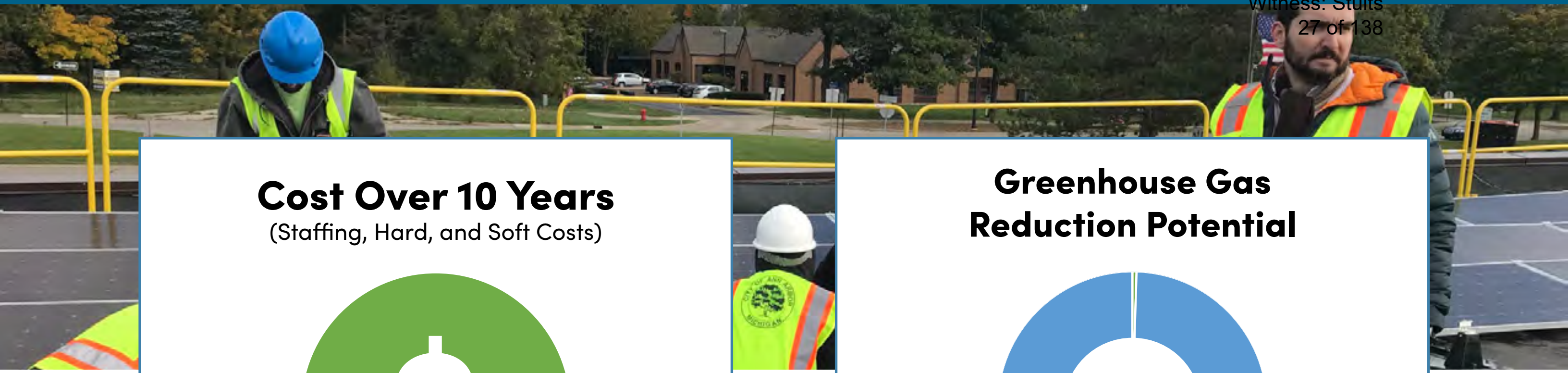
Local pilot program launches.

2024

Expansion of community solar program locally. Includes recruitment of individuals into program.

2026

Landfill solar site opens up for community subscriptions given the success of the initiative. Allows City to take its demand to stimulate more renewable energy development.



Cost Over 10 Years

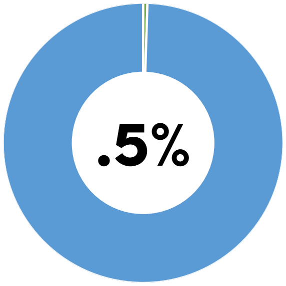
(Staffing, Hard, and Soft Costs)

Costs to the City are

$205,000

over 10 years to help administer the program. If the City becomes an anchor tenant, the costs would rise.

Greenhouse Gas Reduction Potential

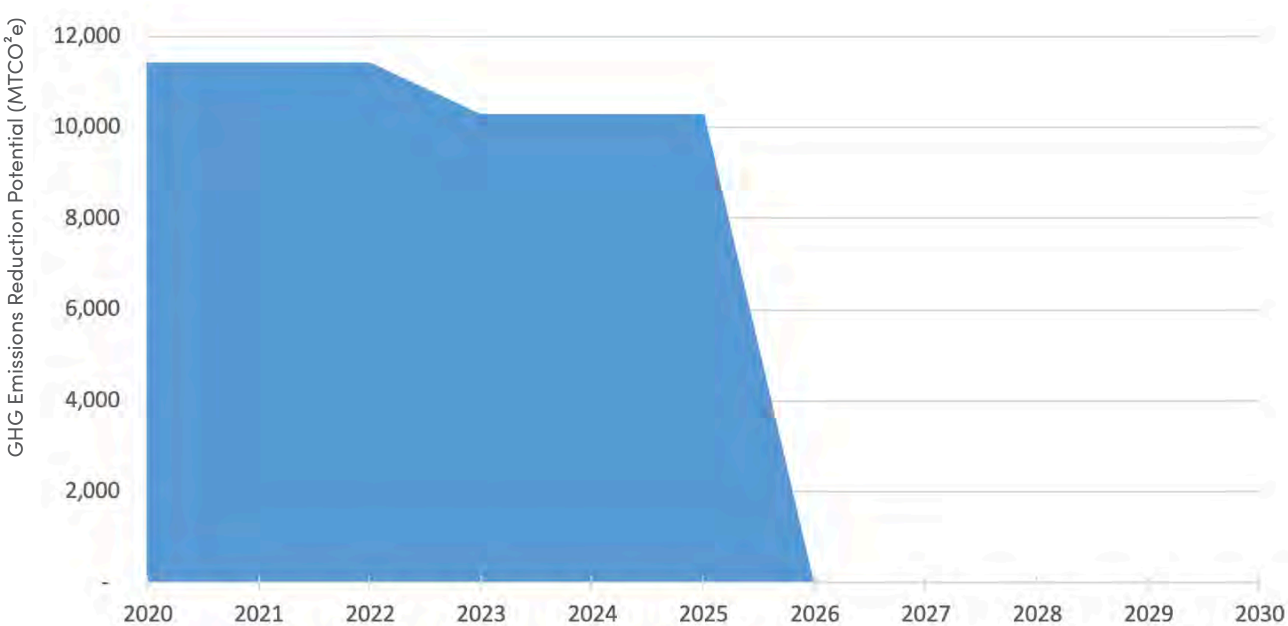


11,500 metric tons carbon dioxide equivalent (.5% of community-wide emissions)

By 2026, the Develop **Community Solar Program** strategy will have achieved all of its potential greenhouse gas emissions reductions.

The figure below shows the total emissions reduction potential of onsite renewable energy generation (in light blue) assuming the community and University participate in the program.

DEVELOP COMMUNITY SOLAR PROGRAM



4. LAUNCH LANDFILL SOLAR PROJECT

The City of Ann Arbor is developing a utility scale solar project with DTE Energy to operate on the City-owned landfill and in Pittsfield Township. The intention is that this installation will provide enough energy to offset roughly 80% of Ann Arbor municipal energy usage. In addition to ground mounted solar, the project incorporates a pilot of solar panels installed on a retention pond, provides a portion of clean energy for Pittsfield Township to offset their municipal operations, and has many co-benefits including creating habitat for local pollinators. If demand exists and enabling legislation is passed, the solar project may be integrated into a community solar program.

Vision for Launching Landfill Solar Project

By 2030, the City-owned landfill and surrounding property has 24 MW of installed solar capacity, the vast majority of it used to offset Ann Arbor municipal energy use.

Party Responsible for Implementation

Office of Sustainability and Innovations

Collaborators / Project Co-Designers

- DTE Energy
- State of Michigan
- Partner organizations

Assumptions

- The landfill is deemed a viable site for utility-scale solar
- Current federal tax credits are leveraged to reduce cost of project

Equity Impacts

Should the landfill solar project include community solar provisions, it could serve many Ann Arborites who cannot install their own solar arrays, whether due to renting, cost, or those with roofs not optimal for solar.

Indicators of Success / Goals

By the end of 2023, a 24MW solar installation is fully operational at the former Ann Arbor landfill and on the land held in PUD with Pittsfield Township.

Target Demographic

The City of Ann Arbor and Pittsfield Township. Once local demand is established, the project may be turned into a community solar program

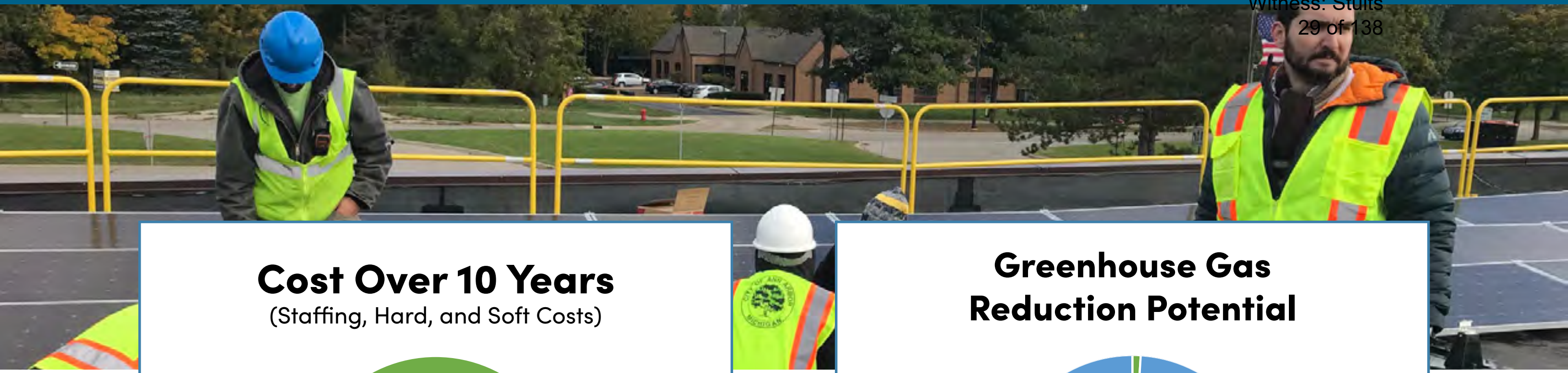
Timeline and Initial Actions

2020

The City of Ann Arbor, in partnership with DTE Energy and Pittsfield Township, completes feasibility and technical assessments of the site. If the project is deemed feasible, an RFP is released and safe harboring of equipment is undertaken.

2023

The landfill solar project begins operation, providing local renewable energy.

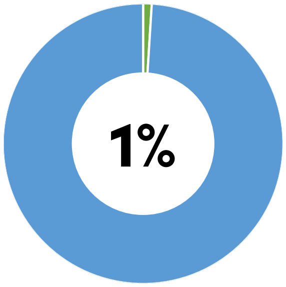


Cost Over 10 Years
(Staffing, Hard, and Soft Costs)

Estimated
$80,000
for staffing support

Final cost to be determined based on any required costs to upgrade the grid at the point of intersection.

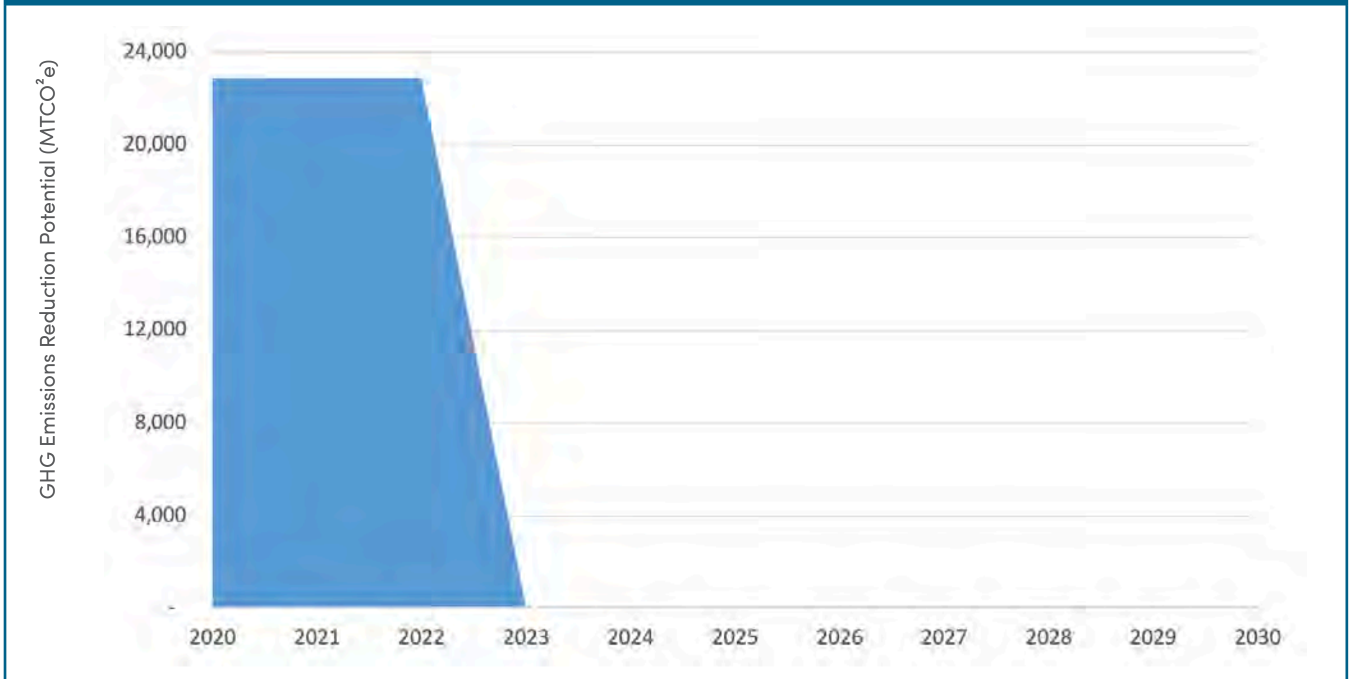
Greenhouse Gas Reduction Potential



23,000 metric tons carbon dioxide equivalent (1% of community-wide emissions)

By 2023, the Launch **Landfill Solar Project** strategy will have achieved all of its potential greenhouse gas emissions reduction potential.

LAUNCH LANDFILL SOLAR PROJECT



STRATEGY 2:

Switch our Appliances and Vehicles from Gasoline, Diesel, Propane, Coal, and Natural Gas to Electric

This strategy focuses on converting the vast majority of our existing gasoline, diesel, propane, coal, and natural gas powered equipment, appliances, and vehicles to electric. This is particularly important since we are working to ensure our electrical grid is powered with 100% renewable energy. To achieve this strategy, 6 specific actions have been identified:

1. Promote Home & Business Electrification
2. Electrify Buses
3. Support Community Electric Vehicle and Solar Bulk Buys
4. Electrify City Fleet
5. Electrify Private Fleet
6. Expand Electric Vehicle Charging Infrastructure

Combined, these six actions are estimated to reduce community-wide emissions by 23% and cost just over $143,000,000.

1. PROMOTE HOME & BUSINESS ELECTRIFICATION

The use of natural gas for heating space and water, as well as cooking in buildings represents over 25% of our community's greenhouse gas emissions. Transitioning away from natural gas to electric, especially given our work to ensure that all electricity is powered with renewable energy, is a pivotal component of A^2Zero. To support the electrification of appliances, the City of Ann Arbor will work to establish policies that promote electrification of heating and cooking systems by evaluating options in codes, inventive programs, and through other avenues. The City of Ann Arbor will lead this effort by electrifying all municipal buildings.

Vision for Promoting Home & Business Electrification

By 2030, 100% of city facilities, 30% of owner-occupied homes, and 25% of rental properties have fully electrified and conducted air sealing and insulation improvements. The electricity now used by these systems is sourced from renewable energy, and the additional capacity has been incorporated into plans for community-wide renewable energy purchasing initiatives. Additionally, building occupants benefit from better indoor air quality.

Party Responsible for Implementation

- Office of Sustainability and Innovations
- For City buildings – Facilities with support from Office of Sustainability and Innovations

Equity Impacts

Few equity impacts from this action except as part of the community solar program (above).

Collaborators / Project Co-Designers

- City of Ann Arbor legal team
- City of Ann Arbor Building, Rental, and Inspection Services
- Michigan Saves
- Home Improvement Stores
- Contractors (i.e., energy efficiency, repair, installation)

Indicators of Success / Goals

By 2030, 100% of city facilities, 30% of owner-occupied homes, and 25% of rental properties have fully electrified and the electricity powering those homes is coming from renewable energy sources.

Assumptions

- 30% of single family homes are all electric by 2030, not including the 20% already using electric heat
- 25% of rentals are all electric by 2030
- City commits to and achieves 100% electrification by 2030
- A 1:1 replacement of natural gas energy to electricity, with 1CCF gas transitioning to 30.36kWh electricity
- All new residential and commercial buildings are designed and built to operate without the use of natural gas, reducing the increased cost associated with retrofitting existing systems
- All additional electric consumption is powered by an associated increase in renewable energy sources

Target Demographic

All buildings in Ann Arbor, including single-family homes, rentals, and businesses. The action was modeled to show the impact if the University of Michigan participates as well as if it does not

Timeline and Initial Actions

2020
Conduct legal analysis and finalize electric vehicles (EV) readiness ordinance.

2021
Develop electrification policy. Begin planning administrative program. Capacity building by ensuring enough contractors are trained in electric heating systems appropriate for Ann Arbor's climate. EV readiness ordinance adopted.

2023
Public outreach and education, including visible and accessible alternatives to natural gas systems. Program launches and is enforced.

2024
Buildings transition at a steady rate annually.

Cost Over 10 Years

(Staffing, Hard, and Soft Costs)

Estimated

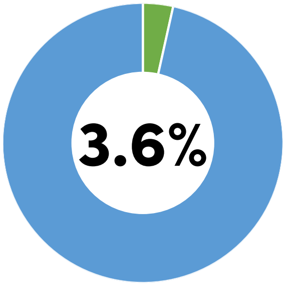
$1,400,000

staffing, trainings, and administrative costs for community portion of electrification program.

$5,700,000

for transitioning City facilities to all electric.

Greenhouse Gas Reduction Potential



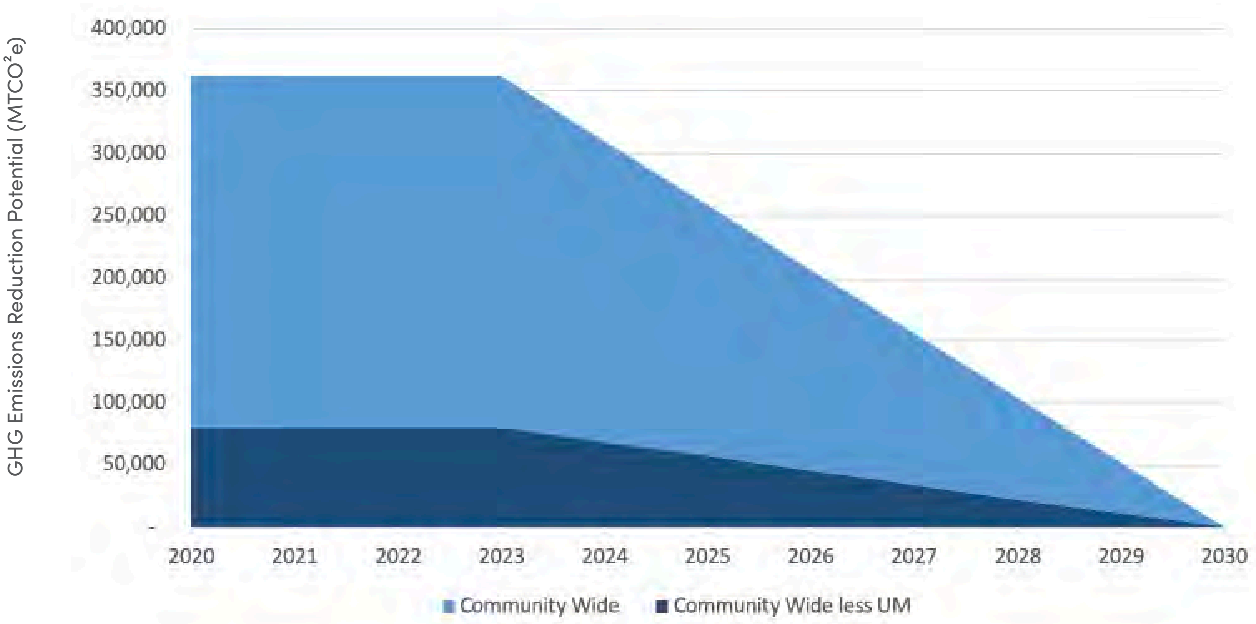
79,200 metric tons carbon dioxide equivalent (3.6% of community-wide emissions) for residential and municipal electrification.

If the University of Michigan were to electrify all of their operations and power that additional electrical demand with clean energy, it would be an additional reduction of 283,000 metrics tons of carbon dioxide equivalent (13% of community-wide greenhouse gas emissions), resulting a total of 362,200 metric tons of carbon dioxide equivalent (16.5% of community-wide emissions).

By 2030, the **Promote Home & Business Electrification** strategy will have achieved all of its potential greenhouse gas emissions reductions.

The figure below shows the total emissions reduction potential of home and business electrification (in light blue) assuming the community and University participate in the program. The dark blue shows the impact of home and business electrification if only the community (not the University) participates in the program.

PROMOTE HOME AND BUSINESS ELECTRIFICATION



2. ELECTRIFY BUSES

This action involves electrifying TheRide's diesel and diesel-hybrid fleet of 87 buses as well as the University of Michigan's ethanol, biodiesel, and gasoline buses on an aggressive time line.

Vision For Electrifying Buses

By 2030, TheRide and UM's bus fleet have transitioned to electric propulsion. Consequentially, both entities are enjoying lower maintenance, operating, and fuel costs. Solar has been installed on AATA and UM properties so that the electricity running the buses is 100% carbon-free.

Party Responsible for Implementation

- TheRide, with support from the Office of Sustainability and Innovations' Sustainability Analyst
- UM Transportation Department, with support from the Office of Sustainability and Innovations

Party Responsible for Implementation

- DTE Energy
- Michigan Department of Environment, Great Lakes, and Energy (EGLE)
- UM Energy Institute
- UM Carbon Neutrality Commission

Equity Impacts

Electrifying buses will give riders a cleaner, more comfortable, and healthier ride. Communities who live along electrified bus routes will benefit from reduced asthma and COPD rates, which disproportionately impact communities of color and low-income communities.

Indicators of Success / Goals

By 2030, TheRide and UM's entire fleet of buses are electric and their power is drawn from renewable energy.

Assumptions

- Annually, 9 new electric buses are purchased starting in 2021 for TheRide
- UM replaces buses at a rate of approximately 5 per year
- Bus fleets stay at their current level
- A traditional bus is $525,000; an electric bus is $750,000
- No value calculated for selling diesel or gasoline buses
- 2 additional electric buses are purchased per year to grow the fleet and expand service
- Assumes limited operational savings in the first few years of operation as facilities adjust to new types of buses
- Costs are only calculated for TheRide's portion of electric buses
- Air quality improves along the bus corridors

Target Demographic

Bus riders and potential bus riders

Timeline and Initial Actions

2020

Planning for e-buses commences. Grant applications filed.

2021

TheRide purchases 9 new e-buses and installs EV charging infrastructure that will be needed for first 5 years of operation. UM purchases first 5 buses and EV charging infrastructure.

2030

All buses operated by TheRide and UM are electric.

Cost Over 10 Years

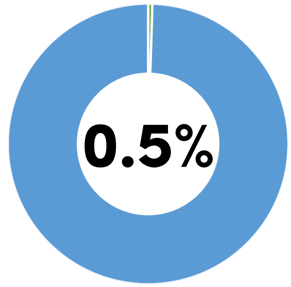
(Staffing, Hard, and Soft Costs)

Estimated

$86,000,000

(only accounting for TheRide's electric buses)

Greenhouse Gas Reduction Potential

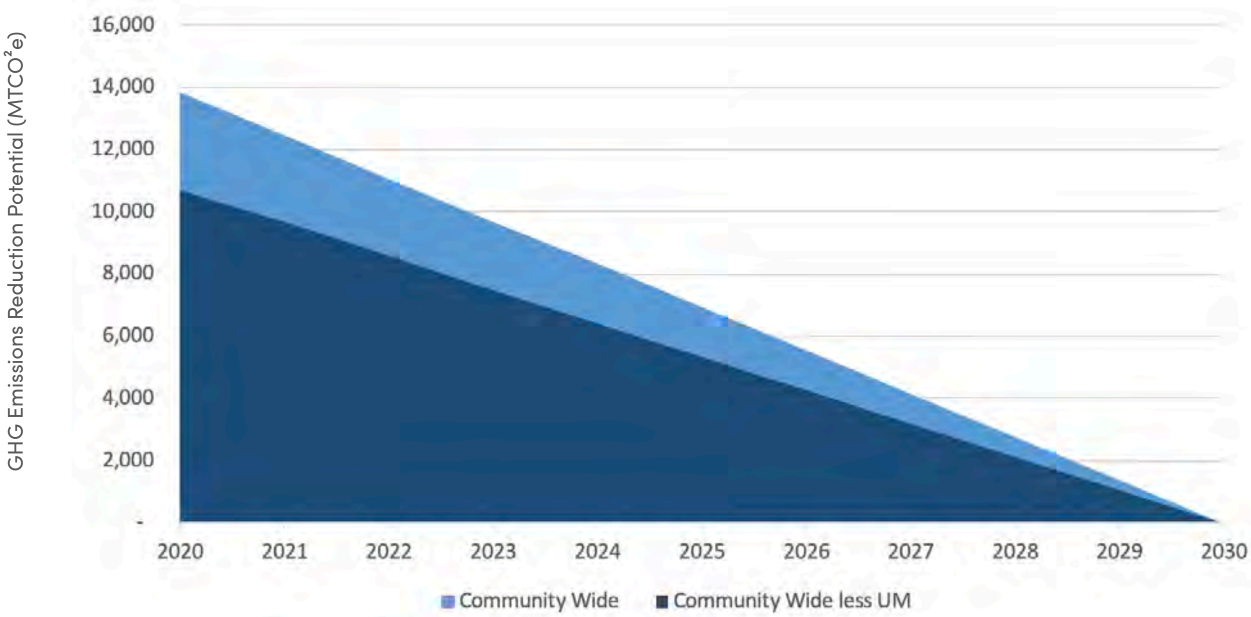


10,700 metric tons of carbon dioxide equivalent (0.5% of community-wide emissions) if TheRide buses are electrified. If the University of Michigan participates and also converts their buses, an additional 3,100 metric tons of carbon dioxide equivalent (0.1% of community-wide emissions) are also reduced. In total, 13,800 metric tons of carbon dioxide equivalent (0.6% of community-wide emissions)

By 2030, the **Electrify Buses** strategy will have achieved all of its potential greenhouse gas emissions reductions.

The figure below shows the total emissions reduction potential of bus electrification (in light blue) assuming the community and University participate in the program. The dark blue shows the impact of bus electrification if only the community (not the University) participates in the program.

ELECTRIFY BUSES



3. SUPPORT COMMUNITY ELECTRIC VEHICLE AND SOLAR BULK BUYS

Group-buy programs increase the accessibility of EVs by allowing potential EV purchasers to take advantage of bulk purchase or lease discounts. In order to promote immediate EV purchases, group-buy programs are only offered for a limited time, typically a few months. Coupling EV group-buy programs with purchase programs for residential solar installation allows EV owners to reduce their EV charging costs, while helping the City of Ann Arbor transition towards clean, renewable energy. The program includes the creation of incentives for low-income residents to purchase off-lease or used EVs.

Vision for Supporting Community Electric Vehicle and Solar Bulk Buys

Residents and businesses in Washtenaw County can purchase new and used EVs at a discount of 10-15%. Local dealerships participate with their auto manufacturers to ensure ample EV stock is available on dealerships' lots and that their sales teams are educated about EVs. Residents are able to pair solar (through Solarize program) with EVs, which should significantly reduce the payback period for solar and the EV.

Party Responsible for Implementation

- Office of Sustainability and Innovations

Collaborators / Project Co-Designers

- DTE Energy
- Michigan Saves
- Energy Commission
- Transportation Commission
- Washtenaw Electric Auto Association
- Urban Sustainability Directors Network
- Local auto dealerships
- Major auto companies (OEMs)
- Plug In America's PlugStar program
- Smart Columbus Electrified Dealers program
- University of Michigan

Equity Impacts

We will explore offering bulk buys for EVs that are coming off leases, and offer bulk buys for e-scooters and e-bikes to ensure equitable and affordable options for all.

Indicators of Success / Goals

By 2030, 50% of all vehicles miles traveled are in electric vehicles.

Assumptions

- DTE Energy will continue partnering with the City
- OEMs will have enough cars to meet demand
- Reduced rates are available through the bulk buy
- The CCA purchase will help reduce new electricity demand from Ann Arbor EV owners

Target Demographic

Residents and local car dealership employees

Timeline and Initial Actions

2020

OSI and DTE Energy kick off a group buy program for City staff with one or two OEMs participating.

2021

OSI and DTE Energy expand the program to all DTE Energy customers in their service territory. The program also includes more OEMs and dealerships participating.

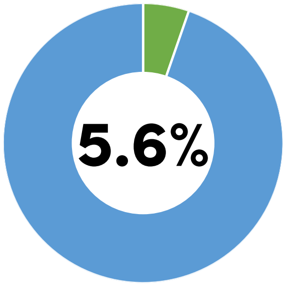
2022

OSI and DTE Energy expand the offering to include paired solar installations.

Cost Over 10 Years
(Staffing, Hard, and Soft Costs)

$700,000

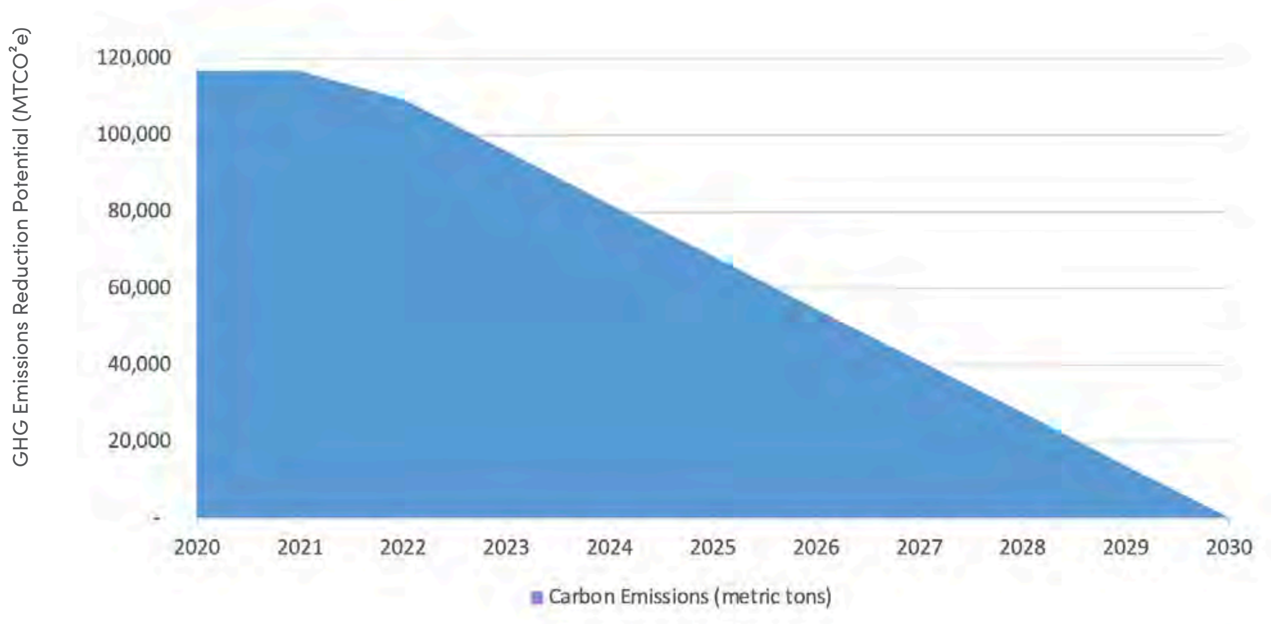
Greenhouse Gas Reduction Potential



122,900 metric tons carbon dioxide equivalent (5.6% of community-wide emissions)

By 2030, the **Support Community Electric Vehicle and Solar Bulk Buys** strategy will have achieved all of its potential greenhouse gas emissions reductions.

SUPPORT COMMUNITY ELECTRIC VEHICLE AND SOLAR BULK BUYS



4. ELECTRIFY CITY FLEET

In June 2017, City Council approved Resolution R-17-237, directing the City Administrator to update and revive the City's Green Fleets Policy, promote the purchase of plug-in electric vehicles, and incorporate updated best practices and lessons learned from peer municipalities. The Green Fleets Team (GFT) was given until the first quarter of 2020 to develop a plan for electrifying the City fleet by 2025. Because there are so many more electric vehicle options for light duty vehicles at this time, the GFT focused first on transitioning those and then on electrifying construction equipment and medium- and heavy-duty vehicles.

Vision for Electrifying City Fleet

By 2025, 90% of the City's fleet has transitioned to electric. The remaining 10% are pieces of medium- and heavy-duty vehicles and equipment that cannot be electrified.

Party Responsible for Implementation

- Fleets and Facilities Department, with support from the Office of Sustainability and Innovations

Collaborators / Project Co-Designers

- Green Fleets Team
- The Electrification Coalition
- Ecology Center

Equity Impacts

Improved local air quality for all.

Indicators of Success / Goals

By 2025, 90% of the City's fleet has transitioned to electric.

Assumptions

- EV market continues to grow and move into new market shares
- Electricity from the EVs is powered through CCA or onsite solar

Target Demographic

Ann Arbor City Employees

Timeline and Initial Actions

2020

Municipal fleet electrification strategy complete and updated fleet replacement rates calculated.

2021

New fleet replacements rates integrated into the budget.

2025

90% of fleet is transitioned to electric.

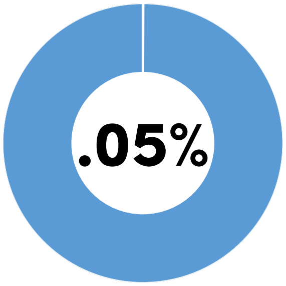
Cost Over 10 Years

(Staffing, Hard, and Soft Costs)

$4,000,000

(only accounting for TheRide's electric buses)

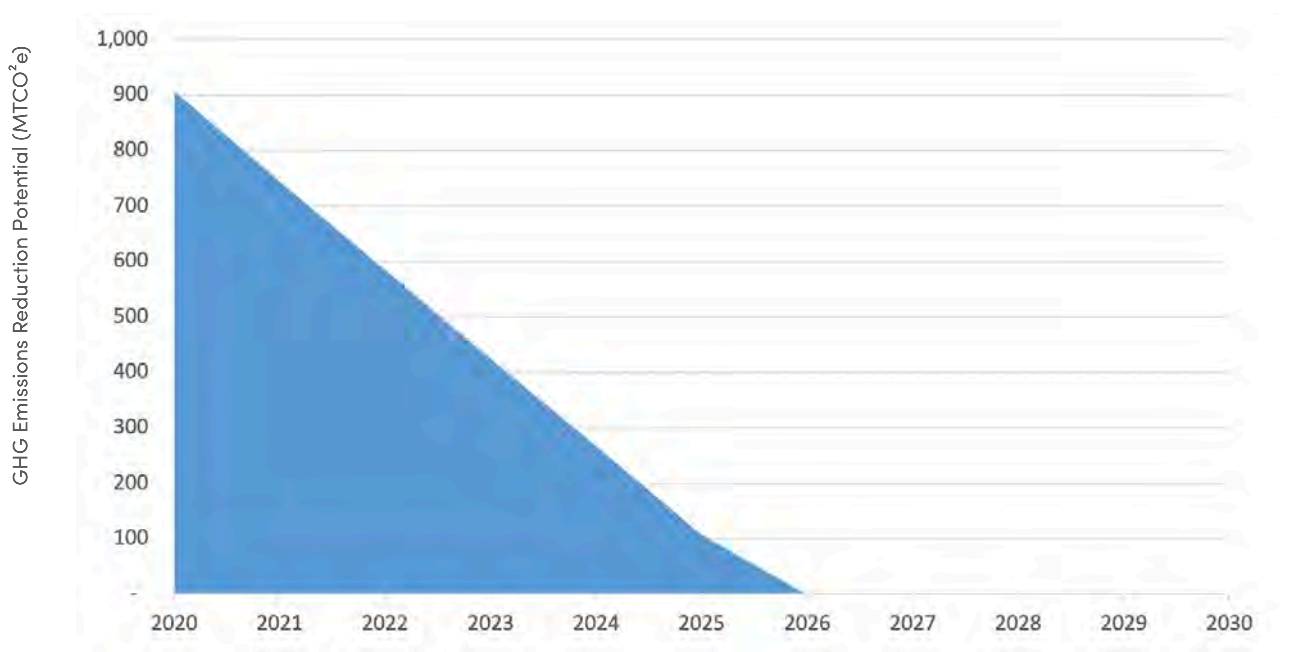
Greenhouse Gas Reduction Potential



1,100 metrics tons of carbon dioxide equivalent (0.05% of community-wide emissions)

By 2026, the **Electrify City Fleet** strategy will have achieved all of its potential greenhouse gas emissions reductions.

ELECTRIFY CITY FLEET



5. ELECTRIFY PRIVATE FLEETS

Programmatic support is offered, along with an ambitious outreach and education program, to support private companies with transitioning their fleets to electric. This includes working with the State and utilities to offer more rebates and incentive programs, and sharing information about existing rebates for charging.

Vision for Electrifying Private Fleets

Medium and large companies in Ann Arbor help the City meets its ambitious climate neutrality goal by transitioning their fleets to electric, encouraging their employees to drive EVs, and installing EV charging infrastructure. Ridesharing companies have agreed to franchise agreements which require that at least half of their fleets are EVs.

Party Responsible for Implementation

- Office of Sustainability and Innovations

Equity Impacts

Improved local air quality for all.

Collaborators / Project Co-Designers

- DTE Energy
- The Electrification Coalition
- Ecology Center
- Washtenaw Electric Automobile
- Association
- Ann Arbor 2030 District
- Ceres
- DDA
- EGLE
- Employers in Ann Arbor with large fleets
- Ridesharing and ride hailing companies
- Delivery companies

Indicators of Success / Goals

By 2030, 50% of private fleets within the City are electric.

Assumptions

- Corporate fleets will encourage a transition to EVs
- The State and utilities will continue to provide incentives for fleet electrification

Target Demographic

Employees and owners of medium to large business in Ann Arbor

Timeline and Initial Actions

2021

Installation of 20 new level 2 EV chargers in each DDA parking garage and lot (using DTE Energy rebates).

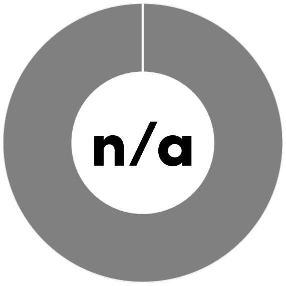
2022

As needed, install more level 2 chargers in garages (75% cap for EV parking charging spots in any garage). Create new Direct Current Fast Chargers (DCFC) infrastructure for use by ride hailing companies, car sharing services, and the public (not fee based).

Cost Over 10 Years
(Staffing, Hard, and Soft Costs)

$123,000

Greenhouse Gas Reduction Potential



The impact of this action was not calculated separately but included in the EV bulk buy action.

ELECTRIFY PRIVATE FLEETS

6. EXPAND ELECTRIC VEHICLE CHARGING INFRASTRUCTURE

In the next three decades, electric vehicles (EVs) will replace internal combustion engine (ICE) vehicles as the dominant type of vehicles on the market. This action item aims to significantly increase electric vehicle charging infrastructure at parking lots and garages, park and ride lots, ride sharing spots, workplaces, and City facilities to support this transition.

Vision for Expanding Electric Vehicle Charging Infrastructure

Ann Arbor has plentiful EV charging infrastructure deployed to meet the needs of a burgeoning transition from ICE vehicles to EVs. While 80% of EV charging will continue to happen at home, public and workplace charging has expanded to fill in the remaining gaps.

Party Responsible for Implementation

- Office of Sustainability and Innovations, in partnership with Downtown Development Authority
- City's Engineering Department Transportation Group

Collaborators / Project Co-Designers

- State of Michigan (EGLE)
- Private businesses for workplace charging
- Property owners for multifamily charging
- Residents for home-based charging
- UM for campus charging
- Transportation Commission
- Ann Arbor 2030 District
- EV charger manufacturers and installers
- Affordable housing community
- Project developers for new housing and commercial projects
- DTE Energy

Equity Impacts

Placement of new EV chargers prioritizes renters in multifamily housing and street-side for residents who do not have a garage or driveway. Expanded public charging in garages and lots will ensure that some basic level of charging is available to all who need it.

Indicators of Success / Goals

10% of all public and private parking spaces are equipped with level 2 EV chargers and 2% with Direct Current Fast Chargers (DCFCs).

Assumptions

- 1,250 level two chargers are installed a year starting in 2021; each year 200 of these chargers are paid for through utility rebates
- 2 fast chargers are installed in the community each year; both are paid for through utility rebates
- Any additions to electrical capacity will be paid for separately
- New EV chargers will be prioritized for placement in low-income areas
- All additional electricity demand is integrated into the CCA

Target Demographic

Current and future EV owners who drive in Ann Arbor

Timeline and Initial Actions

2021

Installation of 20 new level 2 EV chargers in each DDA parking garage and lot (using DTE Energy rebates).

2022

As needed, install more level 2 chargers in garages (75% cap for EV parking charging spots in any garage). Create new Direct Current Fast Chargers (DCFC) infrastructure for use by ride hailing companies, car sharing services, and the public (not free to use)

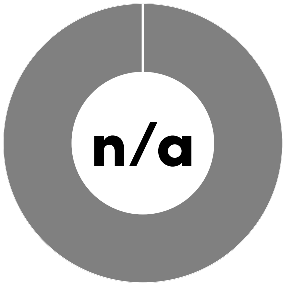
Cost Over 10 Years

(Staffing, Hard, and Soft Costs)

$

$42,000,000

Greenhouse Gas Reduction Potential



This action does not directly lead to greenhouse gas reductions but contributes to the ability of residents and businesses to invest in electric vehicles.

EXPAND ELECTRIC VEHICLE CHARGING INFRASTRUCTURE

STRATEGY 3:

Significantly Improve the Energy Efficiency in our Homes, Businesses, Schools, Places of Worship, Recreational Sites, and Government Facilities

This strategy focuses on drastically improving the energy efficiency of our homes, businesses, schools, places of worship, government buildings, and recreational sites. To achieve this strategy, 11 specific actions have been identified:

1. Transition to More Energy Efficient Homes and Businesses
2. Update Building Codes
3. Power Street Lighting and Traffic Signals with LED
4. Benchmark and Disclose Energy Usage
5. Establish Loan Loss Reserve
6. Develop Energy Concierge and Community Engagement Program
7. Transition Affordable Housing Sites to Net Zero Energy
8. Promote Green Rental Housing Program
9. Launch Green Business Challenge
10. Support Aging in Place Efficiently
11. Expand Weatherization Program

Combined, these 11 actions are projected to reduce community-wide emissions by 13.4% and cost just over $14,500,000.

1. TRANSITION TO MORE ENERGY EFFICIENT HOMES AND BUSINESSES

As much as 80% of energy consumed in our buildings is wasted, through gaps in building envelopes or unnecessary operation of lights and electronics. Improving building envelopes with better insulation and windows, efficient lighting and appliances, and advanced heating and cooling systems can have a significant impact on the amount of energy our community uses to heat and cool our buildings. While energy efficiency improvements pay for themselves through energy savings over time, the upfront cost of installing them can be a barrier for many. Through a widespread, comprehensive group-buy program, the City of Ann Arbor can encourage and enable residents and businesses to procure energy efficiency products for a discounted price.

Vision for Transitioning to More Energy Efficient Homes and Businesses

Through a broad-reaching public engagement campaign, 80% of residents and businesses participate in energy efficiency group-buys, incentivized through discounts achieved through economies of scale. The campaign is inclusive, designed with input from the public and helps reduce energy use of participating buildings by 20%.

Party Responsible for Implementation

- Ann Arbor Building, Rental, and Inspection Services, with support from the Office of Sustainability and Innovations

Collaborators / Project Co-Designers

- Local contractors and energy efficiency financers, like Michigan Saves
- City of Ann Arbor Building, Rental, and Inspection Services
- Community liaisons, including neighborhood ambassadors
- Ann Arbor 2030 District
- DTE Energy

Equity Impacts

If coupled with the Green Rental Housing Policy, all rental housing in homes will be mandated to achieve energy efficiency standards as part of maintaining a rental license through the City.

Indicators of Success / Goals

85% of owner occupied homes, 80% of tenant occupied homes, and 80% of businesses achieve a 20% reduction in electricity usage and 15% reduction in natural gas usage by 2030.

Assumptions

- 85% of owner occupied homes are retrofitted and achieve a 20% electricity savings and 15% natural gas savings
- 80% of tenant occupied and commercial enterprises are retrofitted and achieve a 20% electricity savings and 15% natural gas savings

Target Demographic

This program reaches all homeowners, landlords, and businesses through targeted engagement strategies

Timeline and Initial Actions

2020

Program design and contractor outreach and education.

2021

Program launches and first bulk buy takes place. Participation steadily increases annually.

2030

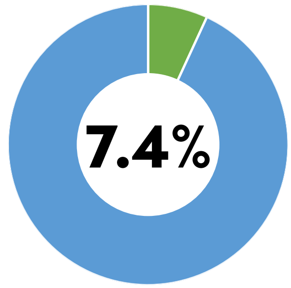
85% of owner occupied homes, 80% of tenant occupied homes, and 80% of businesses have had an energy efficiency improvement.

Cost Over 10 Years

(Staffing, Hard, and Soft Costs)

$950,000

Greenhouse Gas Reduction Potential



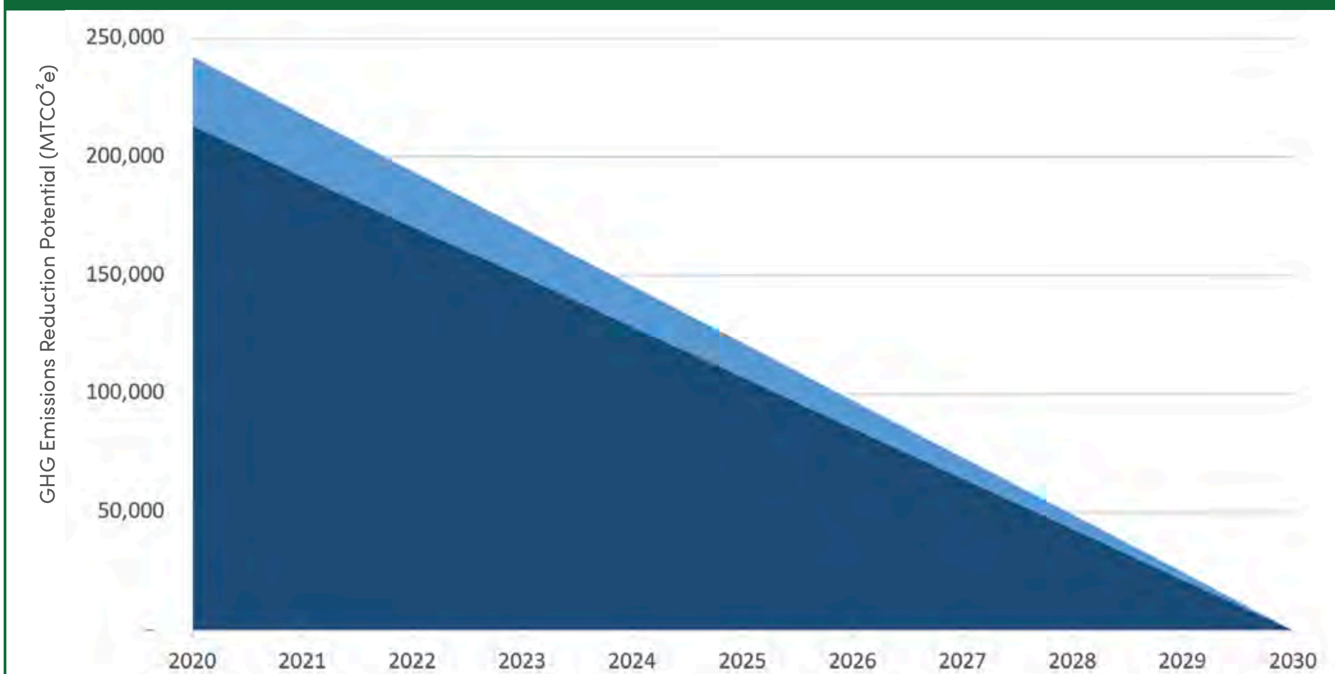
161,000 metric tons of carbon dioxide equivalent (7.4% of community wide emissions).

If the University of Michigan participates and achieves a 20% reduction in total energy usage, an additional 81,500 metric tons of carbon dioxide equivalent could be reduced, resulting in a total of 242,500 metric tons of carbon dioxide equivalent (11.1% of community-wide emissions).

By 2030, the **Transition to More Energy Efficient Homes and Businesses** strategy will have achieved all of its potential greenhouse gas emissions reductions.

The figure below shows the total emissions reduction potential of efficiency initiatives (in light blue) assuming the community and University participate in the program. The dark blue shows the impact of efficiency initiatives if only the community (not the University) participates in the program.

TRANSITION TO MORE ENERGY EFFICIENT HOMES AND BUSINESSES



2. UPDATE BUILDING CODES

Buildings are the largest source of greenhouse gas emissions locally. Doing all we can to reduce their energy consumption and greenhouse gas emissions will have a significant impact on our ability to achieve carbon neutrality. In Michigan, local municipalities are constrained by the State's building code, meaning that efforts to advance more energy efficient and ideally net zero energy buildings will need to be done through changes in the State's building code. This action focused on working with the state to pass the 2021 building code and the zero code appendix so that all new developments and major renovations in Ann Arbor can be net zero energy.

Vision for Updating Buildings Codes

By 2030, through an update to the State's building code, all new buildings and major renovations have been built to net zero energy standards. Any and all growth in Ann Arbor is done so sustainably and equitably.

Party Responsible for Implementation

- Ann Arbor Building, Rental, and Inspection Services, with support from the Office of Sustainability and Innovations

Collaborators / Project Co-Designers

- State of Michigan
- Developers and contractors

Equity Impacts

At first, primarily higher income residents will occupy the new buildings that will be more energy efficient. However, over the long term, all Ann Arborites will benefit from stronger building codes.

Indicators of Success / Goals

By the end of 2030, 2,120 residential units and 160 commercial units are net zero energy buildings.

Assumptions

- All new construction from 2022 through 2030 (and beyond) is built to net zero energy standards, which includes no natural gas consumption and all electricity usage offset through the CCA
- Annual growth rate of 265 housing units for residential, based on past growth rate of housing units per census data
- Annual growth rate of 21 units annually for commercial enterprises, based on past growth rate of commercial units per building permit data
- Does not include savings associated with renovations as those are calculated in other areas of this Plan

Target Demographic

Developers constructing new and renovating buildings

Timeline and Initial Actions

2020

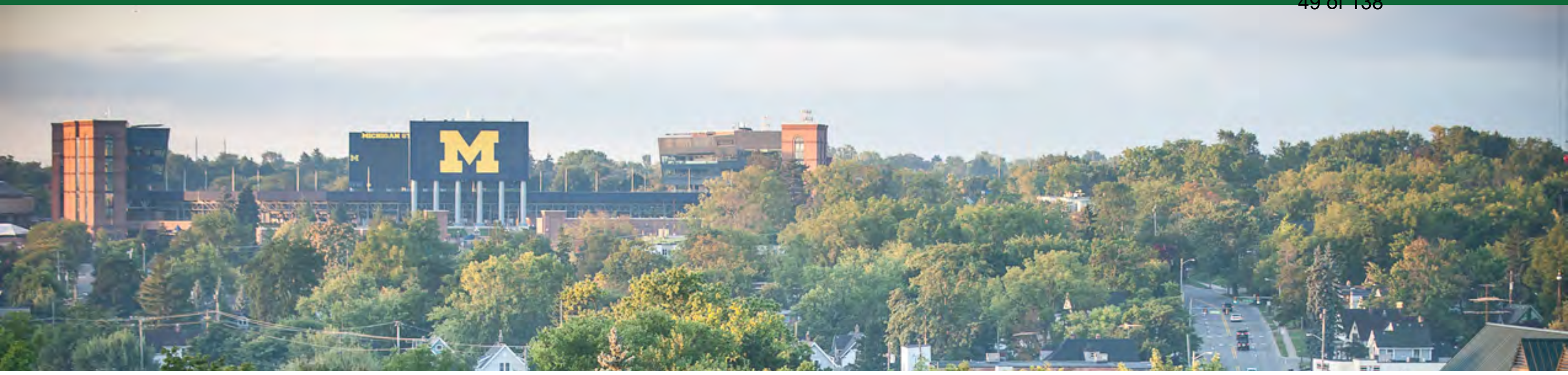
Work with state and local partners to garner support for adopting the 2021 building code and zero code appendix.

2021

State adopts updated building code. City creates infrastructure to support developers, the construction community, electricians, and others in achieving the Code. City works with state on educational material and trains inspectors. Enforcement begins.

2022

City maintains administrative support to achieve code. Enforcement continues. City works with 2030 District to launch net zero energy districts.

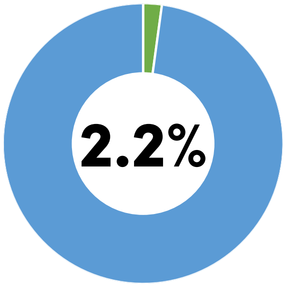


Cost Over 10 Years

(Staffing, Hard, and Soft Costs)

$1,935,000

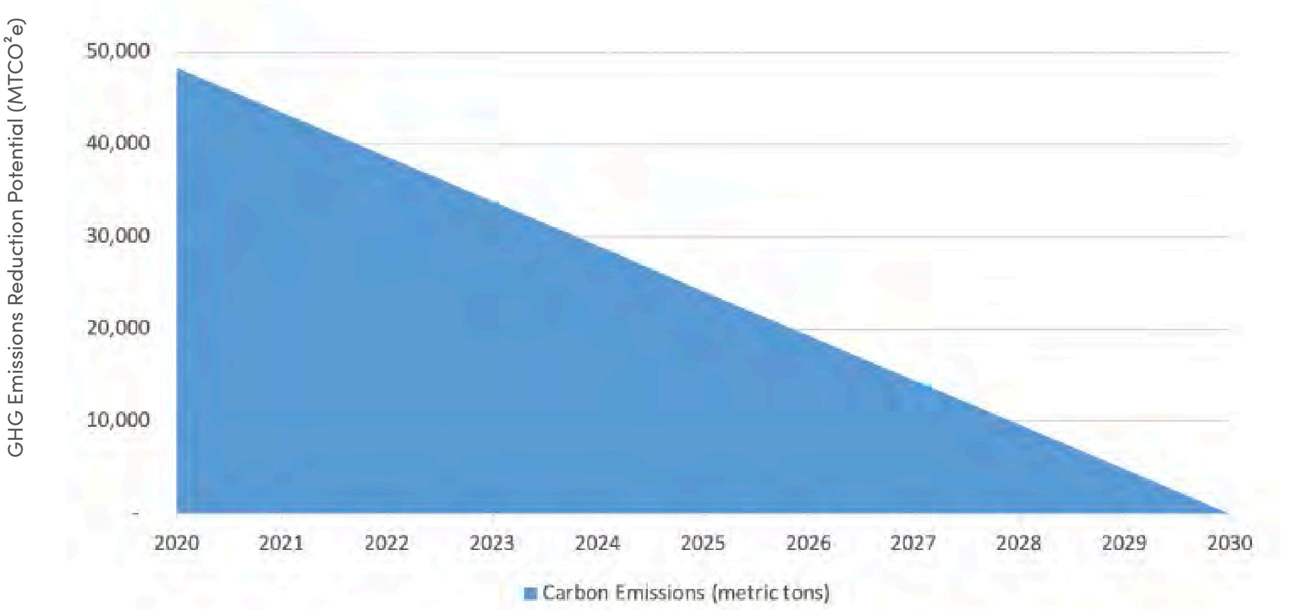
Greenhouse Gas Reduction Potential



48,300 metric tons carbon dioxide equivalent (2.2% of community-wide greenhouse gas emissions)

By 2030, the **Update Building Codes** strategy will have achieved all of its potential greenhouse gas emissions reductions.

UPDATE BUILDING CODES



3. POWER STREET LIGHTING AND TRAFFIC SIGNALS WITH LED

Lighting accounts for 15 percent of global energy use and a significant portion of municipal energy consumption in the form of lighting our streets for safety. The City has started converting streetlights in our community from conventional lights to LEDs, the most energy-efficient bulbs available. This can reduce energy usage by up to 70 percent, significantly reduce maintenance costs, and offer more control over when and how lights shine.

Vision for Powering Street Lighting and Traffic Signals with LED

By 2030 all of our community's public streetlights and traffic signals are LED.

Party Responsible for Implementation

- City of Ann Arbor Signs and Signals

Collaborators / Project Co-Designers

- Office of Sustainability and Innovations
- DTE Energy

Equity Impacts

Few equity issues except slightly increased pedestrian safety.

Indicators of Success / Goals

By 2029, all streetlights and traffic signals have been converted to LEDs.

Assumptions

- City will gain ownership of 2/3 of the streetlights currently owned by utility
- 60% kWh savings by replacing 4,467 lights with LED lighting; Average savings are between 50-70%
- City will replace all traffic lights with LED; 85% efficiency savings
- City will assess/identify opportunity to replace all crosswalk lighting with LED efficient lighting

Target Demographic

This action applies to municipal streetlights, crosswalks, and outdoor lighting

Timeline and Initial Actions

2020

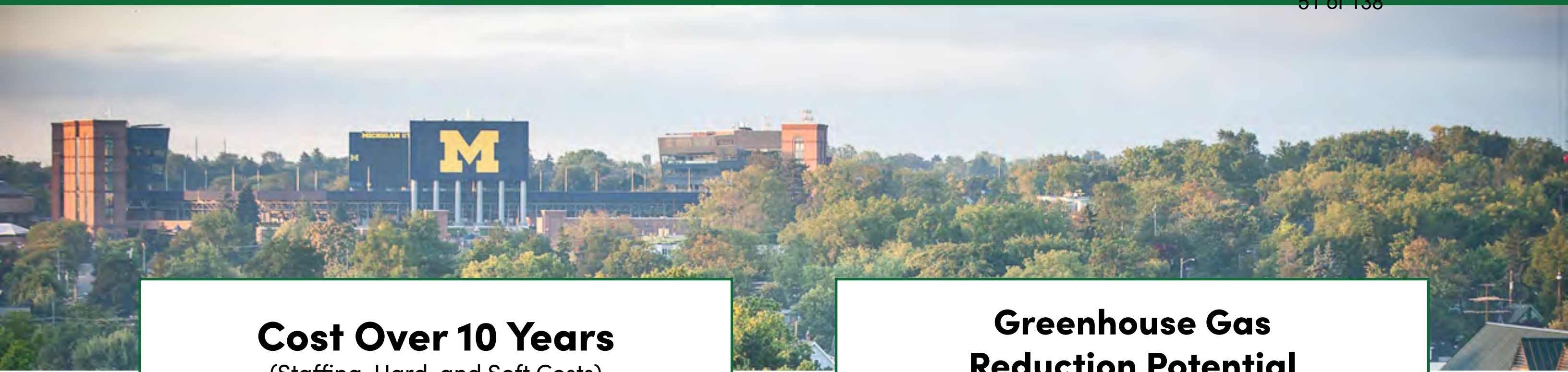
The City initiates negotiations with DTE Energy about purchasing streetlights.

2021

City begins purchasing streetlights and replacing with LEDs. Traffic signals are replaced on a rolling basis.

2029

Replacement of streetlights and traffic signals complete.



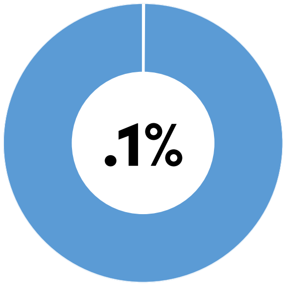
Cost Over 10 Years

(Staffing, Hard, and Soft Costs)

$3,100,000

including the cost to purchase the assets from DTE Energy and finance the conversion to LEDs.

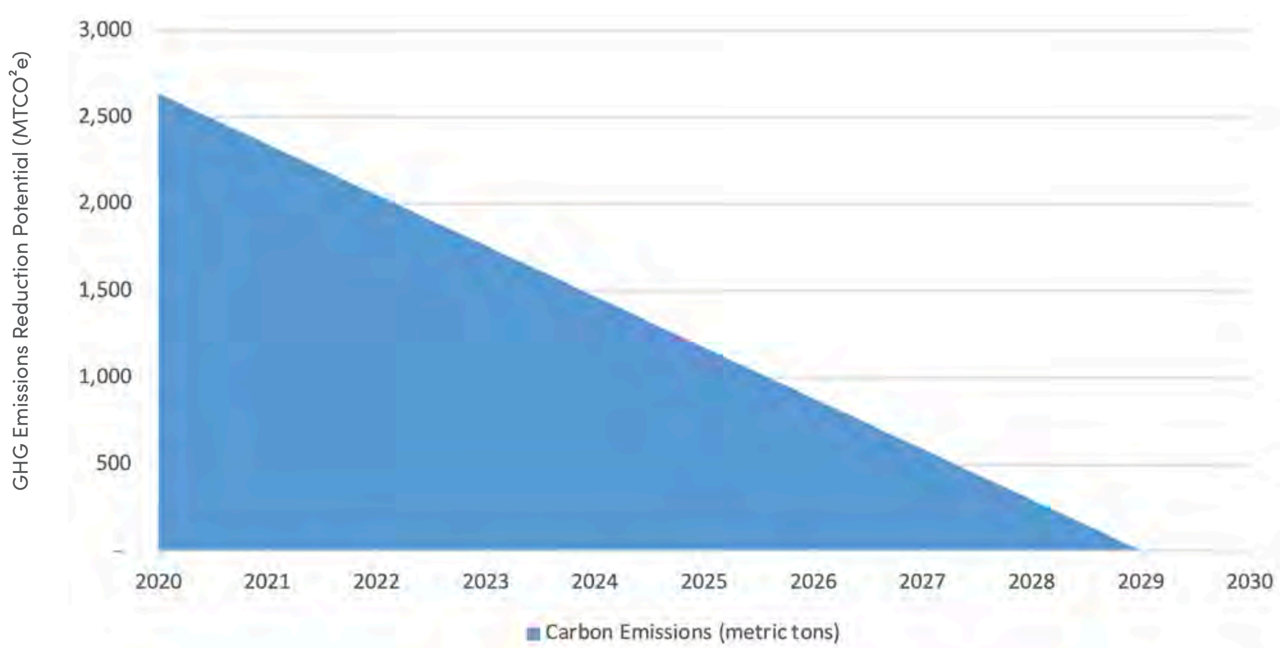
Greenhouse Gas Reduction Potential



2,600 metrics tons of carbon dioxide equivalent (.1% of community-wide emissions)

By 2029, the **Power Street Lighting and Traffic Signals with LED** strategy will have achieved all of its potential greenhouse gas emissions reductions.

POWER STREET LIGHTING AND TRAFFIC SIGNALS WITH LED



4. BENCHMARK AND DISCLOSE ENERGY USAGE

In order to understand our community's potential for and achievement of energy efficiency improvements, we need more granular information about how we use energy. Benchmarking, through the disclosure of energy usage, identifies where we can make the most significant impacts, and serves to motivate performance improvements.

Vision for Benchmarking and Disclosing Energy Usage

Through standardized energy audits and self-reporting, residents and businesses take ownership of their energy usage, and have worked towards significant energy improvements. Achievements have been recognized across sectors, and as a community we have reduced our energy usage by 20%.

Party Responsible for Implementation

- Office of Sustainability and Innovations

Collaborators / Project Co-Designers

- Ann Arbor Information Technology Department
- Commercial property owners and tenant Real estate agents, brokers, and homeowners
- Energy auditors
- DTE Energy and Consumers Energy
- Ann Arbor 2030 District

Equity Impacts

Lower-income homeowners may suffer lower sales prices for their homes if they have inefficient homes. Rents may rise for highly efficient rental units, which may further exacerbate race and income disparities in the community.

Indicators of Success / Goals

Benchmarking requirements are passed, with 90% compliance by the residential, commercial, and institutional sectors by 2025.

Assumptions

- A back-end portal to automatically report energy usage is built between the utilities and the City
- Sufficient Code Enforcement staff exist to ensure compliance in the program
- Support resources are available to help building owners and tenants reduce energy after benchmarking; this initiative contributes to participation in other energy efficiency initiatives in this Plan

Target Demographic

Homeowners, landlords, businesses, and institutions

Timeline and Initial Actions

2021

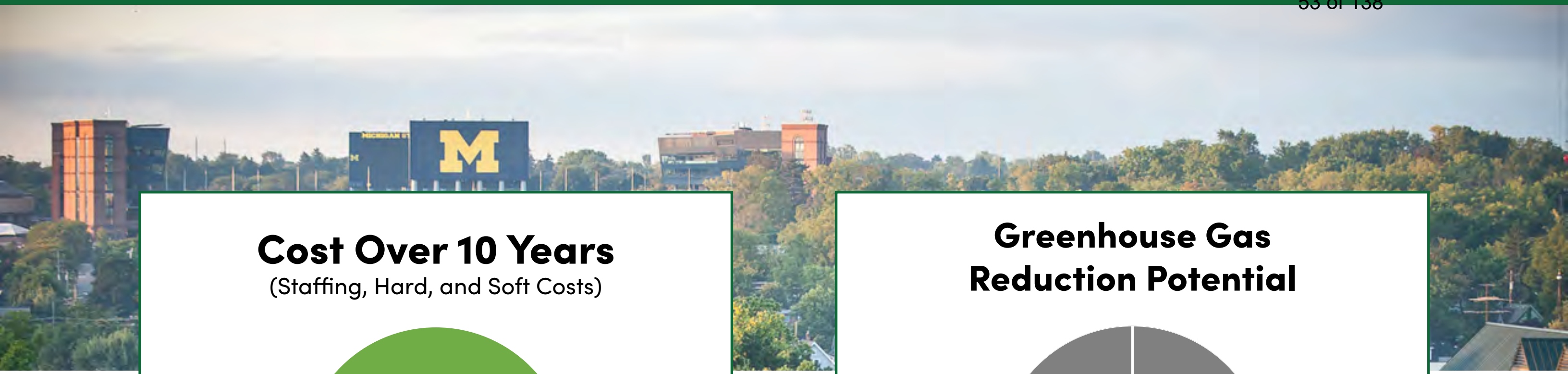
Design program. Conduct building inventory for all sectors. Create reporting platform, educate, and pilot.

2022

Fully administer the program. Continually revisit customer service support, enforcement, and program administration for areas of improvement.

2025

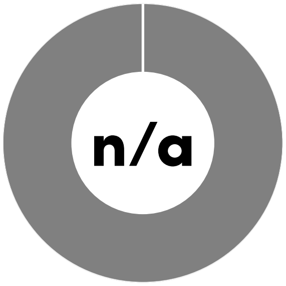
Achieve 90% compliance in the residential, commercial, and institutional sectors.



Cost Over 10 Years
(Staffing, Hard, and Soft Costs)

$2,370,000

Greenhouse Gas Reduction Potential



Not assumed to directly reduce greenhouse emissions but action is foundational for work.

BENCHMARK AND DISCLOSE ENERGY USAGE

5. ESTABLISH LOAN LOSS RESERVE

Well-designed renewable energy, energy efficiency, and electrification improvements pay for themselves over their lifetime. However, the upfront cost of installation can be a barrier to many, especially to those who cannot secure financing. The City of Ann Arbor proposes establishing a loan loss reserve to provide credit enhancements for residents with lower credit scores, expanding those who can finance energy efficiency, renewable energy, fuel switching, and electric vehicle purchases.

Vision for Establishing Loan Loss Reserve

All Ann Arborites can secure the financing they need, at a reasonable rate, to make the energy efficiency, renewable energy, and fuel switching activities needed to achieve carbon neutrality.

Party Responsible for Implementation

- Michigan Saves, with support from the Office of Sustainability and Innovations

Collaborators / Project Co-Designers

- Local and regional banks
- Ann Arbor Finance Department

Equity Impacts

Homeowners with lower credit scores will benefit from the City establishing a loan loss reserve. Banks and Michigan Saves can lower the minimum credit scores needed to qualify for loans to do energy efficiency and renewable projects.

Indicators of Success / Goals

By 2021, Ann Arbor has created a $1,000,000 loan loss reserve fund that enables lenders to loan to low-income residents to undertake energy efficiency and renewable energy improvements.

Assumptions

- $1,000,000 is placed into a loan loss reserve to initiate the program
- Average loan terms of 6% APR over 10 years
- The seed funding has a leverage ratio of 1:20
- 5% default rates

Target Demographic

Low-income residents

Timeline and Initial Actions

2020

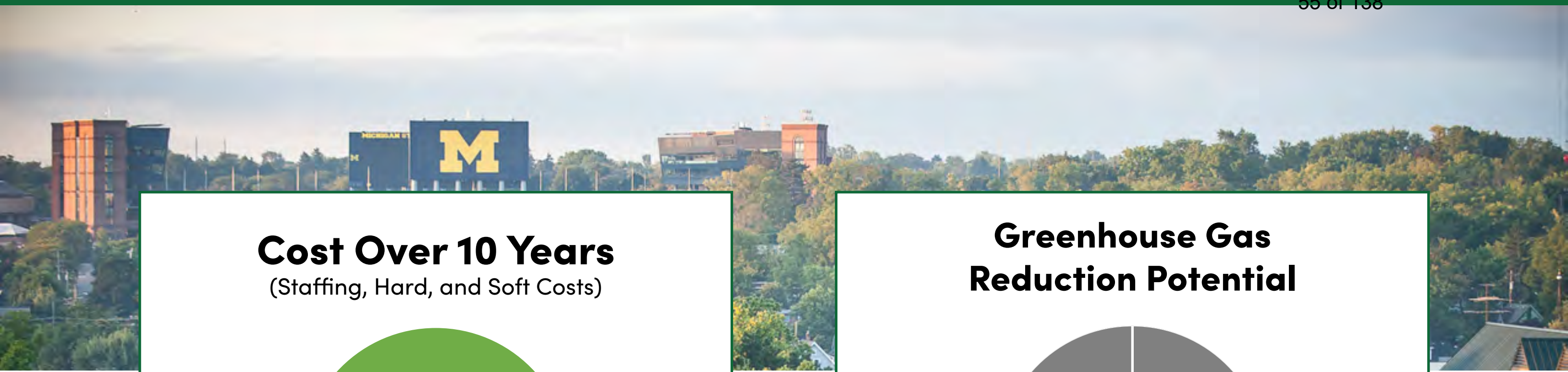
Meet with Michigan Saves to initiate concept. Work on program design and secure lenders.

2021

Launch loan loss reserve.

2022

Monitor progress and revise.

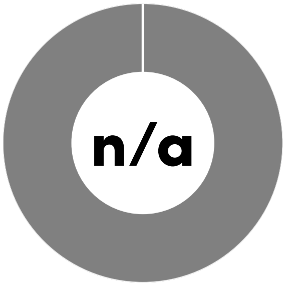


Cost Over 10 Years

(Staffing, Hard, and Soft Costs)

$1,578,000

Greenhouse Gas Reduction Potential



This action does not directly lead to greenhouse gas reductions but contributes to the ability of residents and small businesses with lower credit scores being able to access financing for energy efficiency, renewable energy, electrification, and other activities outlined in this plan.

ESTABLISH LOAN LOSS RESERVE

6. DEVELOP ENERGY CONCIERGE AND COMMUNITY ENGAGEMENT PROGRAM

Many of the actions proposed rely on effective, inclusive, and accessible community engagement programs to reach the required levels of participation to achieve carbon neutrality. The City of Ann Arbor proposes creating an easy to use energy concierge service to help residents and businesses understand the best, highest impact, and most affordable methods to carry out greenhouse gas reduction activities.

Vision for Energy Concierge and Community Engagement

It is 2030, and through an easy to reach energy concierge service and effective, widespread community education, we have reached our carbon neutrality goal. Efforts to install renewable energy, improve energy efficiency, and transition away from fossil fuels have been coordinated at both a community-wide and individual level to ensure that we use the least amount of energy possible.

Party Responsible for Implementation

- Office of Sustainability and Innovations

Collaborators / Project Co-Designers

- Contractors
- Michigan Saves
- Solarize Coordinator
- DTE Energy

Assumptions

- Programs are highlighted through the concierge that serve all members of our community
- High levels of outreach achieved for all sectors of our community

Equity Impacts

Property owners, including owners of rental housing, will primarily benefit from this program. Low-income residents may benefit from programs targeted to help them achieve energy savings.

Indicators of Success / Goals

By 2025, the Energy Concierge has helped 2,500 Ann Arborites access energy-related program, funding, and support resources, leading to the implementation of activities that have reduced community-wide greenhouse gas emissions.

Target Demographic

This action is foundational to the entire carbon neutrality effort, and includes all Ann Arborites

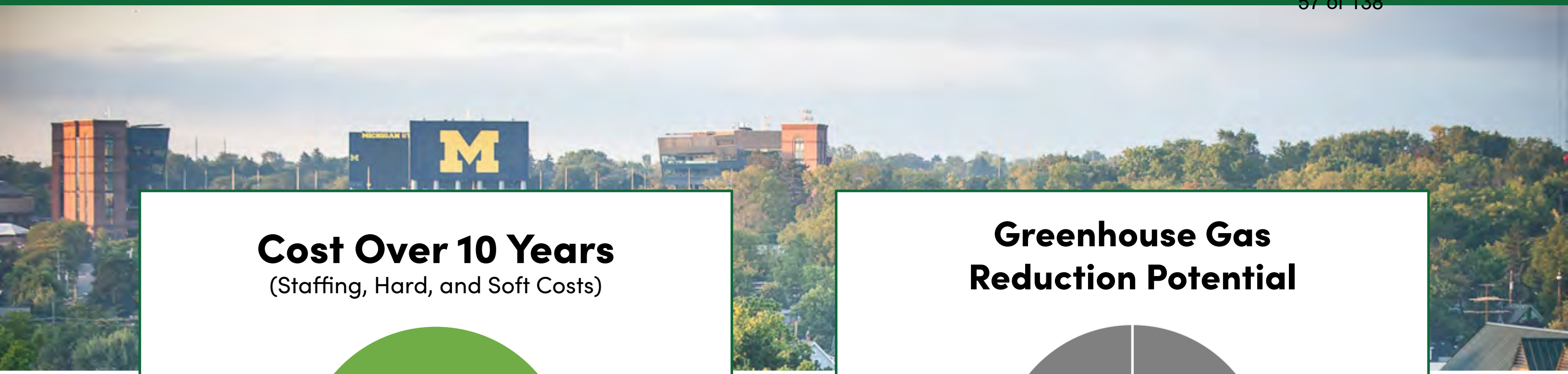
Timeline and Initial Actions

2021

The City develops an energy concierge and engagement program and soft launches

2022

The program continues to operate throughout the community even after carbon neutrality is achieved. The program is continuously improved based on community needs and emerging programs

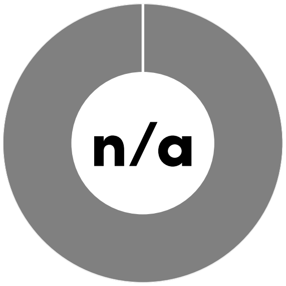


Cost Over 10 Years

(Staffing, Hard, and Soft Costs)

$820,000

Greenhouse Gas Reduction Potential



This action does not directly lead to greenhouse gas reductions but contributes to the ability of residents and businesses to find, access, and implement energy efficiency, renewable energy, electrification, and other activities outlined in this Plan.

DEVELOP ENERGY CONCIERGE AND COMMUNITY ENGAGEMENT PROGRAM

7. TRANSITION AFFORDABLE HOUSING SITES TO NET ZERO ENERGY

Through a deep and collaborative partnership, the Office of Sustainability and Innovations and the Ann Arbor Housing Commission have been working to transition all existing and new affordable housing sites to net zero energy. These systems are also being designed to handle electric vehicle charging and battery storage.

Vision for Net Zero Energy Affordable Housing

Every affordable housing site in the City is net zero energy by 2030. Savings accrued through the program are directly invested in more programming for Housing Commission tenants and into more affordable housing sites.

Party Responsible for Implementation

- Office of Sustainability and Innovations, in partnership with Ann Arbor Housing Commission

Collaborators / Project Co-Designers

- UM Battery Lab
- Energy Contractors
- U.S. Housing and Urban Development
- DTE Energy

Equity Impacts

Ann Arbor Housing Commission funding that would have assisted in paying energy bills can be redirected to help meet Ann Arbor's annual affordable housing goals.

Indicators of Success / Goals

By 2030, every affordable housing site in the City is net zero energy.

Assumptions

- The Office of Sustainability and Innovations continues to provide $200,000 to support energy efficiency improvements and renewable energy at Housing Commission sites through 2021
- Starting in 2022 through 2025, the Office of Sustainability and Innovations provides $100,000 in direct support to the Housing Commission
- Fundraising is conducted to finance the rest of the energy improvements

Target Demographic

Those currently residing in affordable housing and those in need of affordable housing

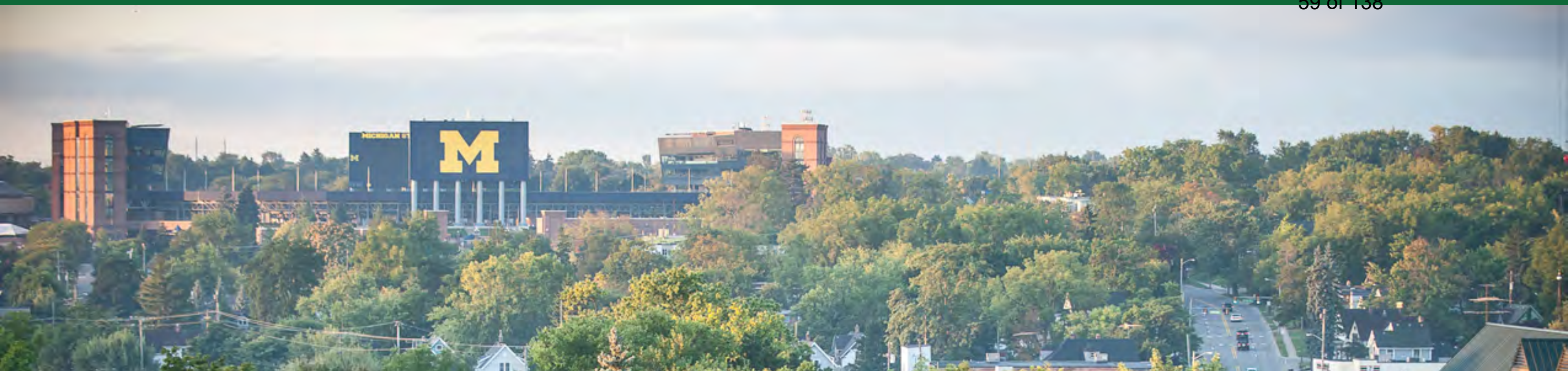
Timeline and Initial Actions

2020

City continues partnership with AAHC to retrofit existing facilities to highest energy standards possible.

2021

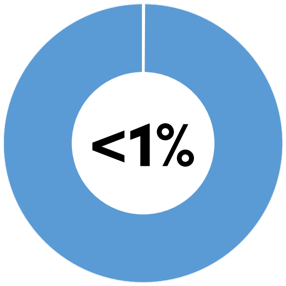
City seeks external funding to support more rapid transition of sites.



Cost Over 10 Years
(Staffing, Hard, and Soft Costs)

$800,000

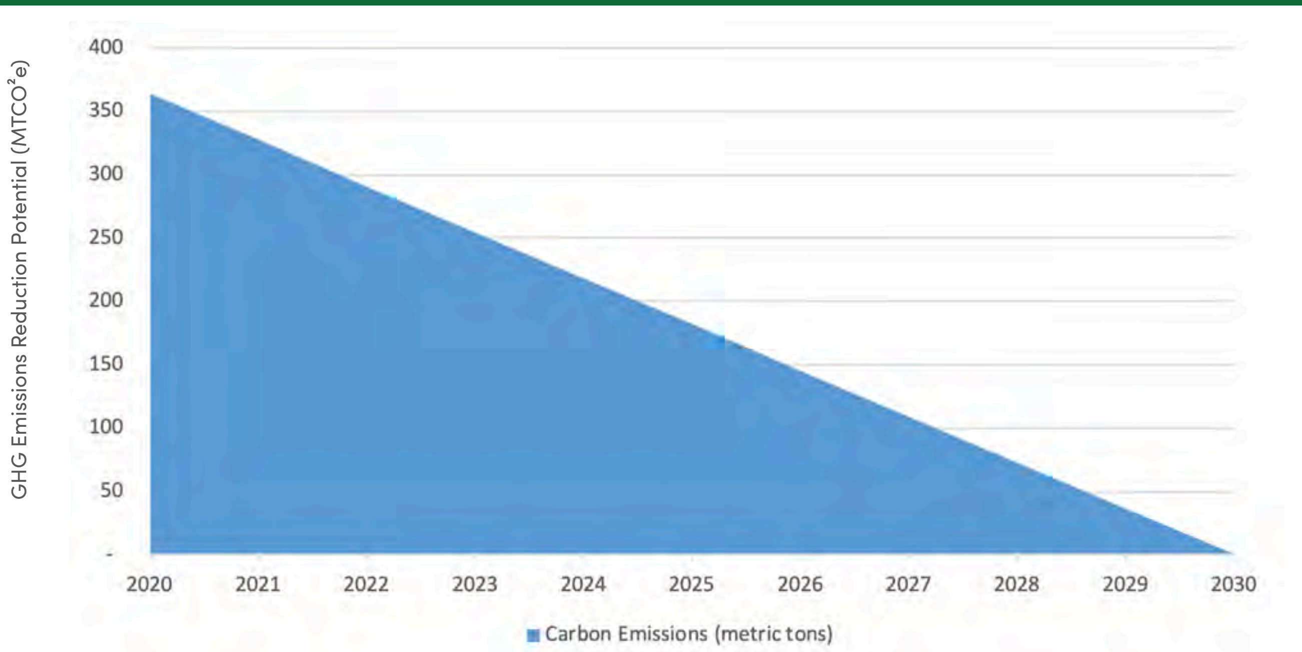
Greenhouse Gas Reduction Potential



400 metric tons of carbon dioxide equivalent (less than 1% of community-wide emissions)

By 2030, the **Transition Affordable Housing Sites to Net Zero Energy** strategy will have achieved all of its potential greenhouse gas emissions reductions.

TRANSITION AFFORDABLE HOUSING SITES TO NET ZERO ENERGY



8. PROMOTE GREEN RENTAL HOUSING PROGRAM

The Green Rental Housing Program improves energy efficiency and reduces greenhouse gas emissions associated with our rental buildings. Since rental units make up 55% of Ann Arbor's housing stock, actions in this area are vital to reducing greenhouse gas emissions. The Green Rental Housing program is accomplished by adding energy efficiency requirements into the existing City rental licensing process, thereby ensuring that every rental unit in Ann Arbor meets a minimum energy efficiency performance standard. Trainings, rebates, and financing support are provided as well to help transition rental units to greater efficiency.

Vision for Promoting Green Rental Housing Program

Renters are living in vastly more energy efficient homes and are saving on their energy bills and/or rents. Property owners are investing in the value of their properties and are seeing increased tenant retention and satisfaction.

Party Responsible for Implementation

- Office of Sustainability and Innovations and Community Services

Collaborators / Project Co-Designers

- Rocky Mountain Institute
- Urban Sustainability Directors Network
- University of Michigan's Beyond the Diag
- Washtenaw Area Apartment Association
- Michigan Saves
- DTE Energy

Equity Impacts

Renters in Ann Arbor may be able to rent more energy efficient homes as soon the ordinance goes into effect, and as more buildings become more energy efficient.

Indicators of Success / Goals

10% reduction in energy usage in rental properties within the City by 2030.

Assumptions

- We are able to integrate energy efficiency requirements into existing City rental licensing processes
- 80% compliance with the policy after the policy has been in effect for 4 years
- No net increase in average rents, outside of normal market inflation, 5 years post policy adoption

Target Demographic

Renters in Ann Arbor, with a special emphasis on low-income and student renters

Timeline and Initial Actions

2020

Stakeholder engagement and policy development commences.

2021

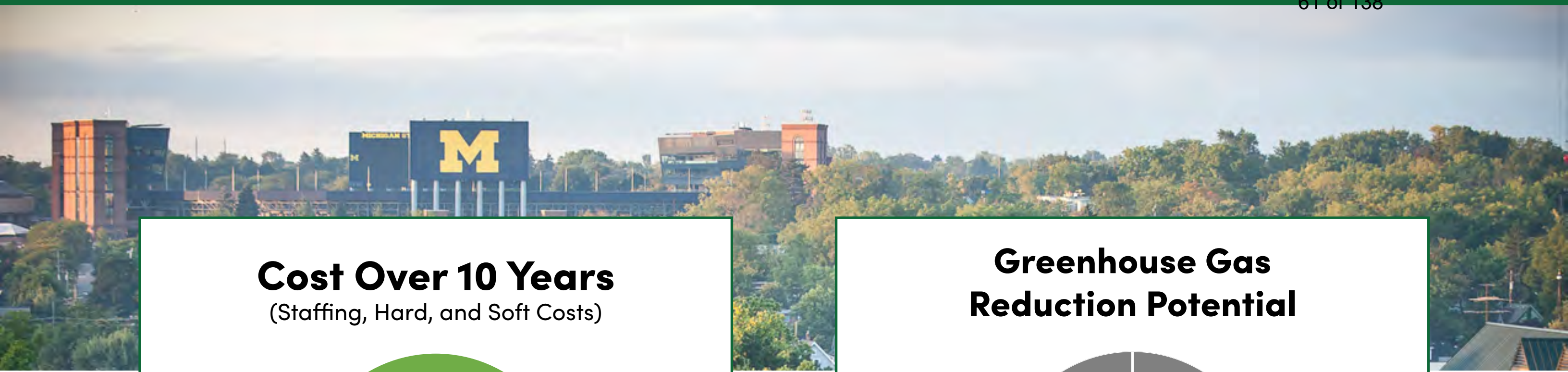
Policy brought forward and adopted by Council; workforce development and training begins to administer the program.

2022

Policy goes into effect.

2025

Policy reviewed and revised, if needed.



Cost Over 10 Years

(Staffing, Hard, and Soft Costs)

$530,000

Greenhouse Gas Reduction Potential

n/a

Impact of this action is included in other calculations.

PROMOTE GREEN RENTAL HOUSING PROGRAM

9. LAUNCH GREEN BUSINESS CHALLENGE

This action encourages our businesses to engage in more sustainable behaviors by providing technical assistance, guidance, and recognition to local businesses that voluntarily become more sustainable and lower their environmental footprint. At the core of the program are energy efficiency, renewable energy usage, waste reduction and material reuse, water reduction, and alternative transportation.

Vision for Launching Green Business Challenge

Ann Arbor businesses are some of the most sustainable in the nation, thanks in part to the City's Green Business Challenge. By providing incentives, guidance, and recognition for local businesses, the Green Business Challenge helped businesses lower their operating costs and reduce their environmental footprints. It has also increased support for the City's thriving small, medium, and large businesses.

Party Responsible for Implementation

- TheRide, with support from the Office of Sustainability and Innovations' Sustainability Analyst
- UM Transportation Department. with support from the Office of Sustainability and Innovations

Collaborators / Project Co-Designers

- Ann Arbor – Ypsilanti Regional Chamber of
- Commerce
- Ann Arbor SPARK
- Public Services
- DTE Energy
- Consumers Energy
- Ecology Center
- Huron River Watershed Council
- Michigan Saves
- Local banks
- Downtown Development Authority
- Ann Arbor 2030 District
- TheRide

Equity Impacts

Few equity impacts.

Indicators of Success / Goals

By 2025, participating businesses have reduced their energy consumption by 10%, increased waste diversion by 10%, reduced water consumption by 10%, and eliminated single-use plastics.

Assumptions

- 2030 District is a partner in educating and engaging/recruiting businesses
- 50 local businesses are participating by 2025

Target Demographic

Local businesses – initially those in the downtown but eventually any local business in town

Timeline and Initial Actions

2020

Launch Green Business Challenge stakeholder committee.

2021

Design the Challenge; recruit participants.

2022

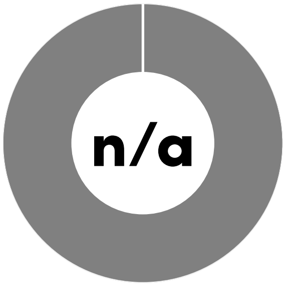
Administer the first year of the Challenge.

Cost Over 10 Years

(Staffing, Hard, and Soft Costs)

$700,000

Greenhouse Gas Reduction Potential



Impact of this action is included in other calculations.

LAUNCH GREEN BUSINESS CHALLENGE

10. SUPPORT AGING IN PLACE EFFICIENTLY

The Aging in Place Efficiently program helps low-income seniors age in a place of their choosing for longer by providing physical and energy efficiency improvements to their residences. More specifically, this program aims to integrate energy efficiency improvements into a wide variety of existing services available to seniors in our community.

Vision for Supporting Aging in Place Efficiently

It is 2035 and all low-income seniors in our community have healthier outcomes. Thanks to physical improvements to their homes and energy efficiency upgrades that reduce their monthly expenditures, they are able to age gracefully and stay in their homes longer.

Party Responsible for Implementation

- Office of Sustainability and Innovations
- Washtenaw County Department of Community and Economic Development
- Meals on Wheels

Equity Impacts

This program will provide expanded weatherization services to a broader segment of low-income senior citizens than the County program is allowed to currently serve.

Collaborators / Project Co-Designers

- Local aging organizations
- Energy efficiency experts
- Michigan Saves
- Dr. Tony Reames
- DTE Energy
- Housing Bureau of Seniors
- City Transportation Team
- TheRide

Indicators of Success / Goals

By 2023, at least 20 low-income seniors have reduced their energy bills by at least 15% and are recording improved quality of life thanks to improvements made in the program.

Assumptions

- Funding is secured through Partners for Places Grant
- Existing partners continue to engage in the initiative
- The model proves scalable and replicable throughout the City and region

Target Demographic

Low-income seniors

Timeline and Initial Actions

2020

Apply for external funding to initiate program. If successful, hire program assistant.

2021

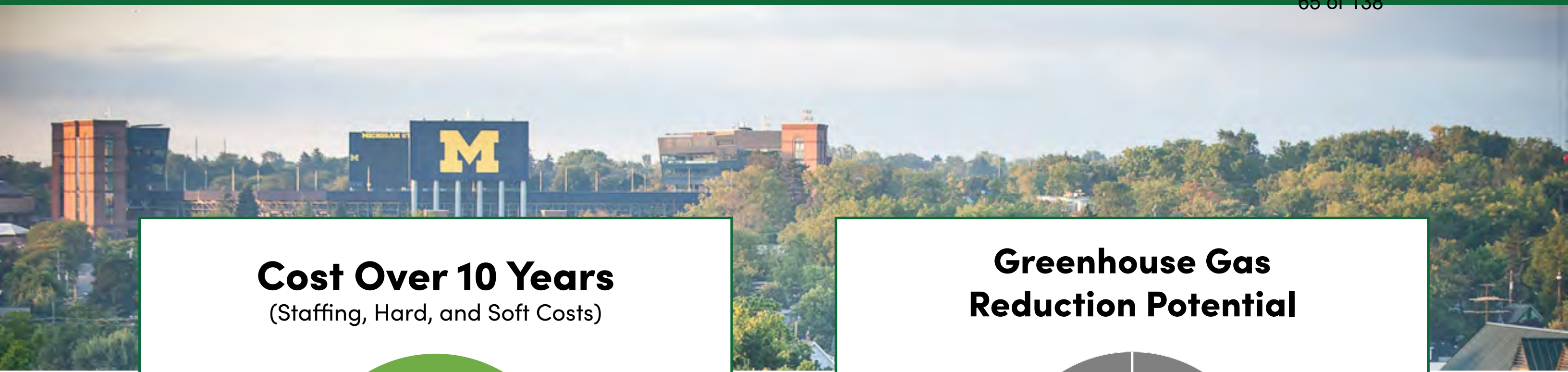
Pilot the program in Ann Arbor.

2022

Review, make revisions, and work with partners to expand in Ann Arbor and begin piloting throughout Washtenaw County.

2025

Program at full scale in the City and launched in the County.



Cost Over 10 Years
(Staffing, Hard, and Soft Costs)

$150,000

Greenhouse Gas Reduction Potential

n/a

Impact of this action is included in other calculations.

SUPPORT AGING IN PLACE EFFICIENTLY

11. EXPAND WEATHERIZATION PROGRAM

Washtenaw County and multiple nonprofits offer weatherization services to low-income homeowners in Ann Arbor. Weatherization is the practice of protecting a building and its interior from the elements, particularly from sunlight, precipitation, wind, and of modifying a building to reduce energy consumption and optimize energy efficiency. Through this program, the City of Ann Arbor will expand weatherization support so that more low-income homeowners can access these services.

Vision for Expanding Weatherization

By 2030, all low-income residents have been offered weatherization services.

Party Responsible for Implementation

- Washtenaw County Office of Community and Economic Development

Collaborators / Project Co-Designers

- Office of Sustainability and Innovations
- Michigan Saves
- Ann Arbor Meals on Wheels
- Habitat for Humanity
- DTE Energy
- Consumers Energy

Equity Impacts

This program will expand weatherization services to more low-income Ann Arbor homeowners than can be served by the County weatherization program.

Indicators of Success / Goals

By 2030, all low-income residents in the City have been offered weatherization services.

Assumptions

- Expansion of weatherization includes funding to support electrification of homes
- Contract is passed by Council to support program and administering of funds to County to implement

Target Demographic

Low-income residents in Ann Arbor

Timeline and Initial Actions

2020

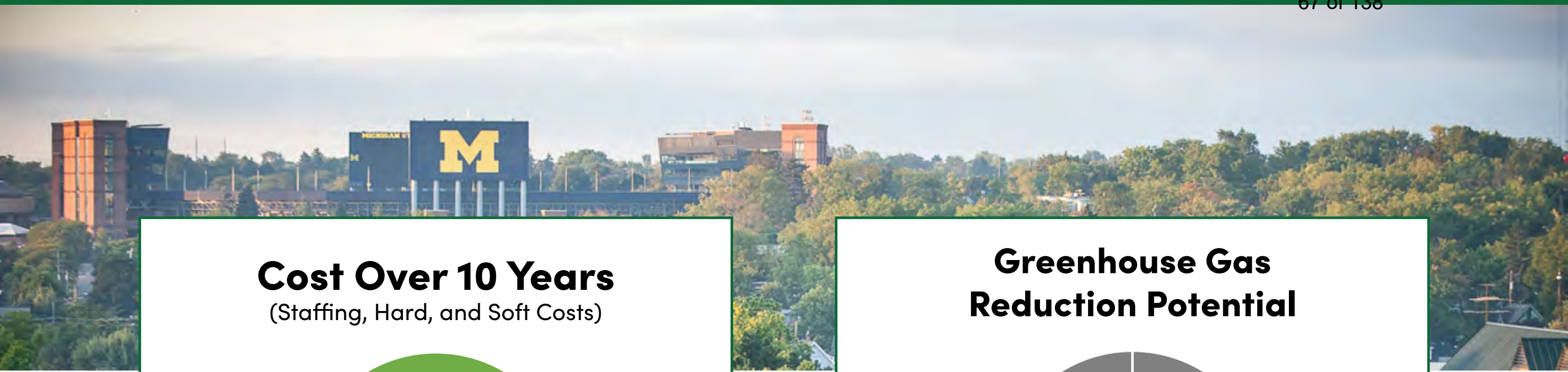
Background research into the number and needs of low-income homeowners in Ann Arbor; work with County Office of Community and Economic Development to design weatherization expansion program.

2021

Create operating agreements with Washtenaw County and pilot program.

2022

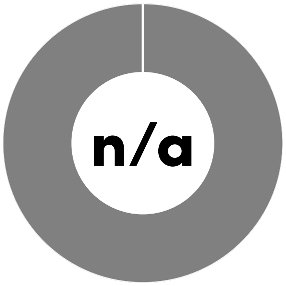
Review, make revisions, and work to serve more individuals in Ann Arbor.



Cost Over 10 Years
(Staffing, Hard, and Soft Costs)

$1,550,000

Greenhouse Gas Reduction Potential



Impact of this action is included in other calculations.

EXPAND WEATHERIZATION PROGRAM

STRATEGY 4:

Reduce the Miles we Travel in our Vehicles by at least 50%

This strategy focuses on reducing the miles we travel in our vehicles, regardless of type, by at least 50%. This is particularly important as emissions from transportation are on the rise, meaning that if we don't act to curtail this source, our greenhouse gas emissions reductions in other areas may be offset by gains in transportation-related emissions. To achieve this strategy, 7 specific actions have been identified:

1. Implement Non-Motorized Transportation Plan
2. Expand and Improve Local Transit
3. Expand and Improve Regional Transit
4. Increase Number of Park and Rides and Ensure Seamless Connection to Transit
5. Increase Diversity of Housing
6. Establish Mixed-Use Neighborhoods
7. Tiered Parking Rates

Combined, these seven actions are projected to reduce just over 8% of community-wide emissions and cost just over $901,000,000 due to mainly physical infrastructure costs.

1. IMPLEMENT NON-MOTORIZED TRANSPORTATION PLAN

The City's Non-Motorized Transportation Plan was designed to ensure an interconnected network of options to achieve 25% of in-city trips through non-motorized transit. New infrastructure such as sidewalks, road crossings, separated bike lanes, streetlights, traffic devices, and connections between public transit and active transport modes will be needed to achieve this goal, which strongly overlaps with the A^2Zero initiative.

Vision for Implementing Non-Motorized Transportation Plan

All Ann Arbor residents, employees, students, and visitors have safe, convenient, and enjoyable choices to move around the City, whether by foot, bicycle, or other self-propelled modes.

Party Responsible for Implementation

- Ann Arbor Engineering Department Transportation Team, with support from Ann Arbor City Council

Collaborators / Project Co-Designers

- Transportation Department
- Transportation Commission
- Planning Commission (Capital Improvement Plan)
- Downtown Development Authority
- Ann Arbor Area Transit Authority
- Michigan Department of Transportation
- Washtenaw Bicycling and Walking Coalition
- University of Michigan
- Smart City group
- Private micromobility companies
- Private employers

Equity Impacts

Residents who cannot afford to buy and maintain private automobiles often bike, walk, or travel by micromobility modes. Investing in new infrastructure will enable those already using non-motorized modes of travel to have safer, more convenient, and faster trips. These investments will also encourage more residents to travel by bike or foot. However, pedestrians and cyclists are often vulnerable road users, and have faced increasing injuries and deaths from traffic collisions. Safe, ubiquitous infrastructure is needed.

Indicators of Success / Goals

By 2030, 25% of in-city trips are conduct by walking or bicycling thanks to ubiquitous and safe infrastructure.

Assumptions

- 25% of in-city trips are done with bicycling and walking
- These trips are in-city trips only
- 5 miles of new bike lanes installed per year – the majority are protected
- At least 5 major mid-block crosswalks and 2 minor mid-block cross-walks installed per year
- 90% of sidewalk gaps are filled by 2030

Target Demographic

Implementing the Non-Motorized Transportation Plan will primarily benefit pedestrians and bicyclists, although the increased safety and access to infrastructure will also reduce vehicle collisions. Drivers will also benefit from less congested streets as people switch to walking and biking

Timeline and Initial Actions

2020

Continue implementing elements on the Non-Motorized Plan. Finalize the VisionZero Transportation Plan update.

2021

Continue hosting public meetings to understand weaknesses in current infrastructure and opportunities for improvement.

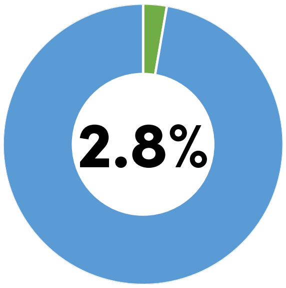
2026

Full implementation of the Non-Motorized Transportation Plan.

Cost Over 10 Years
(Staffing, Hard, and Soft Costs)

$2,400,000

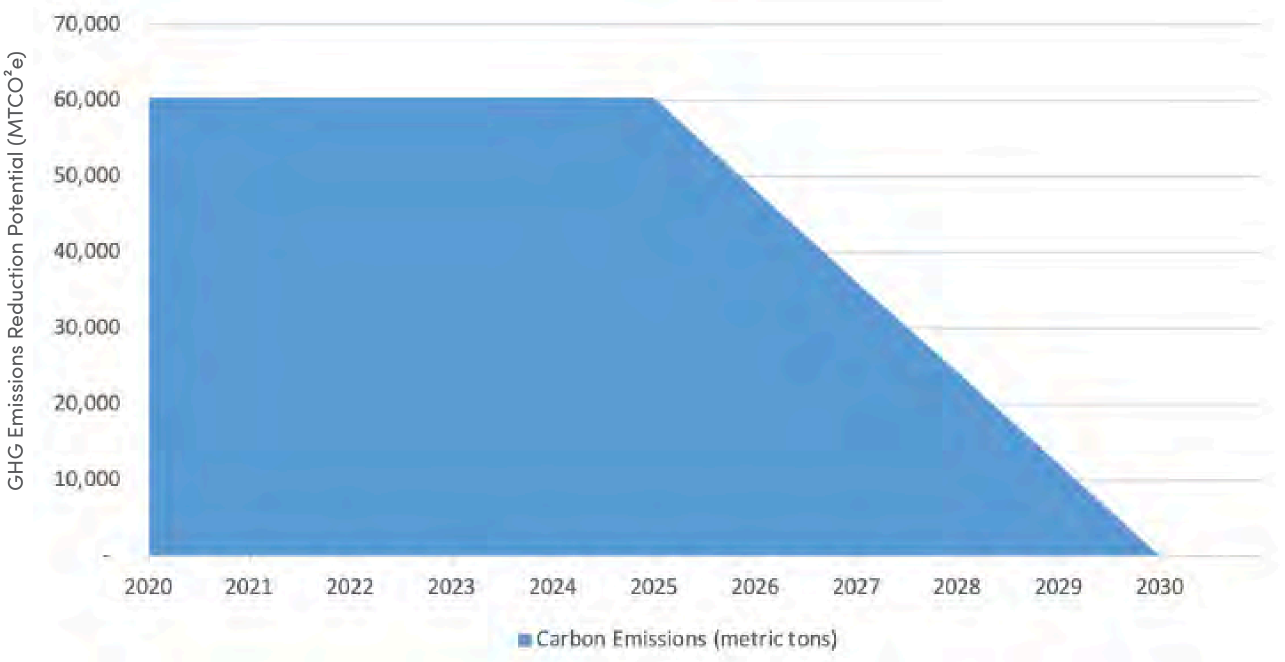
Greenhouse Gas Reduction Potential



60,400 metric tons carbon dioxide equivalent (2.8% of community-wide emissions).

By 2030, the **Implement Non-Motorized Transportation Plan** strategy will have achieved all of its potential greenhouse gas emissions reductions.

IMPLEMENT NON-MOTORIZED TRANSPORTATION PLAN



2. EXPAND AND IMPROVE LOCAL TRANSIT

An extremely common theme during public outreach was the need to expand and improve local transit services. Ideas suggested included longer service, new service routes, dedicated bus lines and bus rapid transit along major transportation corridors, and expanding the Get Downtown Program to companies outside of downtown. This action focuses on how we can expand and improve transit service with the aim of significantly increasing ridership.

Vision for Expanding and Improving Local Transit

By 2030, ninety-five percent of Ann Arbor residents have access to transit within a 10 minute walk with frequencies of 20 minutes or faster. This leads to residents taking transit for 40% of their journeys to work. This extensive transit service is powered with electric vehicles, all fueled with renewable energy.

Party Responsible for Implementation

- Ann Arbor Area Transit Authority, with support from the Regional Transit Authority of Southeast Michigan

Collaborators / Project Co-Designers

- Ann Arbor Transportation Commission
- Southeast Michigan Council of Governments (SEMCOG)
- Washtenaw Area Transportation Study (WATS)
- Federal Transit Administration (FTA)
- Senator Stabenow, Senator Peters, and
- Congresswoman Dingle
- Downtown Development Authority (DDA)
- University of Michigan
- Michigan Department of Transportation (MDOT) SPARK
- Ann Arbor 2030 District
- Ann Arbor Engineering Department
- Transportation Team
- Private employers

Target Demographic

All residents of Ann Arbor

Equity Impacts

Those who stand to benefit the most are those who may not have access to many forms of transportation due to disability, age, or income. The entire community can become economically stronger and more resilient from investments such as improved transit since investments in public transportation generate 31 percent more jobs per dollar than new construction of roads and bridges. Since property values tend to increase with new transit investments which would directly benefit property owners, it is important to find ways of keeping fares low for these new services so low-income residents are not disproportionately burdened by these improvements.

Indicators of Success / Goals

Residents take transit for 40% of their journeys not done through walking and biking.

Timeline and Initial Actions

2020

Vision Zero Transportation Master Plan is finished and adopted by Council. Work with AAATA to include bus rapid transit, electric buses, and solar, in millage renewal.

2021

The Get Downtown Program is expanded to include all businesses with more than 20 employees in Ann Arbor, and also to Ann Arbor residents who ae not working for a participating company.

2030

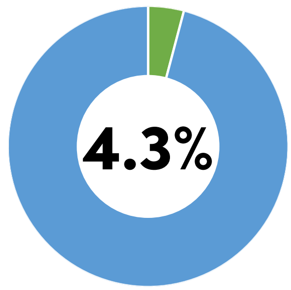
Bus Rapid Transit is built along transportation corridors.

Cost Over 10 Years

(Staffing, Hard, and Soft Costs)

$656,780,000

Greenhouse Gas Reduction Potential



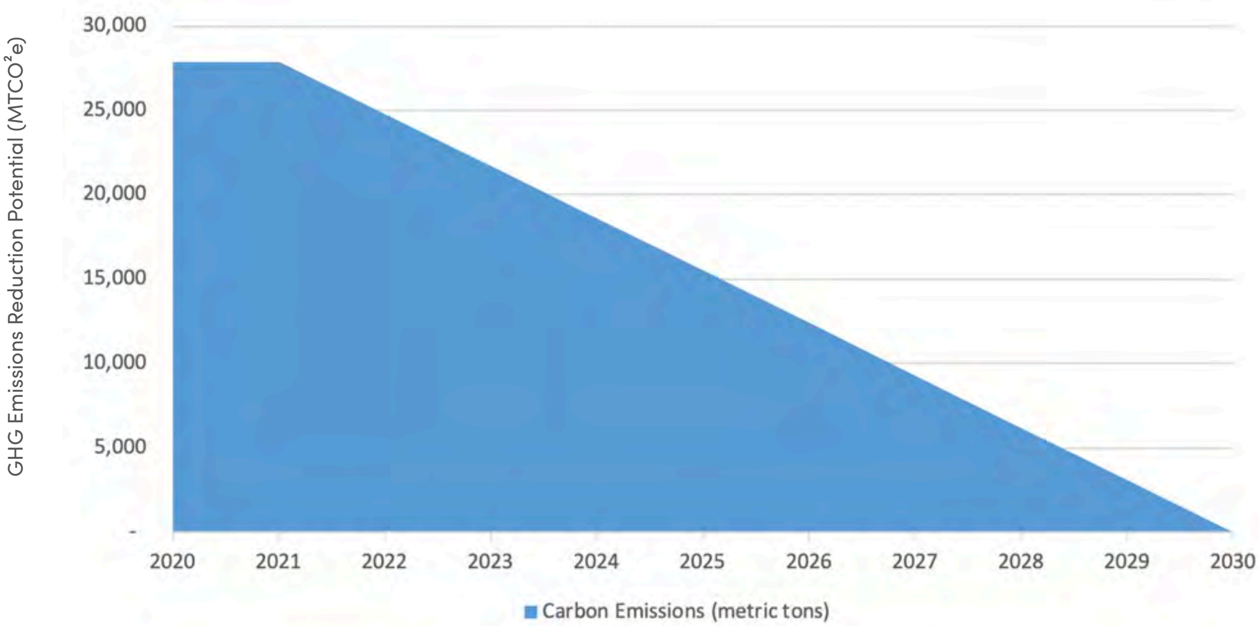
93,200 metric tons carbon dioxide equivalent (4.3% of community-wide emissions).

Assumptions

- Quadrupling of current bus ridership, with the average of 3.5 miles per trip
- Includes costs of new bus rapid transit lines
- Weekday bus rapid transit trips are assumed to run along routes of roughly 8 miles, for 5 days a week, or 48 weeks
- Weekend bus rapid transit trips are assumed to run along routes of roughly 8 miles, for 2 days a week,
- for 52 weeks
- Includes 22 queue jump facilities for regular buses
- Includes stop amenities and signal priority equipment for priority corridors
- Only calculates emissions reductions starting at the border of Ann Arbor (note: staff are working to gather comprehensive origin and destination data to update these figures)
- 2 new electric buses a year for 10 years added to the fleet to expand service

By 2030, the **Expand and Improve Local Transit** strategy will have achieved all of its potential greenhouse gas emissions reductions.

EXPAND AND IMPROVE LOCAL TRANSIT



3. EXPAND AND IMPROVE REGIONAL TRANSIT

Upwards of 80,000 individuals commute into Ann Arbor on any given day for work, school, or recreation. Regional transit service can help significantly reduce these numbers, thereby decongesting roads, improving local health, and reducing stress. Regional transit service into and from Plymouth, Jackson, Detroit, Brighton, Ypsilanti, and Ypsilanti Township are the areas prioritized at this time.

Vision for Expanding and Improving Regional Transit

By 2030, a high capacity transit and express transit system exists that connects Ann Arbor with nearby jurisdictions such as Detroit, Ypsilanti, Chelsea, and Brighton. Twenty-five percent of commuter trips into and out of Ann Arbor occur through these highly effective regional transit services.

Party Responsible for Implementation

- Ann Arbor Area Transit Authority, with support from the Regional Transit Authority of Southeast Michigan

Collaborators / Project Co-Designers

- Engineering Department Transportation Group
- Washtenaw, Oakland, and Wayne counties and the cities and townships in those counties
- Ann Arbor Transportation Commission
- Southeast Michigan Council of Governments
- Washtenaw Area Transportation Study (WATS)
- Federal Transit Administration
- Federal Railroad Administration WATCO
- Senator Stabenow, Senator Peters, and
- Congresswoman Dingell
- University of Michigan
- Michigan Department of Transportation

Equity Impacts

High capacity regional transit and express transit will primarily benefit commuters to and from Ann Arbor. Such service would broaden opportunities and access to jobs for those without access to other forms of transportation. Quality regional transit can also attract occasional riders and all-purpose riders who find it desirable to take transit to and from Ann Arbor to avoid traffic, parking fees, and the hassles of driving. It will be important to ensure that low-income riders have convenient and affordable access to expanded transit opportunites.

Indicators of Success / Goals

By 2030, 25% of the regional commuting trips into the City are done via regional transit options.

Assumptions

- Bus rapid transit lines are created and can be utilized by regional transit lines
- The average regional trip is 8 miles or less, running 5 days a week for 48 weeks
- 25% of the commuter trips will be taken by regional transit
- Includes calculations related to supporting more work from home programs. Estimated 5% participation
- rate for those with a one-way commute of 10 miles or less and a 10% participation rate for those with a
- one-way commute of 11 miles or more.

Target Demographic

Regional transit will primarily benefit people who work or school in Ann Arbor and the jurisdictions where transit stops exist

Timeline and Initial Actions

2020

Work with AAATA to include bus rapid transit, electric buses, and solar, in millage renewal. Regional transit to Detroit is established.

2021

Regional transit to surrounding municipalities is established.

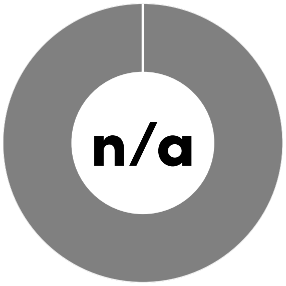
Cost Over 10 Years

(Staffing, Hard, and Soft Costs)

$

The majority of costs for this action are covered in other actions.

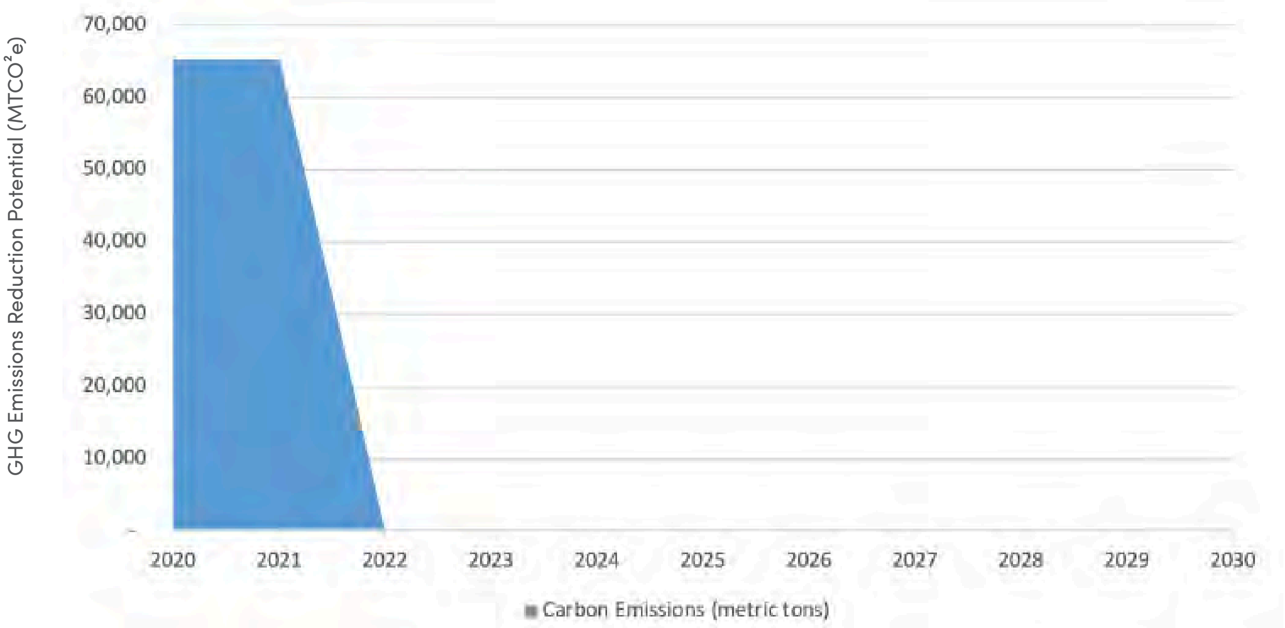
Greenhouse Gas Reduction Potential



The greenhouse gas reduction potential of this action in captured in other actions

By 2022, the **Expand and Improve Regional Transit** strategy will have achieved all of its potential greenhouse gas emissions reductions.

EXPAND AND IMPROVE REGIONAL TRANSIT



4. INCREASE NUMBER OF PARK AND RIDES AND ENSURE SEAMLESS CONNECTION TO TRANSIT

More than 80,000 individuals commute into the City every day for work, school, or recreation. Intercepting people as soon as they arrive and diverting vehicular traffic to park and rides that provide electric vehicle charging and seamless connection to public transit so they can rapidly get to where they need to go is an important component of reducing vehicular miles traveled in the city. Right now, there are just over 1,300 available free Park and Ride parking spaces. We propose at least a 10x increase in the number of spots to reduce in-city traffic.

Vision for Increasing Park and Rides with Seamless Connection to Transit

Through a significant increase in park and ride infrastructure that is seamlessly connected to transit, we have displaced 25% of commuter trips into the City.

Party Responsible for Implementation

- Michigan Department of Transportation with support from the Ann Arbor Area Transit Authority

Collaborators / Project Co-Designers

- Engineering Department Transportation Group
- Downtown Development Authority
- Washtenaw Area Transportation Study
- Employers
- Transportation

Equity Impacts

Park and Rides primarily benefit commuters coming into Ann Arbor, including low-income residents of nearby towns. Parking at Park and Rides would remain free, which would save drivers money, as compared to paying for parking downtown.

Indicators of Success / Goals

By 2030, commuter trips from the border of the City to their destination within the City has declined by 25%.

Assumptions

- 10x more parking spots are provided at park and rides; These spots are free
- Increased transit ridership accounted for in other actions
- Integrates demand management programs such as carpooling and ridesharing

Target Demographic

Transit riders, bicyclists, pedestrians, and car drivers would all benefit from reduced traffic congestion in the downtown core and by major work and educational centers

Timeline and Initial Actions

2020

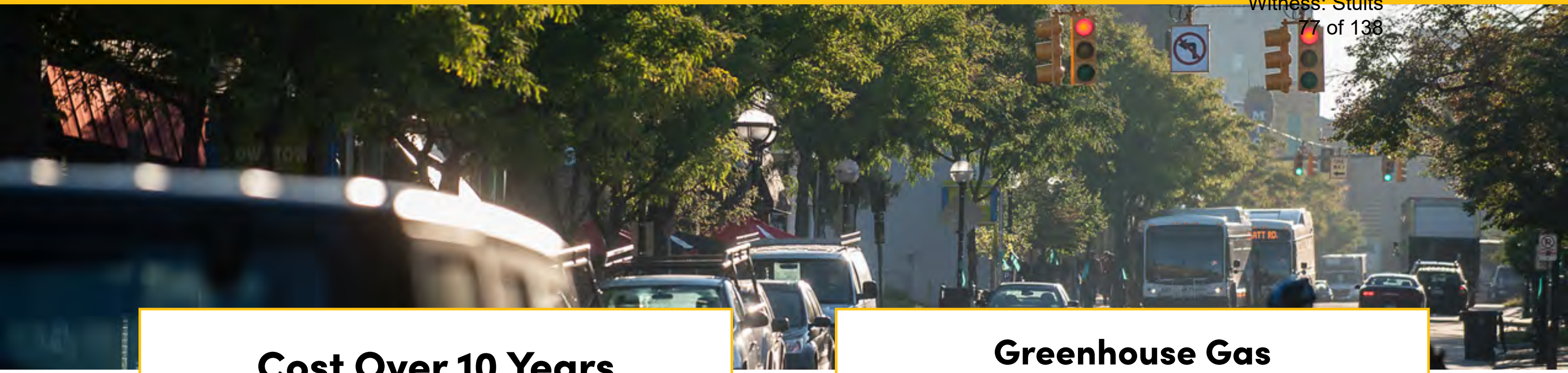
Initiate planning for desired park and ride locations.

2021

Begin working with MDOT to acquire necessary properties and fundraise for infrastructure costs.

2023

Begin building new park and ride lots.



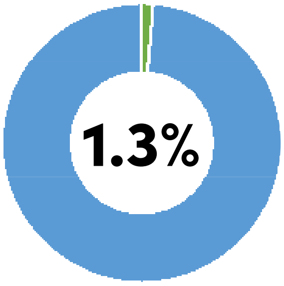
Cost Over 10 Years

(Staffing, Hard, and Soft Costs)

$170,000,000

(Note: This does not include the costs to purchase the land on which park and rides will reside)

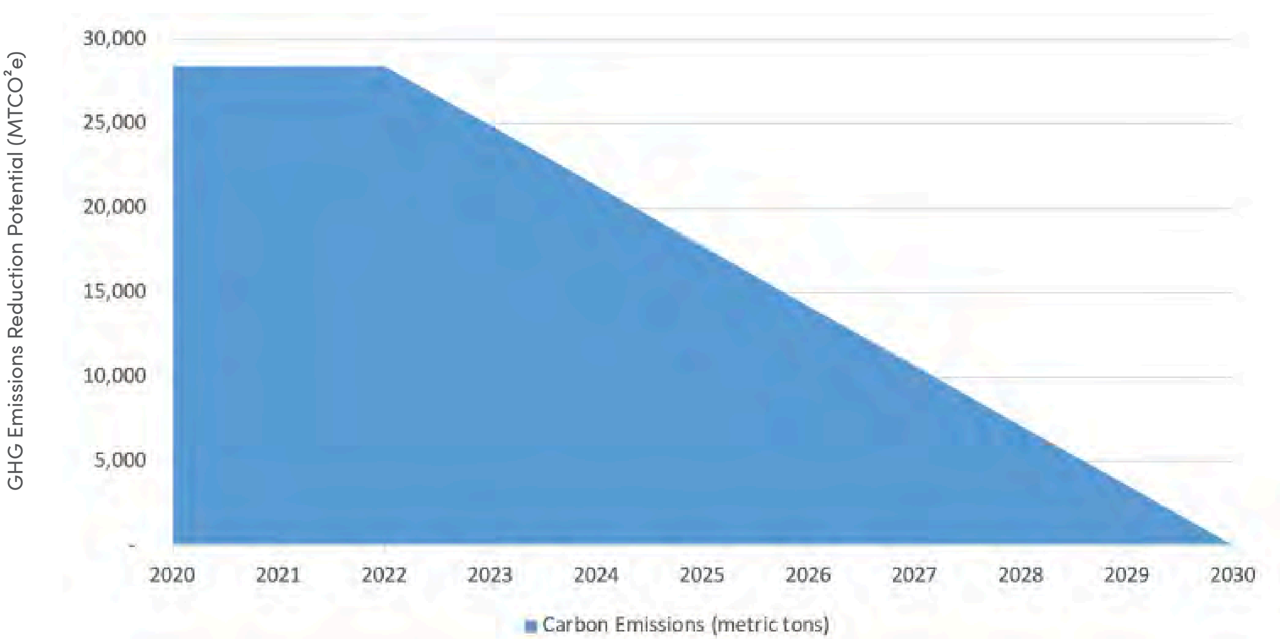
Greenhouse Gas Reduction Potential



28,400 metric tons carbon dioxide equivalent (1.3% of community-wide emissions).

By 2030, the **Increase Number of Park and Rides and Ensure Seamless Connection to Transit** strategy will have achieved all of its potential greenhouse gas emissions reductions.

INCREASE NUMBER OF PARK AND RIDES AND ENSURE SEAMLESS CONNECTION TO TRANSIT



5. INCREASE THE DIVERSITY OF HOUSING

This action focuses on supporting policies to increase housing opportunities within the City. This action was identified numerous times as a way to reduce greenhouse gas emissions, diversify housing options, and address affordability concerns. Overall, this action focuses on increasing the walkability and livability of neighborhoods while creating more accessible housing to a wider array of community members.

Vision for Increasing the Diversity of Housing

Ann Arbor neighborhoods grow slightly while maintaining their character and charm. Ann Arbor begins meeting its goal for reducing single occupancy trips by half while making notable progress toward providing more accessible and afforable housing.

Party Responsible for Implementation

- Ann Arbor Planning Department, with support from the Planning Commission and City Council

Collaborators / Project Co-Designers

- Office of Sustainability and Innovations
- Ann Arbor Housing Alliance
- Ann Arbor Historic District Commission

Equity Impacts

Allowing, multi-units and promoting ADUs will benefit renters, lower-income residents, in-commuters, and project developers. Reduced income disparity benefits all of Ann Arbor, both socially and economically.

Indicators of Success / Goals

2,000 new units of residential multi-family or ADUs are built in residential neighborhoods by 2030.

Assumptions

- City Council will approve an updated Comprehensive Master Plan
- 7-10% increase in housing availability
- Reduces new occupants commute by 20 miles each way and increases public transit usage
- 85% of new residential units are in mixed use areas

Target Demographic

Renters and property owners

Timeline and Initial Actions

2020
Public Engagement on Master Plan Update.

2021
Complete Comprehensive Master Plan Update. Present to Planning Commission and Council.

2024
If needed, zoning code amendments are adopted and implementation begins.

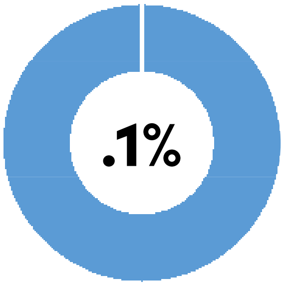
2028
Planning staff and Planning Commission review the code and make suggestions to Council for changes.

Cost Over 10 Years

(Staffing, Hard, and Soft Costs)

$250,000

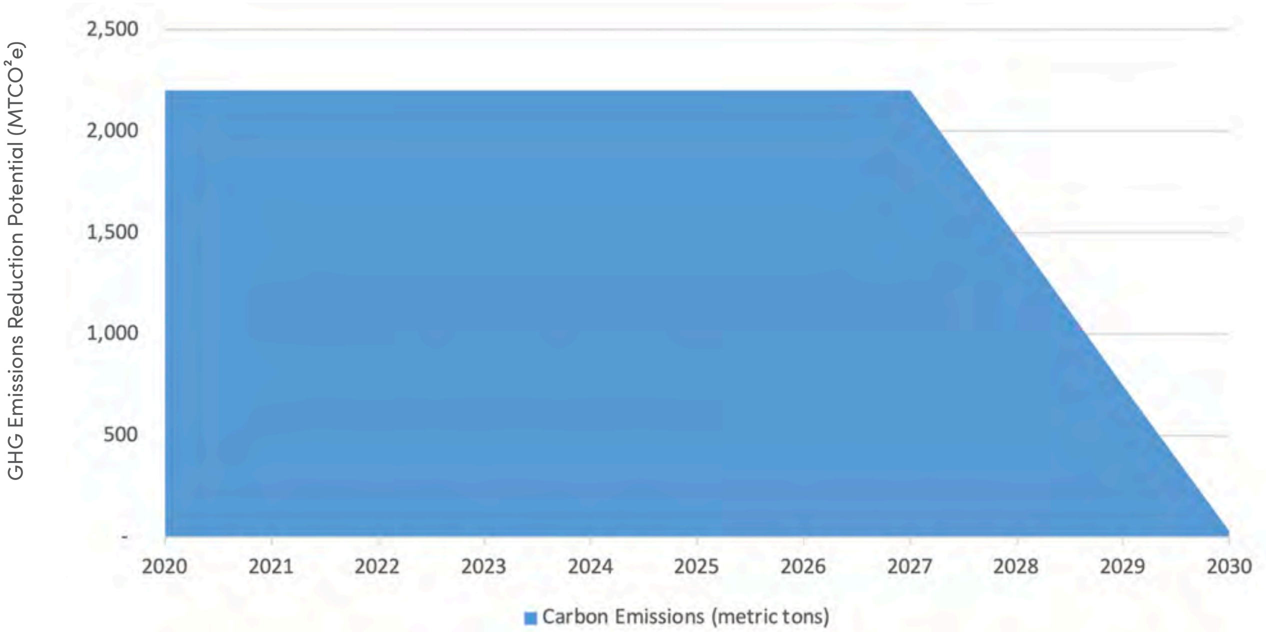
Greenhouse Gas Reduction Potential



2,200 metric tons of carbon dioxide equivalent (.1% of community-wide emissions)

By 2030, the **Increase the Diversity of Housing** action will have achieved all of its potential greenhouse gas emissions reductions.

INCREASE THE DIVERSITY OF HOUSING



6. DEVELOP MIXED-USE NEIGHBORHOODS

Helping residents walk and bike to places of their choosing necessitates having the proper infrastructure in place as well as having the places they desire going within walking and biking distance. This action focuses on updating the zoning code to allow mixed-uses in residential neighborhoods so that things such as bakeries, grocery stories, breweries, coffee shops, etc. can be accessible in nearly all of our neighborhoods. This increases walkability and reduces vehicular miles driven.

Vision for Developing Mixed-Use Neighborhoods

More errands and entertainment are accessible by foot and bike thanks to mixed-use zoning, which has allowed us to maintain the integrity of Ann Arbor's neighborhoods while adding in amenities that enhance quality of life.

Party Responsible for Implementation

- Ann Arbor Planning Department, with support from the Planning Commission and City Council

Collaborators / Project Co-Designers

- Neighborhood associations
- Local businesses
- Ann Arbor Historic District Commission

Equity Impacts

Increasing mixed-use zoning positively impacts residents and small business owners in mixed use neighborhoods.

Indicators of Success / Goals

By 2030, 20% of in-city trips are done by walking or biking

Assumptions

- Increased social cohesion
- Increased walking and biking
- Reduced driving and car ownership in mixed use neighborhoods

Target Demographic

Residents and small business owners

Timeline and Initial Actions

2020

Initiate Comprehensive Master Plan Update.

2021

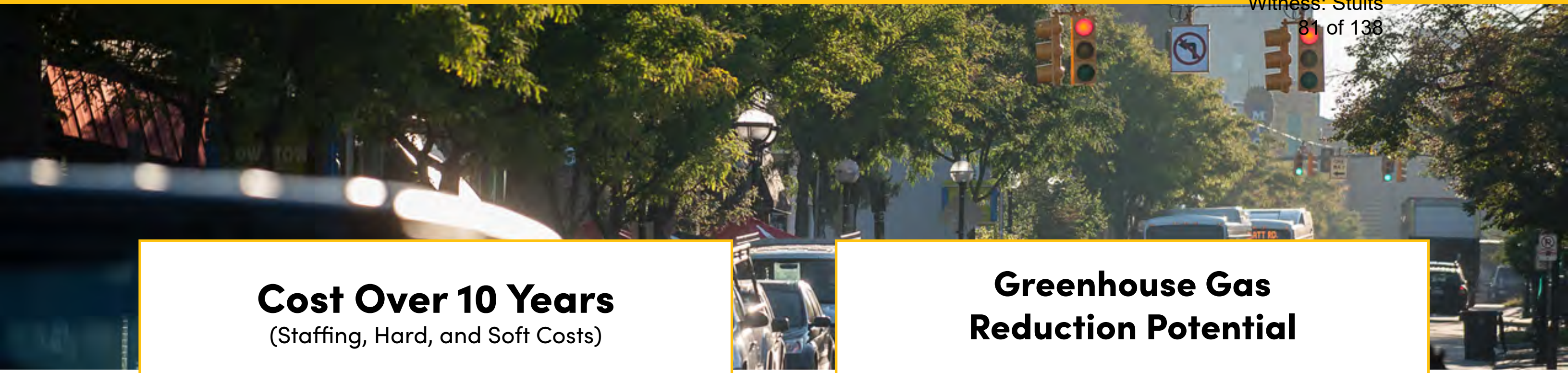
Complete Comprehensive Master Plan Update. Start working on corresponding zoning amendments.

2024

Zoning code amendments are adopted and implementation begins.

2028

Planning staff and Planning Commission review the code and make suggestions to Council for changes.

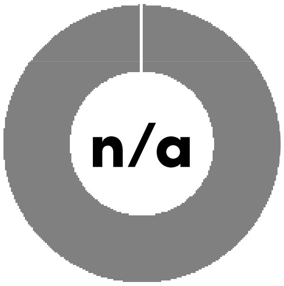


Cost Over 10 Years

(Staffing, Hard, and Soft Costs)

$365,000

Greenhouse Gas Reduction Potential



Emissions reduction potential included in other actions.

DEVELOP MIXED-USE NEIGHBORHOODS

7. ESTABLISH TIERED PARKING RATES

This action focuses on dis-incentivizing driving into the City by having a sliding parking fee structure that increases the cost to park, but has lower rates for low-income residents, residents with disabilities/specific parking needs, and electric vehicle drivers. This includes deploying smart metering and establishing dynamic pricing. Excess on-street parking in the DDA will be removed and replaced with more beneficial street uses, such as infrastructure for pedestrians, bicyclists, transit, and street activities (such as outdoor restaurant seating). Action includes eliminating all parking minimums and setting low parking maximums through the Plan review process.

Vision for Establishing Tiered Parking Rates

Many city streets will be transformed into Complete Streets through the repurposing of on-street parking to more active and pedestrian friendly activities.

Party Responsible for Implementation

- Downtown Development Authority with the Ann Arbor Engineering Department Transportation Group

Collaborators / Project Co-Designers

- Michigan Department of Transportation
- Office of Sustainability and Innovations
- Transportation Commission
- Ann Arbor 2030 District
- Ann Arbor Area Transit Authority
- Ann Arbor Smart City group
- University of Michigan
- Planning Department
- Planning Commission
- US Department of Transportation

Equity Impacts

Biking and walking become safer and more convenient ways to get around, which will open more mobility options for lower-income residents who cannot afford a car. For lower-income residents who must drive, parking rates will be tiered so as to offer lower cost options.

Indicators of Success / Goals

10% increase in walking and biking in the downtown corridor.

Assumptions

- More transportation users help active and sustain transportation modes
- Reduced parking rates for EV drivers and for low-income drivers

Target Demographic

This action will prioritize users of active and sustainable transportation modes

Timeline and Initial Actions

2020

Investigate what equipment and software other cities have used to enable dynamic parking rates.

2021

Develop a partnership to launch new parking technology and pilot dynamic parking rates somewhere in the DDA; eliminate parking minimums in UDC and replace with parking maximums.

2022

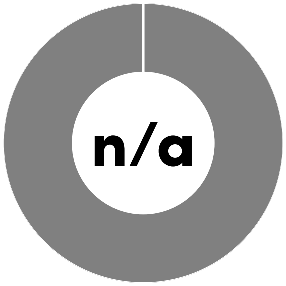
Full scale launch of tiered rates.

Cost Over 10 Years

(Staffing, Hard, and Soft Costs)

$4,500,000

Greenhouse Gas Reduction Potential



Emissions reduction potential included in other actions.

STRATEGY 5:

Change the Way We Use, Reuse, and Dispose of Materials

This strategy focuses on changing our relationship with what we buy and use, how we buy and use materials, and how we dispose of materials once we are done using them. The calculations in this section only focus on the greenhouse gas savings associated with reducing the disposal of materials and products. City staff will continue working on a methodology to capture upstream emissions associated with extracting and creating the goods and materials we use. For now, however, upstream emissions are not included in calculations. To achieve this strategy, six specific actions have been identified:

1. Expand Composting Program
2. Expand Commercial Recycling
3. Require Sustainable Materials in New and Existing Developments
4. Move Toward a Circular Economy
5. Support a Plant Rich Diet
6. Enhance Refrigerant Recycling and Reuse Program

Combined, these six actions reduce baseline community-wide greenhouse gas emissions by 0.3% and cost just over $45,000,000.

1. EXPAND COMPOSTING PROGRAM

The action focuses on moving to year round composting, which includes diverting food and yard waste from the waste stream into more productive uses in our compost system. This reduces methane emissions and helps produce valuable compost that can be used locally.

Vision for Expanding Compost Program

As food waste gets discarded as compost there's a gross reduction in the amount of methane produced from rotting food and a reduced impact on our GHG production.

Party Responsible for Implementation

- Department of Public Works

Collaborators / Project Co-Designers

- Office of Sustainability and Innovations
- Food collection and distribution organizations
- Restaurants
- Communication Department

Equity Impacts

Through the new market for imperfect produce, low-income residents could benefit from being able to access more affordable fruits and vegetables.

Indicators of Success / Goals

By 2022, year round and commercial composting has led to over 5,000 tons of yard and food waste being diverted from our waste stream annually.

Assumptions

- Solid Waste Resource Management Plan (SWRMP) estimates that increasing to year round composting would put collection at 1,000 – 2,784 tons
- SWRMP estimates increasing collection of food from food-related businesses would add another 1,000– 2,400 tons per year
- Includes creating markets for imperfect fruit and vegetables to ensure they don't enter waste stream
- Increased education to ensure food waste doesn't freeze to cart
- Necessitates changes in the downtown area to allow compost pick-up; These costs are not factored into the cost estimate below

Target Demographic

All business and residences in Ann Arbor

Timeline and Initial Actions

2020

Adoption of a Solid Waste Resource Management Plan or at least elements related to compost expansion.

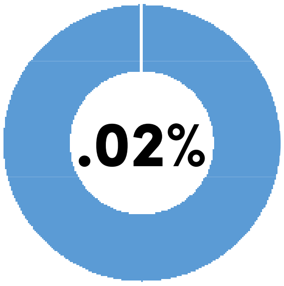
2021

Year round composting begins along with extensive outreach and engagement with businesses and residents about what is compostable and what is not.

Cost Over 10 Years
(Staffing, Hard, and Soft Costs)

$26,000,000

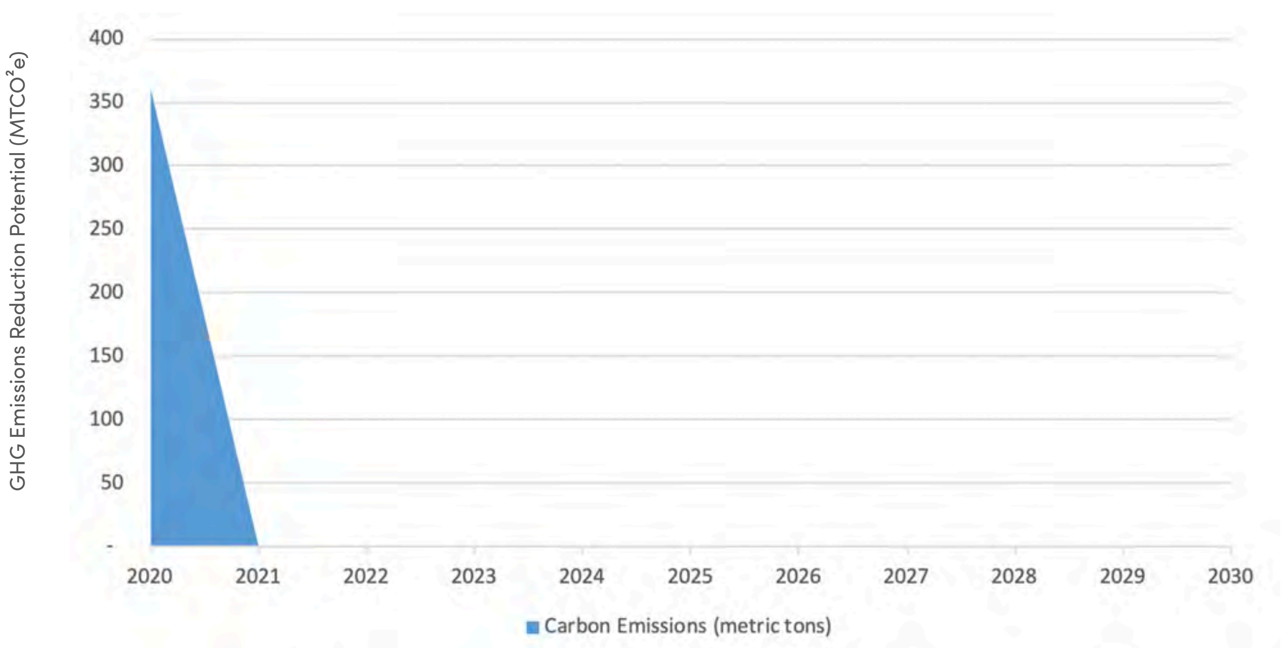
Greenhouse Gas Reduction Potential



400 metric tons carbon dioxide equivalent
(.02% of community-wide emissions)

By 2021, the **Expand Composting Program** strategy will have achieved all of its potential greenhouse gas emissions reductions.

EXPAND COMPOSTING PROGRAM



2. EXPAND COMMERCIAL RECYCLING

Through incentives, education, and enforcement policies, this action focuses on getting commercial sector recycling rates to at least 30%.

Vision for Expanding Commercial Recycling

The Solid Waste Resource Management Plan (SWRMP) estimates a range of 1700 to 4400 tons of waste diverted from landfill as a result of increased participation in commercial sector recycling.

Party Responsible for Implementation

- Department of Public Works, with support from Resource Recycling Associates

Collaborators / Project Co-Designers

- Office of Sustainability and Innovations
- Commercial businesses
- State of Michigan

Equity Impacts

No equity impacts explicitly identified.

Indicators of Success / Goals

By 2028, City of Ann Arbor diverts 30% of commercial sector recyclable waste from the landfill to recycling centers.

Assumptions

- Requiring recycling at restaurants will increase recycling rates in the commercial sector
- Businesses will divert more recyclables from landfill
- Commercial sector diversion rate is 4,400 annual tons
- Increase in enforcement of commercial establishments who don’t recycle and compost

Target Demographic

Ann Arbor businesses

Timeline and Initial Actions

2020

Adoption of a Solid Waste Resource Management Plan, or at least elements related to expanding commercial recycling, and education begins.

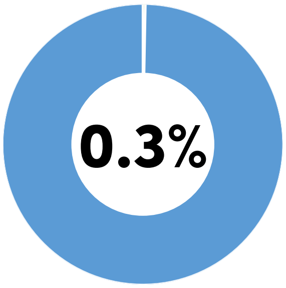
2021

Policies enacted and formal enforcement begins along with extensive outreach and engagement with businesses about what is recyclable and what is not.

Cost Over 10 Years
(Staffing, Hard, and Soft Costs)

$18,400,000

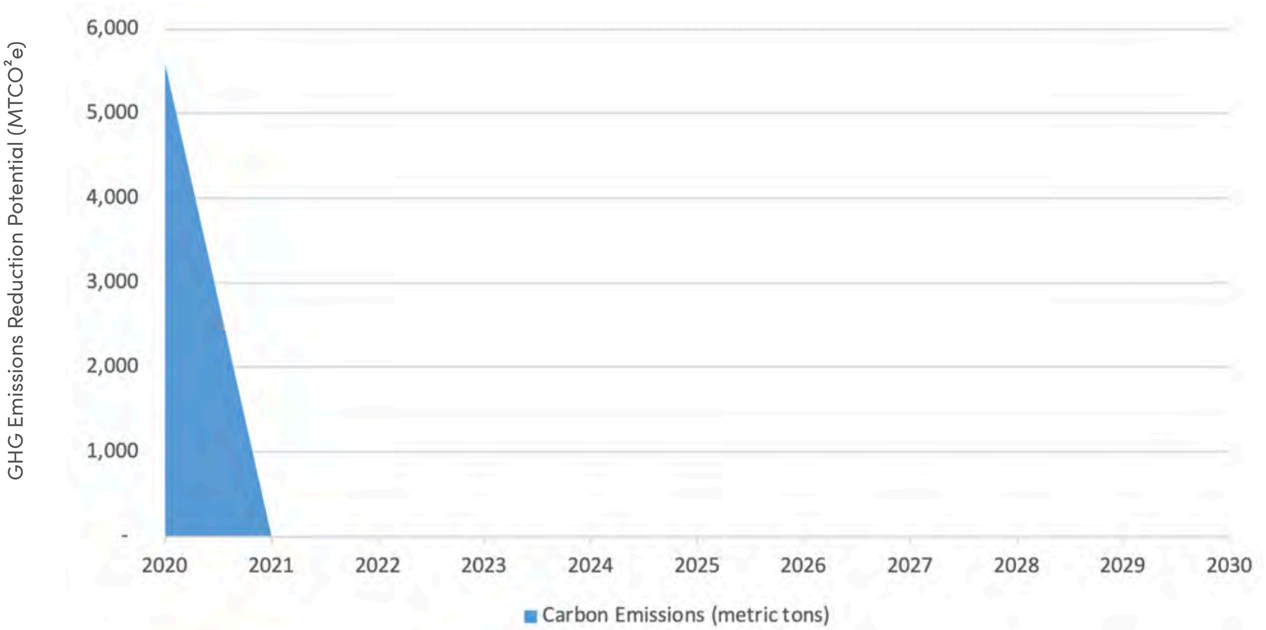
Greenhouse Gas Reduction Potential



5,600 metric tons carbon dioxide equivalent (.3% of community-wide emissions)

By 2021, the **Expand Commercial Recycling** strategy will have achieved all of its potential greenhouse gas emissions reductions.

EXPAND COMMERCIAL RECYCLING



3. REQUIRE SUSTAINABLE MATERIALS IN NEW AND EXISTING DEVELOPMENTS

This action involves the implementation of existing draft City plan for Construction and Demolition Waste to ensure 100% of debris is captured and repurposed. This includes expanding the plan to require sustainable designs in new building approval processes.

Vision for Requiring Sustainable Materials in New and Existing Developments

Ann Arbor has moved one step closer to a circular economy by removing 80% of construction and demolition waste from the landfill and supports it being repurposed for other constructive uses.

Party Responsible for Implementation

- Ann Arbor Department of Public Works, with support from Planning Department

Collaborators / Project Co-Designers

- Office of Sustainability and Innovations
- Resource Recycling Associates
- Construction community

Equity Impacts

No equity impacts explicitly identified.

Indicators of Success / Goals

Would consist of development of an ordinance to require construction and demolition projects to submit waste and diversion data as a component of their building permit or occupancy permit.

Target Demographic

Construction companies, developers, businesses, and community at large

Timeline and Initial Actions

2020

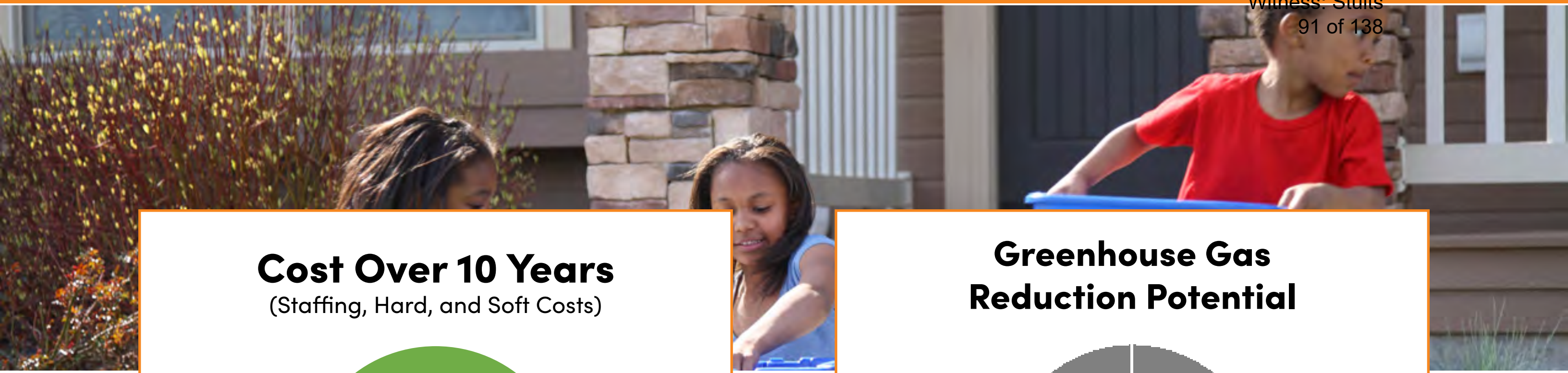
Review existing draft policy and revise, as necessary.

2021

Bring policy to Council for consideration. If passed, begin developing education and outreach materials immediately.

2022

Full scale implementation of policy.

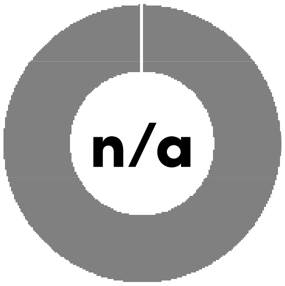


Cost Over 10 Years

(Staffing, Hard, and Soft Costs)

$270,000

Greenhouse Gas Reduction Potential



Not calculated

REQUIRE SUSTAINABLE MATERIALS IN NEW AND EXISTING DEVELOPMENTS

4. MOVE TOWARD A CIRCULAR ECONOMY

This action focuses on moving towards a circular economy, including actions to promote resource reduction, material reuse, and regeneration. By working with peer municipalities, we can create tools that allow for more transparency, traceability, and the calculation of embedded greenhouse gas emissions for different materials, goods, and services.

Vision Statement for Moving Toward a Circular Economy

The City of Ann Arbor will create a model of Circular Economy where goods and materials are recovered, reused, and recycled.

Party Responsible for Implementation

- Department of Public Works, with support from the Office of Sustainability and Innovations

Equity Impacts

Lower-income residents may benefit from being able to buy repurposed and refurbished items.

Collaborators / Project Co-Designers

- Peer Municipalities
- Repair Centers
- Tool Libraries /Lending Libraries
- Thrift Stores
- Curbside textile collection companies

Target Demographic

Ann Arbor residents and businesses

Indicators of Success / Goals

- Repair centers for bicycles, appliances, etc. are promoted as first choice as opposed to replacement
- Support for toy, book and tool libraries to decrease the number of new purchases
- Support for thrift stores and reuse centers, along with having curbside textile collection to reduce the number of materials entering the landfill
- There is no City-coordinated textile collection program; curbside collection of textiles would be contracted for by the City with a private collector to provide weekly curbside collection from single family homes initially with potential future expansion to multi-family properties

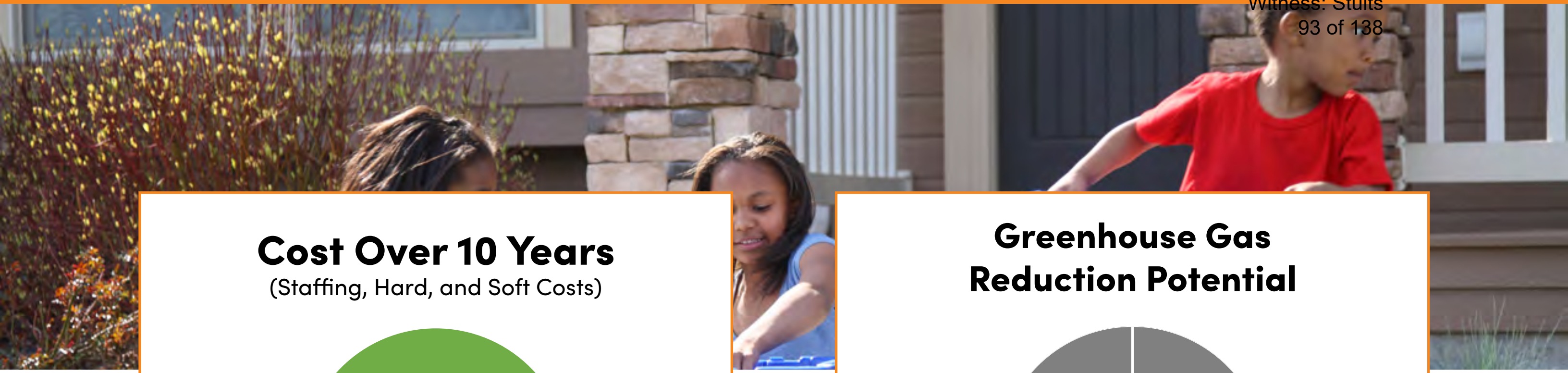
Timeline and Initial Actions

2020

Solid Waste Resource Management Plan gets adopted.

2022

Circular Economy strategy gets finalized and integrated into other planning initiatives.



Cost Over 10 Years
(Staffing, Hard, and Soft Costs)

$270,000

Greenhouse Gas Reduction Potential

n/a

Not calculated

MOVE TOWARD A CIRCULAR ECONOMY

5. SUPPORT A PLANT RICH DIET

Eating less meat and more fruits, vegetables, legumes, whole grains, nuts, and seeds is known to reduce one's environmental footprint and improve one's overall health. This action focuses on educating the community about the benefits of reducing meat consumption. Included in the action is the exploration of a greenhouse gas emissions footprint disclosure (like a calorie disclosure) on food sold at City facilities in order to educate people on the environmental footprint of their dietary choices.

Vision for Supporting a Plant Rich Diet

Ann Arborites are healthier, happier, and more sustainable by increasing the amount of fruits, vegetables, and grains they consume and lowering the amount of meat they consume.

Party Responsible for Implementation

- Office of Sustainability and Innovations, with support from Farmer's Market staff

Collaborators / Project Co-Designers

- Ann Arbor City Council
- Local farmers
- Washtenaw Optimal Wellness
- Department of Public Works
- Growing Hope
- Local grocery stores
- Local Chefs and restaurant owners
- Cultural centers

Equity Impacts

Food deserts exist in our region meaning residents do not have access to healthy and nutritious food. This action can help ensure that everyone in the City, especially our low-income residents, have access to healthy, nutritious options.

Indicators of Success / Goals

When asked, consumers indicate that they are better educated about the environmental impacts of their consumption choices and factor environmental impacts into their decision making.

Target Demographic

All Ann Arbor residents

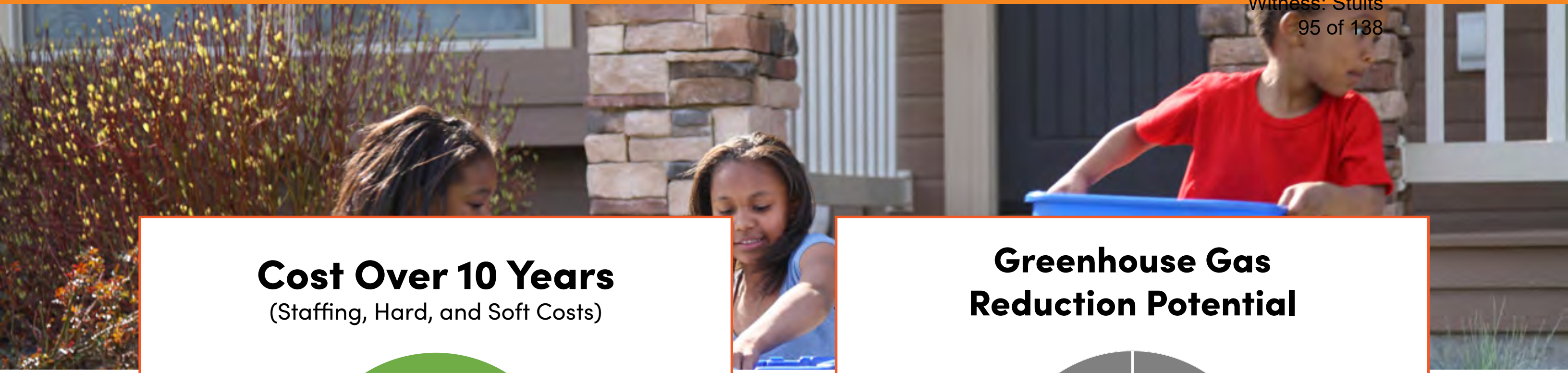
Timeline and Initial Actions

2021

Work with University of Michigan to understand environmental food labeling program; explore expanding to all City facilities where food is stored.

2022

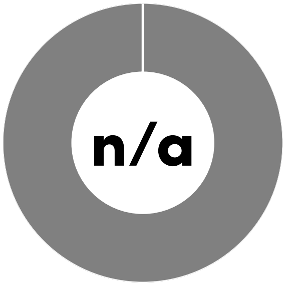
Continue working with partner organizations to develop and disseminate materials about the benefits of a plant rich diet.



Cost Over 10 Years
(Staffing, Hard, and Soft Costs)

$208,400

Greenhouse Gas Reduction Potential



Not calculated

SUPPORT A PLANT RICH DIET

6. ENHANCE REFRIGERANT RECYCLING AND REUSE PROGRAM

The use of refrigerants emits potent greenhouse gases, and removing them from use can have a significant impact on emissions reduction. This action focuses on enhancing refrigerant recycling programs and discouraged refrigerant use where possible.

Vision for Enchancing Refrigerant Recycling and Reuse Program

By banning refrigerants from disposal at City of Ann Arbor landfills we will drastically reduce greenhouse gas emissions from refrigerant emissions.

Party Responsible for Implementation

- Department of Public Works, with support from the Office of Sustainability and Innovations

Collaborators / Project Co-Designers

- Local businesses
- City Communication Team

Equity Impacts

No equity impacts explicitly identified.

Indicators of Success / Goals

95% reduction in the amount of refrigerants disposed of at City facilities.

Assumptions

- Program focuses on education; explores penalties for violation

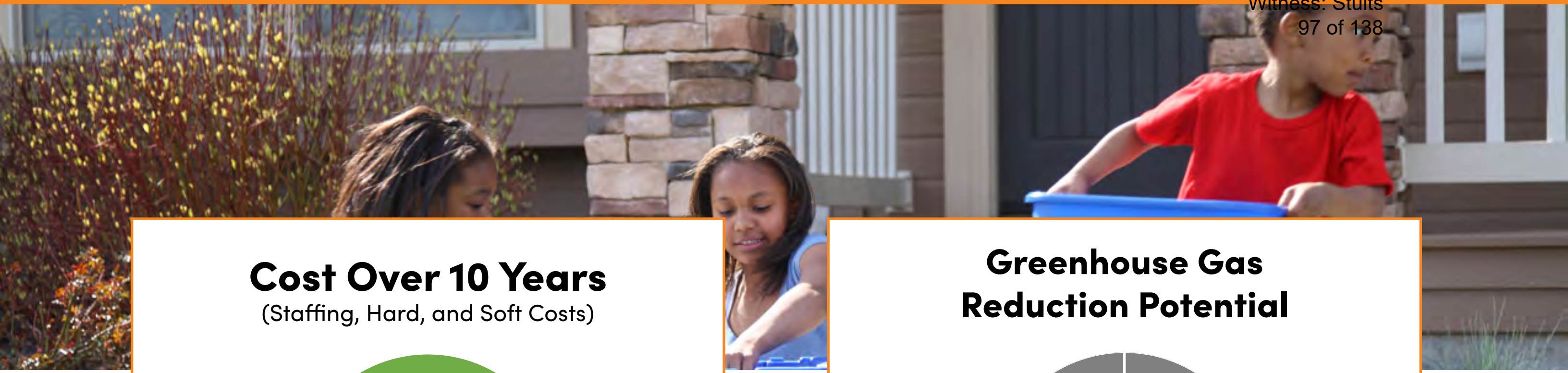
Target Demographic

All Ann Arborites, especially renters, homeowners, and businesses

Timeline and Initial Actions

2021

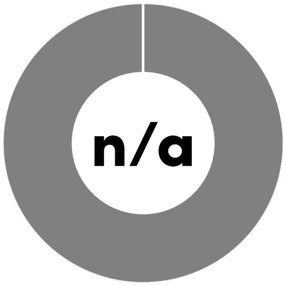
Work with partners to launch an aggressive refrigerant education campaign; ensure systems are in place to properly recycle all refrigerants that are disposed of in the community.



Cost Over 10 Years
(Staffing, Hard, and Soft Costs)

$179,400

Greenhouse Gas Reduction Potential



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ENHANCE REFRIGERANT RECYCLING AND REUSE PROGRAM

STRATEGY 6:

Enhance the Resilience of Our People and Our Place

This strategy focuses on enhancing the resilience of our people and our place. In particular, this strategy focuses on ensuring our community can not only survive, but thrive, regardless of what disruptions or changes may take place. To achieve this strategy, six actions were prioritized:

1. Invest in Resilience Hubs
2. Foster Neighborhood and Youth Ambassador Program
3. Preserve and Enhance the Local Tree Canopy
4. Conduct Asset and Needs Mapping of Neighborhoods
5. Assist in Assembling and Distributing Emergency Preparedness Kits
6. Implement Sensors to Monitor and Manage Heat, Air Quality, Waterways, and Flooding

While reducing greenhouse gas emissions were not the priority in selecting these actions, they do have a modest value to the community's carbon neutrality goals. In total, these actions contribute a 0.1% reduction in community-wide greenhouse gas emissions and cost around $7,500,000.

1. INVEST IN RESILIENCE HUBS

Resilience hubs are community-serving facilities augmented to support residents and coordinate resource distribution and services before, during, or after a natural hazard event. At their core, resilience hubs empower communities to take action around preparedness and increase community and neighborhood capacity. Resilience hubs operate at the nexus of climate mitigation, climate adaptation, and equity, and they strive to enhance community sustainability and resilience through a bottom-up approach centered on co-development and leadership.

Vision for Investing in Resilience Hubs

Ann Arbor's five resilience hubs are equitably enhancing community resilience while reducing greenhouse gas emissions. The hubs improve local quality of life for all of our residents, especially for our front line communities. Our robust network of resilience hubs empower residents to care for one another during a disaster for up to five days before government assistance resources may be needed. The hubs have reduced the poverty rate, increased local economic opportunities, reduced crime rates, and significantly increased people's satisfaction with their community.

Party Responsible for Implementation

- Office of Sustainability and Innovations, with support from Emergency Management

Collaborators / Project Co-Designers

- Residents
- Local businesses
- Community-based organizations
- The city's communications team
- Police department
- Fire department
- Finance and procurement
- Washtenaw County Department Of Community and Economic Development
- City planning team
- Washtenaw County Health Department
- Public Works
- Legal
- Transportation Manager
- Local community institutions
- Parks and Recreation
- Others as co-determined with

Equity Impacts

Many lower-income residents do not have access to a variety of resources in case of an emergency. Resilience hubs provide residents the ability to support one another in a crisis as well as to access community and City services day to day.

Indicators of Success / Goals

Every Ward within the City has a functioning, community-designed and -operated resilience hub that helps improve community sustainability, resilience, and social cohesion by 2030.

Target Demographic

The first few hubs will be placed in our underserved neighborhoods. Eventually, the goal is to have at least one resilience hub in each Ward and, ideally, a resilience hub in all of our front line communities/ neighborhoods

Assumptions

- External funding will be available to support the development of hubs
- External parties will be able and interested to operate the hub once developed
- The community is able to come to near consensus on what to include in their hub

Timeline and Initial Actions

2020

Continue working with community to explore resilience hub in southeastern Ann Arbor; continue seeking funding to support the hub.

2021

Initiate planning and community involvement for second hub; continue seeking funding for hubs and work on design with the community.

2022

Aim to launch first resilience hub.

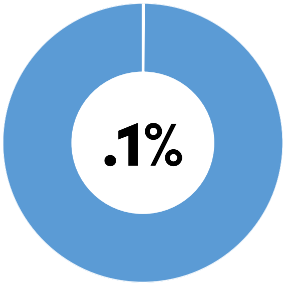
2023+

Continue working with community to design, fundraise for, and launch hubs throughout the community.

Cost Over 10 Years
(Staffing, Hard, and Soft Costs)

$5,025,000

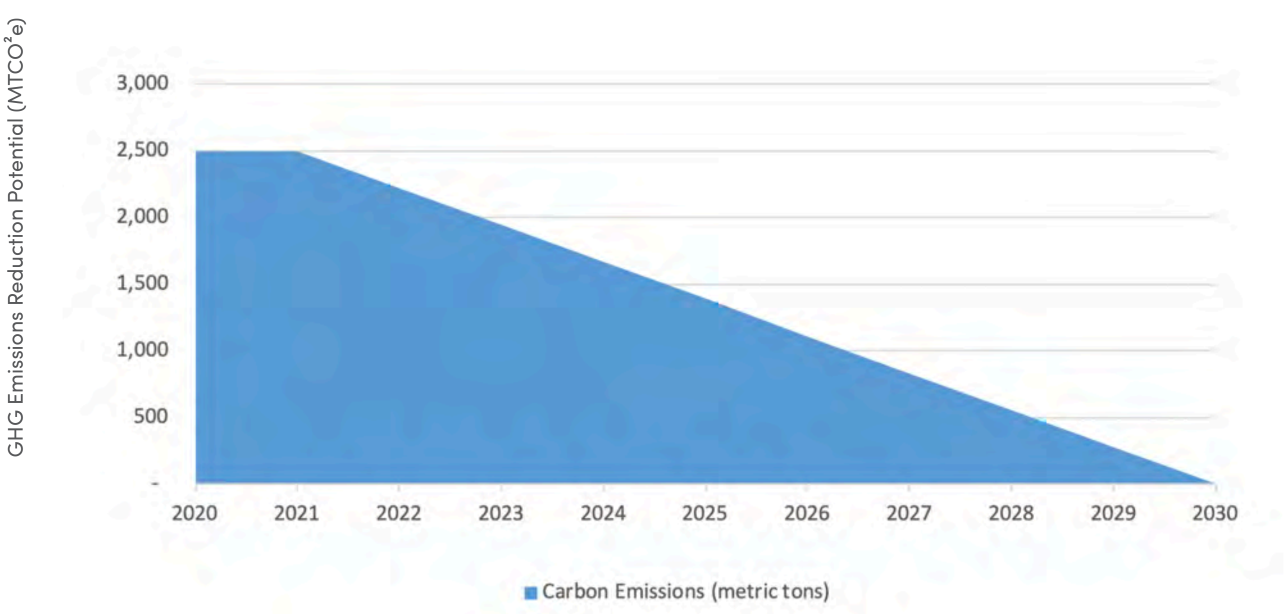
Greenhouse Gas Reduction Potential



2500 metric tons carbon dioxide equivalent (0.1%)

By 2030, the **Invest in Resilience Hubs** strategy will have achieved all of its potential greenhouse gas emissions reductions.

INVEST IN RESILIENCE HUBS



2. FOSTER NEIGHBORHOOD AND YOUTH AMBASSADOR PROGRAM

Achieving carbon neutrality will require mobilization of Ann Arborites on a nearly unprecedented scale. This action seeks to work with interested stakeholders to rapidly scale up and out our carbon neutrality work and the actions outlined in this Plan. In particular, this action calls for the creation of neighborhood as well as youth ambassadors. These individuals will be trained and given the tools and resources to work with their peers to implement many of the actions identified in this document.

Vision for Fostering Neighborhood and Youth Ambassador Programs

Through education and engagement, youth elevate their voices and take ownership of mitigation and adaption initiatives – helping to drive significant community-wide action. Neighborhood ambassadors lead a variety of projects related to energy and water consumption, waste reduction and recycling, transportation, and local food efforts. These actions foster community resource stewardship, climate action, and enhance local social cohesion.

Party Responsible for Implementation

- Office of Sustainability and Innovations

Collaborators / Project Co-Designers

- Neighborhood associations
- A^2Zero youth representatives
- Ann Arbor Public Schools
- Community Action Network
- United Way
- Neutral Zone

Assumptions

- Individuals will want to serve as neighborhood or youth ambassadors
- All regions of the City will have someone volunteer to serve as an ambassador (or be recruited to serve)
  so that there aren't spatial gaps

Equity Impacts

OSI could partner with a nonprofit like United Way to train a cohort of adult residents who are living in affordable housing or who are low-income to be Climate Ambassadors. There could also be a youth cohort who are from underserved communities who could be trained as Youth Ambassadors. Participants in each of these groups would receive stipends. OSI could lead a group of other adults who would not need as much training in a similar program. These people would not get a stipend.

Indicators of Success / Goals

100 individuals are trained as youth or neighborhood ambassadors by 2025 and are actively working with their peers and neighbors to implement that A^2Zero strategy.

Target Demographic

All Ann Arborites interested in helping support the implementation of the A^2Zero Plan

Timeline and Initial Actions

2020

Design the neighborhood and youth ambassador program; work with interested stakeholders.

2021

Launch training and first tranche of ambassadors.

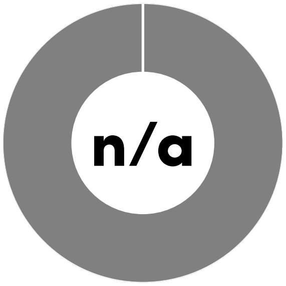
2022

Revise the ambassador program and scale throughout the City.

Cost Over 10 Years
(Staffing, Hard, and Soft Costs)

$350,000

Greenhouse Gas Reduction Potential



Not calculated

FOSTER NEIGHBORHOOD AND YOUTH AMBASSADOR PROGRAM

3. PRESERVE AND ENHANCE THE LOCAL TREE CANOPY

This action begins with conducting an analysis and creating a shared inventory of the local tree canopy as well as updating the master plan to incentivize shade tree and vegetation planting for private projects. This will increase the impact of shade trees as a natural cooling mechanism in urban areas. Tree type and placement are important considerations in advancing this action.

Vision for Preserving and Enhancing the Local Tree Canopy

A properly managed and diverse urban forest increases resiliency against invasive insects that carry diseases and impact the human population. By planting diverse tree species, the community benefits from increased shade and decreased heat island effects, while supporting biodiversity. Careful planning and management help the City mitigate and adapt to changing climate conditions.

Party Responsible for Implementation

- City Forrester/Public Works, with support from the Office of Sustainability and Innovations

Collaborators / Project Co-Designers

- Local nurseries
- Neighborhood associations
- Ambassadors

Equity Impacts

Studies have found that tree canopies in low-income communities and communities of color tend to be smaller. Ann Arbor's first Health Impact Assessment should be updated to ensure equitable enhancement of tree canopy in underserved neighborhoods is prioritized.

Indicators of Success / Goals

By 2030, 10,000 new trees are planted on city property and in the right of way and 10,000 new trees are planted on private property.

Assumptions

- City continues to plant 1,000 trees per year on City property and in the right of ways
- Community plants 1,000 trees per year on private property; These trees all survive
- Over the duration of this Plan, a single tree will absorb 48 pounds of carbon dioxide

Target Demographic

City facilities and private property owners

Timeline and Initial Actions

2020

City to continue annual tree planting.

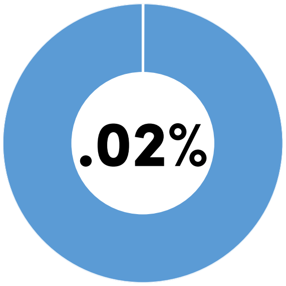
2021

Launch neighborhood tree planting initiative.

Cost Over 10 Years
(Staffing, Hard, and Soft Costs)

$1,160,000

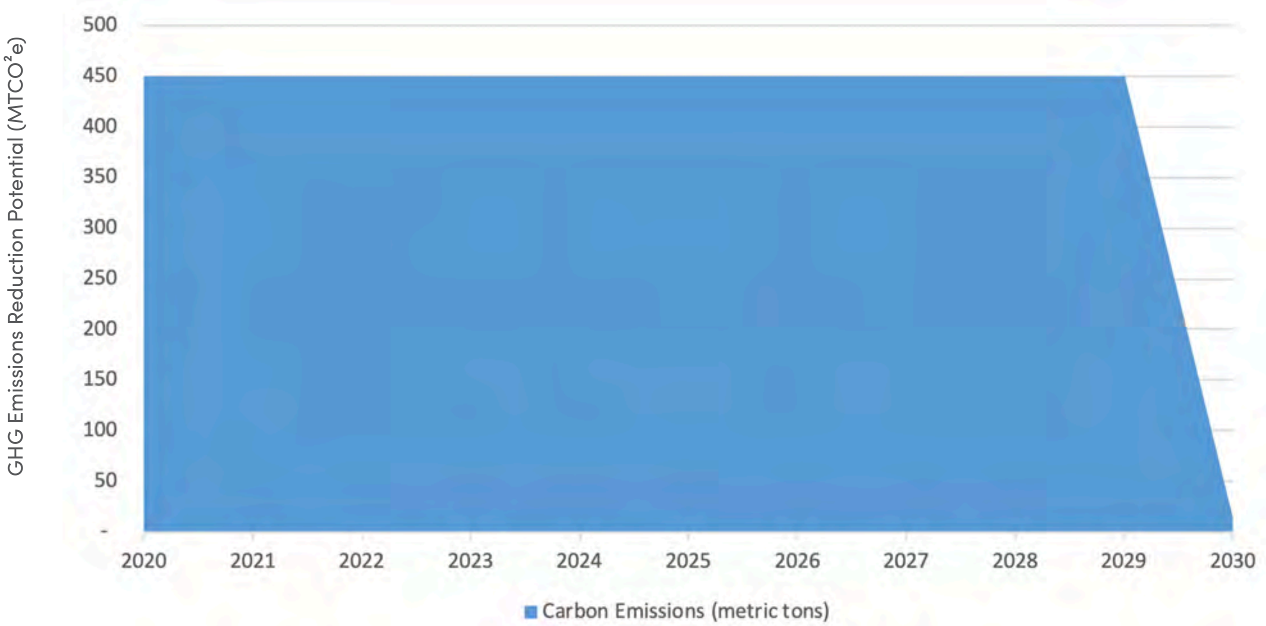
Greenhouse Gas Reduction Potential



450 metric tons of carbon dioxide equivalent (0.02% of community-wide emissions)

By 2030, the **Preserve and Enhance the Local Tree Canopy** strategy will have achieved all of its potential greenhouse gas emissions reductions.

PRESERVE AND ENHANCE THE LOCAL TREE CANOPY



4. CONDUCT ASSET AND NEEDS MAPPING OF NEIGHBORHOODS

This action involves working with neighborhoods to systematically identify what assets and needs exist in the area. Local assets are then leveraged to create a plan that prioritizes and addresses community needs.

Vision for Conducting Asset and Needs Mapping of Neighborhoods

Community mapping leads to the identification of safe gathering points in neighborhoods when events such as natural disasters and power outages occur. Physical spaces, such as homes, are activated as shelters during necessary times.

Party Responsible for Implementation

- Office of Sustainability and Innovations, with support from Emergency Management

Collaborators / Project Co-Designers

- Red Cross
- Neighborhood Associations
- Meals on Wheels
- Neighborhood Ambassadors
- Youth Ambassadors
- Ann Arbor Public Schools

Equity Impacts

Many residents do not have financial security when faced with crisis situations. By identifying assets in advance, community mapping will help residents better rely on each other in crisis situations.

Indicators of Success / Goals

By 2025, every neighborhood in Ann Arbor has an asset map and knows how to activate it in the case of an emergency.

Assumptions

- Enough individuals volunteer to help with the exercise to ensure the entire community is covered
- Capacity exists to update and maintain the asset map

Target Demographic

All Ann Arborites

Timeline and Initial Actions

2020

Develop asset mapping exercise; convene neighborhood associations and those interested in neighborhood ambassador program to get feedback on mapping.

2021

Launch neighborhood asset mapping exercise; create methodology to update and maintain asset map.

2022

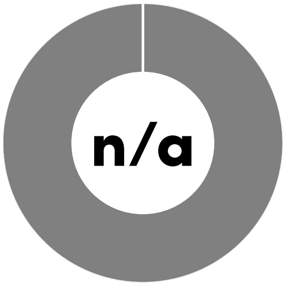
Work with volunteers to ensure all neighborhoods have a preliminary asset map at least.

Cost Over 10 Years

(Staffing, Hard, and Soft Costs)

$300,000

Greenhouse Gas Reduction Potential



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CONDUCT ASSET AND NEEDS MAPPING OF NEIGHBORHOODS

5. ASSIST IN ASSEMBLING AND DISTRIBUTING EMERGENCY PREPAREDNESS KITS

This action involves working directly with partners and community organizations to educate Ann Arborites on emergency preparedness and prepare emergency preparedness kits and plans that residents can keep to ensure they are safe during an emergency.

Vision for Assembling and Distributing Emergency Preparedness Kits

Residents have the resources they need to care for themselves and their families for multiple days during a disaster situation.

Party Responsible for Implementation

- Office of Sustainability and Innovations, with support from Emergency Management

Collaborators / Project Co-Designers

- Red Cross
- Neighborhood Associations
- Meals on Wheels
- Neighborhood Ambassadors
- Youth Ambassadors
- Ann Arbor Public Schools

Equity Impacts

Many residents, whether due to cost, language, or other barriers may not the resources to build emergency preparedness kits for their families on their own. Working as a group will help all residents be better prepared for emergencies.

Indicators of Success / Goals

1000 residents have emergency preparedness kits by 2030 thanks to support from this action.

Assumptions

- AAPS partners with the City on hosting emergency preparedness events
- Some supplies are donated by local businesses

Target Demographic

All Ann Arbor residents with a priority given to low-income residents

Timeline and Initial Actions

2020

Work with Emergency Management to create a list of essential emergency supplies and a template emergency plan.

2021

Work with schools to launch emergency preparedness sessions with students and caregivers throughout the community.

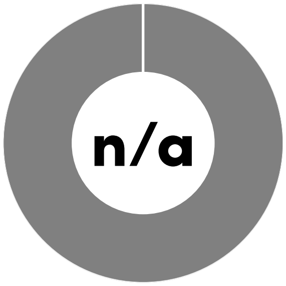
2022

Integrate emergency preparedness module into the Neighborhood and Youth Ambassador programs.

Cost Over 10 Years
(Staffing, Hard, and Soft Costs)

$350,000

Greenhouse Gas Reduction Potential



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ASSIST IN ASSEMBLING AND DISTRIBUTING EMERGENCY PREPAREDNESS KITS

6. IMPLEMENT SENSORS TO MONITOR AND MANAGE HEAT, AIR QUALITY, WATERWAYS, AND FLOODING

This action focuses on collecting data and using sensors to proactively understand risks and mitigate vulnerabilities. Includes the usage of drones and sensors to collect data and to respond to events, when necessary.

Vision for Implementing Sensors to Monitor and Manage Heat, Air Quality, Waterways, and Flooding

Ann Arbor's ubiquitous system of sensors and monitors allows the City to proactively manage threats and risks, while ensuring that Ann Arborites enjoy an exceptional quality of life. Monitors and sensors throughout the City provide real-time data that helps protect the public health, safety, and general welfare.

Party Responsible for Implementation

- Ann Arbor Information Technology Unit

Equity Impacts

Few equity impacts.

Collaborators / Project Co-Designers

- Stormwater, wastewater, and water system
- Office of Sustainability and Innovations
- Emergency Management
- University of Michigan
- Huron River Watershed Council
- Downtown Development

Indicators of Success / Goals

Ann Arbor's landscape of sensors and monitors provides real-time information that has been utilized to protect the public from acute and chronic disruptions.

Assumptions

- Any technology adopted can tie into the City's existing IT infrastructure
- The various technologies used can inter-operate

Target Demographic

This action mostly impacts local government staff and regional decision-makers/planners

Timeline and Initial Actions

2020

Finish Smart City Strategy; include needs for monitoring.

2021

Pilot sensors throughout the City with UM and other partners.

2024

Install sensors and monitors throughout the City as an interconnected network.

Cost Over 10 Years
(Staffing, Hard, and Soft Costs)

$300,000

Greenhouse Gas Reduction Potential

n/a

Not calculated

IMPLEMENT SENSORS TO MONITOR HEAT, AIR QUALITY, WATERWAYS, AND FLOODING

OTHER STRATEGIES:

This strategy covers the remaining programs and activities that don't fit into other areas. It also includes greenhouse gas emissions offsets to close out any lingering gaps in achieving community-wide carbon neutrality. To achieve this strategy, four specific actions have been identified:

1. Advance Equity Programs
2. Promote Sustaining Ann Arbor Together Grant Program
3. Establish Internal Carbon Price
4. Offset Greenhouse Gas Emissions

Combined, these four actions equate to just under 14% of community-wide emissions reductions and are estimated to cost just under $6,000,000.

1. ADVANCE EQUITY PROGRAMS

The Office of Sustainability and Innovations (OSI) is committed to ensuring climate protection and mitigation work improves the lives of Ann Arbor residents who have been historically underrepresented and under-resourced. Our Equity Program works to ensure that equity is embedded in all of the work we do – from the programs we advance, to the stakeholders we engage with, to the advisors we seek.

Vision for Advancing Equity Programs

By 2028, all of OSI's programs have an equity focus, OSI staff reflect the diversity of Ann Arbor and Washtenaw County, and staff have developed strong working relationships with members of local low-income communities and communities of color.

Party Responsible for Implementation

- Office of Sustainability and Innovations

Collaborators / Project Co-Designers

- Washtenaw County's Racial Equity Program Manager
- Dr. Tony Reames
- Urban Sustainability Directors Network
- City Administrator
- All City Service Areas
- OSI's Equity Fellow
- City of Ann Arbor's Diversity, Equity and Inclusion Manager

Equity Impacts

OSI will continue to center equity in their work, and will expand their decision-making and implementation to authentically include marginalized communities who are most at risk due to climate change.

Indicators of Success / Goals

By 2028, all of OSI's programs have an equity focus.

Assumptions

- Resources will continue to exist to support racial equity training for staff

Target Demographic

Ann Arbor City employees and staff of allied organizations, Ann Arbor residents of color, and low-income Ann Arbor residents and workers

Timeline and Initial Actions

2020

OSI staff will receive and lead continuing education about equity issues (ongoing); hire equity fellow to help with aging in place efficiently work

2021

OSI staff will conduct baseline equity trainings with the Energy and Environmental Commissioners; hire summer equity fellow

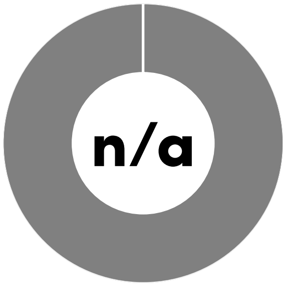
2023

OSI Equity Advisory Commission formed

Cost Over 10 Years
(Staffing, Hard, and Soft Costs)

$200,000

Greenhouse Gas Reduction Potential



Not calculated

ADVANCE EQUITY PROGRAMS

2. PROMOTE SUSTAINING ANN ARBOR TOGETHER GRANT PROGRAM

This program provides small grants to residents, schools, local nonprofits, and local businesses to advance sustainability-related activities in Ann Arbor's right of way.

Vision for Promoting Sustaining Ann Arbor Together Grant Program

Through the Sustaining Ann Arbor Together grant program, Ann Arborites are able to unlock financial capital to implement solutions that are making our community a healthier, more sustainable place to live.

Party Responsible for Implementation

- Office of Sustainability and Innovations

Collaborators / Project Co-Designers

- Nonprofit organizations serving Ann Arbor residents
- Neighborhood associations
- University of Michigan
- Ann Arbor Public Schools

Equity Impacts

These resources can help undeserved areas of the community unlock capital to address their specific sustainability concerns and opportunities.

Indicators of Success / Goals

At least 10 grants are awarded, per year, through the Sustaining Ann Arbor Together grant program.

Assumptions

- $100,000 will continue to be available, annually, for the program
- The program will be fully subscribed

Target Demographic

Ann Arbor residents

Timeline and Initial Actions

2020

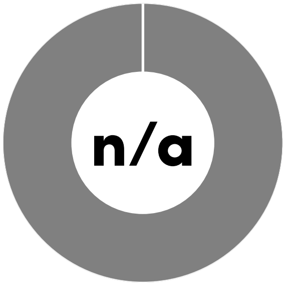
OSI staff continue to administer the program, conducting outreach regularly to let people know about the opportunity.

Cost Over 10 Years

(Staffing, Hard, and Soft Costs)

$1,000,000

Greenhouse Gas Reduction Potential



Not calculated

PROMOTE SUSTAINING ANN ARBOR TOGETHER GRANT PROGRAM

3. ESTABLISH INTERNAL CARBON PRICE

This action creates a financial mechanism whereby all City Service Areas holistically integrate greenhouse gas emissions and their impacts into decision-making. This will happen through the use of an internal carbon tax (e.g., payment by each service area for each ton of greenhouse gases emitted). These resources will then be given back in the form of energy efficiency improvements and renewable energy installations at City facilities.

Vision for Establishing Internal Carbon Price

Citywide greenhouse gas emissions are carbon neutral thanks in part to our internal carbon tax that encourages Service Areas to reduce emissions while providing funding support through the fee collected to finance energy efficiency and renewable energy improvements.

Party Responsible for Implementation

- Office of Sustainability and Innovations

Equity Impacts

No explicit equity impacts were identified.

Collaborators / Project Co-Designers

- Finance
- Information Technology
- DTE Energy
- City Administrator
- Consumers Energy
- Fleet and Facilities

Indicators of Success / Goals

All City operations are powered with 100% clean and renewable energy by the year 2030.

Assumptions

- Funding generated by enterprise funds will remain available for use only by the enterprise funds
- Any funds generated will be applied to energy efficiency work and/or renewable energy activities that reduce the overall greenhouse gas emissions of the unit
- Price will not grow to more than the social cost of carbon

Target Demographic

All City Service Areas

Timeline and Initial Actions

2020

OSI staff create internal carbon tax work plan and work with finance to pilot a $5/ton charge

2021

OSI work to increase fleet rates and administer a $10/ton charge

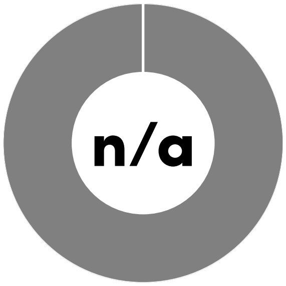
2022

Review program and suggest any needed revisions

Cost Over 10 Years
(Staffing, Hard, and Soft Costs)

$75,000

Greenhouse Gas Reduction Potential



Not calculated

ESTABLISH INTERNAL CARBON PRICE

4. OFFSET GREENHOUSE GAS EMISSIONS

Our community has a lot of work to completely eliminate our greenhouse gas emission by 2030. For the activities that we cannot currently reduce emissions from, due to a lack of technical or financially feasible solutions, we can purchase carbon offsets to reduce greenhouse gas emissions outside of our community. Because greenhouse gases act the same way in the Earth's atmosphere, regardless of where they are produced, our community can purchase and retire renewable energy credits replacing fossil fuels to offset our own emissions as we work towards our target.

Vision for Offsetting Greenhouse Gas Emissions

Offsets are only used to close the greenhouse gas emissions gap between what we are able to do locally and what needs to be offset to achieve our goal of carbon neutrality by 2030.

Party Responsible for Implementation

- Office of Sustainability and Innovations

Collaborators / Project Co-Designers

- Energy Commission
- Environmental Commission
- University of Michigan

Equity Impacts

While local offsets may or may not be feasible, the City will aim to invest our carbon offset funds into programs that will decrease income and/or racial justice inequities. This includes looking at potentially making investments in the global south which has been disproportionately burdened by extractive economies.

Indicators of Success / Goals

The amount of greenhouse gas emission offsets purchased decline over time as the City undertakes more local actions.

Assumptions

- All offsets are additional, meaning that they wouldn't have happened without our investment
- Reduces demand for fossil fuels and other greenhouse gas emissions sources
- Preference given to investing in projects that take place in low-income and front line communities
- Any renewable energy credits generated will be retired
- Includes investigating options for a local carbon offset program

Target Demographic

Entire community

Timeline and Initial Actions

2020

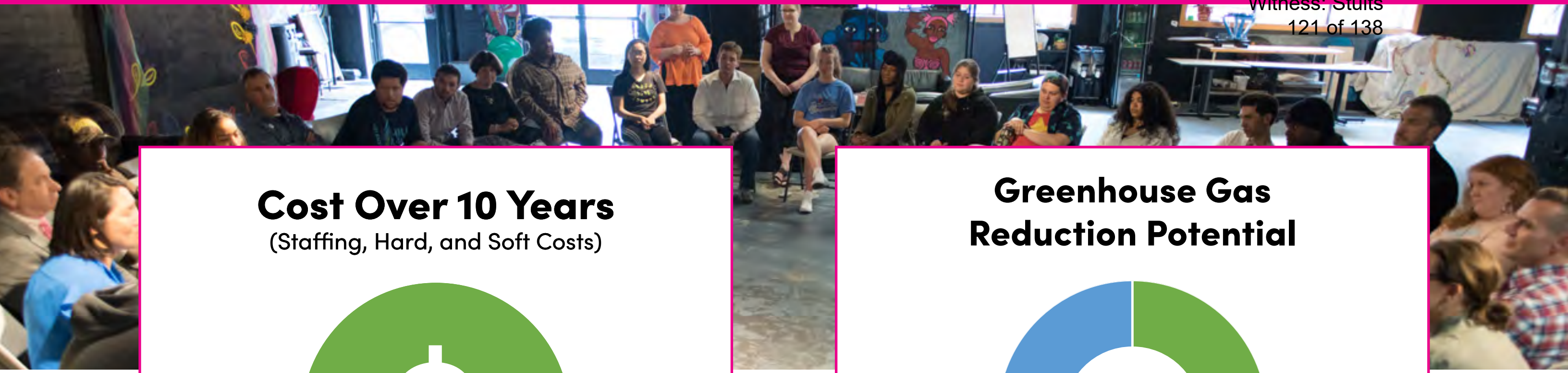
Provide recommendations on characteristics of offsets and get Council's agreement

2021

Solidify the source for purchasing greenhouse gas emissions offsets

2028

Undertake first greenhouse gas emissions offset purchase and continue as needed.



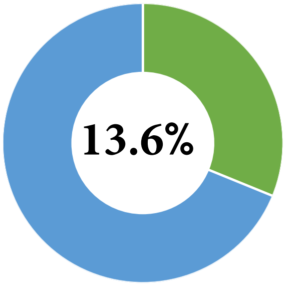
Cost Over 10 Years

(Staffing, Hard, and Soft Costs)

$9,440,000

– this assumes two years of purchasing offsets and the staffing support to set-up the purchase.

Greenhouse Gas Reduction Potential

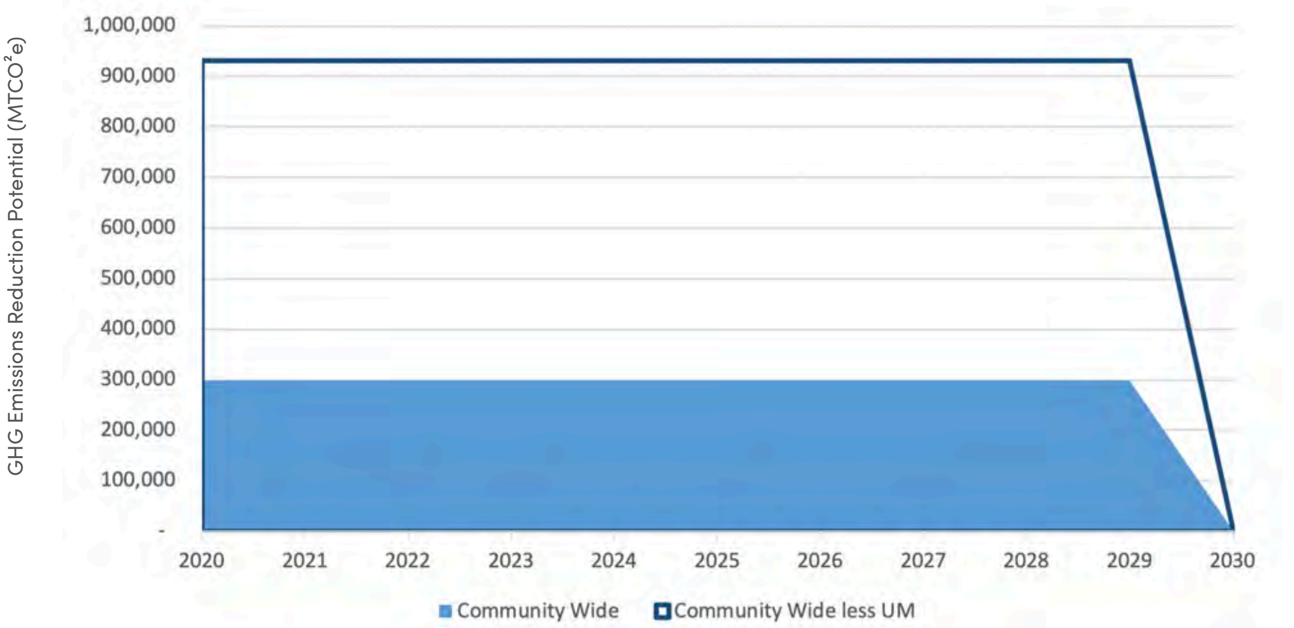


298,500 metric tons carbon dioxide equivalent (13.6% of community wide emissions if UM participates in all programs).

By 2030, the **Offset Greenhouse Gas Emissions** strategy will have achieved all of its potential greenhouse gas emissions reductions.

The figure below shows the estimated total amount of offsets (in light blue) that will need to be purchased assuming the community and University participate in all actions of the Plan outlined above. The dark blue outline shows the amount of offsets that will need to be purchased if the University does not participate in any of the actions outlined.

OFFSET GREENHOUSE GAS EMISSIONS



CLOSING

The A^{2}Zero Plan is a holistic living Plan. It will change. It will evolve. It will get better as the community comes together to implement these and other actions. It is also the beginning of the journey that many other Michigan municipalities will follow in their own efforts to achieve carbon neutrality. With no blueprint for us to follow, A^{2}Zero is our effort to reimagine Ann Arbor in a manner that's equitable, sustainable, and transformative for all Ann Arborites while ensuring we create a more resilient community.

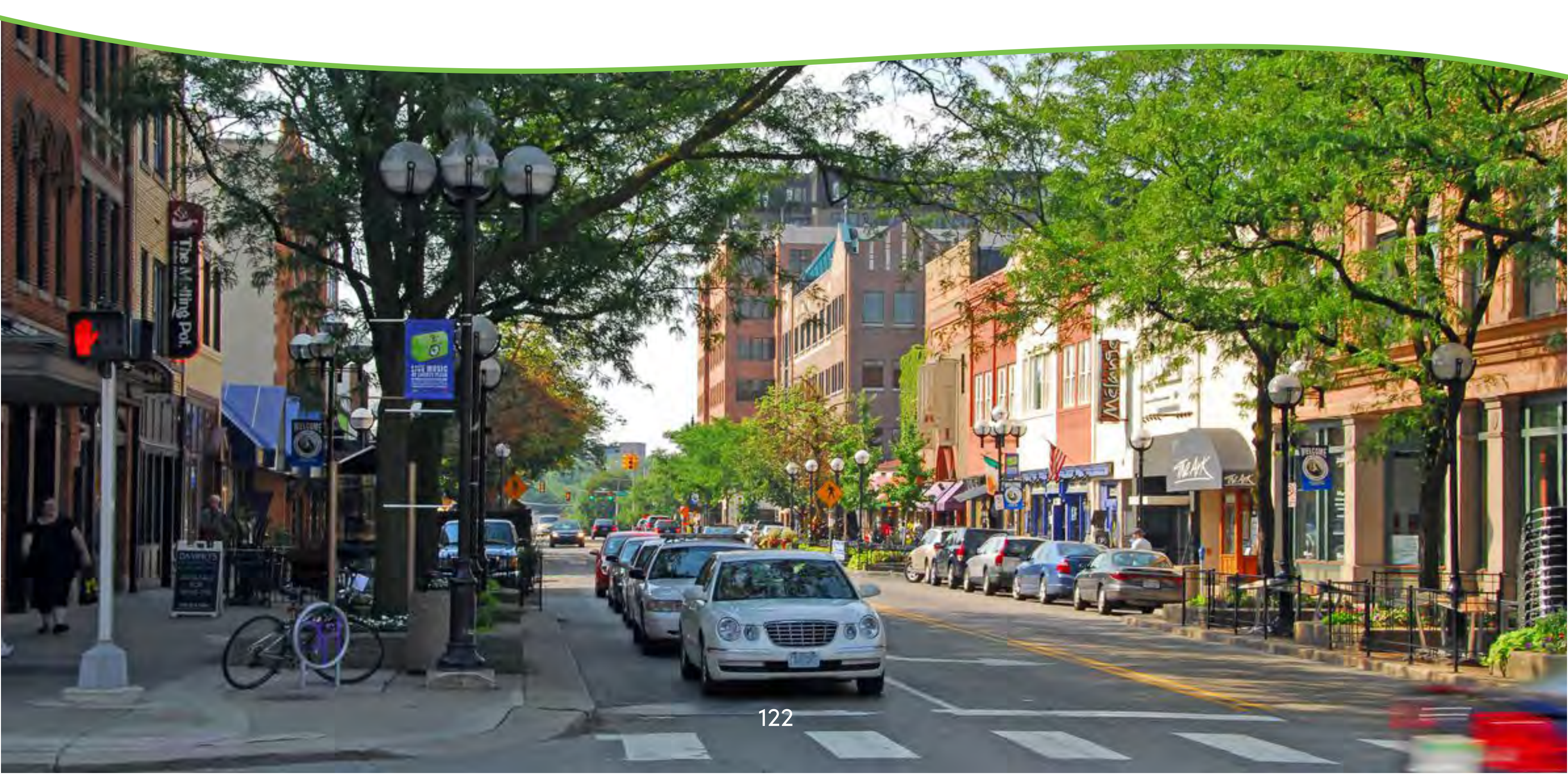
Grounded in equity, the Plan works to ensure the most vulnerable in Ann Arbor can thrive as we bounce forward from any shock or stressors the future may hold. The Plan recommends investing in land use strategies that allow for denser and mixed use neighborhoods to both close the wealth gap by providing more affordable housing so those who work here can also live here ,and by providing more accoutrements within walking and biking distance to our homes. A^{2}Zero encourages more residents and visitors to use an expanded, energy efficient multimodal transportation network to move about our community. It encourages investment in local renewable energy and in our connection to each other and our place.

A^{2}Zero also gives respite to those seniors who desire to age in the places they are most familiar with by ensuring they have access to weatherization programs that lower their energy costs, by launching aging in place programs, and by fostering greater neighborhood social networks.

A^{2}Zero builds upon the significant recent science indicating that society needs to move as rapidly as possible to achieve significant reductions in greenhouse gas emissions in order to avoid the most catastrophic impacts associated with climate change. That is why staff within the Office of Sustainability and Innovations created this Plan as a foundation for achieving community-wide carbon neutrality by 2030.

Time is of the essence, and action is desperately needed. Some of the programs in this Plan will be wildly successful. Others will be moderately successful. And yet others will prove inadequate for the challenge ahead. Our job is not to be beholden to what is written in the pages of this document, but to move intentionally, aggressively, and wholeheartedly towards a significant reduction in local greenhouse gas emissions.

Ann Arbor has the intellect, the human power, the resources, and the skills needed to move climate action and sustainability forward. What is currently missing is the will, and what is lacking is time. Join us as we combat the most significant crisis of our era. Together we can avoid the unmanageable, manage the unavoidable, and create a more equitable and just society for all.



APPENDIX 1 – LIST OF PUBLIC EVENTS

1. November 13, 2019 – Public launch of the A²Zero initiative at Cobblestone Farm. Over 250 individuals attended.
2. November 18, 2019 – Washtenaw International High School sustainability talk to 60 High School students.
3. November 19, 2019 – met with leader of Old Fourth Ward Neighborhood Association to discuss A²Zero.
4. November 20, 2019 – Lunch and Learn with City Staff on A²Zero.
5. November 21, 2019 – Climate Reality Presentation at Vertex Coffee.
6. November 26, 2019 – Ypsilanti Sustainability Committee Climate Reality Presentation at Park Ridge Community Center.
7. December 3, 2019 – Power Hour at Westgate Library discussing energy efficiency and solar power.
8. December 4, 2019 - Meeting to discuss how we can disseminate the word about A²Zero and launch a neighborhood climate ambassadors program.
9. December 4, 2019 - Commercial Power Hour in partnership with the 2030 District & large scale commercial building owners.
10. December 10, 2019 – Cohosted event at Forest Hills Cooperative to begin teaching recycling and composting to over 15 residents and children. Including an introduction to A²Zero.
11. December 11, 2019 – Met with Extinction Rebellion to explain and gather feedback about A²Zero.
12. December 15, 2019 – Tabled at Homegrown at The Cobblestone Art Show to share information about A²Zero.
13. December 18, 2019 – Convened 12 High School and 1 middle school student to glean their thoughts on how they would like to assist in A²Zero at their schools.
14. December 19, 2019 – Tabled about A²Zero at the Ann Arbor Hands on Museum.
15. December 20, 2019 – Climate Reality Presentation at Wheeler Service Center to 140 staff; included an introduction to A²Zero.
16. January 6, 2020 – A²Zero Meeting with Fire Department Management.
17. January 6th, 2020 – A²Zero meeting with Safety unit.
18. January 8, 2020 – Tabled at Veterans Memorial Park during High School Hockey game.
19. January 11, 2020 - A²Zero discussion with Washtenaw 350.
20. January 13, 2020 – Discussed A²Zero and opportunities for resident engagement with property manager of Arrowwood Hills.
21. January 14, 2020 – A²Zero presentation and discussion with the Energy Commission.
22. January 14, 2020 – A²Zero discussion with Clerks Office.
23. January 15, 2020 – Presentation and discussion on A²Zero to the Washtenaw Food Policy Council.
24. January 15, 2020 – A²Zero presentation at the Ann Arbor Housing Commission meeting.
25. January 17, 2020 – Youth and A²Zero discussion with local youth leaders.
26. January 17, 2020 – A²Zero and the Transportation, Energy, Environmental, and Planning Commissions.
27. January 21, 2020 – A²Zero discussion at the Slow Food Huron Valley member meeting.

28. January 21, 2020 – A^{2}Zero presentation and discussion with the Huron Valley Sierra Club members.
29. January 21, 2020 – A^{2}Zero meeting with Forest Hills Cooperative.
30. January 23, 2020 – Arrowwood Youth Conversation.
31. January 23, 2020 – A^{2}Zero discussion with the Attorney's Office.
32. January 26, 2020 – A^{2}Zero presentation and discussion with Citizens Climate Lobby members.
33. January 28, 2020 – A^{2}Zero discussion with Ann Arbor's IT Department.
34. January 29, 2020 – A^{2}Zero presentation to the Ann Arbor School Board.
35. January 30, 2020 – A^{2}Zero Lunch and Learn United Way of Washtenaw County.
36. January 30, 2020 – Sustainability Forum in A^{2}Zero and the Energy Sector.
37. January 30, 2020 – A^{2}Zero presentation and discussion with neighbors in Pittsfield Village.
38. February 6, 2020 – A^{2}Zero presentation and discussion with Main Street Association members.
39. February 8, 2020 – A^{2}Zero tabling at the Ann Arbor Farmers Market.
40. February 12, 2020 – A^{2}Zero presentation at Michigan Municipal League event.
41. February 13, 2020 – Sustainability Forum on A^{2}Zero and Mobility.
42. February 13, 2020 – Shared details about A^{2}Zero at Michigan Environmental Justice Summit.
43. February 15, 2020 – A^{2}Zero presentation and discussion with Ann Arbor Indivisible.
44. February 18, 2020 – A^{2}Zero materials shared at The Polar Vortex Climate Change and Weird Weather event.
45. February 19, 2020 – Bryant Community Center, A^{2}Zero, & A2 Housing Commission Outreach.
46. February 19, 2020 – A^{2}Zero presentation and discussion with the Transportation Commission.
47. February 19, 2020 – A^{2}Zero and Climate Night Trivia.
48. February 20, 2020 – Presentation to Zingerman's Community of Businesses on A^{2}Zero.
49. February 20, 2020 – Presentation on A^{2}Zero to the Washtenaw Area Apartment Association.
50. February 20, 2020 – Presentation to the Ann Arbor Street Design Team on A^{2}Zero.
51. February 22, 2020 – Dive-In Movie (Moana) and Climate Brainstorming.
52. February 22, 2020 – 2nd Carbon Neutrality Town Hall.
53. February 22, 2020 – Washtenaw 350 Environmental Justice Dialogues, including sharing details about A^{2}Zero.
54. February 24, 2020 – A^{2}Zero presentation and discussion with Finance Department.
55. February 26, 2020 – 21 Day Equity Challenge Summit and opportunity to share about A^{2}Zero.
56. February 26, 2020 – A^{2}Zero discussion at the Ann Arbor Climate Partnership meeting.
57. February 27, 2020 – A^{2}Zero discussion with Environmental Commission.
58. February 27, 2020 – Climate change and the Great Lakes presentation and discussion about A^{2}Zero.
59. February 27, 2020 – A^{2}Zero forum with local and regional solar installers.
60. February 29, 2020 – A^{2}Zero tabling at the Ann Arbor Farmers Market.

61. March 2, 2020 – A^{2}Zero and Sustainability presentation to Washtenaw International High School.
62. March 4, 2020 – Climate Leadership Conference– Presentation on A^{2}Zero.
63. March 6, 2020 – Presentation at the New Strategies for Resilient Local Economies about A^{2}Zero.
64. March 9, 2020 – ^{2}Zero presentation at the Local Food Summit.
65. March 9, 2020 – A^{2}Zero presentation at Symposium on Societal Engagement in Climate and Space Sciences.
66. March 9, 2020 – A^{2}Zero presentation to Old West Side Neighborhood Association Board of Directors.
67. March 18, 2020 – A^{2}Zero discussion with Transportation Commission.
68. March 19, 2020 – Sustainability, A^{2}Zero and Local Climate Action at Ford School.
69. March 26, 2020 – A^{2}Zero discussion with Environmental Commission.

Postponed or Delayed Events

1. TBD: Neutral Zone Environmental Justice Forum with A^{2}Zero (rescheduled due to weather).
2. March 11, 2020 – Climate Action Teach-In at University (Cancelled due to Coronavirus Pandemic).
3. March 11, 2020 – A^{2}Zero and Student Engagement presentation (Cancelled due to Coronavirus Pandemic).
4. March 12, 2020 – Michigan Climate Action Summit and Panel on A^{2}Zero and local climate action (Cancelled due to Coronavirus Pandemic).
5. March 12, 2020 – Wege Lecture on Sustainability (Cancelled due to Coronavirus Pandemic)
6. March 12, 2020 – Rise Up for the Earth – Community Earth Day Celebration brief introduction to A^{2}Zero (Cancelled due to Coronavirus Pandemic).
7. March 14, 2020 – Finding the Middle Ground and American Climate presentation (Cancelled due to Coronavirus Pandemic).
8. March 14, 2020 – Climate Strategies: What actions will keep us at 1.5-2oC presentation (Cancelled due to Coronavirus Pandemic).
9. March 14, 2020 – Climate Change and the Great Lakes (Cancelled due to the Coronavirus Pandemic).
10. March 19, 2020 – Sustainability Forum on Carbon Neutrality in the Resource Sector at Downtown Library (Postponed due to Coronavirus Pandemic).
11. March 22, 2020 – Solar Faithful Workshop and discussion on A^{2}Zero (Cancelled due to the Coronavirus Pandemic).

APPENDIX 2 – LIST OF TECHNICAL ADVISORY COMMITTEE MEETINGS

1. November 13, 2019 – Hosted four technical advisory committee meetings simultaneously to launch this element of our work. The four technical advisory committees were: 1) mobility; 2) energy; 3) resource reduction; and 4) adaptation and resilience.
2. December 16, 2019 – Adaptation and Resilience TAC meeting.
3. December 17, 2019 – Resource Reduction TAC meeting.
4. December 17, 2019 – Energy TAC meeting.
5. December 19, 2019 – Mobility TAC meeting.
6. January 9, 2020 – Adaptation and Resilience TAC meeting.
7. January 16, 2020 – Energy TAC meeting.
8. January 22, 2020 – Resource Reduction TAC meeting.
9. January 23, 2020 – Mobility TAC meeting.
10. January 27, 2020 – Adaptation and Resilience TAC meeting.
11. January 31, 2020 – Mobility TAC meeting.
12. February 6, 2020 – Resource Reduction TAC meeting.
13. February 11, 2020 – Adaptation and Resilience TAC.
14. February 21, 2020 – TAC celebration breakfast.

APPENDIX 3 – LIST OF A²ZERO PARTNER EVENTS

1. December 13, 2019 – Hosted first meeting of the A²Zero partners.
2. December 19, 2019 – Hosted equity and climate training for A²Zero partners.
3. March 20, 2020 – A²Zero partners only unveiling of the final strategy.

APPENDIX 4 – COUNCIL RESOLUTION IN SUPPORT OF CREATING A PLAN TO ACHIEVE ANN ARBOR COMMUNITY-WIDE CLIMATE NEUTRALITY BY 2030

..Title

Resolution in Support of Creating a Plan to Achieve Ann Arbor Community-Wide Climate Neutrality by 2030

..Body

Whereas, By adopting the Climate Action Plan (CAP) in 2012, the Ann Arbor City Council ("City Council") committed to an ambitious, multi-strategy vision to address climate change by reducing community-wide greenhouse emissions (8% by 2015, 25% by 2025, and 90% by 2050 relative to year 2000 baseline carbon dioxide equivalent (CO2e) emissions levels);

Whereas, The Environmental Commission and many community and student groups have advocated for Ann Arbor's declaration of a climate emergency;

Whereas, The Office of Sustainability and Innovations ("OSI") was created in FY19 in order to actualize the goals created and reaffirmed by City Council;

Whereas, The Office of Sustainability and Innovations has created a 5-year work plan that will help the City achieve a 25% reduction in community-wide greenhouse gas emissions by the year 2025, based on 2000 levels;

Whereas, Despite the City's goals and progress to-date, the global climate is changing at a rate that necessitates bolder action to reduce greenhouse gas emissions, including getting to net zero emissions as soon as possible;

Whereas, Over 19,000 scientists have signed a Second Warning to Humanity proclaiming that "a great change in our stewardship of the Earth and the life on it is required, if vast human misery is to be avoided",

Whereas, City Council realizes that climate change has direct and pressing impacts on all aspects of public health, safety, and general welfare;

Whereas, Great community interest exists to support the efforts to achieve community-wide carbon neutrality in a just and equitable manner;

Whereas, The University of Michigan has convened The President's Commission on Carbon Neutrality (PCCN), which commission includes Ann Arbor staff, for the purpose of working together with community and regional partners toward shared carbon neutrality goals;

Whereas, Creating a climate neutrality plan is necessary to identify, plan for, budget, and work towards implementing the actions required to achieve community-wide carbon neutrality; and

Whereas, Funding for public engagement is available in the FY2020 Office of Sustainability and Innovations budget;

RESOLVED, That the Ann Arbor City Council declares a climate emergency and commits to take action as a result of that declaration;

RESOLVED, The Ann Arbor City Council supports a public engagement process, beginning immediately, that helps outline how the entire Ann Arbor Community could achieve carbon neutrality by the year 2030, a target date that is both ambitious and achievable;

RESOLVED, City Council requests that the City Administration develop a draft plan for how the Ann Arbor community could achieve carbon neutrality ("2030 Carbon Neutral Ann Arbor Plan") to be presented to Council not later than March 31, 2020 to support its presentation on Earth Day 2020;

RESOLVED, City Council directs the City Administrator to design and execute a community engagement process that culminates with a draft strategy for how the Ann Arbor community could achieve carbon neutrality around the year 2030;

RESOLVED, City Council direct the City Administrator to seek and facilitate collaboration with the University of Michigan and the PCCN to create and realize the 2030 Carbon Neutral Ann Arbor Plan; and

RESOLVED, City Council request the City Administrator to consider the likely outcomes of the in-development 2030 Carbon Neutral Ann Arbor Plan as he develops the FY21 Budget Planning process and, ultimately, the FY21 Budget.

Sponsored by: Mayor Taylor, Councilmembers Bannister, Smith, Ramlawi, Grand, Ackerman, Eaton, Nelson and Griswold

As Amended and Approved by Ann Arbor City Council on November 4, 2019

APPENDIX 5: LIST OF IDEAS CONSIDERED FOR A²ZERO

Through the A²Zero process, we received input from a diverse group of stakeholders, including technical experts, partner organizations, residents, and the general public interested in providing feedback to the A²Zero Initiative. Ideas were generated at public events, like the first A²Zero Town Hall, through multiple public surveys, and from four technical advisory committees. The Plan presented above includes the ideas evaluated to be the most impactful to reducing our community-wide emissions, fairly improving our community's quality of life, and the most feasible to implement. The list of ideas below serves to document the full list of ideas received, and to be turned to should adjustments to the Plan be required. Many of the ideas listed below would enhance our community, and is a testament to our community's dedication, creativity, and hopes and dreams.

TOPIC: ENERGY

Energy Production

- Regional methane digester
- Solar energy on greenbelt
- County/city energy efficiency and renewable energy concierge service
- Create microgrids
- Create community solar on non-city property, university of Michigan, municipal property, or Ann Arbor Public Schools
- Bulk-buy purchasing opportunities for renewable energy, energy efficiency, and electric vehicles and infrastructure
- Target high-energy "districts" with renewables, energy efficiency, electrification: residential, commercial
- Change solar incentives
- Create volunteer solar opportunities

Energy Efficiency

- New building requirements: energy efficiency, renewables
- Net zero affordable housing
- Reduce property taxes based on energy efficiency upgrades to buildings
- Develop carbon neutral districts: zero energy zones, 2030 districts
- DTE Energy on-bill financing for energy efficiency improvements
- Geothermal districts
- Require green/white roofs
- Energy disclosure policies: rental/single family/commercial

Electrification

- Require all existing appliances and HVAC systems be electrified
- Increase grid capacity for electrification

Financing

- Create financing opportunities/loan loss reserve
- Create carbon tax
- Create on-bill financing for renewable energy and energy efficiency projects

Sequestration

- Increase carbon sequestration practices in Ann Arbor

Offsets

- Offset programs

Education, Outreach, and Marketing

- Youth education on carbon neutrality
- Create information sessions on energy efficiency, electrification, renewables, and electric vehicles for different sectors

- Spread information about DTE Energy's existing energy efficiency programs
- Increase awareness of existing programs
- Change zoning laws to allow for more density
- Expedite permitting for more efficient construction
- Create more zoning opportunities for solar

TOPIC: MOBILITY

Motor Vehicle Electrification

- Require new construction to include EV charging stations and expand existing charging (chargers in low demand areas, car-sharing, ride-hailing, Park and Ride lots)
- Allow homeowners to make chargers available/charge others to use
- Encourage/support electrifying car-sharing. Implement a shared-use program (City)
- Incentivize/Convert fleets to EV (City, car sharing, ride-hailing, commercial delivery needs)
- Create a total cost of ownership target commitment for EVs
- Pair EV charging stations (both private and public) with solar power (and storage)
- Set up EV bulk buy program (for individuals, institutions, employers)
- Subsidize EVs and charging for low income households
- Organize buyback program for ICE vehicles
- Encourage pilot/autonomous vehicle programs, electric delivery options. Infrastructure (5G, DSRC, Wifi) that enables connected and autonomous vehicles
- Reduce congestion at chargers by using rotating system (people could be employed to switch chargers between cars?) that emphasizes fast charging, not charging to full battery
- Make battery recycle program for utility batteries to be used in school and public buses
- Hub deliveries to downtown (larger vehicles stay outside of downtown area and transfer deliveries to smaller green vehicles)
- DTE Energy: Coordinate a Workplace Charging Challenge with DTE, Leverage DTE rebates
- Require/encourage electrifying lawn equipment

Active Transportation

- Implement e-bike and e-scooter program to electrify short-distance travel. Offer safe options for riding e-bikes and e-scooters.
- Expand sidewalks and crosswalks in areas that are currently un-walkable
- Maintain and repair bike lanes preferentially (including clearing gravel). Improve snow-clearing to encourage biking and walking year-round.
- Make more bike lanes. Improve bike access to downtown. Increase regional/connected bikeways
- Make more protected bike lanes or elevated bikeways. Prioritize safety on scenic bike routes. Increase bike lanes separated from roads (greenways)
- Expand services like "Common Cycle," a volunteer-based bike repair clinic
- Encourage bike banks/bike sharing
- Provide City snow clearing of sidewalks
- Make interconnecting with public transit easier (allow bikes inside buses)
- Enforce codes protecting bikes and bike lanes (driving distance, parking and obstructions in bike lanes)
- Traffic signals reflect active transport needs and prioritize safety. Safer lighting for crosswalks and bike lanes.
- Add skywalks between major buildings

Transit and Paratransit

- Make public transportation free
- Expand Go-Pass area. Reduce transit fees/offer pass deals (annual)
- Expand TheRide bus routes and connect routes more
- Increase the speed and efficiency of bus transit. Provide rapid transit along major corridors
- Use better technology to make bus system more accurate, on-time, etc.
- Power bus stop shelters with solar power (security lighting, cameras, and info)
- Create bus and carpool lanes
- Create student shuttles to reduce demand for student cars (e.g. shuttle from campus to nearest grocery stores). Collaborate with/address UM transit. Work with UM to create incentives for students not to bring cars on campus. Make shuttle to WCC.
- Develop light rail (commuter, local). Develop electrified regional public transit
- Electrify TheRide vehicles
- “Right size” transit vehicles
- Create “mobility hubs” dispersed through city that act as home-base for multiple transit options (e-bikes, e-scooters, zip cars, bus stops, EV chargers, autonomous delivery vehicles, carpools, etc.)
- Improve public school transit (school of choice, etc.)
- Increase availability and convenience of Park and Ride lots for commuters
- Allow multiple modes of fare payment
- Encourage alternatives to flying (increase trains, etc.)

Policies, Funding, Public Outreach, and Education

- “Upzone” to encourage density and affordability. Make zoning allowances for mixed-use neighborhoods. Walkable grocery stores. Encourage tiny houses and accessory dwelling units (ADUs). Transit-oriented urban planning along transit corridors
- Build affordable workforce housing near workplaces to reduce commuting
- Incentivize work-from-home, 4-day-work-week, and shorter work day policies (with health care credits, bonuses, etc.) to reduce employee commuting. Provide free internet to support telecommuting
- Reduce availability of parking, reduce/eliminate parking minimums. Work towards a parking-space free campus. Tax vacant lots and development of new parking lots
- Enact car-free (or petrol-free) zones. Make downtown pedestrian-only on weekends, linked with shuttles from Park-n-Rides
- Implement odometer tax or congestion tax. Price vehicles on occupancy. Implement City gasoline tax on pumps/new development. Tax large local industries. Implement City income tax
- Enforce no idling laws
- Alter Act 51 (act for distributing funds for road infrastructure) to give locals more control over types of projects. Lobby for state policy that creates a dedicated funding source for non-motorized and electric transportation (like there is for highways)
- Lobby to eliminate state registration fees for EVs
- Increase education about biking and walking through middle and high school (there is nothing after Safety Town). Incentivize driver’s education programs use EVs
- Create education, certification, and/or incentive program for auto dealers to sell EVs. Develop certification program for EV-qualified maintenance shops
- Leverage Forth Mobility for education and outreach
- Work with health-care systems to educate patients about health benefits of active transportation
- Leave behind level of service measures – use a better method like people through-put

- Adopt transportation pyramid (walking as priority to single occupancy driving at the bottom). Carbon neutrality mobility requirements in master plan
- Permeable pavement
- One-way street design
- Encourage carpooling for larger companies using apps
- Spotlight organizations who are taking action/success stories. Provide sample sites, pilots, and working examples of new ideas
- Help people understand their carbon footprint related to transportation and impact of changes

Process-Related

- Improve GHG tracking from transportation
- Using property taxes for funding can create equity concerns
- Always consider accessibility concerns
- Run lifecycle analysis on all ideas to see what is most effective
- Youth need to be at the table
- Carbon off-sets and sequestration (for travel)
- Plans from other communities with carbon neutrality goals (statewide coalition to move legislation at the state level)

TOPIC: RESOURCE REDUCTION

Waste Reduction

- Conduct environmentally-extended input-output analysis: City, University, hospitals
- Create a Zero Waste Plan
- Require all city-wide events be Zero Waste
- Leverage partnerships
- Report out on what happens to recovered waste
- Discourage landfilled waste:
  - Extend time between trash pick ups
  - Initiate payment by amount of trash model
  - Limit size of/availability of containers
  - Use funds from trash can fees for educational campaign
- Reduce single use plastics:
  - Organize a local cohort of business who do not use single use plastics
  - Tax/ban single use plastics (bags, takeaway containers, etc.)
  - Require bottle-filling stations
  - Encourage/enable price incentives for using reusable containers
  - A²Zero branded compostable alternatives to single-use plastics
- Electrify waste truck fleet
- Choose/require methane recovery at landfills in active use

Recycling

- Renovate city-owned Materials Recovery Facility
- Develop new city-owned Materials Recovery Facility
- Educate public/resolve recycling uncertainty
- Eliminate drop-off fees for recycling

- Multi-stream recycling pick-up
- Neighborhood level recycling rather than drop-off
- Improve textile recycling
- Enforce recycling

Organics

- Address waste water
- Methane recovery on waste water (Cross cutting: Energy)
- Improve composting pick up:
- Accessible to commercial, industrial, multi-family
- Ease of use
- Year round composting
- Local composting:
- Compost in neighborhoods/locally
- Return to local farmers
- Provide free compost to residents
- Create compost market
- Encourage/incentivize/educate on homeowner composting
- Provide information on environmental impacts of different compostable materials

Plant Based Diets

- Scale pledge programs, Blue Zone Program
- Incorporate AAPS and institutions
- Provide cooking classes focused on plant-based, local, seasonal foods (Rec & Ed)
- Education/ban on commodity beef/CAFO meat

Local Food Production

- Scale community gardens/local food production
- Local food waste recovery (gardeners, farms, restaurants, grocery stores)
- Farmers Markets Expansion
- Year round
- More locations
- Expanded food hubs/food stops/local food in grocery stores
- Protect SNAP in appropriate scaled sizes
- Pilot local food subscription meals with circular/reusable packaging
- Collaborate with AAPS, UM on food planning, purchasing, and waste

Circular Economy

- Reskilling and skill sharing opportunities
- Repair centers for bikes, appliances, etc.
- Toy and tool library/shed, shared play areas
- Support thrift stores, reuse center, flea markets
- Create a time bank/local currency

Sustainable Purchasing

- Charge a carbon price on the embedded GHG of products
- Create a local market for reusable goods
- Closed loop reusable packaging
- Offer refillable bulk containers, takeout containers, cups (at point of sale)
- Create/enforce purchasing policies, guidelines, or incentives for:
    - Municipal operations
    - Institutions
    - Individuals
- Create consumption-based inventories for:
    - The City
    - Institutions

Construction and Development

- Require sustainable materials in new development

Community Engagement

- Engage with commercial and institutional sector
- Commercial reuse packaging program
- Accelerate/scale current data collection/plans:
    - Green Business Challenge
    - Engagement with private sector
    - Require/encourage disclosure from businesses/community groups

Community/Education

- Publicize available data/educate on:
    - Decreasing and recovering food waste
    - Reducing packaging, single use plastics
    - Purchasing transparency: traceable, embedded GHG, recyclability/compostable, Energy Star
    - Increasing composting and its benefits
    - What is recyclable and how to recycle
- Ongoing community engagement team (provide inventory management)
- Demystify terminology
- Compost at schools, local food at schools
    - School curriculum on environmental science
- Link to public health initiatives (diet, pollution)
- Recognition program for successes, spotlight organizations who are taking action
- Promote sample sites, pilots, and working examples

TOPIC: RESOURCE REDUCTION

Preparation

- Develop new/leverage existing infrastructure as resilience hubs
- Activate some homes as shelters with resources, energy, etc.
- Identify safe gathering points in neighborhoods during power outages, extreme heat/cold, etc.
- Conduct needs mapping of neighborhoods based on specific support residents require
- Generate neighborhood-based resiliency plans, incorporate residential best practices.

- Activate neighborhood climate ambassadors/captains to help
- Enable/organize ongoing training via Red Cross/CERT/partners
- Coordinate across Red Cross/AmeriCorps/partners
- Develop redundant communication (e.g., Code Red), not dependent on internet
- Assist/organize preparing/distribute residential emergency kits
- Host a National Preparedness Month campaign
- Engage behavior change scientists and define actors/actuators
- Conduct risk assessments and incorporate into planning
- Conduct a resilience-aesthetic charrette
- Strengthen relationships with other local governments

Community cohesion

- Activate strong neighborhood community networks that support local efforts
- Activate neighborhood welcome ambassadors
- Educate and engage community on the expected risks/how to prepare/how to respond, sharing experiences, climate tours
- Increase local workshops and space for public input
- Youth participation/education through actions/videos/ambassadors/curriculum/training/competitions
- Develop a program to recognize neighborhood-level efforts
- Enable/organize block parties for energy/resilience themes
- Provide support for emotional resilience, grief management, psychological services, etc.
- Create shared childcare programs.
- Create communal kitchens

Response

- Develop climate refugee support/networks
- Develop program to use city buses for evacuation and power sources during a disaster

Urban Planning

- Implement/leverage sensors and data to monitor heat, air quality, waterway and floods. Assist with drones for data/response.
- Track public health metrics from state and CDC
- Urban planning to moderate heat via shade trees, lighter contract, more rain gardens
- Design for increased urban density and walkability/bike-ability. Update city zoning.
- Street trees: Analysis of shading/inventory/update master plan/incentivize private tree planting
- Improve parking lot design standards for shading, storm water retention, heat island mitigation, trees
- Incentivize white/green roofs
- Purchase repetitive loss properties. Redevelop vacant space as green space.
- Prioritize affordable housing.
- Require all City functions be zero waste.
- Allow/encourage telecommuting

Energy

- Transition to underground power lines
- Create redundancy in energy systems (storage)
- Decentralize energy infrastructure. Incentivize individual energy production.
- Increase renewable energy systems, storage, microgrids, and community solar.

- Plan for higher energy loads due to increasing temperatures.

Green Spaces

- Connect green spaces
- Increase natural area preservation and stewardship for carbon sequestration and storm water management
- Educate on native and invasive plants
- Increase land use for local food production. Host an improved food infrastructure innovation challenge.
- Encourage fruit trees/foraging, collect fallen fruit. Allow food production on city lands in neighborhoods.

Water

- Enable/encourage water generation and reuse and natural water/flood capture systems
- Design flexible water systems that adapt to conditions
- Remove dams/coordinate dam management
- Use accessory dwelling units for drinking water security
- Add vegetated buffers along waterways for storm water management
- Stricter floodway/floodplain management/planning

Transportation

- Design roads for flexibility, networked, alternative transportation, slower traffic, storm water management, trees, boulevards, durability. Fully implement green streets.
- Leverage Common Cycle to keep bikes on the road
- Encourage/enable car sharing
- Minimize parking available
- Install EV chargers at stores/apartments

Residential/Commercial Support

- Define and educate on residential best management practices
- Create a resilience fund/funding focused on equity
- Educate on DTE Energy support for energy efficiency upgrades
- Strengthen building code for efficiency/weatherization. Require 2030 District standards across all buildings.

A2ZERO

EQUITABLE • SUSTAINABLE • TRANSFORMATIVE

Approved by the Regents
June 17, 2021

MAY MEETING, 2021

The University of Michigan
Virtual
May 20, 2021

The regents met at 4:00 p.m. via a livestream link on the university gateway. Participating were Regents Acker, Behm, Bernstein, Brown, Hubbard, Ilitch and Weiser. Regent White was absent. Also, on the call were Vice President Baird, Vice President Churchill, Provost Collins, Vice President Cunningham, Chancellor Dutta, Chancellor Grasso, Vice President Harmon, Vice President Kolb, Vice President Lynch, Vice President Michels, Vice President Pendse, Executive Vice President Runge and Interim Executive Vice President Smith.

Call to Order and President's Opening Remarks

President Schlissel called the meeting to order. He called the roll of all the regents for the record and for those not able to see the screen. He welcomed Interim Executive Vice President and Chief Financial Officer Brian Smith to his first board meeting.

President Schlissel congratulated Regent Ilitch, for being honored by Families Against Narcotics at their Women Honoring Women Gala. The organization's mission is to empower communities through education and recovery services that enhance the quality of life and health of all family members.

President Schlissel said, "I thank the more than 11,000 UM students who have submitted their COVID-19 vaccine status to the university. We're seeing greater levels of vaccination on campus, in Washtenaw County and in the state. This will help tremendously as we continue to strive to return to a more residential experience on campus and to more normal activities in our lives. Vaccination is free, easy and widely available. The vaccines are safe and highly effective. I received the Pfizer vaccine. Please don't miss your shot."

President Schlissel continued, "Last week, the university shared the report that detailed the external investigation into sexual abuse by the late Robert Anderson, a physician in our health service and athletics department until 2003. We are thoughtfully and diligently reviewing and assessing the report's findings, conclusions and recommendations and we will work to regain the trust of survivors and to assure that we foster a safe environment for all.

"At our last meeting in March, I described the work we will do to identify and create a set of unifying, shared values to help us set a high standard for campus behaviors, systems and practices. This is one component of our work to implement changes following the misconduct of Martin Philbert.

"Patricia Hurn, the dean of our School of Nursing and a professor of molecular, cellular, and developmental biology, will co-lead the Working Group on Culture Change, along with Sonya Jacobs, chief organizational learning officer. Dr. Hurn and Ms. Jacobs are developing the charge and a workplan for the group whose purpose is to create an environment of mutual respect and accountability that is free of retaliation, where everyone can feel safe to report misconduct and feel supported throughout the process. The working group will consist of subject matter experts and community members at large."

President Schlissed said, "World-class faculty have always been a hallmark of the University of Michigan. Each May, we are proud to recommend faculty members for promotions and tenure. Today, the recommendations being put forward by Provost Collins, Executive Vice President Runge, Chancellor Dutta and Chancellor Grasso highlight the strength of faculty on our three campuses. This strength enhances our state, as well.

"For instance, Katherine Bauer, who is being promoted to associate professor in our School of Public Health, has translated her research on obesity into community-based interventions that lead to better nutrition and health for Michigan children and families.

"The work of Chemistry Associate Professor Andrew Ault has shown how freshwater particles known as 'lake spray' put pollutants into the atmosphere. His research in places like Grand Traverse Bay and the Leelanau peninsula has increased our understanding of Great Lakes air and water quality.

"Professor Lesli Skolarus of our Medical School has developed community partnerships in Flint to make emergency stroke care accessible to underserved individuals. Professor Ines Ibanez of our School for Environment and Sustainability focuses on the challenges that Great Lakes forests in Michigan are facing in the context of climate change, invasive species and other ecological events. Her work will help us develop best practices to protect beloved natural resources in our state.

"The talent, commitment, statewide impact and hard work of our faculty continually amaze me. Congratulations to all."

President Schlissed continued saying, "In March, the President's Commission on Carbon Neutrality issued its final report and recommendations, after two years of thorough analysis, community engagement and expert input. The recommendations were designed not only to help the UM achieve carbon neutrality, but also to be financially responsible, environmentally just and scalable and transferrable to help other large institutions achieve neutrality, as well.

"Climate change caused by human activity, particularly the burning of fossil fuels, is the defining scientific and social challenge of our age. We will not solve the climate crisis if we stand alone as an island in a rising sea of apathy and inaction. We must use the full breadth of our research, education and service mission to address the problem, while at the same time serving as a model for how a large, comprehensive university with a leading health system and the nation's largest public research enterprise can achieve carbon neutrality in a cold climate.

"The plan put forth by the commission, along with the tremendous advocacy and passion in our community and the actions I am announcing today, will do precisely that. The UM will achieve carbon neutrality across all greenhouse gas emissions scopes. This carbon neutrality commitment is comprehensive, spanning our $1.62 billion research enterprise, our 40 million square feet in buildings, our three campuses, Athletics and Michigan Medicine, which annually serves the public with 2.3 million patient visits, 60,000 surgeries and 5,000 births. By 2025, we will achieve carbon neutrality for Scope Two emissions, or those coming from purchased power, as recommended by the commission. By 2040, we will eliminate Scope One emissions, as recommended by the commission. These are emissions from direct, on-campus sources.

"A set of initial transformative projects will advance this goal, including:

- Geothermal systems for heating and cooling some of our new construction projects, beginning with the Beyster building addition on North Campus.
- Electric campus buses for Ann Arbor and Dearborn, as a first step toward decarbonizing UM's entire vehicle fleet.
- Reevaluating the campus master plan with carbon neutrality at its center in collaboration with faculty experts.

- Making all new building projects compatible with renewable energy powered heating and cooling systems, and developing higher energy efficiency standards for new construction and renovation.

"We'll also launch a university-wide revolving fund for energy efficiency projects, beginning with $25 million over five years. This is a five-fold increase over our current commitment. By 2025, we will establish carbon neutrality goals for Scope Three emissions categories, as recommended by the commission. This covers emissions from indirect sources like commuting, food procurement and university-sponsored travel.

"We will achieve carbon neutrality through actions that embrace urgency, accountability and inclusivity. Further, we will incorporate environmental justice principles in our decision-making, as the climate crisis poses the most harm to frontline communities that are historically and unfairly disadvantaged and disenfranchised. We'll continue meaningful engagement, as well.

"To further strengthen discovery in this area, we will make significant investments in carbon neutrality research and development, building on the success of multidisciplinary initiatives like the Carbon Neutrality Acceleration Program. We will work with deans to identify and support opportunities to integrate sustainability and carbon neutrality into core curricula. And to provide all university community members with the resources they need to live and work sustainably at UM, we will expand the Planet Blue Ambassador program to cover the Flint and Dearborn campuses.

"The work will begin immediately, and following the commission's guidance, I am creating a new executive-level leadership position to manage and coordinate our carbon neutrality efforts. We expect to define and fill that position in the coming months through a national search.

"In the meantime, I am appointing Drew Horning as my special advisor to help lead and develop our near-term efforts. He will split time with his current role as the managing director of our Graham Sustainability Institute. Part of our work will include studying the feasibility of carbon offsets more closely. Though the commission called for offsets to accelerate Scope One neutrality, that recommendation was the only one in the report that was also accompanied by a minority opinion, which called for the prioritization of eliminating direct emissions over purchasing offsets. Further study will allow us to carefully assess different strategies within the context of urgently combating climate change while making a tangible and just impact, locally and beyond.

"Today's commitments place carbon neutrality at the center of UM's mission. To fulfill our mission as a public research university, we must address the climate crisis by leading the way on our campuses and beyond, creating, testing and teaching the knowledge and technologies that will transfer to other large institutions, and inspiring and empowering others to help solve the defining scientific and social challenge of our time.

"Finally, I want to thank the commission for their great work. Their process was thoughtful and engaging. It brought together a broad group of stakeholders and advocates – the outcome is better as a result. This is a plan created by our community and for our community. Hundreds of faculty, staff and students participated in its creation. The level of enthusiasm is inspiring, and most definitely needed as achieving our carbon neutrality goals will require all of us to participate and do the work needed to ensure a better future for our planet and society. We are sharing more details on our plans today on my website and in the University Record."

Regent Bernstein said, "This is a really big deal. It's a big day to celebrate together. I want to start by thanking President Schlissel for his leadership and initiative on this, Jennifer Haverkamp and Stephen Forrest who led the President's Commission on Carbon Neutrality as co-chairs, and, of course, the 15 commissioners who have worked for two years to produce a 194 page report, as well as others who have supported the work of the commission.

"At our recent meeting we announced our commitment to carbon neutrality with regard to our investment policy. Today, we commit to carbon neutrality with regard to the operations of our university.

"The President's Commission on Carbon Neutrality completed an ambitious endeavor. The process was thorough and inclusive. And their report is outstanding. We embrace the commission's high level of analysis, applaud the commission's robust engagement and are proud to announce these first of many steps toward implementation. We're integrating sustainability into the core of our mission. I think it's important to highlight how comprehensive this commitment will be. This work applies to every single aspect of our institution, every decision, every building, every student, every faculty member, every staff person, every administrator on every campus, in Ann Arbor, Dearborn and Flint.

"We are not taking any shortcuts. We're including every single structure and process of our university from teaching to research to the health system to athletics. And we're including every single source of greenhouse gas emissions, Scope One emissions caused by direct, on-campus emissions from heating and cooling our buildings to fueling our transit systems;

Scope Two emissions – emissions generated by electricity we purchase; and Scope Three emissions – emissions created by indirect sources like commuting, food procurement and travel.

"Make no mistake, this is going to be a really big challenge. This challenge may be harder for us than most other universities given our massive, complex infrastructure.

"Environmental justice will be an important feature of this work. As the commission notes 'the climate crisis poses the most harm to communities that are historically and unfairly disadvantaged and disenfranchised.' To put it bluntly, the people who have done the least to cause climate change feel the impact of climate change most acutely. That's why environmental justice experts and communities most affected by climate change must have a powerful voice in shaping solutions. The commission and our community have demanded that we prioritize and integrate environmental justice into our work and we will.

"We're building accountability into every step of this process. We'll have a public dashboard and the carbon neutrality leader will ensure that we embrace the urgency and accountability that this issue needs and deserves. If we can do this, and we will, then every university/every institution must step up. Nothing is going to be easy about this effort, but everything depends upon us meeting this challenge. There is no time to waste. So, let's get to work."

Regent Brown echoed Regent Bernstein's comments and said, "Large efforts like this are the reason why I wanted to join the board. We all are aware of how difficult the past year and a half has been, particularly at the UM. Despite these unprecedented challenges, the university, led by the President, staff and commission, has remained focused on achieving one of my campaign, and the board and president's, promises, that is, to make the University of Michigan carbon neutral in the coming decades.

"Everyone should understand, the allocation of UM's resources is a pure zero-sum game. This effort will take an enormous investment and that could mean other priorities are delayed or scaled back. But we will never compromise on educating our students, caring for our patients or competing with Ohio State. Becoming carbon neutral, in many ways, is our moon shot. But we are definitely not choosing to do this because it will be easy. It will not. We are also not choosing to do this because it is hard. We are choosing to become carbon neutral because it is absolutely necessary.

"This will serve the university, but like our core mission, this will also serve our state and society. This will test whether we are truly the leaders and best, because that is what it will take to achieve this goal. As President Kennedy said, this is a challenge 'we are willing to accept, we are unwilling to postpone, and one which we intend to win.'"

President Schlissel continued and said, "I congratulate the UM women's gymnastics team and Coach Plocki on winning our first NCAA title in the sport. The squad posted the best team score in program history, and it came down to the final routine for the national championship.

"Our field hockey team came back from being down two goals before falling to North Carolina in overtime of the NCAA Tournament championship game earlier this month. Our women's golf team advanced to the NCAA Finals for the fourth time in program history, with play beginning tomorrow. Our cheerleading and dance programs both won national championships in their respective competitions. Our water polo team made the NCAA tournament for the fifth consecutive season. Our rowing team will compete in its 13th consecutive NCAA Championship. Our softball team has won its third consecutive Big Ten title. The Wolverines play tomorrow in the NCAA Tournament against Seattle. And baseball is nationally ranked. It's great to be a Michigan Wolverine!"

Regent Hubbard said, "I wanted to offer my appreciation to you, the administration and others on the board for the wonderful in-person commencement we had on May 1. It was a beautiful day and it was great to see the students outside at the stadium. I think those who were able to attend did so safely and those who couldn't, stayed home and had a satisfying experience. I really appreciate that. And given that and the governor's announcement today that on July 1 virtually all restrictions for indoor and outdoor gatherings will be removed as we come out of this COVID situation. I look forward to seeing everyone in person, in-class this fall. I certainly do hope we will all be there together. As we started this meeting, MSU announced that they will have a full football stadium this fall, and I hope we will be able to as well."

President Schlissel shared the excitement and said, "the key to be able to be in-person is continuing with our efforts around vaccinations, which is the surest and safest way forward."

Conflicts of Interest

On a motion by Regent Behm, seconded by Regent Acker, the regents unanimously approved the following conflict of interest items that fall under the State of Michigan Conflict of Interest Statute. The following information is provided in compliance with statutory requirements:

Authorization for the University to transact with EnlivenWork, Inc.

An agreement with EnlivenWork, Inc. was approved.

1. The parties to the agreement are the regents of the University of Michigan, its Stephen M. Ross School of Business and EnlivenWork, Inc.
2. The agreement is for a duration of three years at a total cost not to exceed $162,000. EnlivenWork, Inc. will be supplying all the necessary resources and personnel to fulfill this contract. The remaining base contract terms and

conditions are typical to those used in Procurement Services' standard templates for other similar contracts entered into by the regents.
3. The pecuniary interest arises from the fact that University of Michigan employee Monica Worline is owner and stockholder of EnlivenWork, Inc.

Authorization for the University to transact with LynxDx, Inc.

An agreement with LynxDx, Inc. was approved.

1. The parties to the agreement are the regents of the University of Michigan, its University Health Service and LynxDx, Inc.
2. The value of the agreement for one year will be increased by $18,000,000 to a new total cost not to exceed $27,000,000, which is anticipated to cover testing requirements through December 31, 2021. LynxDx, Inc. will be supplying all the necessary resources and personnel to fulfill this contract. The remaining base contract terms and conditions are typical to those used in Procurement Services' standard templates for other similar contracts entered into by the regents.
3. The pecuniary interest arises from the fact that University of Michigan employees Yashar Niknafs, Arul Chinnaiyan, Jeff Tosoian and Javed Siddiqui are co-founder, employee, stockholder, chair of scientific advisory board and/or laboratory clinical consultant of LynxDx, Inc.

Authorization for the University to enter into an agreement with Mouko, LLC

An agreement with Mouko, LLC was approved.

1. The parties to the agreement are the regents of the University of Michigan, its School for Environment and Sustainability and Mouko, LLC.
2. The agreement is for a duration of one year at a total cost not to exceed $1,707. Mouko, LLC will be supplying all the necessary resources and personnel to fulfill this contract. The remaining base contract terms and conditions are typical to those used in Procurement Services' standard templates for other similar contracts entered into by the regents.
3. The pecuniary interest arises from the fact that University of Michigan employees Justin Laby and Alex Ade are members and owners of Mouko, LLC.

Authorization for the University to enter into an agreement with Mynerva, Inc.

An agreement with Mynerva, Inc. was approved.

1. The parties to the agreement are the regents of the University of Michigan, its Department of Electrical and Computer Engineering and Mynerva, Inc.
2. The agreement is for a duration of two years at a total cost not to exceed $1,200,000. Mynerva, Inc. will be supplying all the necessary resources and personnel to fulfill this contract. The remaining base contract terms and conditions are typical to those used in Procurement Services' standard templates for other similar contracts entered into by the regents.
3. The pecuniary interest arises from the fact that University of Michigan employees Rajesh Rao Nadakuditi and Travis DePratois are co-founder, partner, owner, stockholder and/or director of Mynerva, Inc.

Authorization for the University to enter into an agreement with Ripple Science Corporation

An agreement with Ripple Science Corporation was approved.

1. The parties to the agreement are the regents of the University of Michigan, its Department of Neurology and Ripple Science Corporation.
2. The agreement is for a duration of one year at a total cost not to exceed \$1,538. Ripple Science Corporation will be supplying all the necessary resources and personnel to fulfill this contract. The remaining base contract terms and conditions are typical to those used in Procurement Services' standard templates for other similar contracts entered into by the regents.
3. The pecuniary interest arises from the fact that University of Michigan employee Nestor Lopez-Duran is founder, director and owner of Ripple Science Corporation.

Authorization for the University to transact with Adithya Sanjay

An agreement with Adithya Sanjay was approved.

1. The parties to the agreement are the regents of the University of Michigan, its Stephen M. Ross School of Business and Adithya Sanjay.
2. The agreement is for a duration of one year at a total cost not to exceed \$6,500. Adithya Sanjay will be supplying all the necessary resources and personnel to fulfill this contract. The remaining base contract terms and conditions are typical to those used in Procurement Services' standard templates for other similar contracts entered into by the regents.
3. The pecuniary interest arises from the fact that University of Michigan employee Adithya Sanjay is owner of Adithya Sanjay.

Authorization for the University to transact with Brassi LLC

An agreement with Brassi LLC was approved.

1. The parties to the agreement are the regents of the University of Michigan, its Stephen M. Ross School of Business and Brassi LLC.
2. The agreement is for a duration of one year at a total cost not to exceed \$6,500. Brassi LLC will be supplying all the necessary resources and personnel to fulfill this contract. The remaining base contract terms and conditions are typical to those used in Procurement Services' standard templates for other similar contracts entered into by the regents.
3. The pecuniary interest arises from the fact that University of Michigan employees Jacqueline Sun and Taylor Hurley are owners of Brassi LLC.

Authorization for the University to transact with MyAutO2, LLC

An agreement with MyAutO2, LLC was approved.

1. The parties to the agreement are the regents of the University of Michigan, its Zell Lurie Institute and MyAutO2, LLC.
2. The agreement is for a duration of one year at a total cost not to exceed \$6,500. MyAutO2, LLC will be supplying all the necessary resources and personnel to fulfill this contract. The remaining base contract terms and conditions are typical to those used in Procurement Services' standard templates for other similar contracts entered into by the regents.
3. The pecuniary interest arises from the fact that University of Michigan employee Stewart Kerr is owner of MyAutO2, LLC.

Authorization to enter into or amend Agreements

Project agreements with the University of Michigan were approved.

1. The parties to the contract are the Regents of the University of Michigan and the following companies: ATGC Inc Subcontract Agreement 21-PAF06344; ATGC Inc Subcontract Agreement 21-PAF06357; Entos, Inc. Other Sponsored Activity 21-PAF05612; FibrosIX Inc. Subcontract Agreement 21-PAF06533; GeneToBe, LLC Subcontract Agreement 21-PAF06358; ONL Therapeutics, Inc. Research Agreement 21-PAF05252; and Sublime, LLC Subcontract Agreement 21-PAF06543 COVID-19.
2. The terms of the agreements and/or amendments conform to university policy. The funding support will not exceed the amount reported in Attachment A for each agreement and/or amendment. Since projects are often amended, these agreements and/or amendments include provisions for changes in time and scope. University procedures for approval of these changes will be followed and additional conflict of interest review will be done as appropriate.

Approval of Technology Transfer Agreements

Technology Transfer agreements were approved.

1. The parties to the contract are the Regents of the University of Michigan and the following companies: Courage Therapeutics, Inc. License Agreement; EIQ, Inc. License Agreement; Entos, Inc. Option Agreement; Entos, Inc. License Agreement; Entos, Inc. License Agreement; GeneToBe, LLC License Agreement; GrayRain, LLC License Agreement; HumanShape, LLC License Agreement; Lympharma LLC. License Agreement; Mbrace, Inc. License Agreement; and Precision Trauma, LLC License Agreement
2. The university will retain ownership of the optioned, licensed or reassigned technologies and may continue to further develop and use them internally. No use of university services or facilities, nor any assignment of university employees, is obligated or contemplated under the agreements. Standard disclaimers of warranties and indemnification apply, and the agreements may be amended by consent of the parties, such as adding related technology. University procedures for approval of these changes will be followed and additional conflict of interest review will be done as appropriate. Terms specific to each agreement are described in Attachment A.

Presentation

Chancellor Grasso introduced UM-Dearborn Associate Professor of Mathematics Yunus Zeytuncu. Associate Professor Zeytuncu described the geometry of music and explored the answer to the question, ‘can you hear the shape of a drum?’

Consent Agenda

Government Relations. Vice President Kolb provided an update on the state of Michigan budget process for the coming fiscal year, and noted the Governor's Executive Recommendation and the Senate budget for higher education, both of which provide an across the board 2% increase in public universities. The House budget does not increase funding for higher education. Instead, it redistributes the existing fund in a new and radical formula weighted heavily on an in-state student model. State business leaders believe that this new formula could make it harder for people to attend college and diminish the state's ability to compete in the global economy. By statute the budget is supposed to be presented to the Governor by July 1st and the fiscal year for the state starts on October 1st.

Minutes. Vice President Churchill submitted for approval the minutes of the meetings of March 25, 2021 and April 2, 2021.

Reports. Interim Executive Vice President Smith submitted the Investment Report, the Plant Extension Report, the University Human Resources Report and Regents Report on Non-Competitive Purchases equal to or over $10,000 from Single Sources, December 16, 2020 through March 15, 2021.

Litigation Report. Vice President Lynch had no additional report.

Research Report. Vice President Cunningham submitted the Report of Projects Established through April 30, 2021.

University of Michigan Health System. Executive Vice President Runge had no report.

Student Life. Vice President Harmon had no report.

University of Michigan-Dearborn. Chancellor Grasso reported on commencement, the receipt of the 'Coalition for Life-Transformative Education' grant, which is a digital storytelling project, and provided a DEI update.

University of Michigan-Flint. Chancellor Dutta reported that Spring enrollment is up 6% in headcount and 12% in credit hours over the last year. He congratulated three new Frances Willson Thompson Fellows: Mihai Burzo, associate professor of engineering; Beverly Dabney, associate professor of nursing; and Gergana Kodjebacheva, associate professor of public health and health sciences. He thanked Regent Acker who participated in recent virtual commencement events.

Student Government Reports. UM-Dearborn Student Government President Ramsey Fakhouri reported on planned virtual events and plans for the return to campus in the fall.

Voluntary Support. Vice President Baird had no additional report.

Personnel Actions/Personnel Reports. Provost Collins commented on the university's excellence founded on the strength of the faculty despite a year of unprecedented challenges in teaching, research and service. There are recommendations for 299 faculty promotions, including 184 instructional track faculty members, 104 clinical track and 11 research track faculty. She highlighted three faculty members:

Erin Cech is a faculty member in the sociology department in LS&A. In her path-breaking research, she brings cultural analysis to sociological questions about inequalities in work and education that have generally ignored culture's role and focused more on structures. She is the university carillonneur and a faculty member in music, theatre and dance. She is an inspiring teacher, drawing students from across the campus for carillon lessons and for courses in social entrepreneurship in the arts and the role of the arts in the transformation of cities.

Sunitha Nagrath is a chemical engineer whose research goal is to bring the next generation of engineering tools to patient care, especially in cancer. Her major focus is to develop advanced tools for understanding cell trafficking in cancer through isolation, characterization, and study of circulating cells in peripheral blood of cancer patients.

Executive Vice President Runge highlighted faculty members Tammy Chang, being promoted to associate professor, Department of Family Medicine. She is a nationally recognized family physician and adolescent health policy researcher. He also highlighted Costas A. Lyssiotis, being promoted to associate professor, Department of Molecular & Integrative Physiology, and who is an internationally recognized leader in cancer biochemistry, pancreatic cancer, and metabolomics.

Chancellor Grasso highlighted Dr. Amanda Esquivel, an assistant professor of mechanical engineering being promoted to associate professor of mechanical engineering with tenure. Dr. Esquivel focuses her research on vital areas of biomechanics with a specific focus on head injury prevention. He also highlighted Dr. Francine Banner, an associate professor of sociology being promoted to professor of sociology, with tenure. Her primary area of research, and the one that has garnered scholarly praise, concentrates on sexual assault and harassment in institutional contexts.

Chancellor Dutta highlighted Julie Ma, promoted from assistant professor of Social Work to associate professor of Social Work, with tenure. Professor Ma has established herself as a strong teacher, researcher, scholar, servant-leader and citizen of the university and community.

He also highlighted George White III, promoted from associate professor of management, with tenure to professor of management, with tenure. Professor White is recognized as an excellent and innovative teacher, whose use of computer simulations in all of his courses creates a memorable and pedagogically sound experience for students.

Executive Vice President Collins brought forward two supplemental personnel items. She recommended the appointment of Adele Brumfield as the vice provost for enrollment management. Ms. Brumfield has broad experience in college admissions at institutions, including independent liberal arts colleges and several R1 universities. From these experiences, she has developed a keen understanding of college applicants. She is also deeply knowledgeable about an array of institutional efforts to address access, equity and student success. As her career has progressed, Ms. Brumfield has brought her knowledge to bear on a number of concerns in enrollment management. Currently, the associate vice chancellor for enrollment management at UC San Diego, she leads work on undergraduate admissions and financial aid, business and technology operations and enrollment analytics. With her leadership, UCSD has seen a 51% increase in applications from underrepresented minority students and increased matriculation of Black and Latinx/Chicanx students. Ms. Brumfield will bring great knowledge, important experience and a strong commitment to access and success to the role of vice provost for enrollment management.

She also recommended Kathleen Cagney as the director of the Institute for Social Research. Dr. Cagney, currently a faculty member at the University of Chicago, is an accomplished social scientist. She will bring a strong research record and a commitment to service to the role of director. In her own research on social inequality and health, she has collaborated with scholars in many scientific disciplines to develop a holistic view of how physical and social factors influence individual behavior and outcomes. Dr. Cagney's knowledge of the social sciences, considerable administrative experience and deep commitment to increasing diversity among faculty and students who are engaged in social research as well as for her ability to lead ISR. When the institute was founded in 1949, UM President Alexander Ruthven noted that it would "bring to bear quantitative and experimental research methods on complex and important social problems." The appointment of Dr. Cagney will carry this critical work forward.

Retirement Memoirs. Vice President Churchill submitted 27 retirement memoirs.

Memorials. There were no deaths reported to the regents this month.

Degrees. There are no actions with respect to degrees this month.

Approval of Consent Agenda. On a motion by Regent Hubbard, seconded by Regent Behm, the regents unanimously approved the consent agenda.

Alternative Asset Commitments

Interim Executive Vice President Smith reported on the university's follow-on investments with previously approved partnerships with a commitment of up to $55 million to two Eclipse Ventures sponsored investments.; and up to $40 million for the next four-year investment cycle of Chengwei Ventures Evergreen Fund, L.P.

Alternative Asset Commitment

On a motion by Regent Weiser, seconded by Regent Bernstein, the regents unanimously approved a commitment up to $50 million from the university's Long Term Portfolio to FCP Realty Fund V.

Public Equity Commitment

On a motion by Regent Acker, seconded by Regent Weiser, the regents unanimously approved the GQG Partners International Equity Strategy with an initial funding of $100 million from the university's Long Term Portfolio.

Public Equity Commitment

On a motion by Regent Hubbard, seconded by Regent Weiser, the regents unanimously approved up to two percent of the university's Long Term Portfolio (LTP) to be invested in an internally managed direct equity portfolio.

Appointment of Auditors

On a motion by Regent Weiser, seconded by Regent Acker, the regents unanimously approved PricewaterhouseCoopers as external auditors for fiscal year 2021.

Planned Uses of Income from the Julian A. Wolfson and the Marguerite Wolfson Endowment Funds for the fiscal year 2021-2022.

On a motion by Regent Hubbard, seconded by Regent Weiser, the regents unanimously approved

1. The uses of the income of the Wolfson Endowment Funds as recommended by the Law Faculty:
    a. Expenditures not to exceed $3,000 for any individual faculty member, or $2,500 for director of the Library, or $1,000 for any emeritus member of the faculty maintaining an office at the Law School, during the fiscal year to support research, membership in and attendance at meetings of professional organizations and improved faculty/student relations and modernization and equipping of faculty offices.
    b. Expenditures not to exceed $800 for any individual faculty member, including clinical professors and emeritus members of the faculty maintaining an office at the Law School, for attendance at one professional meeting.

c. Expenditures not to exceed $115,000 on specific authorization and at the discretion of the Dean for Law School purposes including research and educational meetings, informal faculty discussion meetings, and the Wolfson Scholar-in-Residence program and alumni activities.

2. The Wolfson Reserves (unspent income accumulated from prior years) as recommended by the Law Faculty for recruitment and retention of faculty.

Approval of Academic Calendar for 2023-2024

On a motion by Regent Acker, seconded by Regent Weiser, the regents unanimously approved the academic calendar for 2023-2024.

Public Comment

The regents heard public comments from: Adam Simon, UM-Ann Arbor faculty, on carbon neutrality, PCCN report; Ashvin Pai, UM-Ann Arbor student, on UM Flint/Dearborn funding; Elliott Brannon, UM-Ann Arbor student, on housing; Christine Oldenburg-McGee, UM-Ann Arbor staff, on bargaining update; Jane Vogel, alumna, on carbon neutrality; Nancy Kursman, UM-Dearborn faculty, on LEO bargaining platform; Andy Thompson, UM-Ann Arbor faculty, on LEO bargaining platform; Lisa Hine, UM-Flint Faculty, on LEO bargaining platform; Bobby Madamanchi, UM-Ann Arbor faculty, on LEO bargaining platform; Amytess Girgis, alumna, on UM Flint/Dearborn funding; Cierra Murphy, UM-Dearborn student, on LEO bargaining; Pamela Miles, citizen, on restrictions in dorms; Nataliya Kofman, alumna, on full fall re-opening freshmen; and Lola Pons-Hervas, UM-Flint faculty, on One University.

President Schlissel thanked all the speakers for their comments.

Adjournment

The meeting was adjourned at 6:00 p.m. The next meeting will take place on June 17, 2021.

GOALS & DASHBOARDS

DASHBOARDS

CARBON NEUTRALITY

— PRIORITIES & PROGRESS

— REVOLVING ENERGY FUND & ENERGY CONSERVATION

— RENEWABLE PURCHASED ELECTRICITY

— SUSTAINABLE BUILDINGS

— INITIATIVE HISTORY

— FAQ

— NEWS & FEATURES

ADDITIONAL ANN ARBOR GOALS

GOALS IN ACTION

Priorities & Progress

Learn more about key objectives and ongoing efforts toward U-M carbon neutrality and climate action goals.

NEW: Read the Climate Action at the University of Michigan report for FY23.

Sections below were last updated on October 2, 2023. For information on past U-M greenhouse gas emission levels and expected future trajectories toward net-zero emissions, visit the U-M Emissions Reduction Dashboard.

Infrastructure & Energy (Scopes 1 & 2)

ELECTRICITY +

CAMPUS PLANNING +

HEAT & POWER INFRASTRUCTURE –

Key Objective

- Develop campus-specific utility master plans focused toward decarbonizing heating and cooling infrastructure.
- Selectively install geothermal exchange heating and cooling systems in conjunction with new construction projects.

Progress to Date

- Hired a firm to help develop a utility master plan for North Campus, focused on decarbonizing heating and cooling infrastructure
- Drilled 99 bores (700 ft. deep) for a geoexchange system at the Leinweber Computer Science and Information Building.
- Geoexchange systems planned for dining hall of the newly-announced Central Campus residence halls, as well as for the new Ginsberg Center building planned for Central Campus.
- Designing all new building and renovation projects to be compatible with renewable energy-driven heating and cooling systems.

Near-Term Priorities

- Develop the North Campus utility master plan focused on decarbonizing heating and cooling infrastructure.
- Construct geoexchange systems in conjunction with new construction projects, and build district-level systems to serve multiple buildings at once.

BUILDING STANDARDS +

ENERGY CONSERVATION MEASURES & REVOLVING ENERGY FUND +

VEHICLE FLEET +

Indirect Impacts (Scope 3)

MITIGATION STRATEGIES +

ACCOUNTING +

FINANCE & INVESTMENTS +

Academics & Involvement

CURRICULA & RESEARCH +

EXECUTIVE LEADERSHIP +

CAMPUS ENGAGEMENT +

COMMUNITY ENGAGEMENT +

PROGRESS REPORTING +

Read the Climate Action at the University of Michigan report for FY23.

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PLANET BLUE
UNIVERSITY OF MICHIGAN

File #:	23-0382 Version: 1	Name:	3/20/23 Resolution Directing the City Administrator to Begin Negotiating a New Natural Gas Franchise
Type:	Resolution	Status:	Passed
File created:	3/20/2023	In control:	City Council
On agenda:	3/20/2023	Final action:	3/20/2023
Enactment date:	3/20/2023	Enactment #:	R-23-101
Title:	Resolution Directing the City Administrator to Negotiate a New Natural Gas Franchise		

Title
Resolution Directing the City Administrator to Negotiate a New Natural Gas Franchise
Memorandum
While researching the City's opportunities related to beneficial electrification, limiting new natural gas connections, and achieving the A^2ZERO goal of community-wide carbon neutrality by 2030, City staff reviewed the City's natural gas franchise (Ann Arbor City Code, Chapter 34) and noted that it is set to expire in 2027. Under Michigan law, a franchise is a contract between a local unit of government and a utility that: (i) governs the use of the public rights of way, and (ii) sets the conditions under which the company may, for a set period, provide the specified utility service. Franchises can also include additional terms and several local governments across the country (e.g., Chicago, Salt Lake City, and San Diego) have successfully advanced affordability, equity, and clean energy goals via franchise negotiations while optimizing use of the public rights of way.

Given the City's aggressive and time sensitive A^2ZERO goals, the community's desire for more resilient, reliable, and affordable energy, and the need to accomplish these ends in a legally prudent manner, staff request Council authorization to begin negotiations immediately with the goal of bringing a new franchise aligned with A^2ZERO and best practices regarding the use of the City's rights of way, back to Council as soon as possible.

Budget/Fiscal Impact: Budget currently exists within the Office of Sustainability and Innovations to fund legal support services to advance this work.
Staff
Prepared by: Missy Stults, Sustainability and Innovations Director
Reviewed by: Atleen Kaur, City Attorney
Approved by: Milton Dohoney Jr., City Administrator
Body
Whereas, In 1997 the City of Ann Arbor granted a non-exclusive franchise to Michigan Consolidated Gas Company, a subsidiary of DTE, to supply and sell natural gas within the City of Ann Arbor for a period of 30 years;

Whereas, This franchise for natural gas is set to expire in 2027, but is also revocable at will;

Whereas, The Ann Arbor City Council has adopted A^2ZERO, setting the goal of community wide carbon neutrality by the year 2030, including the sub-strategy of supporting beneficial electrification and an incremental transition from natural gas to electric transportation and building systems;

Whereas, The City and all utilities, including DTE Gas, that use the rights of way to provide utility service would benefit from improved communication and practices regarding the use of the City's rights of way;

Whereas, Ann Arbor City Council recognizes the urgency in identifying and implementing thoughtful and innovative approaches to meet the City's goals;

RESOLVED, That Ann Arbor City Council directs the City Administrator to begin negotiating a new or amended natural gas franchise;

RESOLVED, That Ann Arbor City Council directs the City Administrator to ensure that any new or amended proposed franchise is aligned, to the fullest extent possible, with the City's A^2ZERO goals and best practices regarding uses of the City's rights of way, without compromising the ability of community members to heat or cook in their homes and businesses; and

RESOLVED, That the City Administrator be authorized to take all necessary administrative actions to implement this resolution.

RATING ACTION COMMENTARY

Fitch Affirms DTE Energy, DTE Electric Co. and DTE Gas Co.'s Ratings; Outlook Stable

Thu 21 Mar, 2024 - 9:31 AM ET

Fitch Ratings - New York - 21 Mar 2024: Fitch Ratings has affirmed DTE Energy Co.'s (DTE) Long-Term Issuer Default Rating (IDR) at 'BBB'. In addition, Fitch has affirmed the Long-Term IDRs of DTE Electric Company (DTEE) at 'A-' and DTE Gas Company (DTEG) at 'BBB+'. The Rating Outlooks for DTE, DTEE and DTEG are Stable.

Fitch projects funds from operations (FFO) leverage to remain largely stable for all three entities through 2026 despite significant capital expenditure plans at both utilities. Stable credit metrics are supported by a constructive regulatory environment in Michigan.

KEY RATING DRIVERS

DTE Energy

Stable Utility Business: Fitch believes Michigan's regulatory environment, overseen by the Michigan Public Service Commission (MPSC), remains constructive from a credit perspective. Fitch believes the last DTEE rate order issued in December 2023 is credit-supportive and reflects a constructive regulatory environment in Michigan. A supportive regulatory environment remains a key rating driver, as most of DTE's cash flow is derived from its two utilities. Non-regulated business contributes less than 10% of total earnings. Fitch does not expect RNG investments and other non-regulated investments to increase beyond 10% of DTE's total earnings.

Significant Utility-Focused Investments: DTE's current $25 billion capital program for 2024-2028 represents an approximately $2 billion increase compared with the 2023-2027 plan, driven by investment in cleaner generation. The plan also includes distribution, environmental compliance projects, gas generation, and pumped storage. Non-regulated investments, which represent about 5% of total capex, are focused on developing new renewable natural gas (RNG) and cogeneration projects.

Credit Metrics Support Ratings: Fitch projects that DTE's FFO leverage will remain in line with its ratings over the forecast period following near-term pressures from higher storm costs and unfavorable weather in 2023. DTE's FFO leverage was modestly elevated in 2023 at 5.9x, driven by unfavorable weather and above average storm activity and a lower than expected outcome of the 2022 DTE Electric rate case. The leverage is projected to improve and average 5.3x in 2024-2026 following DTEE' s 2023 rate case increase implementation. Fitch projects that DTE's parent debt will remain elevated at around 34%-35% of its total debt over the forecast period.

IRA Tailwinds: Fitch expects DTE's renewable plans will be supported by the extended and expanded tax incentives and introduction of tax credit transferability under the Inflation Reduction Act (IRA) passed in August 2022. Additionally, DTE does not project any impact from Alternate Minimum Tax (AMT) until it hits the $1 billion of pre-tax earnings threshold in 2025. Any potential negative cash impact should be mostly offset by accelerated depreciation and renewable tax credits.

DTE Vantage's RNG investments will also benefit from the tax credits and lower cost of construction. Fitch incorporates tax credit transferability estimated by the company in its leverage projections. Fitch assumes any changes in the ability to monetize tax credits at projected levels would result in DTE's financial plan adjustment supportive of credit ratings.

Parent/Subsidiary Linkage: There is parent subsidiary linkage between DTE and its rated subsidiaries. Fitch determines DTE's Standalone Credit Profile (SCP) based upon consolidated metrics. Fitch believes DTEE and DTEG have SCPs stronger than DTE. As such, Fitch has followed the stronger subsidiary path. Fitch places emphasis on DTEE's and DTEG's status as regulated entities. Legal ring fencing is porous given the general protections afforded by economic regulation. Access and control are also porous.

DTE centrally manages the treasury function for all of its entities and is the sole source of equity. However, each subsidiary issues its own short-term and long-term debt. Due to the aforementioned linkage considerations, Fitch limits the difference between DTE and its subsidiaries DTEE and DTEG to two notches.

DTE Electric

Supportive Regulatory Environment: Fitch views the regulatory environment for electric utilities in Michigan as mostly constructive from a credit perspective. The regulatory framework allows full pass-through of fuel costs and purchased power, forward-looking test years and a timely 10-month review period for general rate case resolution. DTEE's authorized ROE of 9.9% compares favorably with industry averages.

Increasing storm activity in Michigan and resultant power outages have attracted regulatory focus on reliability. In March 2023, the MPSC tightened performance standards for utilities, including enhancing outage credits and updating reliability standards. An MPSC led straw proposal for additional potential financial incentives and disincentives is also underway since August 2023.

Fitch does not expect a material negative outcome from the pending audit ordered by the MPSC to assess compliance with storm outages and safety regulations. In Fitch's view, the risk of reliability related performance-based penalties is manageable within DTEE's current credit profile. The final audit report is expected in summer 2024.

Rate Case Resolution: Fitch believes the rate order issued in December is credit-supportive and reflects a constructive regulatory environment in Michigan. The approved revenue requirement increase of $368 million is based on the 9.9% ROE and 50% equity ratio on a rate base of $22.15 billion. The MPSC also approved a two-year investment recovery mechanism for recovery of a $350 million investment in the distribution grid to improve reliability and resilience over 2024-2025. The increase in base rates is partially offset by a $300 million reduction in fuel costs, resulting in an average customer bill increase of about $2.50 per month.

DTEE filed its last rate case in February 2023, for a $619 million rate increase effective Dec. 1, 2023. DTEE requested an ROE of 10.25% based on a 50% equity ratio on a rate base of $22.6 billion. About 50% of the requested rate increase was related to the rate base growth and $102 million was related to the expected lower residential sales margins, reflecting the post pandemic hybrid work environment.

Residential sales declined about 3% in 2022 on a weather normalized basis and continued to decline in 2023 by another 2.1%, although remain above pre-pandemic levels. DTEE has indicated it plans to file a new rate case in March 2024. Fitch projects a constructive outcome of the filing, in-line with the last rate case.

Elevated Capex Driven by Decarbonization: DTEE plans to invest approximately $20 billion in 2024-2028, with $7 billion for clean generation and other projects, $9 billion for distribution infrastructure and $4 billion for base infrastructure. This is a $2 billion increase compared with the previous plan for 2023-2027. The increase is driven by additional investments in cleaner generation. The investments will result in FCF negative in the intermediate term. Fitch expects the capital program will be funded with internal cash flow, debt and equity support to maintain DTEE's balanced capital structure.

Fitch believes an upward revision in capex in future is possible given the increasing focus on reliability and the string of legislations passed in Michigan in 2023 that target 100% clean generation by 2040 in Midcontinent Independent System Operator (MISO). However, any concerns regarding the large capex plan are mitigated by the MPSC's constructive ratemaking policies and alignment of planned capex with state policy. The new energy legislation provides expanded incentives for energy efficiency and improved economics for PPAs, which are beneficial in Fitch's view.

IRP's Decarbonization Path: DTEE is retiring coal-fired generation and replacing it with a mix of natural gas and renewable resources to meet its environmental targets. The 2022 integrated resource plan (IRP), approved in 2023, aims for a carbon dioxide (CO_2) emissions reduction of 85% in 2032, 90% by 2040 and net-zero emissions by 2050. At DTEE, 15.4 gigawatts (GW) of renewables and 1.8GW of storage are expected to be added to the current 3GW and 1.1GW, respectively by 2042.

Fitch anticipates DTE's FFO leverage to average 5.3x in 2024-2026, in line with CMS's, and modestly worse than DEI. Fitch projects that DEI will average above 5.0x as it funds a large offshore wind project in the next couple of years.

DTEE

DTEE compares favorably with regulated single-state peers Consumers Energy Company (A-/Stable) and Northern States Power Company-Wisconsin (NSP-W; A-/Stable). All three operate in supportive regulatory environments with favorable recovery mechanisms. DTEE and Consumers operate in Michigan and are similarly sized, while NSP-W is smaller and based in Wisconsin.

However, Consumers also operates a gas utility, while DTE and NSP are both electric utilities. DTEE's financial profile compares favorably with Consumers' and NSP-W's. Fitch forecasts FFO leverage to average 3.8x at DTEE through 2026, modestly better than 4.1x at Consumers and 3.8x-4.0x expected at NSP-W over the forecast period.

DTEG

DTEG's business risk profile compares well with local distribution peers Southwest Gas Corporation (SWG; BBB+/Stable) and Wisconsin Gas LLC (A-/Stable). All three risk profiles benefit from low-risk businesses, supportive regulatory environments and favorable recovery mechanisms. SWG benefits from regulatory diversity in three states and above-average customer growth.

DTE Gas' financial profile is slightly weaker than peer Wisconsin Gas, but is modestly stronger than SWG's. Fitch forecasts DTE Gas' FFO leverage will remain approximately 4.2x-4.5x in 2024-2026, better than SWG's projected leverage of approximately 5.0x for 2024. Wisconsin Gas has a more favorable financial profile, with forecast leverage metrics of 3.7x projected over 2024-2027.

KEY ASSUMPTIONS

--Constructive regulatory environment in Michigan with ROEs for DTEE and DTEG in line with the currently approved going forward;

--No material equity issuances;

--Securitization debt and revenues are excluded from the FFO and debt calculations.

--DTE Vantage business growing earnings over $15 million annually and remaining below 10% EBITDA target over the forecast period;

--Capital structure commensurate with regulatory structure.

RATING SENSITIVITIES

DTE

Factors that could, individually or collectively, lead to positive rating action/upgrade:

--While not anticipated at this time, given the sizable capital program and elevated leverage, sustained improvement in FFO leverage of 4.8x or lower through the forecast period.

Factors that could, individually or collectively, lead to negative rating action/downgrade:

--A significant deviation from the current business risk with the regulated businesses comprising less than 90% of consolidated cash flow due to growth in the non-utility businesses;

--An adverse change in Michigan's regulatory environment;

--Sustained weakening in FFO leverage of 5.8x or higher through the forecast period;

--Sustained increase in Parent Level debt beyond currently projected 35% of total.

DTEE

Factors that could, individually or collectively, lead to positive rating action/upgrade:

--Sustained FFO leverage of 3.5x or better.

Factors that could, individually or collectively, lead to negative rating action/downgrade:

--A notch downgrade at the parent DTE;

--An adverse change in Michigan's regulatory environment;

--Sustained FFO leverage greater than 4.5x.

DTEG

Factors that could, individually or collectively, lead to positive rating action/upgrade:

--Sustained FFO leverage at or below 4.0x.

Factors that could, individually or collectively, lead to negative rating action/downgrade:

--An unexpected change in the regulatory environment that limits the utility's ability to recover cost of capital investments in a timely manner;

--Sustained FFO leverage greater than 5.0x.

LIQUIDITY AND DEBT STRUCTURE

Adequate Liquidity: DTE had around $1.8 billion of available liquidity as of Dec. 31, 2023, consisting of cash and amounts available under revolving credit facilities and letter of credit facilities. DTE's revolving credit facilities expire in 2028.

The revolving credit facilities are $1.5 billion at DTE, $800 million at DTEE and $300 million at DTEG. DTE, DTEE and DTEG were compliant with consolidated debt/capitalization of 63%, 51% and 48%, respectively, as defined under the credit agreement, as of Dec. 31, 2023. Debt maturities remain manageable given the history of successful refinancing and Fitch expects DTE to have continued access to the capital markets.

Fitch assigns 50% equity credit to $883 million junior subordinated debentures issued by DTE.

ISSUER PROFILE

DTE Energy Co. (DTE) is the parent holding company of DTE Electric (DTEE) and DTE Gas (DTEG), regulated electric and natural gas utilities that provide electric and natural gas sales, distribution, and storage services throughout Michigan. DTE also owns non-utility operations consisting of industrial energy projects and energy trading.

REFERENCES FOR SUBSTANTIALLY MATERIAL SOURCE CITED AS KEY DRIVER OF RATING

The principal sources of information used in the analysis are described in the Applicable Criteria.

ESG CONSIDERATIONS

The highest level of ESG credit relevance is a score of '3', unless otherwise disclosed in this section. A score of '3' means ESG issues are credit-neutral or have only a minimal credit impact on the entity, either due to their nature or the way in which they are being managed by the entity. Fitch's ESG Relevance Scores are not inputs in the rating process; they are an observation on the relevance and materiality of ESG factors in the rating decision. For more information on Fitch's ESG Relevance Scores, visit https://www.fitchratings.com/topics/esg/products#esg-relevance-scores.

RATING ACTIONS

ENTITY / DEBT	RATING			PRIOR
DTE Gas Company	LT IDR	BBB+	Affirmed	BBB+
	ST IDR	F2	Affirmed	F2
senior secured	LT	A	Affirmed	A
senior unsecured	ST	F2	Affirmed	F2
DTE Electric Company	LT IDR	A-	Affirmed	A-
	ST IDR	F2	Affirmed	F2
senior secured	LT	A+	Affirmed	A+

PREVIOUS Page 1 of 2 10 rows NEXT

VIEW ADDITIONAL RATING DETAILS

Additional information is available on www.fitchratings.com

PARTICIPATION STATUS

RELATED REGIONS

United States

ENTITIES

DTE Energy Company
DTE Electric Company
DTE Gas Company

ISSUER CONTENT

4Q23 North American Utilities Earnings Wrap Up Report
Fitch Rates DTE Electric Company's 2024 Series B and C Mortgage Bonds 'A+'
Fitch Rates DTE Energy's 2024 Series A Senior Unsecured Notes 'BBB'
DTE Electric Company
DTE Gas Company
Deteriorating Outlook for North American Utilities, Power & Gas in 2024
North American Utilities, Power & Gas Outlook 2024
North American Utilities, Power & Gas — Relative

RECOMMENDED CONTENT

Global Contagion Risk Growing from Rising CRE Losses, Led by Office
Global Contagion Risk Growing from Rising CRE Delinquencies and Losses
Sacramento Municipal Utility District, California
Barings BDC, Inc. - Ratings Navigator
Hercules Capital, Inc. - Ratings Navigator
U.S. Leveraged Finance and CLO Weekly

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 1398

BEFORE THE
MICHIGAN PUBLIC SERVICE COMMISSION

In the matter of the application of	)	
DTE GAS COMPANY for authority	)	
to increase its rates, amend its rate	)	
schedules and rules governing the	)	Case No. U-20940
distribution and supply of natural gas,	)	
and for miscellaneous accounting authority	)	

REVISED DIRECT TESTIMONY

OF

DR. BENTE VILLADSEN

LIST OF TOPICS ADDRESSED:

COST OF COMMON EQUITY CAPITAL

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BEFORE THE
MICHIGAN PUBLIC SERVICE COMMISSION

DTE GAS COMPANY	))))	**CASE NO. U-20940**

REVISED DIRECT TESTIMONY OF DR. BENTE VILLADSEN

I. INTRODUCTION AND PURPOSE

Q1. Please state your name, occupation and business address for the record.

A1. My name is Bente Villadsen (she/her/hers) and I am a Principal of The Brattle Group, whose business address is One Beacon Street, Suite 2600, Boston, Massachusetts, 02108.

Q2. Briefly describe your present responsibilities at The Brattle Group.

A2. As a Principal, it is my responsibility to research and direct research into the utility industry as it pertains to cost of capital and related issues. It is also my responsibility to consult on utility industry issues and testify on utility industry matters. Among my other duties is the supervision and training of staff and ensuring that work products are of high quality and accurate.

Q3. Briefly describe your educational and professional qualifications.

A3. I have more than 20 years of experience working with regulated utilities on cost of capital and related matters. My practice focuses on cost of capital, regulatory finance, and accounting issues. I am the co-author of the text, "Risk and Return for Regulated Industries"[1] and a frequent speaker on regulatory finance at conferences and webinars. I have testified or filed expert reports on cost of capital in Alaska, Arizona, California,

[1] Bente Villadsen, Michael J. Vilbert, Dan Harris, A. Lawrence Kolbe, "Risk and Return for Regulated Industries," Academic Press, 2017.

Illinois, Michigan,[2] New Mexico, New York, Oregon, and Washington, as well as before the Bonneville Power Administration, Federal Energy Regulatory Commission ("FERC"), the Surface Transportation Board, the Alberta Utilities Commission, and the Ontario Energy Board. I have provided white papers on cost of capital to the British Columbia Utilities Commission, the Canadian Transportation Agency as well as to European and Australian regulators on cost of capital. I have testified or filed testimony on regulatory accounting issues before the FERC, the Regulatory Commission of Alaska, the Michigan Public Service Commission ("Commission"), the Texas Public Utility Commission as well as in international and U.S. arbitrations and regularly provide advice to utilities on regulatory matters as well as risk management.

I hold a Ph.D. from Yale University and a BS/MS from University of Aarhus, Denmark. Appendix A contains more information on my professional qualifications as well as a list of my prior testimonies and publications.

Q4. What is the purpose of your testimony in this proceeding?

A4. DTE Gas Company ("DTE Gas" or the "Company") has asked me to estimate the cost of equity that the Commission should allow DTE Gas an opportunity to earn on the equity-financed portion of its regulated utility rate base. I also consider the relative risk of the Company and its proposed regulatory capital structure ratio to arrive at my recommendation for the allowed Return on Equity ("ROE").

Q5. Are you sponsoring any exhibits?

A5. Yes. I am sponsoring Exhibit D5.1 – D5.18, which contains the details of my analysis and supporting tables

Schedule	Description
D5.1	Table of Contents
D5.2	Classification of Companies by Assets

[2] Previously I filed testimony on cost of equity before the Michigan Public Service Commission ("Commission") in U-20561.

D5.3	Market Value of the Sample Companies
D5.4	Capital Structure Summary of the Samples
D5.5	Estimated Growth Rates of the Samples
D5.6	DCF Cost of Equity of the Samples
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D5.16	Risk Premiums Determined by Relationship Between Authorized ROEs and Long-term Treasury Bond Rates
D5.17	Estimation of S&P 500 Cost of Equity Using FERC Methodology
D5.18	DTE and Proxy Group's Capital Intensity

Q6. Was this material prepared by you or under your supervision?

A6. Yes. It was.

II. SUMMARY OF CONCLUSIONS

Q7. Please summarize your recommendation for DTE Gas' ROE.

A7. I recommend that DTE Gas be allowed to earn a 10.25 percent rate of return on the equity portion of its regulated rate base including the requested 51.9 percent equity. This recommendation is based on 1) my implementations of standard cost of capital estimation models including two versions each of the Discounted Cash Flow ("DCF") model and Capital Asset Pricing Model ("CAPM"), as well as an implied risk premium analysis, and 2) an analysis of DTE Gas' risks.

First, my analysis of standard cost capital estimation models results using the requested 51.9 percent equity are summarized below in Figure 1. In the current environment, where there has been considerable consolidation in the natural gas industry and considerations of switching from gas to other fuels, I find it beneficial to add a sample of highly regulated water utilities, which similar to natural gas utilities serve a mix of residential, commercial, and industrial customers through a regulated set of pipelines. The full sample consists of the natural gas and water utility sample.

The gas sample results range from 8.6 to 11.1 percent with the average of the methods ranging from 9.2 to 10.2 percent. The range for the full sample is wider at 8.4 to 11.8 percent with the average of the methods ranging from about 9 to 10.6 percent. For completeness, the water sample range is even wider at about 8.4 to 12.8 percent.

Looking to the Commission Staff's recent reliance on the historical and forward-looking CAPM, constant-growth DCF and risk premium, the high end of the sample is most comparable. For that reason and because DTE Gas as discussed below face higher risk than the average gas LDC, the most comparable figure prior to any DTE Gas specific adders is 10.2 percent for the natural gas utility sample and 10.6 percent for the full sample.

Based on my consideration of the model results in the context of Michigan and DTE Gas' specific risk, I believe it is appropriate to place DTE Gas' allowed return at or near the upper end of the range that is reasonable. Using DTE Gas' requested 51.9 percent equity, I find a range of cost of equity of 9.25 to 10.25 percent for a gas utility proxy group (and a wider range of about 9 to 10.5 percent for the full sample). The corresponding reasonable ranges are further discussed in Section V below.

Figure 1
Summary of Reasonable Ranges of Estimates at 51.9% Equity[3]

	Gas Sample		Full Sample	
	Low	High	Low	High
CAPM	9.4%	9.9%	9.2%	9.8%
ECAPM	9.4%	10.1%	9.3%	10.2%
Multi-Stage DCF	8.6%		8.4%	
Single-Stage DCF		11.1%		11.8%
Risk Premium	9.4%	9.6%	na	na
Range	8.6 - 9.4%	9.6 - 11.1%	8.4- 9.3%	9.8 - 11.8%
Average, all methods	9.2%	10.2%	9.0%	10.6%

Second and looking to DTE Gas' specific risks as well as risks associated with its service territory, I find an appropriate ROE for DTE to be higher than that of the average gas utility and recommend DTE Gas be allowed a ROE of 10.25 percent. As discussed in Section VI below, the Company face higher than average risk as DTE Gas

- has high level of capital expenditure,
- has a high capital intensity meaning revenue to Property Plant & Equipment is low, and
- operate in a service territory with challenging economic conditions.

Because of the high level of company-specific risks, I recommend that DTE Gas be allowed a ROE of 10.25 percent, which is at the high end of the gas sample but well below the high end of the full sample

Q8. What impact do the current economic and financial conditions due to the ongoing COVID-19 pandemic have on the determination of DTE Gas' allowed ROE?

A8. The current determination of DTE Gas' allowed ROE takes place during uncertain economic and financial conditions due to the ongoing impacts of the COVID-19

[3] My analysis was conducted as of November 30, 2020.

pandemic, which has led to unprecedented low U.S. Treasury bond yields, substantial volatility in stock prices, and uncertainty on how long the recovery period will be.4 Measures of the premium that investors require over and above the risk-free rate to invest in equities and bonds have increased as well. Going forward, the length and extent of the impacts of the pandemic are unknown and will depend on how measures impacting commerce stay in place and when a vaccine becomes widely available.[5]

In light of this uncertainty, it is important to assure investors that the allowed ROE and capital structure is such that DTE Gas can continue to raise the needed capital to continue to provide safe, adequate and reliable service to its customers while also providing a return that is comparable to those that investors expect.

In November 2019, DTE Gas filed its most recent rate case in U-20642 and in August 2020, the Commission approved a settlement, which authorized a 9.9% ROE on 52 percent common equity.[6] Since the filing of U-20642, economic and financial markets have been dramatically impacted by COVID-19 resulting in substantial increases in the level of volatility and premiums required by investors to hold risky assets as compared to the pre-COVID-19 time frame. Specifically, in November 2019, the Chicago Board of Options Exchange's CBOE Volatility Index ("VIX") averaged 12.5.[7] During November 2020 and similarly during January 2021, the VIX has ranged from a low of 20.7 to a high of 37.1. This level followed an all-time high of 82.69 in March 2020. Throughout 2020, the VIX has averaged approximately 30, compared to its long term average of 19.4.[8] Similarly, Bloomberg's estimation of the market risk premium ("MRP") was 6.7% in November 2019, then reached a high of 9.8% in March 2020, stood

[4] I acknowledge that all of society has been impacted to a degree not seen in decades, but I focus my discussion on the financial and economic impacts in this report.

[5] The U.S. started COVID-19 vaccinations on December 14, 2020.

[6] Michigan Public Service Commission, "Order Approving Settlement Agreement," Case No. U-20642, Appendix A, August 20, 2020, Appendix p. 2. ("Commission U-20642 Order")

[7] Villadsen Direct Testimony on behalf of DTE Gas in U-20642 relied on August 2019 data for the VIX (18.8).

[8] Bloomberg as of November 25, 2020. As of January 25, 2021, the VIX was 23.2 according to the CBOE before increasing to 36.33 on January 29, 2021. (https://www.cboe.com/tradable_products/vix/)

at 7.85% at the time of estimation (11/30/2020), but was up to 8.89 percent as of 1/29/2021.[9] Lastly, flight-to-quality and monetary policy has put downward pressure on U.S. Treasury bond yields – whereby10 Year U.S. Treasury yields were at 1.8% in November 2019 before reaching record lows in July 2020 (0.53%). While the government bond yield has since increased, it remains unusually low, but is forecasted to increase in 2021, 2022, 2023 and subsequent years.[10] Simply put, the financial markets are in turmoil, which has had negative impacts for investors with regard to volatility and risk. As a result, utilities systematic risk as measured by beta has increased. Therefore, it is important to look to stability in investors' allowed returns and recognize that the currently low Treasury yields are not reflective of a low cost of equity. Specifically, the data points to a return on equity that reflects a higher premium above the risk-free rate (systematic risk and market risk premium) today than at the time of DTE Gas' last rate case.[11] Thus, if we assume that a ROE of 9.9% and an equity percentage of 52% was appropriate in U-20642, then the appropriate ROE and capital structure today is higher. I provide more discussion of the current capital market conditions and their impact on the ROE for DTE Gas in Section IV below.

Q9. Please explain why a ROE of 10.25% in conjunction with 51.9% equity is appropriate today when DTE Gas' most recent order determined a ROE of 9.9% on 52% equity.[12]

A9. As I explain below, financial markets have become substantially more uncertain than they were when DTE Gas had its last rate case. Specifically, uncertainty in the market has led investors to require a higher return on assets that are not risk free. Specifically, the risk premium investors require to invest in equity instead of risk-free government

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9 Id. as of February 2.

10 Blue Chip Economic Indicators expect the 10-year government bond yield to be 1.4% in 2022 and 1.7% in 2023.

11 For example, I found an average Value Line beta for natural gas utilities of 0.66 for U-20642, but as of today, I find that the average Value Line beta for natural gas utilities is 0.84 for a non-trivial increase in the premium investors require to hold natural gas utilities' stock.

12 Commission U-20642 Order.

bonds has increased. I explain this further in section III below. Additionally, the relative risk of natural gas utilities has increased,[13] so that the return investors require to invest in natural gas utilities has increased relative to that required in other industries. I elaborate on this point in Section V below. Lastly, DTE Gas is requesting an equity percentage of 51.9%, which is lower than the 52% equity granted in the U-20642 Order. As the cost of equity increases when the equity percentage is reduced, the lower equity percentage gives rise to an, all else equal, higher return on equity.[14] Put differently, the return on equity (10.25 percent) goes hand in hand with the equity percentage (51.9 percent).

Q10. Do you have any other preliminary comments?

A10. Yes. Several equity and credit analysts have noted the constructive regulatory environment in Michigan as a reason that utilities in Michigan have solid access to capital. The analysts emphasize the stability of the regulatory regime as being beneficial to both customers and the utility.[15] I concur.

Q11. How is the remainder of your testimony organized?

A11. Section III formally defines the cost of capital and explains the techniques for estimating it in the context of utility rate regulation. Section IV discusses conditions and trends in capital markets and their impact on the cost of capital. Section V explains my analyses and presents the results. Finally, Section VI discusses DTE Gas' business risk characteristics, unique risks facing Michigan-based gas utilities, and other company-specific circumstances relevant to my recommended allowed ROE. Finally, Section VII concludes with a summary of my recommendations.

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13 As measured by the systematic risk, beta.

14 This is discussed further in the Direct Testimony of Company witness, Mr. ~~Edward Solomon~~ W. Scott Bennett's.

15 Goldman Sachs, "Americas Utilities: A focus on stability and incentives – a conversation with the MI PSC," September 22, 2020, p. 1; Scotiabank, "DTE Energy Company," September 24, 2020, p. 1; Moody's Investor Service, "DTE Gas Company," July 23, 2020, p. 2.

III. COST OF CAPITAL PRINCIPLES AND APPROACH

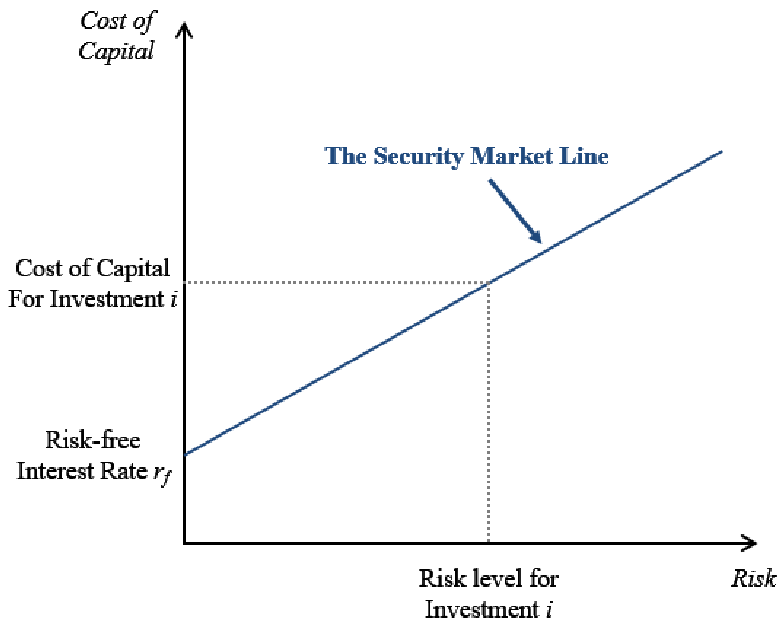
A. RISK AND THE COST OF CAPITAL

Q12. How is the "Cost of Capital" defined?

A12. The cost of capital is defined as the expected rate of return in capital markets on alternative investments of equivalent risk. Put differently, it is the rate of return investors require based on the risk-return alternatives available in competitive capital markets. The cost of capital is a type of opportunity cost: it represents the rate of return that investors could expect to earn elsewhere without bearing more risk. "Expected" is used in the statistical sense: the mean of the distribution of possible outcomes. The terms "expect" and "expected," as in the definition of the cost of capital itself, refer to the probability-weighted average over all possible outcomes.

The definition of the cost of capital recognizes a tradeoff between risk and return that can be represented by the "security market risk-return line" or "Security Market Line" for short. This line is depicted in Figure 2 below. The higher the risk, the higher the cost of capital required.

Figure 2
The Security Market Line



Q13. What factors contribute to systematic risk for an equity investment?

A13. When estimating the cost of equity for a given asset or business venture, two categories of risk are important. The first is business risk, which is the degree to which the cash flows generated by the business (and its assets) vary in response to moves in the broader market. In context of the CAPM, business risk can be quantified in terms of an "assets beta" or "unlevered beta." For a company with an assets beta of 1, the value of its enterprise will increase (decrease) by 1% for a 1% increase (decline) in the market index.

The second category of risk relevant for an equity investment depends on how the business enterprise is financed and is called financial risk. Section III.B below explains how financial risk affects the systematic risk of equity.

Q14. What are the guiding standards that define a just and reasonable allowed rate of return on rate-regulated utility investments?

A14. The seminal guidance on this topic was provided by the U.S. Supreme Court in the *Hope* and *Bluefield* cases,[16] which found that:

- The return to the equity owner should be commensurate with returns on investments in other enterprises having corresponding risks;[17]
- The return should be reasonably sufficient to assure confidence in the financial soundness of the utility; and
- The return should be adequate, under efficient and economical management for the utility to maintain and support its credit and enable it to raise the money necessary for the proper discharge of its public duties.[18]

Q15. How does the standard for just and reasonable rate of return relate to the cost of capital?

A15. The first component of the *Hope* and *Bluefield* standard, as articulated above, is directly aligned with the financial concept of the opportunity cost of capital.[19] The cost of capital is the rate of return investors can expect to earn in capital markets on alternative investments of equivalent risk.[20]

By investing in a regulated utility asset, investors are tying up some capital in that investment, thereby foregoing alternative investment opportunities. Hence, the investors

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[16] Bluefield Water Works & Improvement Co. v. Public Service Com’n of West Virginia, 262 U.S. 679 (1923) (“Bluefield”), and Federal Power Com’n v. Hope Natural Gas Co., 320 U.S. 591 (1944) (“Hope”).

[17] Hope, 320 U.S. at 603.

[18] Bluefield, 262 U.S. at 680.

[19] A formal link between the opportunity cost of capital as defined by financial economics and the proper expected rate of return for utilities was developed by Stewart C. Myers, “Application of Finance Theory to Public Utility Rate Cases,” *Bell Journal of Economics & Management Science* 3:58-97 (1972).

[20] The opportunity cost of capital is also referred to as simply the “cost of capital,” and can be equivalently described in terms of the “required return” needed to attract investment in a particular security or other asset (i.e., the level of expected return at which investors will find that asset at least as attractive as an alternative investment).

are incurring an "opportunity cost" equal to the returns available on those alternative investments. The allowed return on equity needs to be at least as high as the expected return offered by alternative investments of equivalent risk or investors will choose these alternatives instead. Otherwise the utility's ability to raise capital and fund its operations will be negatively impacted. This is a fundamental concept in cost of capital proceedings for regulated utilities such as DTE Gas.

Q16. Please summarize how you considered risk when estimating the cost of capital.

A16. To evaluate comparable business risk, I looked to a proxy group of regulated natural gas and water utilities. The natural gas and water utilities I consider have a high proportion of regulated assets and revenue with the majority having more than 80% of assets subject to regulation. Additionally, they all have a network of assets that are used to serve end customers and they are capital intensive (meaning that each dollar in revenue requires substantial investment in fixed assets). Further, (as explained in Section III.B below) I analyzed and adjusted for differences in financial risk due to different levels of financial leverage among the proxy companies and between the capital structures of the proxy companies and the regulatory capital structure that will be applied to DTE Gas for ratemaking purposes. To determine where in the estimated range DTE Gas' ROE reasonably falls, I compared the business risk of DTE Gas to that of the proxy group companies.

B. FINANCIAL RISK AND THE COST OF EQUITY

Q17. How does capital structure affect the cost of equity?

A17. Debtholders in a company have a fixed claim on the assets of the company and are paid prior to the company's owners (equity holders) who hold the inherently variable residual claim on the company's operating cash flows. Because equity holders only receive the profit that is left over after the fixed debt payments are made, higher degrees of debt in the capital structure amplify the variability in the expected rate of return earned by equity-holders. This phenomenon of debt resulting in financial leverage for equity holders means that, all else equal, a greater proportion of debt in the capital structure increases risk for equity holders, causing them to require a higher rate of return on their equity investment, even for an equivalent level of underlying business risk.

Q18. How do differences in financial leverage affect the estimation of the cost of equity?

A18. The CAPM and DCF models rely on market data to estimate the cost of equity for the proxy companies, so the results reflect the value of the capital that investors hold during the estimation period (market values).

The authorized ROE is applied to the regulatory equity portion of DTE Gas' rate base. Because the cost of equity is measured using a group of proxy companies, it may well be the case that these companies finance their operations with a different debt and equity proportion than the proportion the Commission allows in DTE Gas' rate base. Specifically, the CAPM and DCF models measure the cost of equity using market data and consequently are measures of the cost of equity using the proportion of debt and equity that is inherent in that data. Therefore, I consider the impact of any difference between the financial risk inherent in those cost of equity estimates and the capital structure used to determine DTE Gas' required return on equity.

Differences in financial risk due to the different degree of financial leverage in DTE Gas' regulatory capital structure compared to the capital structures of the proxy companies mean that the equity betas measured for the proxy companies must be adjusted before they can be applied in determining DTE Gas' CAPM return on equity. Similarly, the cost of equity measured by applying the DCF models to the proxy companies' market data requires adjustment if it is to serve as an estimate of the appropriate allowed ROE for DTE Gas at the regulatory capital structure the Commission grants.

Importantly, taking differences in financial leverage into account does not change the value of the rate base. Rather, it acknowledges the fact that a higher degree of financial leverage in the regulatory capital structure imposes a higher degree of financial risk for an equity investment in DTE Gas' rate base than is experienced by equity investors in the market-traded stock of the less leveraged proxy companies.

Q19. How specifically do you consider financial risk in your analysis of the cost of equity using market data for the proxy group companies?

A19. The impact of financial risk is taken into account in an analysis of cost of equity using market-based models such as the DCF and CAPM in several manners.[21] One way is to determine the after-tax weighted-average cost of capital ("WACC") for the proxy group using the equity and debt percentages as the weight assigned to the cost of equity and debt. Financial theory holds that for a given level of business risk, the WACC is constant over a broad set of capital structures, i.e., the WACC is the same at, for example, 55% and 45% equity, as the cost of equity increases as the percentage of equity decreases. I estimate the WACC for each utility in the proxy group based on that utility's capital structure. I then evaluate the average WACC across the proxy group. Once the weighted cost of capital is determined for the proxy group, I can determine the cost of equity that is required at DTE Gas' capital structure. This approach assumes that the after-tax WACC is constant for a range that spans the capital structures used to estimate the cost of equity and the regulatory capital structure.

A second approach was developed by Professor Hamada[22] who estimated the cost of equity using the CAPM and made comparisons between companies with different capital structure using beta. Specifically, under the Hamada approach, I use the estimated beta to calculate what beta would be associated with a 100 percent equity financed firm to obtain a so-called all-equity or assets beta and then re-lever the beta to determine the beta associated with the regulatory capital structure. This requires an estimate of the systematic risk associated with debt (*i.e.*, the debt beta), which is usually quite small. In

[21] The impact of financial leverage on the risk premium model needs to be considered separately as it uses regulatory data rather than market data, meaning that differences in regulatory capital structures are relevant for this model.

[22] Distinguished professor emeritus of finance and former dean of the University of Chicago's Booth School of Business. Professor Hamada is credited for developing a method to determine the cost of equity for a company with a different capital structure than that of the comparable companies. His research allows us to compare the cost of equity for companies that have different amounts of equity on an apples-to-apples basis.

Appendix B, I set forth additional technical details regarding the methods that can be used to account for financial risk when estimating the cost of capital.

Q20. Can you provide a numerical illustration of how the cost of equity changes, all else being equal, when the degree of leverage changes?

A20. Yes. I constructed a simple example below where only the leverage of a company varies. I assumed the return on equity is 11.00 percent at a 50 percent equity capital structure and determine the return on equity that would result in the same overall return if the percentage of equity in the capital structure were reduced to 45 percent.

Figure 3
Illustration of Impact of Financial Risk on ROE

		Company A (50% Equity)	Company B (45% Equity)
Rate Base	[a]	$1,000	$1,000
Equity	[b]	$500	$450
Debt	[c]	$500	$550
Total Cost of Capital (8%)	[d] = [a] × 8%	$80.0	$80.0
Cost of Debt (5%)	[e] = [c] × 5%	$25.0	$27.5
Equity Return	[f] = [d] - [e]	$55.0	$52.5
Rate of Return on Equity (ROE)	**[g] = [f] / [b]**	**11.00%**	**11.67%**

Figure 3, above, illustrates how financial risk[23] affects returns and the ROE. The overall return remains the same for Company A and B at $80. However, Company B with the lower equity share and higher financial leverage must earn a higher percentage ROE in order to maintain the same overall return. This higher percentage allowed ROE represents the increased risk to equity investors caused by the higher degree of leverage.

The principle illustrated in Figure 3 is an example of the adjustments I performed to account for differences in financial risk when conducting estimates of the cost of equity applicable to DTE Gas. This is important because it implies that if an equity percentage

[23] Financial risk is risk that a company has due to its capital structure; specifically the higher a company's debt, the larger the financial risk.

lower than the relied upon 51.9 percent is allowed, then DTE Gas' cost of equity is higher than what I estimate here.

C. APPROACH TO ESTIMATING THE COST OF EQUITY

Q21. Please describe your approach for determining the cost of equity for DTE Gas.

A21. As stated above, the standard for establishing an appropriate rate of return on equity requires that a regulated utility be allowed to earn a return equivalent to what an investor could expect to earn on an alternative investment of equivalent risk. Therefore, my approach to estimating the cost of equity for DTE Gas focuses on measuring the expected returns required by investors to invest in companies that face business and financial risks comparable to those faced by DTE Gas. Because certain of the models require market data, my consideration of comparable companies is restricted to those that have publicly traded stock. To this end, I have selected two proxy groups consisting of publicly traded companies. The first proxy group consists of companies providing primarily regulated natural gas distribution services and the second proxy group consists of highly regulated companies in the water utility industry.[24] I consider both the natural gas distribution sample and the full sample, which consist of the natural gas utilities **and** the water utilities, when deriving estimates of the representative cost of equity according to standard financial models including two versions of the CAPM—the traditional version and a version that takes into account the empirical observation that the security market line in Figure 2 is too steep relative to what is observed using market data. I also implement a single-stage and a multi-stage version of the DCF.

[24] I consider both a natural gas distribution utility sample (because DTE Gas is a natural gas distribution utility) and a sample including water utilities. The latter sample has the advantage of being highly regulated and, like natural gas distribution utilities, engaged in distributing a commodity through an extensive network of pipes. Further, in most state investor-owned water utilities are regulated by the same entity that regulates natural gas distribution utilities. Lastly, the number of companies in the natural gas distribution industry is limited due to mergers and acquisitions, so the water utility industry serves to increase the number of available, fully regulated utilities that serve customers through a network of pipes.

Lastly, I perform an analysis of historical allowed ROEs for natural gas LDCs in relation to prevailing risk-free interest rates at the time the ROE was authorized and use the implied allowed risk-premium relationship to estimate a utility cost of equity consistent with current economic conditions. The results of this implied risk premium analysis (sometimes referred to herein as the "Risk Premium" model) are an additional consideration that informs my recommendation and serves as a check on the reasonableness of my market-based results.

Q22. How does your approach and the models you employ compare to what the Commission has considered in prior DTE Gas proceedings?

A22. The Commission has in past decisions considered the DCF, CAPM, and Risk Premium models, as do I. Additionally, the Commission has in the past recognized that "some consideration should be given to current market volatility and uncertainty."[25] The Commission also stated that it will "monitor a variety of market factors in future applications to gauge whether volatility and uncertainty continue to be prevalent issues that merit more consideration in setting the ROE."[26] In its recent order regarding Consumer Energy, the Commission maintained its position stating that

> *It is also important to consider how extreme market reactions to global events, as have occurred in the recent past, may impact how easily capital will be able to be accessed during the future test period should an unforeseen market shock occur. The Commission will continue to monitor a variety of market factors in future rate cases to gauge whether volatility and uncertainty continue to be prevalent issues that merit more consideration in setting the ROE.* [27]

Given the level of uncertainty in the US economy, it is important that the Commission continues to consider the impact on ROE and capital structure.

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[25] Michigan Public Service Commission, Order for Case No. U-18999, September 13, 2018, p. 53.

[26] Michigan Public Service Commission, Order for Case No. U-20162, May 2, 2019, pp. 67-68.

[27] Commission Order in U-20697, pp. 165-166.

Q23. Have other utility regulatory bodies acknowledged the importance of relying upon multiple models?

A23. Yes. Notably FERC, which regulates electric transmission operations, recently issued an order proposing to rely explicitly on multiple models in its determination of just and reasonable ROEs for transmission owners.[28] In FERC's most recent (Order 569-A), the FERC relies on versions of the DCF and CAPM as well as the implied Risk Premium method. These recent FERC ROE Orders represents a substantial change of FERC's historical practice of relying on only a single model—the DCF—to set allowed ROEs. In it, FERC explicitly recognizes that different models offer complementary views of investor requirements and market expectations and that it is necessary to evaluate and consider all such evidence.

Q24. What reasons did FERC give for revising its approach to consider multiple models rather than only the DCF?

A24. In the FERC Coakley Order (October 2018), FERC stated its concern that compared to when it originally adopted the DCF model as its only focus of consideration for determining utility ROEs, "the DCF methodology may no longer singularly reflect how investors make their decisions," since "investors have increasingly used a diverse set of data sources and models to inform their investment decisions." The FERC Coakley Order also lays out other "difficulties with sole reliance on the DCF methodology," including that the single model's results appear at times to diverge from its underlying principles and the real world experience of capital market participants, and that the results sometimes move differently from the results of other models on which those market participants may rely to inform their investment decisions. Ultimately, FERC views its

[28] See Coakley v. Bangor Hydro-Electric Co., 165 FERC ¶ 61,030 (October 2018)("Coakley Order") wherein FERC switched from relying on the DCF to relying on four cost of equity estimation methodologies (DCF, CAPM, Implied Risk Premium, and Expected Earnings). See also FERC Order 569-A, Docket No. EL14-12-004, May 21, 2020 and FERC Order 569-B, Docket No. EL14-12-004, November 19, 2020, which confirmed Order 569-A.

proposal to rely on multiple models as a way to avoid this "model risk" and summarizes its rationale as follows.

> In relying on a broader range of record evidence to estimate [New England Transmission Owners'] cost of equity, we ensure that our chosen ROE is based on substantial evidence and bring our methodology into closer alignment with how investors inform their investment decisions.[29]

In FERC's most recent Order 569-A, the Commission affirmed this view stating, "We continue to find that ROE determinations should consider multiple models, both to capture the variety of models used by investors and to mitigate model risk."[30] FERC's assessment and reasoning in this regard is very much in line with the principles that guide my own decision to inform my analysis based on the results of multiple complementary analyses.

IV. CAPITAL MARKET CONDITIONS AND THE COST OF CAPITAL

Q25. What do you cover in this section?

A25. In this section, I address recent changes in capital market conditions, the increased volatility in equity and debt markets, and how these factors affect the cost of equity and its estimation. Specifically, I address (i) interest rate developments; (ii) recent changes in utility credit spreads; and (iii) investors perception of the market risk premium.

Q26. Why do you discuss capital market conditions in a testimony aimed at determining DTE Gas' ROE?

A26. Capital market conditions are important to cost of equity estimation methodologies and can affect the inputs to the cost of equity models. Inputs to the DCF models are affected by the economy in general as economic growth will affect growth rates and utility stock

[29] FERC Coakley Order, p. 15.

[30] FERC Order 569-A, p. 25.

prices. Consequently, the capital market developments affect the growth rates, dividend yield, and the assessment of estimates' reasonableness.

Furthermore, the risk-free rate is an input to the risk premium model and CAPM, so that recent and expected developments in government bond yields are important to assess the validity of any measure of the risk-free rate. Similarly, the Market Risk Premium ("MRP") is an input to the CAPM, so factors that affect the MRP (e.g. volatility and changes in investors' risk perceptions) are vital for accurate determination of the ROE.

Q27. Can you provide a summary of recent events, which have impacted capital market conditions?

A27. Capital markets have seen historic changes since DTE Gas filed its last rate case. Starting in January 2020, long-standing trade tensions that were weighing on the economy began to ease. The U.S. signed Phase 1 of the U.S.-China Trade Agreement and also the United States-Mexico-Canada Agreement ("USMCA"). However, around the same time, a novel virus was beginning to spread in China and Europe. By March 2020, the World Health Organization declared that the COVID-19 outbreak was a pandemic. Many governments around the world, including in the U.S., sought measures to limit the health and economic impacts from the pandemic. By mid-March, local and state governments began issuing stay-at-home orders and major portions of the U.S. economy were shut down. As a result, over 65 million people in the U.S. have filed initial unemployment claims since March 21, 2020.[31] To help mitigate the economic impacts, the U.S. Federal Government passed the $2.1 trillion CARES Act on March 27, 2020.[32] The U.S. Federal Reserve also cut its policy rate to 0 to 0.25 percent and announced "unlimited"

[31] U.S. Department of Labor, "Unemployment Insurance Weekly Claims," New Release, November 26, 2020.

[32] The White House, "Statement by the President," March 27, 2020, accessed April 16, 2020, https://www.whitehouse.gov/briefings-statements/statement-by-the-president-38/.

quantitative easing and emergency liquidity programs to support financial markets.[33] As a result the Federal Reserve's balance sheet has climbed to over $7.2 trillion in assets as of December 2020.[34] This compares to about $4 trillion as of year-end 2019. Despite the monetary and fiscal policies intended to support the economy, the U.S. economy contracted substantially in the first half of 2020. According to the Bureau of Economic Analysis ("BEA") first and second quarter 2020, GDP decreased by annualized rate of 5.0% and 31.4%, respectively.[35] By June 2020, the National Bureau of Economic Research declared the U.S. was in a recession. As of December 2020, the U.S. had 10.7 million unemployed for an unemployment rate of 6.7%, which is twice the pre-pandemic level.[36] However, the Detroit area unemployment was higher at 8.9 percent in November 2020.[37]

Q28. What are the expectations going forward?

A28. The extent and length of the economic and financial impacts from COVID-19 are still unknown. The impacts on the economy and unemployment will depend on how long social-distancing measures are required and how long it takes to distribute a vaccine. Recent surveys by economists, such as in the Blue Chip Economic Indicators survey, indicate that the nominal U.S. GDP will decline by 3.0% in 2020 before recovering to 6% in 2021.[38] The Congressional Budget Office expects nominal GDP growth by 5.7%

[33] U.S. Federal Reserve, "Federal Reserve Announces Extensive New Measures to Support the Economy," Press Release, March 23, 2020. The policy was largely continued in the Federal Reserve's most recent meeting; U.S. Federal Reserve, "Federal Reserve issues FOCM statement," December 16, 2020.

[34] S&P Global Market Intelligence, "Gray Swans: Blinded by Pandemic Investors May be Ignoring these Risks in 2021," December 16, 2020.

[35] Bureau of Economic Analysis, "Gross Domestic Product, 2nd Quarter 2020 (Third Estimate); Corporate Profits, (Revised), U.S. Department of Commerce, September 30, 2020. Accessed October 2, 2020, https://www.bea.gov/news/2020/gross-domestic-product-third-estimate-corporate-profits-revised-and-gdp-industry-annual.

[36] https://www.bls.gov/news.release/pdf/empsit.pdf

[37] www.bls.gov/regions/economic-summaries.htm, "Detroit Area Economic Summary," January, 2021.

[38] Wolters Kluwer Blue Chip Economic Indicators and PwC Analysis, October 2020, pp. 2-3.

in 2021.[39] However, the expectations of a 6% growth is the average of upward 40 financial and academic institutions' forecasts, which span a wide range from 3.7 to 8.1 percent in January 2021.[40] The nominal GDP growth rate is the figure that impacts the cost of equity estimate in the DCF model. In August 2020, the U.S. Federal Reserve announced a policy change whereby they would target inflation at 2% on average indicating the Federal Reserve may hold interest rates for longer.[41] After their September 2020 meeting, the Federal Reserve released economic projections indicating that policy rates would remain at current levels through 2023.[42] The policy was continued after the Feds December 2020 meeting[43] and will likely continue to exert downward pressure on interest rates over the near to medium term. While the length and extent of the economic impacts from COVID-19 are currently unknown, the impacts are expected to persist for some time until a vaccine is widely distributed or some other effective treatment is developed.[44]

Q29. How does this impact the cost of equity estimation for DTE Gas?

A29. It is important to remember that the cost of equity and capital structure established for DTE Gas in this proceeding is expected to be in effect beyond the current extraordinary

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[39] Wolters Kluwer Blue Chip Economic Indicators and PwC Analysis, October 2020, p. 14 shows a long-term nominal GDP growth of 4.1%. and Congressional Budget Office at https://www.cbo.gov/publication/56368#_idTextAnchor011

[40] Wolters Kluwer Blue Chip Economic Indicators, January 2021m pp. 2-3.

[41] U.S. Federal Reserve, "Federal Open Market Committee announces approval of updates to its Statement on Longer-Run Goals and Monetary Policy Strategy," August 27, 2020, accessed September 10, 2020, https://www.federalreserve.gov/newsevents/pressreleases/monetary20200827a.htm. See also, the December 16, 2020 Federal Reserve FOCM Statement.

[42] U.S. Federal Reserve, "Table 1. Economic Projections of Federal Reserve Board members and Federal Reserve Bank presidents under their individual assumptions of projected appropriate monetary policy, September 2020," September 15, 2020, accessed September 21, 2020,

https://www.federalreserve.gov/monetarypolicy/files/fomcprojtabl20200916.pdf.

[43] Federal Reserve December 16, 2020 FOCM Press Release;

https://www.federalreserve.gov/newsevents/pressreleases/monetary20201216a.htm

[44] The Federal Reserve in their September 16, 2020 FOMC statement said, "The ongoing public health crisis will continue to weight on economic activity, employment, and inflation in the near term, and poses considerable risks to the economic outlook over the medium term."

https://www.federalreserve.gov/newsevents/pressreleases/monetary20200916a.htm.

impacts of the COVID-19 pandemic. The analysis and recommendations should reflect expected market conditions that will prevail over the relevant rate period and not exclusively current market conditions. As discussed further below, many of the inputs to the cost of equity estimation methodologies are currently at unprecedented levels. Sole reliance on current economic and financial conditions to estimate DTE Gas' cost of equity would unfairly lock DTE Gas and their customers into the current economic and financial environment. Doing so would also not provide a fair return, especially when compared to other utilities that did not undergo a cost of capital proceeding during this period. However, the current conditions create an unusually large amount of uncertainty about the future and, if the financial crisis can be used as a guide, then investors' heightened perception of risk are likely to linger. As noted earlier, the Commission's Order in U-20697 acknowledge the need to consider market volatility and uncertainty.[45]

A. INTEREST RATES

Q30. How do interest rates affect the cost of equity?

A30. The current interest rate environment affects the cost of equity estimation in several ways. Most directly, the CAPM takes as one of its inputs a measure of the risk-free rate (see Figure 2). The estimated cost of equity using the CAPM decreases (increases) by one percentage point when the risk free rate decreases (increases) by one percentage point. Therefore, to the extent that prevailing government yields are depressed due to economic uncertainties related to COVID-19 or the monetary policy responses, using current yields as the risk-free rate will depress the CAPM estimate below what is representative of the forward-looking cost of equity, which will be in effect during the relevant regulatory period. Put another way, with current government bond yields downwardly biased due to flight-to-quality behavior by investors and "unlimited" quantitative easing programs by the U.S. Federal Reserve, using current yields in the CAPM will also downward bias the cost of equity estimate. At the same time, a low interest rate is associated with a high market risk premium, so that these two measures offset one another to a degree. To avoid

[45] Order in U-20697, pp. 165-166.

any bias in the cost of equity estimate, it is important to use a forecasted risk-free rate and consider whether the rate needs to be normalized (or the risk premium investors require needs to be adjusted) to ensure the resulting CAPM estimate reflects a non-biased estimate of DTE Gas cost of equity over the relevant regulatory period. As the economy begins to recover, as forecasted, in 2021 interest rates are expected to increase from current lows.[46] Therefore, the allowed fair return on equity for utilities should reflect the future interest rate environment.

Q31. What are the relevant developments regarding interest rates?

A31. Interest rates are currently near historic lows due to flight-to-quality behaviors by investors as well as the Federal Reserve's expansion of its quantitative easing programs. Interest rates on 10-year U.S. Government bonds were at 1.86% at the end of 2019.[47] As large parts of the economy began to shut down in response to the pandemic, investors fled riskier assets for safer assets. This demand for U.S. government bonds caused bond yields to decrease rapidly. On March 9, 2020, the entire U.S. yield curve fell below 100 bps for the first time in history and the 10-year U.S. government bond yield hit a record low of 0.339%.[48] Since then, long-term government bond yields have increased somewhat—10 year U.S. Government bonds as of January 26, 2021 was 1.05%.[49]

Most economists expect the economy to begin to recover in 2021.[50] This is expected to cause interest rates to rise from near-historic lows. Blue Chip Economic Indicators' ("BCEI") October 2020 edition forecasts that the yield on 10-year treasury bonds will

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[46] The 10-year treasury bond yield has increased more than 50 basis points from the summer of 2020; for example, the yield was 0.55% on August 6, 2020 but stood at 1.05% on January 26, 2021.

[47] Bloomberg accessed October 23, 2020 and Federal Reserve, FRED assessed December 3, 2020.

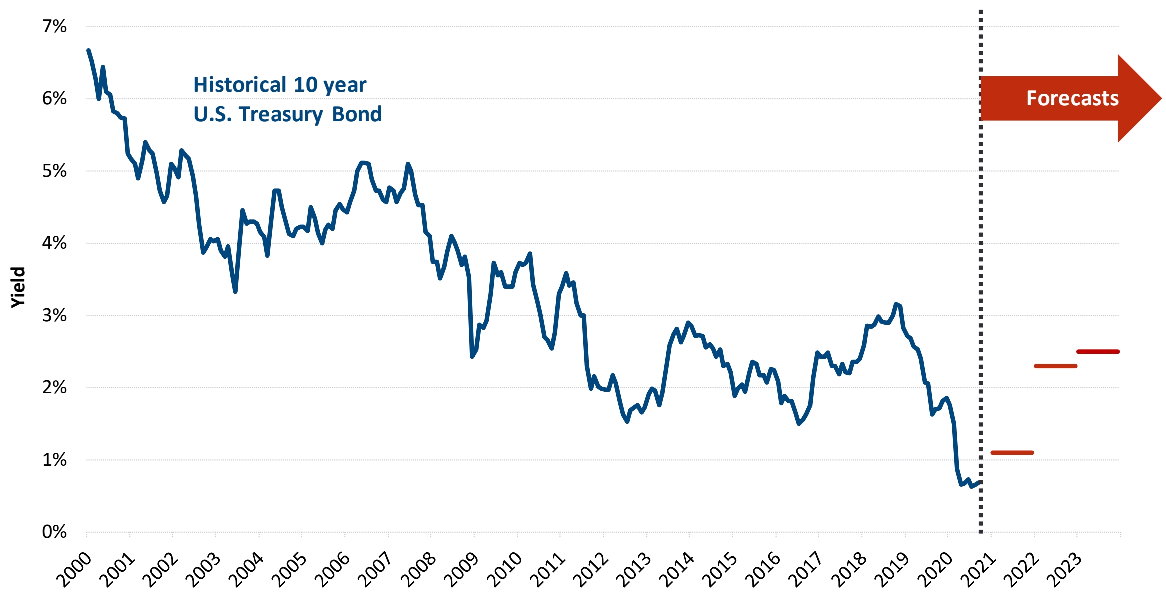
[48] Sunny Oh, "Treasury yield curve sinks below 1% after oil and coronavirus worries rout stocks," *Market Watch*, March 9, 2020, accessed March 31, 2020, https://www.marketwatch.com/story/30-year-treasury-yield-tumbles-below-1-after-oil-and-coronavirus-worries-rout-stocks-2020-03-09

[49] Federal Reserve Bank of St. Louis, January 26, 2021; https://fred.stlouisfed.org/series/DFII10.

[50] For example, Wolters Kluwer Blue Chip Economic Indicators and PwC Analysis, October 2020 collects GDP growth data from 40 financial institutions, academic institutions and other entities – all of whom predict a positive growth for 2021 with an average of 5.5 percent. The January 2021 issue of the publication forecast 2021 GDP growth at 6.0 percent.

increase.[51] Specifically, BCEI projects the 10-year government bond yield will be 1.4 and 1.7 percent in 2022 and 2023, respectively (Figure 4).[52] The expectations for 2022 and 2023 is what is relevant for this proceeding and consistent with Mr. ~~Solomon~~ Bennett development of the cost of long-term debt for year-end 2022..[53] Because the risk-free rates is an input to several cost of equity estimation models, the relationship between current and forecasted risk-free rates is an important consideration.

Figure 4: Historical and Projected Ten-Year Treasury Bond Yields[54]



Source: Historical data from Bloomberg. Forecasts from Blue Chip Economic Indicators October and December 2020 issue.

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[51] Wolters Kluwer Blue Chip Economic Indicators and PwC Analysis, December2020, p. 3. The historical maturity premium for a 20-year treasury bond over a 10-year treasury bond is approximately 50 basis points.

[52] Wolters Kluwer Blue Chip Economic Indicators and PwC Analysis, October 2020, p.

14. [53] Direct Testimony of Mr. ~~E.J. Solomon~~ W. S. Bennett.

[54] Id.

B. **YIELD SPREADS**

Q32. Why are bond yield spreads relevant to your cost of equity analysis?

A32. Bond yield spreads (also called credit spreads) reflect the premium that investors demand to hold debt securities (specifically corporate or utility bonds) that are not risk free. Analogously, the MRP, which is a key input to the CAPM cost of equity estimation—represents the risk premium that investors require to hold equities rather than risk-free government bonds.

If bond yields are influenced to some extent by the same underlying market factors that drive the systematic risk premium for equities, then shifts in directly observable credit spreads can assist with inference about changes in the MRP, which itself must be estimated.[55] More specifically, if both credit spreads and equity premiums are determined in part by the general premium required by investors for bearing systematic risk, then an increase in credit spreads may indicate an increase in the forward-looking MRP.

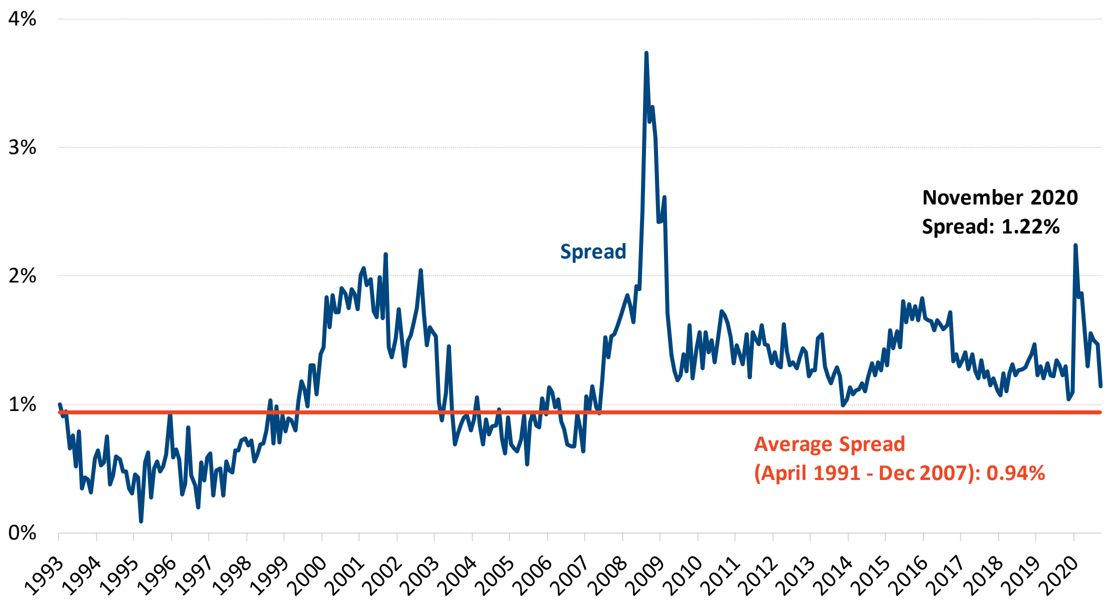
Q33. How does the current spread between utility and U.S. government bond yields compare to historical spreads?

A33. Utility bond yield spreads have increased substantially recently as investors require additional compensation to hold non-government debt due to the increased business risks and economic uncertainties. As shown in Figure 5 below, the spread between 20-year A-rated utility bond yields and 20-year U.S. government bond yields are currently at 1.15%, which is approximately 28 basis points above the pre-financial crisis average of 0.94%. At the same time the BBB utility bond spread is 36 basis points higher than the spread from 1991 to 2008 and 59 bps above the spread from 1991 to today (leaving out 2008-2011). Thus, regardless of the period over which I measure the increase in spread, it is higher today than historically and thus indicate a higher than historical premium over the

[55] This is the same issue as in cost of capital estimation more generally: the cost of debt can often be directly observed in the form of market bond yields, whereas the cost of equity must be estimated based on financial models.

risk-free rate to hold assets that are not risk free. I note that the spread increased dramatically in early 2020, but has since declined some.

Figure 5: Yield Spread Between Utility A-rated Bond Yields and 20 Year U.S. Treasury Bonds

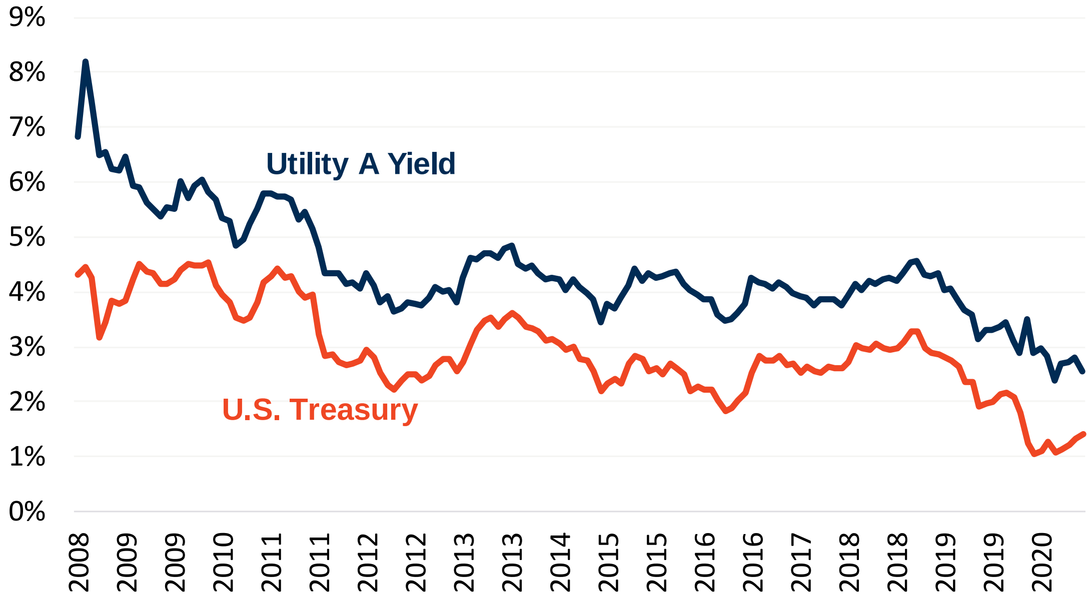


Source: Bloomberg as of 11/30/2020.

The yield spread is commonly thought to be explained by default risk, taxes, downward pressure on government bond yields due to monetary policy, or the equity risk premium. Hence, an increase in the spread could be caused by any or all of these components. As the default risk has not changed materially for highly rated utility bonds[56] and taxes are a very small portion of the spread, the remaining components: downward pressure and the equity risk premium must explain the majority of the spread increase. Figure 6 below illustrates that the increased spread is attributable both to lower yields on government bonds and also an increased premium required by investors to hold riskier assets.

[56] S&P Ratings reports Utility defaults are down slightly in 2020 versus 2019 year to date. S&P Global Ratings, "Corporate Defaults Slow In The Third Quarter While The Oil and Gas Total Remains High," October 2, 2020.

Figure 6: Utility A-rated Bond Yields and 20 Year U.S. Treasury Yields



Source: Bloomberg, data as of November 30, 2020.

While spreads have narrowed since the height of the COVID-19 pandemic in March and April, they remain elevated compared to the pre-COVID-19 period indicating lingering uncertainty and elevated risk. On April 2, 2020, S&P Global Ratings downgraded the outlook for North American utilities from "stable" to "negative" due to COVID-19 risks, citing concerns about the adequacy of utilities' financial cushions to weather the financial downturn.[57] As of January 25, 2025, S&P Global Ratings maintain the negative outlook on utilities noting that the "[c]redit quality for the North American regulated utility industry weakened in 2020" and that "[d]espite our negative 2021 industry outlook, [S&P] expect a modest improvement to credit quality over the next 12 months."[58] With heightened concern about utility credit, spreads and risk premiums are likely to remain elevated.

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[57] *S&P Global Market Intelligence*, "S&P lowers North American utilities outlook to negative on coronavirus risk," April 2, 2020, Accessed April 3, 2020, https://www.spglobal.com/marketintelligence/en/news-insights/latest-news-headlines/s-p-lowers-north-american-utilities-outlook-to-negative-on-coronavirus-risk-57886477

[58] S&P Global Ratings, "North American Regulated Utilities: Negative Outlook Could See Modest Improvement," January 20, 2021.

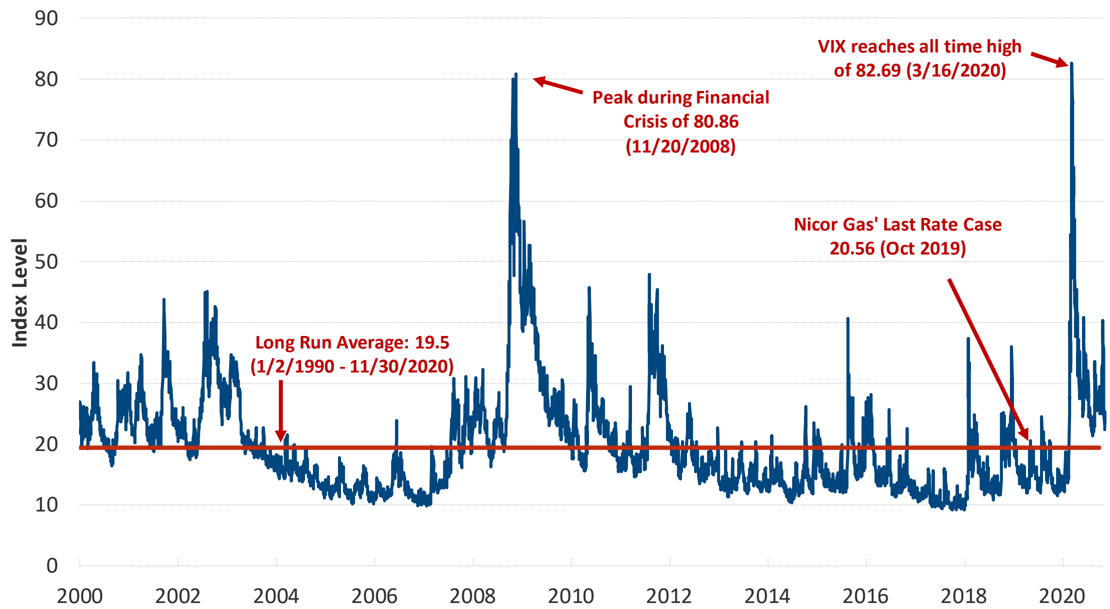
C. RISK PREMIUMS

Q34. What is the current evidence regarding market volatility?

A34. Recently, financial markets have become extremely volatile as shown in near-term common volatility measures, such as the VIX, which is frequently referred to as the market's fear index. The VIX reached an all-time high of 82.69 on March 16, 2020, which was higher than the peak of 80.86 during the Financial Crisis. Although, the VIX has slowly retreated from recent highs to between 21.6 to 37.2 in January 2021 with thehighest level seen more recently on January 27, 2021.[59] Comparably, at the time of DTE Gas' last rate case in Michigan (filed in November 2019), the VIX stood at approximately 12.5. Clearly, investors are faced with substantially higher volatility today than when DTE Gas' last rate case was filed and higher volatility implies a higher risk premium.

[59] Bloomberg, as of October 23, 2020 and CBOE as of January 27, 2021 (https://www.google.com/search?q=VIX+cboe&sourceid=ie7&rls=com.microsoft:en-US:IE-Address&ie=&oe=#spf=1611799158418)

Figure 7: VIX

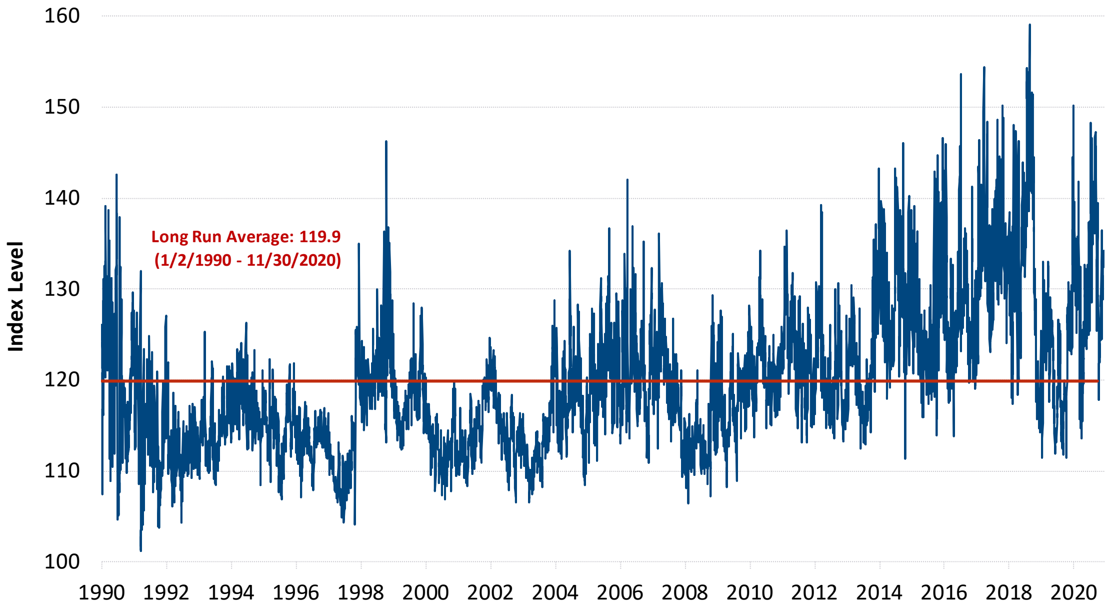


Source: Bloomberg as of 11/30/2020

Similarly, the SKEW index, which measures the market's willingness to pay for protection against negative "black swan" stock market events (i.e., sudden substantial downturns),[60] shows that investors are cautious. A SKEW value of 100 indicates outlier returns are unlikely, but as the SKEW increases, the probability of outlier returns becomes more significant. Figure 8 below shows the development in the SKEW since 1990 and that the index has recently increased following a period of declining SKEW. The index spiked over 148.3 on June 30, 2020 and stood at 137.9 on January 27, 2021, which is well above its long run average of 119.9. The recent spike in the SKEW shows that investors are willing to pay for protection against downside risks.

[60] For example, http://www.cboe.com/products/vix-index-volatility/volatility-indicators/skew.

Figure 8: SKEW



Source: Bloomberg as of 11/30/2020

The currently very high level of both the VIX and SKEW is consistent with day-to-day observations of volatile financial markets and shows that investors are cautious about investing in equity. Such circumstances lead investors to require a higher premium to invest in assets or financial instruments that are not risk-free.

Q35. What is the Market Risk Premium?

A35. In general, a risk premium is the amount of "excess" return—above the risk-free rate of return—that investors require to compensate them for taking on risk. As illustrated in Figure 2 the riskier the investment, the larger the risk premium investors will require.

The MRP is the risk premium associated with investing in the market as a whole. Since the so-called "market portfolio" embodies the maximum possible degree of diversification for investors,[61] the MRP is a highly relevant benchmark indicating the

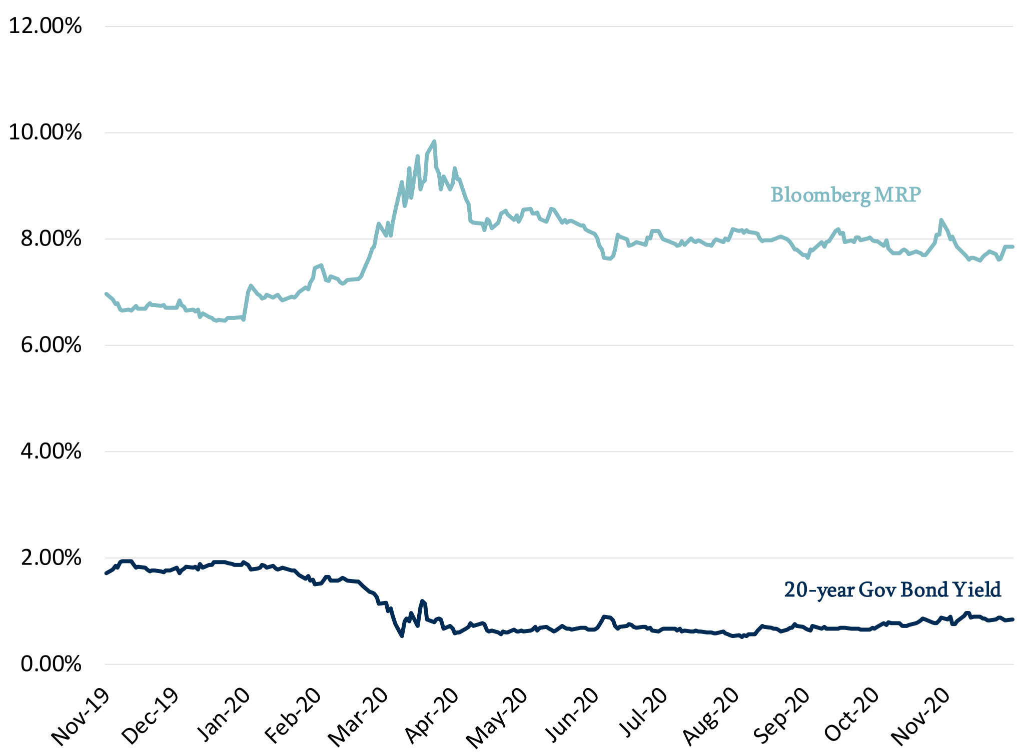
[61] In finance theory, the "market portfolio" describes a value-weighted combination of all risky investment assets (e.g., stocks, bonds, real estate) that can be purchased in markets. In practice, academics and financial analysts nearly always use a broad-based stock market index, such as the S&P 500, to represent the overall market.

level of risk compensation demanded by capital market participants. It is also a direct input necessary to estimating the cost of equity using the CAPM and other risk-positioning models.

Q36. Please explain the current evidence related to the MRP.

A36. The heightened volatility has increased the premium that investors require to hold risky assets, especially when measured utilizing forward-looking methodologies that estimate expected market returns with reference to current dividend yields. This year, Bloomberg's forward looking estimate of the MRP for the U.S. increased to as high as 9.84% in March 2020 and was 8.39% as of January 2021.[62]

Figure 9: Bloomberg's Daily Market Risk Premium and Risk Free Rate; (Nov. 2019 to Nov. 2020).



[62] Bloomberg, as of February 2, 2021. Measured over a 10-year U.S. Treasury bond.

Q37. Are higher risk premiums relevant given that treasures are near historic lows?

A37. Yes—this is highly relevant for cost of equity estimation as current risk-free rates are extremely low. On March 9, 2020, the entire U.S. yield curve settled below 1.00% for the first time in history.[63] Since then, U.S. Government bond yields have increased somewhat with the 20-year and 30-year bond yields at or slightly above 1.00%. This decrease in bond yields has occurred as investors fled to safer assets due to the heightened market uncertainty.

As shown above in Figure 9, the MRP has also increased as the risk-free rate declined. Further, as shown in both academic and industry analyses, the allowed risk premium over the risk-free rate is inversely related to the risk-free rate. For example, Villadsen et al. (2017) found that the allowed risk premium increases by approximately 0.44% for each 1% decline in the risk-free rate for the period 1990 to 2015.64 Morin finds that the risk premium increases by 0.52% for each 1% decline in the risk-free rate.65 Thus, the risk premium is likely to increase as the risk-free rate declines. As shown in Figure 9 above, this phenomenon is also documented in the forward-looking market risk premium calculated by Bloomberg. According to Bloomberg, the MRP is 7.85%,[66] which is higher than the historical average MRP of about 7.15 percent. It is also an increase over the forward-looking MRPs at the end of 2019 of 6.48%, which were much more in line with the historical average MRP.[67]

[63] According to the Federal Reserve, the yield on the 10-year, 20-year, and 30-year Treasury bonds on March 9, 2020 was 0.54%, 0.87%, and 0.99% respectively. These yields have since increased. Source: https://www.treasury.gov/resource-center/data-chart-center/interest-rates/Pages/TextView.aspx?data=yield

[64] Bente Villadsen, Michael J. Vilbert, Dan Harris, and A. Lawrence Kolbe, "*Risk and Return for Regulated Industries*," Academic Press, 2017, pp. 118-119.

[65] Roger A. Morin, "*New Regulatory Finance*," Public Utilities Reports, Inc., 2006, pp. 123-125.

[66] Bloomberg, as of November 30, 2020.

[67] Id.

Q38. Is there evidence that the MRP will remain elevated going forward?

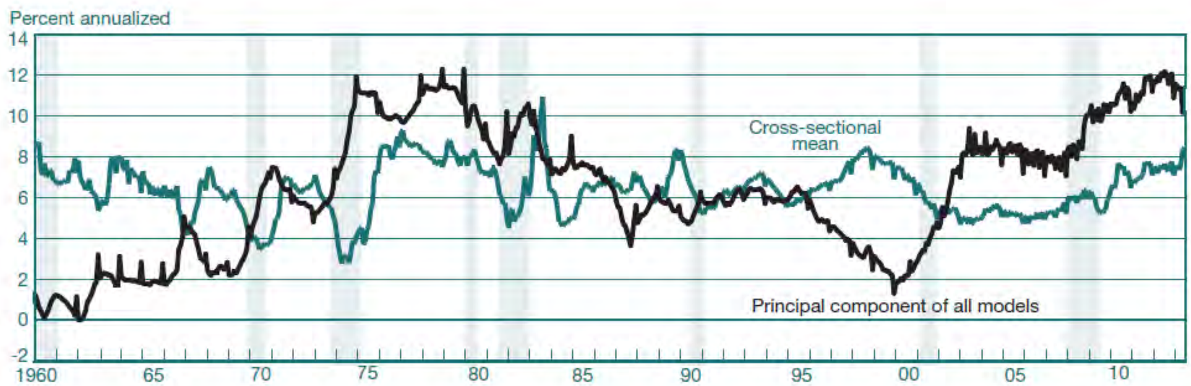
A38. Yes. In 2015, Duarte and Rose of the Federal Reserve of New York performed a study that aggregated the results of many models of the required MRP in the United States and tracked them over time.[68] This analysis found a very high MRP after the financial crisis, relative to time periods prior the crisis.

The authors estimated the MRP that resulted from a range of models each year from 1960 through the time of their study. The authors then reported the average as well as the first principal component of the results.[69] The authors found that the models used to determine the risk premium were converging to provide comparable estimates and that the average annual estimate of the MRP had reached an all-time high in 2012-2013. (Figure 10 below is a copy of the summary chart from Duarte and Rosa's 2015 paper). These directional trends identified by Duarte and Rosa are reasonably consistent with those observed from Bloomberg and they further support the proposition that the elevation of the MRP over its historical pre-crisis levels was a persistent feature of capital markets in the time following the financial crisis. Specifically, the financial crisis saw high volatility and a flight to quality – similar to conditions seen in 2020 in response to the COVID-19 pandemic. Therefore, it is reasonable to expect that the current MRP will remain elevated compared to historical levels, especially given the uncertainty related to the extent of economic and financial impacts from COVID-19 and the historically low interest rates.

[68] Fernando Durate and Carlo Rosa, "The Equity Risk Premium: A Review of Models," *Federal Reserve Bank of New York*, December 2015 ("Duarte and Rosa, 2015")
https://www.newyorkfed.org/research/staff_reports/sr714.html.

[69] Duarte and Rosa emphasize the "first principal component" of the 20 models. This means that the authors used statistics to compute the weighted average combination of the models that captures the variability among the 20 models over time.

Figure 10: Duarte and Rosa's Chart 3
One-Year Ahead MRP and Cross-Sectional Mean of Models



Q39. Please summarize how the economic developments discussed above have affected the return on equity and debt that investors require.

A39. Utilities rely on investors in capital markets to provide funding to support their capital expenditure programs and efficient business operations. Investors consider the risk-return tradeoff in choosing how to allocate their capital among different investment opportunities. It is therefore important to consider how investors view the current economic conditions, including the plausible developments in the risk-free rate and the growth in the U.S. GDP.

These investors have been dramatically affected by the ongoing market uncertainty, so there are reasons to believe that their risk aversion remains elevated relative to pre-COVID-19 levels. As DTE Gas is expected to be compensated as a utility on the equity component of its rate base, the same factors would affect DTE Gas' equity.

V. ESTIMATING THE COST OF EQUITY

A. PROXY GROUP SELECTION

Q40. How do you identify proxy companies of comparable business risk to DTE Gas?

A40. DTE Gas is primarily engaged in the regulated natural gas distribution business. The business risk associated with these endeavors depends on many factors including the specific characteristics of the service territory and regulatory environment in which the provider of these services operates. Consequently, it is not possible to identify publicly traded proxy companies that replicate every aspect of DTE Gas' risk profile. However, selecting companies with business operations concentrated in regulated industries or having similar lines of business and/or business environments is an appropriate starting point for selecting one or more proxy groups of comparable risk to DTE Gas. As a second step, I must evaluate DTE Gas or Michigan-specific risks to ensure that the Company's ROE is placed appropriately relative to the sample companies.

To this end I have selected a sample of natural gas distribution utilities and highly regulated water utilities. Jointly these companies comprise the "Full Sample." I also report results for the natural gas distribution utilities that are included in the Full Sample and refer to that sample as the Gas Sample. The proxy companies are similar to DTE Gas in that they are rate regulated by state utility commissions, provide customers a product through a network of pipeline assets, and rely on substantial capital to provide service; i.e., they are capital intensive like DTE Gas.

It is important that a proxy group used to assess the cost of equity for DTE Gas (absent of any unique Michigan or Company characteristics) is regulated, because regulation tends to place substantial requirements and also protections on the companies. I also believe the physical characteristics of the industry – e.g., network, capital intensive, serving many different customers – is a characteristic of DTE Gas and of the selected natural gas distribution and water utilities. The network characteristic implies that assets cannot readily be employed in a different capacity, capital intensity affects the operating risks through the split between fixed and variable costs, and the customer composition affects the demand risk. For example, natural gas and water utilities all face declining per-customer demand due to conservation.

Q41. Why are you including water utilities when evaluating the cost of capital for a natural gas distribution utility?

A41. For several reasons. First, the natural gas distribution industry is expected to undergo substantial changes as customers, regulators and the legislature focus on carbon reductions. This means that initiatives in a specific state influences stock prices and analysts' evaluations along with more fundamental operating and market conditions.[70] I therefore select a group of water utilities where there are no carbon considerations to assess whether the estimates from the natural gas LDCs are reasonable. Second, investors make comparisons across regulated companies, so it becomes important to consider whether the returns awarded DTE Gas are comparable not only to other natural gas utilities, but also to other similar risk benchmarks – I consider a broader sample of natural gas and water utilities a reasonable such benchmark. Third, natural gas and water utilities generally share not only regulators but also the characteristics of being (a) capital-intensive,[71] (b) network industries, and (c) having an obligation to serve and interfacing with the local community.[72] I therefore believe these companies provide a useful benchmark when evaluating the cost of equity for DTE Gas.

Q42. Please summarize how you selected the members of the Full Sample and the Gas Sample.

A42. To identify companies suitable for inclusion in the Full Sample, I started with the universe of publicly traded companies in the natural gas and water utility industry as identified by *Value Line Investment Analyzer* (*"Value Line")*. I started with Value Line's list of publicly traded companies classified as natural gas LDCs or water utilities. Next, I reviewed business descriptions and financial reports of these companies and eliminated companies that had less than 50 percent of their assets dedicated to regulated utility activities in their industry; e.g., natural gas or water utility services.[73]

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[70] In some jurisdictions, there has been initiatives to ban natural gas from new or existing housing and to enhance electrification of the residential sector.

[71] As shown in Schedule D5.18, DTE Gas' capital intensity is between the average of the gas and water proxy groups.

[72] I recognize that the Commission does not regulate water utilities. In contrast most state regulatory commissions do regulate (investor-owned) water utilities that operate in their jurisdiction.

73 I calculate the share of assets devoted to regulated activities using information from the companies' 10-Ks.

With this group of companies, I applied further screening criteria to eliminate companies that have had recent significant events that could affect the market data necessary to perform cost of capital estimation. Specifically, I identified companies that have cut their dividends or engaged in substantial merger and acquisition ("M&A") activities over the relevant estimation window.[74] I eliminated companies with such dividend cuts because the announcement of a cut may produce disturbances in the stock prices and growth rate expectations in addition to potentially being a signal of financial distress. I generally eliminated companies with significant M&A activities because such events typically affect a company's stock price in ways that are not representative of how investors perceive its business and financial risk characteristics. For example, a utility's stock price will commonly jump upon the announcement of an acquisition to match the acquirer's bid.

Further, I require companies have an investment grade credit rating[75] and a fundamental, requirement is that the proxy companies have the necessary data available for estimation.

Q43. What are the characteristics of the Gas and Water Utility Proxy Group?

A43. The Gas and Water Utility Proxy Group is comprised of natural gas and water utilities whose primary source of revenues and majority of assets are subject to regulation. The final proxy group consists of the nine natural gas and six water utilities listed in Figure 11 and Figure 12 below.

All companies are engaged in the distribution of a commodity to end customers through a network of pipes and mains. While the product differs across natural gas and water utilities, they are all focused on distribution, a mix of residential, commercial and industrial customers and all are regulated. Further, the proxy group companies have

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74 As described in Sections V.B, the CAPM requires five years of historical data, while the DCF relies on current market data.

75 In a few cases, a proxy company does not have a credit rating from any of the major rating agencies. However, if they were to be rated, they would receive an investment grade rating. In these instances, I assign the company the average credit rating of the rest of the proxy group.

credit ratings in the range of BBB to A+, which is consistent with DTE Gas' credit rating albeit the average for the proxy companies is slightly higher.[76]

Figure 11 reports the natural gas utility proxy companies' annual revenues for the most recent four quarters as of Q3, 2020 and also reports the market capitalization, credit rating, beta and growth rate. The annual revenue as well as the market cap was obtained from Bloomberg. The credit ratings are reported by Bloomberg. The growth rate estimate is a weighted average between estimates from Thomson Reuters and *Value Line.* Betas were obtained from *Value Line*. Similar data for the water utility proxy group are reported in Figure 12, below. Of note, while the average beta for the natural gas utility proxy group was approximately 0.66, when I undertook my analysis for U-20642, the average beta has now increased to 0.87. Similarly, the water utilities' beta has increased from approximately 0.65 on average to 0.76.[77] This indicate a substantial increase in systematic risk.

[76] DTE Energy's unsecured rating is BBB from S&P, while secured ratings for DTE Gas is higher at A. Source: DTE, "EEI Financial Conference," November 9-10, 2020.

[77] In each case Value Line betas were used. Source: Villadsen Direct in U-20642, Schedule D5.10.

Figure 11
Gas Proxy Group

Company	Annual Revenue (Q3 2020) ($MM)	Regulated Assets	Market Cap. (Q3 2020) ($MM)	Value Line Beta	S&P Credit Rating	Long-Term Growth Estimate
	[1]	[2]	[3]	[4]	[5]	[6]
Atmos Energy	$2,821	MR	$11,798	0.80	A	6.3%
Chesapeake Utilities	$483	R	$1,304	0.80	A-	8.0%
New Jersey Resources	$1,954	R	$2,627	0.95	A-	6.0%
NiSource Inc.	$4,868	R	$8,443	0.85	BBB+	6.9%
Northwest Natural	$761	MR	$1,379	0.80	BBB+	6.2%
ONE Gas Inc.	$1,499	R	$3,638	0.80	A	6.2%
South Jersey Inds.	$1,519	R	$1,957	1.05	BBB	10.7%
Southwest Gas	$3,233	MR	$3,511	0.95	BBB+	7.3%
Spire Inc.	$1,855	R	$2,725	0.85	A-	6.4%
Average	$2,110		$4,154	0.87	A-	7.1%

Sources and Notes:
[1]: Bloomberg as of November 30, 2020.
[2]: Key R - Regulated (80% or more of assets regulated).
MR - Mostly Regulated (less than 80% of assets regulated).
[3]: See Schedule No. BV-3 Panels A through I.
[4]: See Schedule No. BV-10
[5]: Bloomberg as of November 30, 2020.
[6]: See Schedule No. BV-5.

Figure 12
Water Proxy Group

Company	Annual Revenue (Q3 2020) ($MM)	Regulated Assets	Market Cap. (Q3 2020) ($MM)	Value Line Beta	S&P Credit Rating	Long-Term Growth Estimate
	[1]	[2]	[3]	[4]	[5]	[6]
Amer. States Water	$477	R	$2,699	0.65	A+	5.2%
Amer. Water Works	$3,756	R	$25,696	0.85	A	7.3%
California Water	$782	R	$2,143	0.65	A+	15.1%
Middlesex Water	$140	R	$1,089	0.75	A	3.8%
SJW Group	$555	R	$1,724	0.85	A-	14.6%
York Water Co. (The)	$53	R	$557	0.80	A-	5.3%
Average	$960		$5,651	0.76	A	8.6%

Sources and Notes:
[1]: Bloomberg as of November 30, 2020.
[2]: Key R - Regulated (80% or more of assets regulated).
MR - Mostly Regulated (less than 80% of assets regulated).
[3]: See Schedule No. BV-3 Panels A through I.
[4]: See Schedule No. BV-10
[5]: Bloomberg as of November 30, 2020.
[6]: See Schedule No. BV-5.

Q44. How do the proxy companies compare to DTE Gas in terms of financial metrics?

A44. DTE Gas regulated operations expects to generate income of $202-212 million in 2021 according to DTE's presentation at the EEI Financial Conference.[78] Compared to the annual revenues of the proxy companies, DTE Gas is smaller than all but two of the water utilities. DTE Energy's unsecured credit rating at BBB is towards the lower end of the comparable companies while DTE Gas' A rating is a secured bond rating and hence not fully comparable rating. Lastly, as noted above, DTE Gas is a regulated distribution company as is all the proxy companies.

Q45. What regulatory capital structure did you use for DTE Gas?

A45. As recommended by DTE Gas, I use a capital structure including 51.9 percent equity in my recommendation.

Q46. How does that capital structure compare to those of the comparable companies or industry?

A46. The average allowed equity percentage for natural gas LDC having a rate case decided in the first three quarters of 2020 was over 52 percent,.[79] Consequently, DTE Gas' requested capital structure is in line with what has been approved for other natural gas LDCs, but has a lower equity percentage than that relied upon in the estimation process (for CAPM and DCF based methods).[80]

B. THE CAPM BASED COST OF EQUITY ESTIMATES

Q47. Please briefly explain the CAPM.

A47. CAPM assumes the collective investment decisions of investors in capital markets will result in equilibrium prices for all risky assets such that the returns investors expect to

[78] DTE, "EEI Financial Conference," November 9-10, 2020 p.
40. [79] Direct Testimony of ~~Edward J. Solomon~~.W. Scott Bennett.
[80] See Schedule D5.4.

receive on their investments are commensurate with the risk of those assets relative to the market as a whole. The CAPM posits a risk-return relationship known as the Security Market Line (see Figure 2 in Section III), in which the required expected return on an asset (above the risk-free return) is proportional to that asset's relative risk as measured by that asset's beta.

More precisely, the CAPM states that the cost of capital for an investment, S (*e.g.*, a particular common stock), is determined by the risk-free rate plus the stock's systematic risk (as measured by beta) multiplied by the market risk premium. Mathematically, the relationship is given by the following equation:

$$\boldsymbol{r_s = r_f + \beta_s \times MRP} \quad (1)$$

- $\boldsymbol{r_S}$ is the cost of capital for investment S;
- $\boldsymbol{r_f}$ is the risk-free interest rate;
- $\boldsymbol{\beta_S}$ is the beta risk measure for the investment S; and
- $\boldsymbol{MRP}$ is the market equity risk premium.

The CAPM is a "risk-positioning model," which operates on the principle (corroborated by empirical data) that investors price risky securities to offer a higher expected rate of return than safe securities. It says that an investment, whose returns do not vary relative to market returns, should receive the risk-free interest rate (that is the return on a zero-risk security, the y-axis intercept in Figure 2), whereas investments of the same risk as the overall market (*i.e.*, those that by definition have average systematic market risk) are priced so as to expect to return the risk-free rate plus the MRP. Further, it says that the risk premium of a security over the risk-free rate equals the product of the beta of that security and the MRP.

1. Inputs to the CAPM

Q48. What inputs does your implementation of the CAPM require?

A48. As demonstrated by equation (1), estimating the cost of equity for a given company requires a measure of the risk-free rate of interest and the MRP as well as a measure of the stock's beta. There are several choices and sources of data that inform the selection of these inputs. I discuss these issues below. (Additional technical detail, along with a discussion of the finance theory underlying the CAPM is provided in Appendix B.)

Q49. What value did you use for the risk-free rate of interest?

A49. I use the yield on a 20-year U.S. Treasury bond as the risk-free asset for purposes of my analysis. I rely on a forecast of what Treasury bond yields will be in 2022-23 and use the average of the forecasts for these two years. Specifically, *Blue Chip Economic Indicators* projects that the yield on a ten-year Government Bond will be 1.4 percent by 2022 and 1.70 percent by 2023 for an average of 1.55 percent.[81] I adjust this value upward by 50 basis points ("bps"), which is my estimate of the representative historical maturity premium for the 20-year over the ten-year Government Bond. This produces a base risk-free rate of 2.05 percent for 2022.

I consider this a conservative estimate as the spread between the yield on A-rated (BBB-rated) utility bonds and the 20-year Treasury bond is elevated by about 28 (and 36) basis points relative to the spread's long-run average as shown in Appendix B, Figure B-1. Thus, an adjustment for yield spread might be warranted. I conservatively add 25 basis points to one of my scenarios for this reason.

Alternatively, the increase in yield spread can be viewed as an increase in the return investors require to hold assets that are not risk-free; i.e., an increase in the MRP. I consider this possibility in a second scenario, where I rely on a forecasted MRP and the base risk-free rate of 2.05 percent. Consequently, I implement two scenarios for the CAPM / ECAPM. In Scenario I, the forecasted risk-free rate including a 25 bps yield spread adjustment is combined with the historical average MRP. In scenario II, I rely on the base risk-free rate and combine that with the forecasted MRP.

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[81] Blue Chip Economic Indicators, October 2020. Blue Chip does not provide estimates for 2022 or further out years in its November or December issue, but I note that Blue Chip increased its 2021 forecast for the 10-year yield from 0.9% in the October issue to 1.1% in its December issue.

Q50. What value did you use for the MRP?

A50. Like the cost of capital itself, the MRP is a forward-looking concept. It is by definition the premium above the risk-free interest rate that investors can expect to earn by investing in a value-weighted portfolio of all risky investments in the market. The premium is not directly observable. Rather, it must be inferred or forecasted based on known market information. One commonly used method for estimating the MRP is to measure the historical average premium of market returns over the income returns on government bonds a long historical period.[82] The average market risk premium from 1926 to the present (March 2020) is 7.15 percent.[83] I use this value of the MRP along with a risk-free rate of 2.30 percent in one of my CAPM scenarios.

I also use a forward-looking MRP of 7.35 percent, which is Bloomberg's November30 forecasted MRP. I use that MRP in combination with the base risk-free rate of 2.05 percent. I note that this is a conservative estimate as the FERC-relied upon methodology to determine the MRP currently results in an MRP of 9.12% as shown in Schedule D5.17.

Of note, the increase in yield spread can be used to provide a quantitative benchmark for the implied increase in MRP based on a paper by Edwin J. Elton, et al., which documents that the yield spread on corporate bonds is normally a combination of a default premium, a tax premium, and a systematic risk premium.[84] Of these components, it is the systematic risk premium that likely explains the vast majority of the yield spread increase. In other words, unless the risk-free rate is underestimated as described above, the market equity risk premium has increased relative to its "normal" level.[85] For example, assuming a beta

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[82] The longest period for which Duff & Phelps reports data is 1926 to current. Based on financial textbooks such as Ross, Westerfield and Jaffe, "*Corporate Finance*," 10'th Edition, 2013, pp. 324-327, I use the longest period for which reliable estimates are available – in this case 1926 to 2018.

[83] Duff & Phelps, *Ibbotson SBBI 2020 Valuation Yearbook* 10-21.

[84] "Explaining the Rate Spread on Corporate Bonds," Edwin J. Elton, Martin J. Gruber, Deepak Agarwal, and Christopher Mann, *The Journal of Finance*, February 2001, pp. 247-277.

[85] In theory, some of the increase in yield spread for A rated debt may be due to an increase in default risk, but the increase in default risk for A rated debt is very small because utilities with A range rated debt have a low default risk – even following the COVID-19 impact on credit risk. This means that the vast majority—if not all—of the increase in A rated yield spreads is due to a combination of the increased systematic risk premium and the downward pressure on the yields of government debt. Although there

of 0.25 for A rated debt[86] means that an increase in the MRP of one percentage point translates into a ¼ percentage point increase in the risk premium on A rated debt (i.e., 0.25 (beta) times 1 percentage point (increase in MRP) = ¼ percentage point increase in yield spread). Thus, a 25 bps increase in the yield spread is therefore consistent with a 0.8 percentage point increase in the MRP ($\frac{0.25\%}{0.25} = 1.0\%$). Thus, there is evidence that the current MRP is higher than the historical MRP of 7.15 percent.

The fact that recent forward-looking estimates of the MRP exceeded the historical average level is consistent with the broader body of evidence that risk premiums have remained elevated relative to their pre-financial crisis levels. (See Section IV above.)

Therefore, I believe the 7.15 percent long-term historical average MRP value I rely on is a low-end estimate of what the market risk premium will be during the period at issue in this proceeding. I similarly believe that the 7.35 percent I rely on for my Scenario 2 is also conservative as the FERC approach would result in a substantially higher MRP.

Q51. Please summarize the parameters of the scenarios and variations you considered in your CAPM and ECAPM analyses.

A51. As discussed above, I consider two scenarios; in each case, the risk-free interest rate represents Blue Chip Economic Indicators projection for the ten-year Treasury Yield to prevail in 2022, adjusted to a 20-year maturity. However, I consider that the elevated spread between the yield on A rated utility bonds and 20-year Treasury bonds could either be reflected predominantly in the risk-free rate (Scenario 1) on in the MRP (Scenario 1). The MRP is the long-term historical arithmetic average of annual realized premiums of

is no increase in the tax premium discussed in the Elton et al. paper due to coupon payments, there may be some increase due to a small tax effect resulting from the probability of increased capital gains taxes when the debt matures.

86 Elton, *et al*. estimates the average beta on BBB-rated corporate debt as 0.26 over the period of their study, and A-rated debt will have a slightly lower beta than BBB-rated debt. I note that 0.25 is a conservatively high estimate of the beta on A-rated utility debt. Most academic estimates, including those presented in *Berk & Demarzo* that I utilize for my Hamada adjustments are significantly lower: in the range of 0.0 – 0.1 percent. Using the lower debt betas would result in a substantially higher MRP estimate.

U.S. stock market returns over long-term (approximately 20-year maturity) Treasury bond income returns from 1926 to 2019 as reported by Duff and Phelps in Scenario 1. In Scenario 2, I look to the forecasted MRP from Bloomberg and validate the figure by increased yield spreads and also looking to the FERC MRP methodology consistent with Order 569-A was 9.12% as of November 30, 2020.[87]

Q52. What betas did you use for the companies in your proxy groups?

A52. I used *Value Line* betas, which are estimated using the most recent five years of weekly historical returns data.[88] The *Value Line* levered equity betas are reported in Figure 11 above. Importantly, natural gas LDCs' betas as reported by Value Line have increased substantially since DTE Gas' last rate case. For example, the average natural gas LDC beta (as measured by Value Line) was 0.66 in September 2019, whereas it today is 0.84. This indicate a large increase in the systematic risk of the natural gas LDC industry, which therefore has moved towards the overall market in terms of systematic risk. Consequently, the allowed return for natural gas LDCs need to approach that of the market when taking into account the higher leverage of DTE Gas.

Importantly, as explained in Section III.B above, these betas—which are measured (by *Value Line*) using the market stock return data of the proxy companies—reflect the level of financial risk inherent in the proxy companies' market value leverage ratios over the estimation period. Because DTE Gas regulatory capital structure includes a higher proportion of debt financing compared to some of the proxy companies, the financial risk associated with an equity investment in DTE Gas rate base is correspondingly greater than the financial risk borne by investors in the proxy companies' publicly traded stock.[89]

[87] FERC Opinion No. 569-A, Docket No. EL14-12-004, EL15-45-013, May 21, 2021, FERC Order on Rehearing, see also Schedule D5.17.

[88] See Value Line Glossary, accessible at http://www.valueline.com/Glossary/Glossary.aspx

[89] A further detailed discussion is contained in Appendix B, Section III.

Consequently, standard textbook techniques are applied to unlever the *Value Line* betas reported in Figure 11 above and relever the resulting asset betas at DTE Gas' regulatory capital structure. See Schedules D5.14 and D5.15.[90]

2. The Empirical CAPM

Q53. What other equity risk premium model do you use?

A53. Empirical research has long shown that the CAPM tends to overstate the actual sensitivity of the cost of capital to beta: low-beta stocks tend to have higher risk premiums than predicted by the CAPM and high-beta stocks tend to have lower risk premiums than predicted.[91] A number of variations on the original CAPM theory have been proposed to explain this finding, but the observation itself can also be used to estimate the cost of capital directly by using beta to measure relative risk by making a direct empirical adjustment to the CAPM.

The second variation on the CAPM that I employ makes use of these empirical findings. It estimates the cost of capital with the equation,

$$\boldsymbol{r_S = r_f + \alpha + \beta_S \times (MRP - \alpha)} \qquad (2)$$

where $\boldsymbol{\alpha}$ is the "alpha" adjustment of the risk-return line, a constant, and the other symbols are defined as for the CAPM (see equation (2) above).

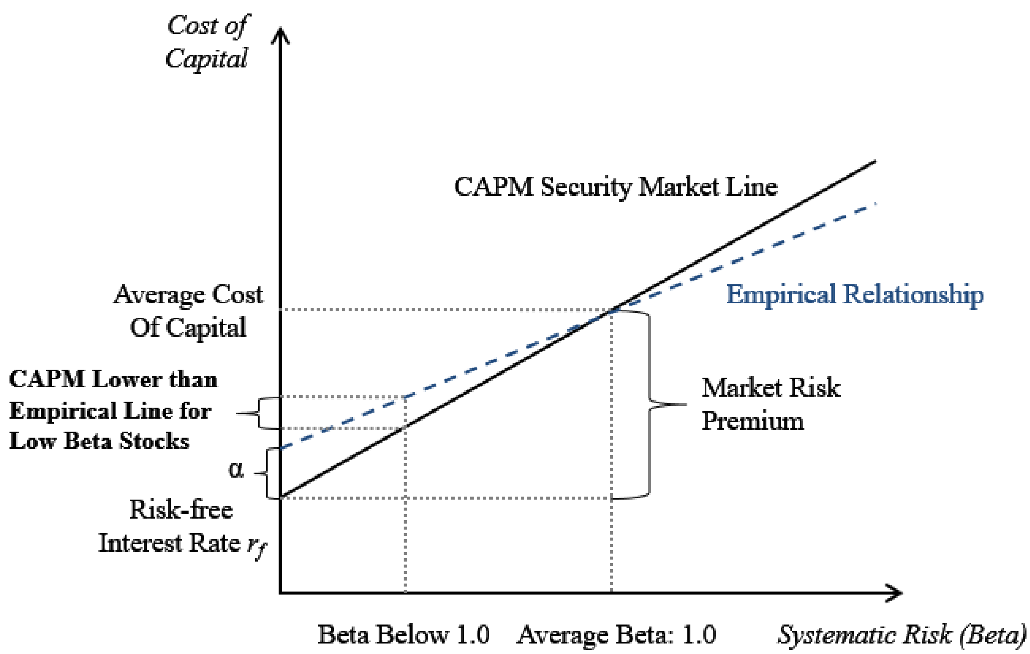
I label this model the Empirical Capital Asset Pricing Model, or "ECAPM." The alpha adjustment has the effect of increasing the intercept, but reducing the slope of the Security Market Line in Figure 2, which results in a Security Market Line that more

[90] The Technical Appendix (Appendix B) to this testimony provides a detailed description of the standard textbook formulas used to implement the "Hamada" technique for unlevering measured equity betas based on the proxy companies' capital structures to calculate "asset betas" that measure the proxy companies' business risk independent of the financial risk impact of differing capital structures. The proxy group average asset betas are then relevered at the target capital structure (i.e., DTE Gas' regulatory capital structure), with the precise relevered beta depending on the specific version of the unlevering/relevering formula employed.

[91] *See* Figure B-2 in Appendix B for references to relevant academic articles.

closely matches the results of empirical tests. This adjustment is portrayed in Figure 13 below. In other words, the ECAPM produces more accurate predictions of eventual realized risk premiums than does the CAPM.

Figure 13
The Empirical Security Market Line



Q54. Why do you use the ECAPM?

A54. Academic research finds that the CAPM has not generally performed well as an empirical model. One of its short-comings is directly addressed by the ECAPM, which recognizes the consistent empirical observation that the CAPM underestimates the cost of capital for low beta stocks. In other words, the ECAPM is based on recognizing that the actual observed risk-return line is flatter and has a higher intercept than that predicted by the CAPM. The alpha parameter (α) in the ECAPM adjusts for this fact, which has been established by repeated empirical tests of the CAPM. In summary, these studies estimate alpha parameters that range between 1%[92] and 7.32%.[93] I apply an alpha parameter of 1.5% in my application of the ECAPM. Appendix B Section II.C provides further discussion of the empirical findings that have tested the CAPM and also provides documentation for the magnitude of the adjustment, α.

3. Results from the CAPM Based Models

Q55. Please summarize the results of the CAPM-based models.

A55. The results of CAPM and ECAPM estimation for the two proxy groups are presented in Figure 14 below. The ranges of results for each model (CAPM and ECAPM) reflect the application of different specific versions of the textbook formulas used to account for the impact of different financial leverage on financial risk.

[92] Black, Fischer. Beta and Return. *The Journal of Portfolio Management* 20 (Fall): 8-18.

[93] Fama, Eugene F. and Kenneth R. French. 1992. The Cross-Section of Expected Stock Returns. *Journal of Finance* 47 (June): 427-465.

Figure 14
CAPM / ECAPM Summary at 51.9% Equity

Estimated Return on Equity	Scenario 1 [1]	Scenario 2 [2]
Full Sample		
Financial Risk Adjusted Method		
CAPM	9.8%	9.7%
ECAPM (α = 1.5%)	10.2%	10.1%
Hamada Adjustment Without Taxes		
CAPM	9.6%	9.5%
ECAPM (α = 1.5%)	9.5%	9.5%
Hamada Adjustment With Taxes		
CAPM	9.3%	9.2%
ECAPM (α = 1.5%)	9.3%	9.3%
Gas Sample		
Financial Risk Adjusted Method		
CAPM	9.9%	9.8%
ECAPM (α = 1.5%)	10.1%	10.0%
Hamada Adjustment Without Taxes		
CAPM	9.6%	9.6%
ECAPM (α = 1.5%)	9.6%	9.6%
Hamada Adjustment With Taxes		
CAPM	9.4%	9.4%
ECAPM (α = 1.5%)	9.4%	9.4%

Sources and Notes:
[1]: Long-Term Risk Free Rate of 2.30%, Long-Term Market Risk Premium of 7.15%.
[2]: Long-Term Risk Free Rate of 2.05%, Long-Term Market Risk Premium of 7.35%.

Q56. How do you interpret the results of your CAPM and ECAPM Analyses?

A56. Looking to Figure 14 above, the results range from about 9.0 percent to a bit over 10.0 percent.[94] As discussed above, the established academic evidence indicates that the traditional CAPM tends to understate the cost of equity for lower-than-average risk

[94] I round to the nearest 0.25% when determining ranges of reasonable results. Clearly, there are numbers below 9% and numbers above 10% in the table, but if rounding to the nearest .25%, all results are within that range.

companies such as those in Figure 11 above, so the ECAPM may be more applicable. I acknowledge that the Commission in U-18999 agreed "in general, with the ALJ's analysis"[95] and that the ALJ found that "DTE Gas' CAPM results were calculated using the ATWACC and ECAPM methods and neither the Commission, nor any other state regulatory commission, have adopted these methods."[96] For the record, the New York Public Service Commission consistently implement an ECAPM version as does the Mississippi Public Service Commission.[97] Thus, the method has certainly been adopted. Similarly, the Surface Transportation Board calculates a weighted average cost of capital using market value and uses that figure to assess the freight railroads' earnings.[98]

C. DCF BASED ESTIMATES

Q57. Can you describe the DCF model's approach to estimating the cost of equity?

A57. The DCF model attempts to estimate the cost of capital for a given company directly, rather than based on its risk relative to the market as the CAPM does. The DCF method assumes that the market price of a stock is equal to the present value of the dividends that its owners expect to receive. The method also assumes that this present value can be calculated by the standard formula for the present value of a cash flow—literally a stream of expected "cash flows" discounted at a risk-appropriate discount rate. When the cash flows are dividends, that discount rate is the cost of equity capital:

$$\boldsymbol{P_0 = \frac{D_1}{1+r} + \frac{D_2}{(1+r)^2} + \frac{D_3}{(1+r)^3} + \cdots + \frac{D_T}{(1+r)^T}} \quad (3)$$

Where,

$\boldsymbol{P_0}$ is the current market price of the stock;

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95 Order in U-18999, p. 53.

96 Order in U-18999, p. 48.

97 See, for example, State of New York Public Service Commission, "Staff Finance Panel Testimony", Case Nos. 18-E-0067, 18-G-0068, May 2018, p. 134 and Mississippi Public Service Commission, "PERFORMANCE EVALUATION PLAN RATE SCHEDULE "PEP-5A" 2015.

98 See, for example, Surface Transportation Board, "Decision: Docket No. EP 558 (Sub-No. 23), Railroad Cost of Capital – 2019."

$\boldsymbol{D_t}$ is the dividend cash flow expected at the end of period $\boldsymbol{t}$;

$\boldsymbol{T}$ is the last period in which a dividend cash flow is to be received; and

$\boldsymbol{r}$ is the cost of equity capital.

Importantly, this formula implies that if the current market price and the pattern of expected dividends are known, it is possible to "solve for" the discount rate r that makes the equation true. In this sense, a DCF analysis can be used to estimate the cost of equity capital implied by the market price of a stock and market expectations for its future dividends.

Many DCF applications assume that the growth rate lasts into perpetuity, so the formula can be rearranged algebraically to directly estimate the cost of capital. Specifically, the implied DCF cost of equity can then be calculated using the well-known "DCF formula" for the cost of capital:

$$\boldsymbol{r = \frac{D_1}{P_0} + g = \frac{D_0}{P_0} \times (1 + g) + g} \qquad (4)$$

where $\boldsymbol{D_0}$ is the current dividend, which investors expect to increase at rate $\boldsymbol{g}$ by the end of the next period, and over all subsequent periods into perpetuity.

Equation (4) says that if equation (3) holds, the cost of capital equals the expected dividend yield plus the (perpetual) expected future growth rate of dividends. I refer to this as the single-stage DCF model; it is also known as the Gordon Growth model, in honor of its originator, Professor Myron J Gordon.

Q58. Are there other versions of the DCF model?

A58. Yes. There are many alternative versions, notably (i) multi-stage models, (ii) models that use cash flow rather than dividends, or versions that combine aspects of (i) and (ii).[99]

99 The Surface Transportation Board uses a cash flow based model with three stages. See, for example, Surface Transportation Board Decision, "STB Ex Parte No. 664 (Sub-No. 1)," Decided January 23, 2009 and most recently re-affirmed in "STB Ex Parte No. 664 (Sub-No. 4)," issued June 23, 2020.

One such alternative expands the Gordon Growth model to three stages. In the multistage model, earnings and dividends can grow at different rates, but must grow at the same rate in the final, constant growth rate period. [100]

In my implementation of the multi-stage DCF, I assume that companies grow their dividend for five years at the forecasted company-specific rate of earnings growth, with that growth then tapering over the next five years toward the growth rate of the overall economy (*i.e*., the long-term GDP growth rate forecasted to be in effect ten years or more into the future). I note that the multi-stage DCF model likely understates the cost of equity as it is plausible the payout ratio changes and a company reaches steady-state growth. The model ignores that possibility.

1. DCF Inputs and Results

Q59. What growth rate information do you use?

A59. The first step in my DCF analysis (either constant growth or multi-stage formulations) is to examine a sample of investment analysts' forecasted earnings growth rates for companies in my proxy group. For the single-stage DCF and for the first stage of the multi-stage DCF, I use investment analyst forecasts of company-specific growth rates sourced from *Value Line* and Thomson Reuters *IBES*.

For the long-term growth rate for the final, constant-growth stage of the multistage DCF estimates, I use the long-term U.S. GDP growth forecast of 4.1 from Blue Chip Economic Indicators.[101] Thus, the long-run (or terminal) growth rate in the multi-stage model is nominal GDP growth.

Q60. What are the pros and cons of the input data?

A60. Both the Gordon Growth and single-stage DCF models require forecast growth rates that reflect investor expectations about the pattern of dividend growth for the companies over

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100 See Appendix B, Section I for further discussion of the various versions of the DCF model, as well as the details of the specific versions I implement in this proceeding.

101 See Blue Chip Economic Indicators, October 2020, p. 14.

a sufficiently long horizon, but estimates are typically only available for three - five years. In the multi-stage version, I taper these growth rates toward a stable growth rate corresponding to a forecast of long-term GDP growth for all companies.

One issue with the data is that it includes solely dividend payments as cash distributions to shareholders, while some companies also use share repurchases to distribute cash to shareholders. To the extent that companies distribute cash to shareholders via share repurchases, a DCF model that uses dividends as the payment to shareholders will under-estimate the cost of equity capital.

Q61. Please summarize the DCF-based cost of equity estimates for the proxy groups.

A61. The results of the DCF based estimation for the proxy groups are displayed below in Figure 15.

Figure 15
DCF Model Results at 51.9% Equity

	Simple	Multi-stage
	[1]	[2]
Gas Sample	11.1%	8.6%
Full Sample	11.8%	8.4%

Q62. How do you interpret the results of your DCF analyses?

A62. The DCF models are estimated based on dividend yields that may be expected to increase as interest rates continue to rise in the coming months and years. It is also possible that the current growth forecasts are impacted by the financial impact of the COVID-19 pandemic, so that macro-economic forecasts may change as the pandemic moderates. Consequently, I believe that the multi-stage DCF underestimates the cost of equity at this point in time, so that emphasis should be put on the simple DCF (consistent with Staff's practice). I also note that because the results reported in Figure 15 above are relatively close to those obtained before considering financial risk – for example, the natural gas

LDC proxy group show an average DCF-based cost of equity of 10.7 percent prior to any consideration of financial risk.[102]

D. RISK PREMIUM MODEL ESTIMATES

Q63. Did you estimate the cost of equity that results from an analysis of risk premiums implied by allowed ROEs in past utility rate cases?

A63. Yes. In this type of analysis, sometimes called the "risk premium model," the cost of equity capital for utilities is estimated based on the historical relationship between allowed ROEs in utility rate cases and the risk-free rate of interest at the time the ROEs were granted. These estimates add a "risk premium" implied by this relationship to the relevant (prevailing or forecast) risk-free interest rate:

$$Cost\ of\ Equity = r_f + Risk\ Premium \qquad (5)$$

Q64. What are the merits of this approach?

A64. First, it estimates the cost of equity from regulated entities as opposed to holding companies, so that the relied-upon figure is directly applicable to a rate base. Second, the allowed returns are readily observable to market participants, who will use this one data input in making investment decisions, so that the information is at the very least a good check on whether the return is comparable to that of other investments. Third, I analyze the spread between the allowed ROE at a given time and the then-prevailing interest rate to ensure that I properly consider the interest rate regime at the time the ROE was awarded. This implementation ensures that I can compare allowed ROE granted at different times and under different interest rate regimes.

[102] Schedule D5.7.

Q65. How did you use rate case data to estimate the risk premiums for your analysis?

A65. The rate case data from 1990 through November 2020 is derived from Regulatory Research Associates.[103] Using this data I compared (statistically) the average allowed rate of return on equity granted by U.S. state regulatory agencies in natural gas LDC cases to the average 20-year Treasury bond yield that prevailed in each quarter.[104] I calculated the allowed utility "risk premium" in each quarter as the difference between allowed returns and the Treasury bond yield, since this represents the compensation for risk allowed by regulators. Then I used the statistical technique of ordinary least squares ("OLS") regression to estimate the parameters of the linear equation:

$$Risk\ Premium = A_0 + A_1 \times (Treasury\ Bond\ Yield) \tag{6}$$

I derived my estimates of A_0 and A_1 using standard statistical methods (OLS regression) and found that the regression has a high degree of explanatory power in a statistical sense. I report my results for the respective classifications of rate cases below in Figure 16.[105] I note that the results displayed in Figure 16 below shows that the risk premium model fits the data well as the R-squared is above 80% for the more recent period of 2011 to today and above 70% for the full period. The R-squared is a measure of how well the data fits the model and these R-squared indicate solid results.

103 SNL Financial as of December 2020.

104 I rely on the 20-year government bond to be consistent with the analysis using the CAPM to avoid confusion about the risk-free rate. While it is important to use a long-term risk-free rate to match the long-lived nature of the assets, the exact maturity is a matter of choice.

105 Schedule D5.17 contains my risk premium analysis.

Figure 16
Implied Risk Premium Model Estimates

	R Squared	Estimate of Intercept (A0)	Estimate of Slope (A1)	Implied Cost of Equity Range	
	[1]	[2]	[3]	[4]	[5]
Q1 2011 - Q3 2020	0.883	9.41%	-0.900	9.6%	9.6%
Q1 1990 - Q4 2010	0.711	8.34%	-0.534	9.3%	9.4%

Sources and Notes:
[1]-[3]: Estimated Using S&P Market Intelligence, as of 11/30/2020.
[4]: Risk-free rate of 2.05%
[5]: Risk-free rate of 2.30% (includes utility yield spread adjustment of 0.25%)

The negative slope coefficient reflects the empirical fact that regulators grant smaller risk premiums when risk-free interest rates (as measured by Treasury bond yields) are higher. This is consistent with past observations that the premium investors require to hold equity over government bonds increases as government bond yields decline. In the regression described above, the risk premium declined by less than the increase in Treasury bond yields. Therefore, the allowed ROE on average declined by less than 100 bps when the government bond yield declined by 100 bps. Because I was concerned that the market has changed since the substantial drop in risk-free rates, I statistically tested whether the results for the full period and the results for the more recent period could be considered the same from a statistical perspective – and they could not.[106] Hence, the relationship has changed, so that the slope today is steeper meaning that a change in the risk-free rate has less of an impact on ROE than previously. The more recent regression is correspondingly more reliable today.

Q66. Please summarize your results before considering where to place DTE Gas.

A66. The results are summarized in Figure 17 below.

[106] Technically, I undertook a ML test to determine whether and where a structural break may have happened and a standard Chow test to investigate whether the difference between the two regressions could be explained by the statistical variation in the data. The test rejected that so from a statistical perspective the period from 2011 onward is different from the prior period.

Figure 17
Summary of Ranges

	Gas Sample		Full Sample	
	Low	High	Low	High
CAPM	9.4%	9.9%	9.2%	9.8%
ECAPM	9.4%	10.1%	9.3%	10.2%
Multi-Stage DCF	8.6%		8.4%	
Single-Stage DCF		11.1%		11.8%
Risk Premium	9.4%	9.6%	na	na
Range	8.6 - 9.4%	9.6 - 11.1%	8.4- 9.3%	9.8 - 11.8%
Average, all methods	9.2%	10.2%	9.0%	10.6%

VI. DTE GAS SPECIFIC CIRCUMSTANCES AND ROE RECOMMENDATION

A. BUSINESS RISK CHARACTERISTICS

Q67. Are there any differences in the regulatory environment in which the comparable companies and DTE Gas operates?

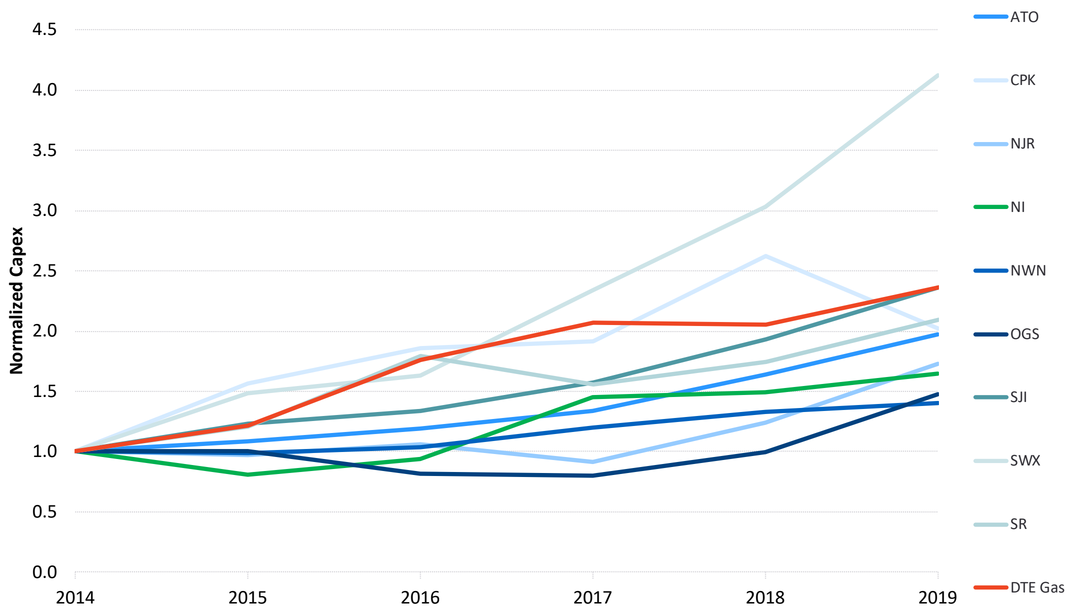
A67. Like many of the sample companies, DTE Gas benefits from certain regulatory policies that reduce regulatory lag, including a forward test year for rate cases, and an annual recovery mechanism for expenses such as fuel. DTE Gas also has a decoupling mechanism. However, many of these mechanisms are similar to those of the majority of the sample companies. For example, SNL reports that more than half of U.S. jurisdictions use decoupling mechanisms and all have a fuel recovery mechanism.[107]

Q68. Are there any specific area in which DTE Gas has higher risk than the sample?

A68. Yes, there are several. First, DTE Gas has higher capital expenditures than the average company in the Gas Sample as can be seen in the table below, which normalizes all natural gas LDCs capital expenditures to equal 1.0 in 2014. It is readily seen that DTE Gas have experienced higher capital expenditures than its peers.

[107] SNL, "RRA Regulatory Focus: Adjustment Clauses – A State-by-State Overview," November 12, 2019

Figure 18
Comparison of DTE Gas' and Gas Sample's Capital Expenditures



Source: DTE Gas and S&P Capital IQ.

As can be seen from the figure above, DTE Gas' capital expenditures has exceeded those of all sample gas utilities but Southwest Gas. Because a higher capital expenditure is associated with higher risk, DTE Gas is all else more risky. Higher capital expenditures also indicate a move towards becoming more capital intensive. Capital intensity is also associated with higher risks as capital cost are fixed costs that cannot be eliminated should economic conditions deteriorate. DTE Gas' high capital expenditure is also noted as a credit challenge Moody's Investor Service.[108]

Q69. Are there other measures of capital intensity?

A69. Yes. A common measure of capital intensity is the amount of revenue relative to fixed assets (property, plant, and equipment). The less revenue each dollar of fixed asset generates, the more capital intense is the company. A higher level of capital intensity

[108] Moody's Investor Service, "DTE Gas Company," July 23, 2020.

implies that a larger amount of fixed assets has to be supported by each dollar revenue, which results in less flexibility. Looking next to DTE Gas' capital intensity, I find that it is higher than the gas sample average meaning the amount of revenue per dollar invested in property, plant, and equipment ("PP&E") is lower than that of the proxy group.

Figure 19
Comparison of DTE Gas' and Gas Sample Capital Intensity

	2012	2013	2014	2015	2016	2017	2018	2019	Average
	[1]	[2]	[3]	[4]	[5]	[6]	[7]	[8]	
Atmos Energy	0.47	0.52	0.57	0.37	0.24	0.25	0.24	0.19	0.36
Chesapeake Utilities	0.56	0.55	0.56	0.43	0.40	0.32	0.30	0.26	0.42
New Jersey Resources	1.20	1.58	1.52	0.87	0.66	0.74	0.89	0.55	1.00
NiSource Inc.	0.23	0.20	0.30	0.24	0.22	0.23	0.22	0.21	0.23
Northwest Natural	0.26	0.26	0.25	0.23	0.21	0.24	0.21	0.21	0.23
ONE Gas Inc.	0.32	0.37	0.38	0.30	0.26	0.27	0.27	0.26	0.30
South Jersey Inds.	0.36	0.32	0.34	0.32	0.32	0.37	0.37	0.33	0.34
Southwest Gas	0.36	0.34	0.35	0.38	0.36	0.35	0.35	0.35	0.36
Spire Inc.	0.67	0.51	0.44	0.41	0.33	0.33	0.33	0.28	0.41
Gas SampleAverage	0.49	0.52	0.52	0.40	0.33	0.34	0.35	0.29	0.41
DTE Gas	0.32	0.35	0.38	0.30	0.27	0.26	0.25	0.24	0.30

In each year, DTE Gas saw lower revenue per dollar PP&E and hence is more capital intensive. Looking to Schedule D5.18, DTE Gas' capital intensity in between that of the gas sample and water sample average.

Q70. What do you conclude from this analysis?

A70. Because DTE Gas is more capital intensive and has relatively higher capital expenditures, it has relatively less flexibility regarding the use of the revenue; (i.e.., they face a higher degree of risk from fluctuations in revenue and is all else equal more risky).

Q71. Are there other factors that may impact DTE Gas' relative risk?

A71. Yes. DTE Gas operates in the state of Michigan, where the Detroit area is predominant in its service territory. Michigan's economy is heavily dependent upon the auto industry, and Detroit's economy in relatively weaker than the Michigan economy. The City of Detroit ("City"), which was in bankruptcy until December 10, 2014, was recovering until the COVID-19 pandemic hit. Currently, the unemployment in the Detroit area is about 8.9 percent while that of the U.S is about 6.7%.[109]

Further, according to recent census data, Detroit is among the poorest cities in the country[110] and the City has experienced falling population year-over-year since 2005.

The weak local economic conditions and declining population and industrial activity in the Company's service territory contribute to and exacerbate the effect of declining sales, which—in conjunction with a rate structure that relies on volumetric charges to recover fixed costs—increases the downside risk that DTE Gas may not be able to earn its authorized return.

The risk of under-recovery of DTE Gas' fixed costs due to its reliance on volumetric charges to recover fixed costs is magnified by DTE Gas' relatively higher capital intensity and capital spending.

Q72. Are there other factors that impact DTE Gas' risk?

A72. Yes. As discussed in the direct testimony of Mr. ~~Solomon~~ Bennett, DTE Gas was downgraded by Moody's in July 2019 due to the high level of capital expenditure, the effect of the federal tax reform and pressure on its financial metrics. Combined with the higher than average capital spending and capital intensity, it is evidence that DTE Gas is riskier than the average natural gas sample company.

Q73. Can you please summarize your assessment of DTE Gas' business risk relative to the sample?

A73. Compared to the sample, DTE Gas is engaged in the same line of business, has a comparable credit rating and access to similar regulatory mechanisms. However, DTE

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[109] www.bls.gov/regions/economic-summaries.htm, "Detroit Area Economic Summary," January, 2021 and https://www.bls.gov/news.release/pdf/empsit.pdf

[110] https://www.mlive.com/news/2019/09/flint-and-detroit-among-nations-top-5-poorest-cities-new-census-data-shows.html

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Gas has relatively higher capital intensity, higher capital expenditure in recent years and operates in a distressed locality. As a result, DTE Gas is riskier than the sample profile.

VII. COST OF CAPITAL RECOMMENDATION

Q74. Please summarize your conclusions regarding DTE Gas' risk and the necessary return.

A74. I find that DTE Gas to be of higher than average risk relative to the sample companies and merits placement in the upper end of the reasonable range that I summarized in Figure 17 above. I therefore recommend that DTE Gas be placed at the upper end of the reasonable range.

Q75. What do you recommend for DTE Gas' cost of equity in this proceeding?

A75. I find a range of about 9¼ to 10¼ percent for the gas sample and wider range of about 9 to 10½ percent for the full sample. As DTE Gas is of higher risk, the Company can reasonably be placed at the upper end of this range and I recommend 10.25 percent along with the 51.9% percent equity. This recommendation is at the upper end of the reasonable range I obtained from the DCF, CAPM and Risk Premium models, considering the natural Gas Sample and the full sample.111 Lastly, I note that if a lower than 51.9% equity is allowed DTE Gas, then its cost of equity is higher than the 10.25 percent I recommend at 51.9 percent equity.

Q76. Does this conclude your direct testimony?

A76. Yes, it does.

[111] I emphasize the gas LDC sample as the Commission in the past has found that sample more compelling.

RATING ACTION COMMENTARY

Fitch Affirms DTE Energy, DTE Electric Co. and DTE Gas Co.'s Ratings; Outlook Stable

Mon 07 Nov, 2022 - 11:17 AM ET

Fitch Ratings - New York - 07 Nov 2022: Fitch Ratings has affirmed DTE Energy Co.'s (DTE) Long-Term Issuer Default Rating (IDR) at 'BBB'. In addition, Fitch has affirmed the Long-Term IDRs of DTE Electric Company (DTEE) at 'A-' and DTE Gas Company (DTEG) at 'BBB+'. expecting the largely stable financial metrics over 2023-2025 despite significant capital expenditure plans at both utilities. The Rating Outlooks for DTE, DTEE and DTEG are Stable.

The Gas Storage and Pipeline (GSP) spin off in 2021 resulted in a positive shift in DTE's risk profile with state-regulated operations comprising more than 90% of the company's EBITDA. Fitch projects that DTE's FFO leverage will remain modestly elevated in 2022, but will reduce to 5.2x in 2023 following DTEE rate case implementation and deferred fuel and purchased power costs recovery. FFO leverage is projected to remain within the rating sensitivities' range at all three entities through 2025.

KEY RATING DRIVERS

DTE Energy

Sound Credit Metrics Beyond 2022: DTE's Funds from operations (FFO) leverage is projected at 5.9x in 2022, just over Fitch's negative sensitivity threshold, primarily due to higher than expected fuel costs and absence of a rate case filing at DTEE since 2020 vs. its usual annual rate case filings. Although weaker than previously estimated FFO leverage is expected to improve in 2023 to about 5.2x in 2023 following the Gas Cost Recovery Mechanism (GCR) and Power Supply Cost Recovery Mechanism (PSCR) recoveries and a rate relief from DTE Electric rate case. FFO leverage is projected to increase in 2024-2025 due to debt funded capex, but remain within our sensitivities. Parent debt is projected to continue to remain elevated at around 33% of the total debt in 2022-2025.

Significant Utility-Focused Investments: DTE's current $19.1 billion-19.5 billion capital program in 2022-2026 represents a 6% increase vs. previous 2021 plan. This includes distribution, environmental compliance projects, gas generation, pumped storage, and a 40% increase in wind and solar generation to 1.9GW. DTE is expected to announce an upward revision in its capital plan in mid-November factoring in the renewable tax benefits provided by the Inflation Reduction Act (IRA). Non-regulated investments are focused on developing new renewable natural gas (RNG) and cogeneration projects. Fitch projects any incremental capital investment over our forecast period, beyond currently announce program, will be financed to maintain leverage commensurate with the current ratings.

IRA Tailwinds: DTE's renewable plans are expected to be supported by the extended and expanded tax incentives and introduction of tax credit transferability under the IRA passed in August 2022. Additionally, DTE does not project any impact from Alternate Minimum Tax (AMT) until it hits the $1 billion of pre-tax earnings threshold in 2025.Any potential negative cash impact should be mostly offset by accelerated depreciation and renewable tax credits. DTE Vantage's RNG investments will also benefit from the tax credits and lower cost of construction. However, RNG investments are not expected to increase beyond 10% of DTE's total earnings.

Constructive Utility Regulatory Environment: The Michigan regulatory environment remains constructive from a credit perspective, evidenced by approved authorized ROEs of 9.9% for DTEE and DTEG which are above industry averages for electric and gas utilities. The regulatory framework, overseen by the Michigan Public Service Commission (MPSC), allows full pass through of fuel and purchased power costs, forward-looking test years and a timely 10-month review period for the General Rate Case resolution. The gas utility business also benefits from partial revenue decoupling, and infrastructure recovery mechanisms (IRM).

Fitch believes recent rate orders are constructive and supportive of current credit ratings and significant capital investment. Fitch doesn't expect any material negative outcome of the audit ordered by MPSC in October 2022 to assess DTE's compliance with storm outages and safety regulations. A supportive regulatory environment remains a key rating driver as most of DTE's cash flow are derived from its two utilities.

Cash flow Impact from Rising Fuel Costs: The steep increase in fuel prices in 2022 is projected to lead to temporary cash flow and credit metrics pressure for DTE given timing delays in fuel cost recovery. DTEE and DTEG do not bear exposure to the commodity risk, due to the PSCR and GCR; purchased power and fuel recovery mechanisms in place at both utilities. DTEE's diversified generation and the hedging program at DTEG, also provide some customer bill protection in the rising natural gas environment. DTE has also been successful historically in managing its costs and keeping O&M expense increases below inflation. Fitch expects the company to continue managing its costs in the current rising interest rate environment.

DTEE filed its last PSCR in September 2022, which reflects higher natural gas and purchased power prices expected in 2023, as well as, under-recovered 2022 balances. DTEG filed for an increase in its GCR factor in May 2022 and the increase in the GCR became effective September 2022.

Parent/Subsidiary Linkage: There is parent subsidiary linkage between DTE and its rated subsidiaries. Fitch determines DTE's standalone credit profile (SCP) based upon consolidated metrics. Fitch considers DTEE and DTEG to have SCPs stronger than DTE. As such, Fitch has followed the stronger subsidiary path. Emphasis is placed on the DTEE and DTEG status as regulated entities. Legal ring fencing is considered porous given the general protections afforded by economic regulation. Access and control are evaluated as porous.

DTE centrally manages the treasury function for all of its entities and is the sole source of equity; however, each subsidiary issues its own short-term and long-term debt. Due to the aforementioned linkage considerations, Fitch will limit the difference between DTE and its subsidiaries DTEE and DTEG to two notches.

DTE Electric

Rate Case Filing: DTEE, following a two-year deferral period due to the pandemic, filed a rate case with the MPSC on Jan. 21, 2022. A final MPSC order is expected in late November 2022. Fitch assumes a constructive outcome of the upcoming rate case filing with ROE and equity ratio in line with recent rate case decisions in the state. Although the absence of a rate increase is modestly pressuring cash flows in 2022, it should be mostly offset by proceeds from the securitization proceeds and further O&M cost management. Going forward, DTEE is expected to file a rate case every year.

Elevated Capex Driven by Decarbonization: DTEE plans to invest approximately $15 billion ($4 billion for capital replacements and other projects, $8 billion for distribution infrastructure, and $3 billion for renewable generation) during 2022-2026, a $1 billion or a 7% increase versus previous plan for 2021-2025. Further upward capex revision is expected later this month driven primarily by the recent IRA implementation. Fitch believes the capex program over the next five years will not present major technological or execution risks. Fitch expects internal cash flows to fund the program, with debt and equity support from DTE to maintain the utility's regulatory capital structure.

On Nov. 3, 2022, DTE filed its 2022 IRP accelerating its decarbonization goals targeting a CO_2 emissions reduction of 65% in 2028, 85% in 2035, 90% by 2040 and net zero emissions by 2050. At DTEE, 15.4GW of renewables and 1.8GW of storage is expected to be added by 2042 to the current 3GW and 1.1GW, respectively. DTE also plans to retire all coal plants by 2035 (vs. previous retirement date of 2040).

Solid Financial Profile: Fitch estimates FFO leverage of 4.2x in 2022, reflecting moderate pressure from high capital spending, fuel costs and PSCR under recoveries. FFO leverage is expected to average 4.0x through 2025 following a return to regular annual rate case filings. Fitch believes the credit metrics are consistent with the current rating. Debt maturities are manageable, and Fitch expects DTEE to have continued access to capital markets.

DTE Gas

Supportive Regulatory Environment: DTEG's currently authorized ROE of 9.9% compares favorably with industry averages. Furthermore, revenue-decoupling and an IRM helps DTEG reduce exposure to regulatory lag. On Dec. 9, 2021, the MPSC approved an increase of $84 million as of Jan. 1, 2022, including a return on equity of 9.9%, a credit constructive outcome in Fitch's views. DTEG tends to a file rate case every other year and Fitch believes outcomes will remain constructive.

Capex Program: DTEG plans to spend $3.1 billion ($1.5 billion for base infrastructure and $1.6 billion for gas main renewal, meter move out, and pipeline integrity programs) on capital investments in 2022-2026, The timely cost-recovery mechanism provided under the IRM covers about 49% of the projects in 2021 (47% projected for 2022). The investments, will render FCF negative in the intermediate term. Fitch expects the capital program will be funded with internal cash flow, debt and equity support to maintain DTEG's balanced capital structure.

Solid Financial Metrics: DTEG's current and projected credit measures are supportive of its current rating. FFO leverage exceeded negative sensitivity threshold in 2021 due to the higher O&M and rate base costs. However, Fitch estimates FFO leverage to remain within the sensitivity range over our forecast period, with FFO leverage averaging 4.8x from 2022-2025.

DERIVATION SUMMARY

DTE's credit profile is in line with its peers, Dominion Energy, Inc. (DEI; BBB+/Stable) and CMS Energy (BBB/Stable), which are also parents to regulated utility operations and with sizeable debt at the parent-level. DTE's consolidated operations are smaller than Dominion's which is geographically diversified in six states, but larger than CMS Energy's which is also limited to a single state, Michigan.

90% of DTE's EBITDA is expected to come from its single- state regulated utility businesses over the forecast period. DEI has approximately 85%-90% of EBITDA coming from state-regulated utility businesses. However, CMS has a higher (96% in 2020) EBITDA coming from a regulated utility in Michigan. In addition, DTE's parent- level debt is projected to stay around 33% over our forecast period. Although still elevated it is lower than 35%-40% projected for DEI post the asset sales but higher than about 25% at CMS Energy.

Fitch anticipates DTE's FFO leverage to be in the range of 5.2x-5.9x over 2022-2025. CMS's and DEI's FFO leverage are lower than DTE's and projected to average around 4.0x and 5.0x respectively over their forecast period (2022-2024).

DTEE compares favorably with other regulated single state peers, Consumers Energy Company (A-/Stable) and Northern States Power Company-Wisconsin (NSP; A-/Stable). All three operate in supportive regulatory environments with favorable recovery mechanisms. DTEE and Consumers both operate in Michigan and are similarly sized, while NSP is smaller and based in Wisconsin. However, Consumers also operates a gas utility while DTE and NSP are both electric utilities. DTEE's financial profile compares favorably with Consumers' but less so with NSP's. Fitch forecasts FFO-adjusted leverage to average 4.1x at DTEE through 2025, largely in line with 4.1x through 2024 at Consumers and 3.5x-3.8x through 2024 at NSP.

DTEG's business risk profile compares well to other local distribution peers Southwest Gas Corporation (SWG; A-/Negative) and Wisconsin Gas LLC (A-/Stable). All three risk profiles benefit from low risk businesses, supportive regulatory environments and favorable recovery mechanisms. SWG's benefits from regulatory diversity in three states and above-average customer growth.

However, less favorable regulatory outcomes, fuel expense and continuing high capex has pressured SWG's metrics. DTEG's financial profile is slightly weaker than peer WI Gas, but modestly stronger than SWG's. DTEG's forecasted FFO leverage is around 4.8x during the 2022-2025, similar to SWG's leverage projected around 4.8x in 2023. WI Gas has a more favorable financial profile with forecast leverage metrics around 4.2x-5.4x in 2022-2024.

KEY ASSUMPTIONS

--Constructive regulatory environment in Michigan with ROEs for DTEE and DTEG in line with the currently approved going forward.

--No material equity issuances apart from the mandatory converts in 2022.

--Securitization debt and revenues are excluded from the FFO and debt calculations.

--DTE Vantage business growing earnings 5%-7% annually and remaining below 10% EBITDA target over the forecast period.

--Capital structure commensurate with regulatory structure.

RATING SENSITIVITIES

DTE

Factors that could, individually or collectively, lead to positive rating action/upgrade:

--While not anticipated at this time given the sizable capital program and elevated leverage, sustained improvement in FFO leverage of 4.8x or lower through the forecast period.

Factors that could, individually or collectively, lead to negative rating action/downgrade:

--A significant deviation from the current business risk with the regulated businesses comprising less than 90% of consolidated cash flow due to growth in the non-utility businesses;

--An adverse change in Michigan's regulatory environment;

--Sustained weakening in FFO leverage of 5.8x or higher through the forecast period;

--Sustained increase in Parent Level debt beyond currently projected 30%-35% of total.

DTEE

Factors that could, individually or collectively, lead to positive rating action/upgrade:

--Sustained FFO leverage of 3.5x or better.

Factors that could, individually or collectively, lead to negative rating action/downgrade:

--A notch downgrade at the parent DTE;

--An adverse change in Michigan's regulatory environment;

--Sustained FFO leverage greater than 4.5x.

DTEG

Factors that could, individually or collectively, lead to positive rating action/upgrade:

--Sustained FFO leverage at or below 4.0x.

Factors that could, individually or collectively, lead to negative rating action/downgrade:

--An unexpected change in the regulatory environment that limits the utility's ability to recover cost of capital investments in a timely manner;

--Sustained FFO leverage greater than 5.0x.

BEST/WORST CASE RATING SCENARIO

International scale credit ratings of Non-Financial Corporate issuers have a best-case rating upgrade scenario (defined as the 99th percentile of rating transitions, measured in a positive direction) of three notches over a three-year rating horizon; and a worst-case rating downgrade scenario (defined as the 99th percentile of rating transitions, measured in a negative direction) of four notches over three years. The complete span of best- and worst-case scenario credit ratings for all rating categories ranges from 'AAA' to 'D'. Best- and worst-case scenario credit ratings are based on historical performance. For more information about the methodology used to determine sector-specific best- and worst-case scenario credit ratings, visit https://www.fitchratings.com/site/re/10111579.

LIQUIDITY AND DEBT STRUCTURE

DTE had around $1.7 billion of available liquidity as of Sept. 30, 2022, consisting of cash and amounts available under revolving credit facilities. DTE also has access to the unfunded committed amount of $725 million of the $1.125 billion delayed draw bank term at DTE Energy which matures in December 2023. DTE's LOCs and revolving credit facilities expire in 2023/2027, respectively, and the $50 million LOC has an automatic renewal provision. In October 2022, DTE increased its revolver by $300 million to $2.6 billion, amended its maximum debt/capitalization covenant to 70% from 65% (utilities remain at 65%) and extended its revolvers to October 2027.

The facilities are $1.5 billion at DTE, $800 million at DTEE and $300 million at DTEG. DTE, DTEE and DTEG were compliant with consolidated debt/capitalization of 68%, 52% and 50%, respectively, as defined under the credit agreement, as of Sept. 30, 2022. Debt maturities remain manageable given the history of successful refinancing and Fitch expects DTE to have continued access to the capital markets.

Fitch assigns 50% equity credit to $883 million junior subordinated debentures issued by DTE.

ISSUER PROFILE

DTE Energy Co. (DTE) is the parent holding company of DTE Electric (DTEE) and DTE Gas (DTEG), regulated electric and natural gas utilities that provide electric and natural gas sales, distribution, and storage services throughout Michigan. DTEE is an integrated electric utility company that serves approximately 2.3 million customers in south-eastern Michigan and is the primary driver of consolidated cash flows. DTEG is a natural gas utility distribution company serving approximately 1.3 million customers throughout Michigan. DTE also owns non-utility operations consisting of industrial energy projects and energy trading.

REFERENCES FOR SUBSTANTIALLY MATERIAL SOURCE CITED AS KEY DRIVER OF RATING

The principal sources of information used in the analysis are described in the Applicable Criteria.

ESG CONSIDERATIONS

Unless otherwise disclosed in this section, the highest level of ESG credit relevance is a score of '3'. This means ESG issues are credit-neutral or have only a minimal credit impact on the entity, either due to their nature or the way in which they are being managed by the entity. For more information on Fitch's ESG Relevance Scores, visit www.fitchratings.com/esg.

RATING ACTIONS

ENTITY / DEBT	RATING			PRIOR
DTE Gas Company	LT IDR	BBB+	Affirmed	BBB+
	ST IDR	F2	Affirmed	F2
senior secured	LT	A	Affirmed	A
senior unsecured	ST	F2	Affirmed	F2
DTE Electric Company	LT IDR	A-	Affirmed	A-
	ST IDR	F2	Affirmed	F2
senior secured	LT	A+	Affirmed	A+

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VIEW ADDITIONAL RATING DETAILS

Additional information is available on www.fitchratings.com

PARTICIPATION STATUS

The rated entity (and/or its agents) or, in the case of structured finance, one or more of the transaction parties participated in the rating process except that the following issuer(s), if any, did not participate in the rating process, or provide additional information, beyond the issuer's available public disclosure.

APPLICABLE CRITERIA

Corporate Hybrids Treatment and Notching Criteria (pub. 12 Nov 2020)

Corporates Recovery Ratings and Instrument Ratings Criteria - Effective from 9 April 2021 to 13 October 2023 (pub. 09 Apr 2021) (including rating assumption sensitivity)

Parent and Subsidiary Linkage Rating Criteria - Effective from 1 December 2021 to 16 June 2023 (pub. 01 Dec 2021)

Corporate Rating Criteria - Effective from 28 October 2022 to 3 November 2023 (pub. 28 Oct 2022) (including rating assumption sensitivity)

APPLICABLE MODELS

Numbers in parentheses accompanying applicable model(s) contain hyperlinks to criteria providing description of model(s).

Corporate Monitoring & Forecasting Model (COMFORT Model), v8.0.3 (1)

ADDITIONAL DISCLOSURES

Dodd-Frank Rating Information Disclosure Form

Solicitation Status

Endorsement Policy

ENDORSEMENT STATUS

DTE Electric Company	EU Endorsed, UK Endorsed
DTE Energy Company	EU Endorsed, UK Endorsed
DTE Gas Company	EU Endorsed, UK Endorsed

DISCLAIMER & DISCLOSURES

SOLICITATION STATUS

The ratings above were solicited and assigned or maintained by Fitch at the request of the rated entity/issuer or a related third party. Any exceptions follow below.

ENDORSEMENT POLICY

Fitch's international credit ratings produced outside the EU or the UK, as the case may be, are endorsed for use by regulated entities within the EU or the UK, respectively, for regulatory purposes, pursuant to the terms of the EU CRA Regulation or the UK Credit Rating Agencies (Amendment etc.) (EU Exit) Regulations 2019, as the case may be. Fitch's approach to endorsement in the EU and the UK can be found on Fitch's Regulatory Affairs page on Fitch's website. The endorsement status of international credit ratings is provided within the entity summary page for each rated entity and in the transaction detail pages for structured finance transactions on the Fitch website. These disclosures are updated on a daily basis.

Energy and Natural Resources | Corporate Finance | Utilities and Power | North America | United States

RELATED REGIONS

United States

ENTITIES

DTE Energy Company
DTE Gas Company
DTE Electric Company

ISSUER CONTENT

and C Mortgage Bonds 'A+'
Fitch Rates DTE Energy's 2024 Series A Senior Unsecured Notes 'BBB'
DTE Electric Company
DTE Gas Company
Deteriorating Outlook for North American Utilities, Power & Gas in 2024
North American Utilities, Power & Gas Outlook 2024
North American Utilities, Power & Gas — Relative Credit Analysis
Fitch Rates DTE Energy's 2023 Series C Senior Unsecured Notes 'BBB'

RECOMMENDED CONTENT

Recent Department Store Rating Actions Reflect Ongoing Challenges
Better Credit Trend Forecast for HY than IG Corporates Through 2025
Blackstone Secured Lending Fund- Ratings Navigator
– Fitch Ratings to Present EMEA Food Retail Webinar
High Interest Rates, Vacancies Pressure Hong Kong Commercial Real-Estate Issuers
Pressure Rising for Hong Kong Commercial Real-Estate Issuers

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STATE OF MICHIGAN

BEFORE THE MICHIGAN PUBLIC SERVICE COMMISSION

In the matter of the application of	)	
DTE GAS COMPANY for authority	)	
to increase its rates, amend its rate	)	
schedules and rules governing the	)	Case No. U-20642
distribution and supply of natural gas,	)	
and for miscellaneous accounting authority	)	
______________________________________	)	

DIRECT TESTIMONY

OF

DR. BENTE VILLADSEN

LIST OF TOPICS ADDRESSED:

COST OF COMMON EQUITY CAPITAL

TABLE OF CONTENTS

DTE GAS COMPANY
DIRECT TESTIMONY OF BENTE VILLADESN

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I. INTRODUCTION AND PURPOSE

Q1. Please state your name, occupation and business address for the record.

A1. My name is Bente Villadsen and I am a Principal of The Brattle Group, whose business address is One Beacon Street, Suite 2600, Boston, Massachusetts, 02108.

Q2. Briefly describe your present responsibilities at The Brattle Group.

A2. As a Principal, it is my responsibility to research and direct research into the utility industry as it pertains to cost of capital and related issues. It is also my responsibility to consult on utility industry issues and testify on utility industry matters. Among my other duties is the supervision and training of staff and ensuring that work products are of high quality and accurate.

Q3. Briefly describe your educational and professional qualifications.

A3. I have 20 years of experience working with regulated utilities on cost of capital and related matters. My practice focuses on cost of capital, regulatory finance, and accounting issues. I am the co-author of the text, "Risk and Return for Regulated Industries"[1] and a frequent speaker on regulatory finance at conferences and webinars. I have testified or filed expert reports on cost of capital in Alaska, Arizona, California, Illinois, Michigan,[2] New Mexico, New York, Oregon, and Washington, as well as before the Bonneville Power Administration, Federal Energy Regulatory Commission, the Surface Transportation Board, the Alberta Utilities Commission, and the Ontario Energy Board. I have provided white papers on cost of capital to the British Columbia Utilities Commission, the Canadian Transportation Agency as well as to European and Australian regulators on cost of capital. I have testified or filed testimony on regulatory accounting

[1] Bente Villadsen, Michael J. Vilbert, Dan Harris, A. Lawrence Kolbe, "Risk and Return for Regulated Industries," Academic Press, 2017.

[2] Previously I filed testimony on cost of equity before the Michigan Public Service Commission ("Commission") in U-20561.

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issues before the Federal Energy Regulatory Commission ("FERC"), the Regulatory Commission of Alaska, the Michigan Public Service Commission, the Texas Public Utility Commission as well as in international and U.S. arbitrations and regularly provide advice to utilities on regulatory matters as well as risk management.

I hold a Ph.D. from Yale University and a BS/MS from University of Aarhus, Denmark. Appendix A contains more information on my professional qualifications as well as a list of my prior testimonies and publications.

Q4. What is the purpose of your testimony in this proceeding?

A4. DTE Gas Company ("DTE Gas" or the "Company") has asked me to estimate the cost of equity that the Michigan Public Service Commission ("Commission") should allow DTE Gas an opportunity to earn on the equity-financed portion of its regulated utility rate base. I also consider the relative risk of the Company and its proposed regulatory capital structure ratio to arrive at my recommendation for the allowed Return on Equity ("ROE").

Q5. Are you sponsoring any exhibits?

A5. Yes. I am sponsoring Exhibit D5, which contains the details of my analysis and supporting tables

Schedule	**Description**
D5.1	Table of Contents
D5.2	Classification of Companies by Assets
D5.3	Market Value of the Sample Companies
D5.4	Capital Structure Summary of the Samples
D5.5	Estimated Growth Rates of the Samples
D5.6	DCF Cost of Equity of the Samples
D5.7	Overall After-Tax DCF Cost of Capital of the Samples
D5.8	DCF Cost of Equity at DTE Gas Company's Proposed Capital Structure
D5.9	Risk-Free Rates
D5.10	Risk Positioning Cost of Equity of the Samples

D5.11	Overall After-Tax Risk Positioning Cost of Capital of the Samples
D5.12	Risk Positioning Cost of Equity at DTE Gas Company's Proposed Capital Structure
D5.13	Hamada Adjustment to Obtain Unlevered Asset Beta
D5.14	The Samples' Average Asset Beta Relevered at DTE Gas Company's Proposed Capital Structure
D5.15	Risk-Positioning Cost of Equity using Hamada-Adjusted Betas
D5.16	Risk Premiums Determined by Relationship Between Authorized ROEs and Long-term Treasury Bond Rates
D5.17	Capital Intensity-Revenues
D5.18	Estimation of S&P 500 Cost of Equity - DDM

Q6. Was this material prepared by you or under your supervision?

A6. Yes. It was.

II. SUMMARY OF CONCLUSIONS

Q7. Do you have any preliminary comments regarding the appropriate ROE?

A7. Yes. DTE Gas' allowed ROE in its most recent rate case, U-18999, was 10 percent. Since then interest rates have declined and economic growth has increased. Interest rates are expected to increase, but at a slower pace than expected a year or two ago. However, current economic growth is higher than at the time of U-18999 and the long-term GDP growth estimate is virtually unchanged. Consequently, there are contradicting factors regarding economic conditions, so that the cost of equity might be relatively constant – in DTE Gas' last case, U-18999, so that I recommend the same return on equity, 10½ percent for the Company's requested 52 percent equity.

- The yield on both government bonds and utility bonds has declined since the filing of U-18999, but the spread between the yield on BBB-rated utility bond and 20-year government bonds is up slightly from U-18999.

- Nominal GDP growth was 4.2 percent in 2017,[3] whereas the most recent GDP for 2019 was 4.6 percent.[4] Thus, actual economic growth is up. However, the long-term forecast for GDP growth is 4.0 percent and slightly below the forecast of 4.2 percent as of 2017.[5]

- As for the industry, analysts' growth forecasts are higher today than at the time of U-18999, while the Value Line betas are similar.

I provide more discussion of the current capital market conditions and their impact on the ROE for DTE's gas operations in Section IV.

Q8. Please summarize your recommendation for DTE Gas' ROE.

A8. I recommend that DTE Gas be allowed to earn a 10½ percent rate of return on the equity portion of its regulated rate base including the requested 52 percent equity. This recommendation is based on my implementations of standard cost of capital estimation models including two versions each of the Discounted Cash Flow ("DCF") model and Capital Asset Pricing Model ("CAPM"), as well as an implied risk premium analysis, along with an analysis of DTE Gas' risks. Figure 1 below summarizes the model results using the requested 52 percent equity. The corresponding reasonable ranges that are presented are discussed in Section V below. Based on my consideration of the model results in the context of Michigan and DTE Gas' specific risk, I believe it is appropriate to place DTE Gas' allowed return at or near the upper end of the range that is reasonable.

Using DTE Gas' requested 52 percent equity, I find a range of 9.5 to 10.75 percent rate of return on equity to be reasonable using a sample of regulated gas utilities as well as regulated water utilities. In the current environment, where there has been considerable

3 https://data.oecd.org/gdp/nominal-gdp-forecast.htm

4 https://www.bea.gov/news/2019/gross-domestic-product-2nd-quarter-2019-second-estimate-corporate-profits-2nd-quarter

5 Blue Chip Economic Indicators, March 10, 2017 and March 10, 2019.

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consolidation in the natural gas industry and considerations of switching from gas to other fuels, I find it beneficial to add a sample of highly regulated water utilities.

Figure 1
Summary of Reasonable Ranges of Estimates at 52% Equity

	Gas Sample			Full Sample		
CAPM	9.25%	-	9.75%	9.50%	-	10.25%
ECAPM	9.50%		10.00%	9.50%		10.75%
DCF	9.25%	-	11.00%	9.25%	-	11.25%
Risk Premium	9.90%	-	10.00%	na	-	na
Average	9.48%	-	10.19%	9.42%	-	10.75%

Q9. How is the remainder of your testimony organized?

A9. Section III formally defines the cost of capital and explains the techniques for estimating it in the context of utility rate regulation. Section IV discusses conditions and trends in capital markets and their impact on the cost of capital. Section V explains my analyses and presents the results. Finally, Section VI discusses DTE Gas' business risk characteristics, unique risks facing Michigan-based gas utilities, and other company-specific circumstances relevant to my recommended allowed ROE. Finally, Section VII concludes with a summary of my recommendations.

III. COST OF CAPITAL PRINCIPLES AND APPROACH

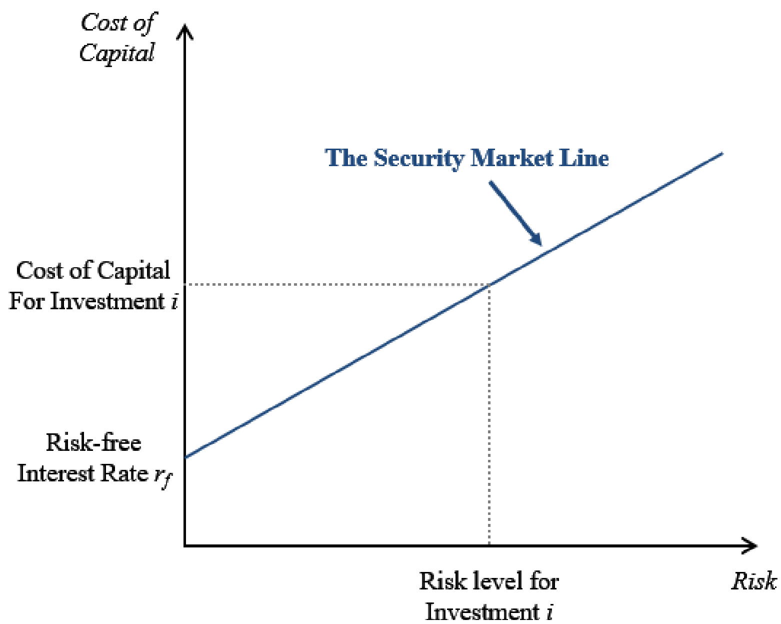
A. RISK AND THE COST OF CAPITAL

Q10. How is the "Cost of Capital" defined?

A10. The cost of capital is defined as the expected rate of return in capital markets on alternative investments of equivalent risk. Put differently, it is the rate of return investors require based on the risk-return alternatives available in competitive capital markets. The cost of capital is a type of opportunity cost: it represents the rate of return that investors could expect to earn elsewhere without bearing more risk. "Expected" is used in the statistical sense: the mean of the distribution of possible outcomes. The terms "expect" and "expected," as in the definition of the cost of capital itself, refer to the probability-weighted average over all possible outcomes.

The definition of the cost of capital recognizes a tradeoff between risk and return that can be represented by the "security market risk-return line" or "Security Market Line" for short. This line is depicted in Figure 2 below. The higher the risk, the higher the cost of capital required.

Figure 2
The Security Market Line



Q11. What factors contribute to systematic risk for an equity investment?

A11. When estimating the cost of equity for a given asset or business venture, two categories of risk are important. The first is business risk, which is the degree to which the cash flows generated by the business (and its assets) vary in response to moves in the broader market. In context of the CAPM, business risk can be quantified in terms of an "assets beta" or "unlevered beta." For a company with an assets beta of 1, the value of its enterprise will increase (decrease) by 1% for a 1% increase (decline) in the market index.

The second category of risk relevant for an equity investment depends on how the business enterprise is financed and is called financial risk. Section III.B below explains how financial risk affects the systematic risk of equity.

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Q12. What are the guiding standards that define a just and reasonable allowed rate of return on rate-regulated utility investments?

A12. The seminal guidance on this topic was provided by the U.S. Supreme Court in the *Hope* and *Bluefield* cases,[6] which found that:

- The return to the equity owner should be commensurate with returns on investments in other enterprises having corresponding risks;[7]
- The return should be reasonably sufficient to assure confidence in the financial soundness of the utility; and
- The return should be adequate, under efficient and economical management for the utility to maintain and support its credit and enable it to raise the money necessary for the proper discharge of its public duties.[8]

Q13. How does the standard for just and reasonable rate of return relate to the cost of capital?

A13. The first component of the *Hope* and *Bluefield* standard, as articulated above, is directly aligned with the financial concept of the opportunity cost of capital.[9] The cost of capital is the rate of return investors can expect to earn in capital markets on alternative investments of equivalent risk.[10]

By investing in a regulated utility asset, investors are tying up some capital in that investment, thereby foregoing alternative investment opportunities. Hence, the investors are incurring an "opportunity cost" equal to the returns available on those alternative

6 Bluefield Water Works & Improvement Co. v. Public Service Com'n of West Virginia, 262 U.S. 679 (1923) ("Bluefield"), and Federal Power Com'n v. Hope Natural Gas Co., 320 U.S. 591 (1944) ("Hope").

7 Hope, 320 U.S. at 603.

8 Bluefield, 262 U.S. at 680.

9 A formal link between the opportunity cost of capital as defined by financial economics and the proper expected rate of return for utilities was developed by Stewart C. Myers, "Application of Finance Theory to Public Utility Rate Cases," *Bell Journal of Economics & Management Science* 3:58-97 (1972).

10 The opportunity cost of capital is also referred to as simply the "cost of capital," and can be equivalently described in terms of the "required return" needed to attract investment in a particular security or other asset (i.e., the level of expected return at which investors will find that asset at least as attractive as an alternative investment).

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investments. The allowed return on equity needs to be at least as high as the expected return offered by alternative investments of equivalent risk or investors will choose these alternatives instead. If it is not, the utility's ability to raise capital and fund its operations will be negatively impacted. This is a fundamental concept in cost of capital proceedings for regulated utilities such as DTE Gas.

Q14. Please summarize how you considered risk when estimating the cost of capital.

A14. To evaluate comparable business risk, I looked to a proxy group of regulated natural gas and water utilities. The natural gas and water utilities I consider have a high proportion of regulated assets and revenue with the majority having more than 80% of assets subject to regulation. Additionally, they all have a network of assets that are used to serve end customers and they are capital intensive (meaning that each dollar in revenue requires substantial investment in fixed assets). Further, (as explained in Section III.B below) I analyzed and adjusted for differences in financial risk due to different levels of financial leverage among the proxy companies and between the capital structures of the proxy companies and the regulatory capital structure that will be applied to DTE Gas for ratemaking purposes. To determine where in the estimated range DTE Gas' ROE reasonably falls, I compared the business risk of DTE Gas to that of the proxy group companies.

B. FINANCIAL RISK AND THE COST OF EQUITY

Q15. How does capital structure affect the cost of equity?

A15. Debtholders in a company have a fixed claim on the assets of the company and are paid prior to the company's owners (equity holders) who hold the inherently variable residual claim on the company's operating cash flows. Because equity holders only receive the profit that is left over after the fixed debt payments are made, higher degrees of debt in the capital structure amplify the variability in the expected rate of return earned by equity-holders. This phenomenon of debt resulting in financial leverage for equity holders means that, all else equal, a greater proportion of debt in the capital structure increases

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risk for equity holders, causing them to require a higher rate of return on their equity investment, even for an equivalent level of underlying business risk.

Q16. How do differences in financial leverage affect the estimation of the cost of equity?

A16. The CAPM and DCF models rely on market data to estimate the cost of equity for the proxy companies, so the results reflect the value of the capital that investors hold during the estimation period (market values).

The authorized ROE is applied to the regulatory equity portion of DTE Gas' rate base. Because the cost of equity is measured using a group of proxy companies, it may well be the case that these companies finance their operations with a different debt and equity proportion than the proportion the Commission allows in DTE Gas' rate base. Specifically, the CAPM and DCF models measure the cost of equity using market data and consequently are measures of the cost of equity using the proportion of debt and equity that is inherent in that data. Therefore, I consider the impact of any difference between the financial risk inherent in those cost of equity estimates and the capital structure used to determine DTE Gas' required return on equity.

Differences in financial risk due to the different degree of financial leverage in DTE Gas' regulatory capital structure compared to the capital structures of the proxy companies mean that the equity betas measured for the proxy companies must be adjusted before they can be applied in determining DTE Gas' CAPM return on equity. Similarly, the cost of equity measured by applying the DCF models to the proxy companies' market data requires adjustment if it is to serve as an estimate of the appropriate allowed ROE for DTE Gas at the regulatory capital structure the Commission grants.

Importantly, taking differences in financial leverage into account does not change the value of the rate base. Rather, it acknowledges the fact that a higher degree of financial leverage in the regulatory capital structure imposes a higher degree of financial risk for an equity investment in DTE Gas' rate base than is experienced by equity investors in the market-traded stock of the less leveraged proxy companies.

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Q17. How specifically do you consider financial risk in your analysis of the cost of equity using market data for the proxy group companies?

A17. The impact of financial risk is taken into account in an analysis of cost of equity using market-based models such as the DCF and CAPM in several manners.[11] One way is to determine the after-tax weighted-average cost of capital for the proxy group using the equity and debt percentages as the weight assigned to the cost of equity and debt. Financial theory holds that for a given level of business risk, the weighted average cost of capital is constant over a broad set of capital structures, i.e., the weighted average cost of capital is the same at, for example, 55 and 45 percent equity, as the cost of equity increases as the percentage of equity decreases. I estimate the weighted cost of capital for each utility in the proxy group based on that utility's capital structure. I then evaluate the average weighted cost of capital across the proxy group. Once the weighted cost of capital is determined for the proxy group, I can determine the cost of equity that is required at DTE Gas' capital structure. This approach assumes that the after-tax weighted average cost of capital is constant for a range that spans the capital structures used to estimate the cost of equity and the regulatory capital structure.

A second approach was developed by Professor Hamada, who estimated the cost of equity using the CAPM and made comparisons between companies with different capital structure using beta. Specifically, in the Hamada approach, I use the estimated beta to calculate what beta would be associated with a 100 percent equity financed firm to obtain a so-called all-equity or assets beta and then re-lever the beta to determine the beta associated with the regulatory capital structure. This requires an estimate of the systematic risk associated with debt (*i.e.*, the debt beta), which is usually quite small. In Appendix B, I set forth additional technical details regarding the methods that can be used to account for financial risk when estimating the cost of capital.

[11] The impact of financial leverage on the risk premium model needs to be considered separately as it uses regulatory data rather than market data, meaning that differences in regulatory capital structures are relevant for this model.

Q18. Can you provide a numerical illustration of how the cost of equity changes, all else being equal, when the degree of leverage changes?

A18. Yes. I constructed a simple example below, where only the leverage of a company varies. I assumed the return on equity is 11.00 percent at a 50 percent equity capital structure and determine the return on equity that would result in the same overall return if the percentage of equity in the capital structure were reduced to 45 percent.

Figure 3
Illustration of Impact of Financial Risk on ROE

		Company A (50% Equity)	Company B (45% Equity)
Rate Base	[a]	$1,000	$1,000
Equity	[b]	$500	$450
Debt	[c]	$500	$550
Total Cost of Capital (8%)	[d] = [a] × 8%	$80.0	$80.0
Cost of Debt (5%)	[e] = [c] × 5%	$25.0	$27.5
Equity Return	[f] = [d] - [e]	$55.0	$52.5
Rate of Return on Equity (ROE)	**[g] = [f] / [b]**	**11.00%**	**11.67%**

Figure 3, above, illustrates how financial risk[12] affects returns and the ROE. The overall return remains the same for Company A and B at $80. But Company B with the lower equity share and higher financial leverage must earn a higher percentage ROE in order to maintain the same overall return. This higher percentage allowed ROE represents the increased risk to equity investors caused by the higher degree of leverage.

The principle illustrated in Figure 3 is an example of the adjustments I performed to account for differences in financial risk when conducting estimates of the cost of equity applicable to DTE Gas.

[12] Financial risk is risk that a company has due to its capital structure; specifically the higher a company's debt, the larger the financial risk.

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C. Approach to Estimating the Cost of Equity

Q19. Please describe your approach for determining the cost of equity for DTE Electric.

A19. As stated above, the standard for establishing a fair rate of return on equity requires that a regulated utility be allowed to earn a return equivalent to what an investor could expect to earn on an alternative investment of equivalent risk. Therefore, my approach to estimating the cost of equity for DTE Gas focuses on measuring the expected returns required by investors to invest in companies that face business and financial risks comparable to those faced by DTE Gas. Because certain of the models require market data, my consideration of comparable companies is restricted to those that have publicly traded stock. To this end, I have selected two proxy groups consisting of publicly traded companies. The first proxy group consists of companies providing primarily regulated natural gas distribution services and the second proxy group consists of highly regulated companies in the water utility industry.[13] I consider both the natural gas distribution sample and the full sample when deriving estimates of the representative cost of equity according to standard financial models including two versions of the CAPM—the traditional version and a version that takes into account the empirical observation that the security market line in Figure 2 is too steep relative to what is observed using market data. I also implement a single-stage and a multi-stage version of the DCF.

Lastly, I perform an analysis of historical allowed ROEs for gas LDCs in relation to prevailing risk-free interest rates at the time the ROE was authorized, and use the implied allowed risk-premium relationship to estimate a utility cost of equity consistent with current economic conditions. The results of this implied risk premium analysis

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[13] I consider both a natural gas distribution utility sample (because DTE Gas is a natural gas distribution utility) and a sample including water utilities. The latter sample has the advantage of being highly regulated and, like gas distribution utilities, engaged in distributing a commodity through an extensive network of pipes. Additionally, there is no substitute for water, while there are initiative to substitute gas for renewable sources in some jurisdictions. As a result, the estimates from water companies are less influenced by individual state policies or changing federal policies than those of the natural gas companies – i.e., they reflect to a larger degree the fundamental risks of regulated utilities. Lastly, the number of companies in the natural gas distribution industry is limited due to mergers and acquisitions, so the water utility industry serves to increase the number of available, fully regulated utilities that serve customers through a network of pipes.

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(sometimes referred to herein as the "Risk Premium" model) are an additional consideration that informs my recommendation and serves as a check on the reasonableness of my market-based results.

Q20. How do your approach and the models you employ compare to what the Commission has considered in prior DTE Gas proceedings?

A20. The Commission has in past decisions considered the DCF, CAPM and Risk Premium models, as do I. Additionally, the Commission has in the past recognized that "some consideration should be given to current market volatility and uncertainty."[14] The Commission also stated that it will "monitor a variety of market factors in future applications to gauge whether volatility and uncertainty continue to be prevalent issues that merit more consideration in setting the ROE."[15]

Q21. Are there any potential concerns about how current capital market conditions may influence the DCF model results that may caution against giving it disproportionate weight in setting DTE Gas ROE?

A21. Yes. To the extent utility stocks are currently acting as a *relatively* less-risky investment vehicle for risk-averse investors, who look for returns during a time of volatile capital markets and low government bond yields, the demand for utility stocks contribute to their high price-to-earnings ratios ("PE ratios"). As a result, the dividend yields are unrepresentatively low—compared to what investors might expect in a more normal interest rate environment. If this is the case, implementing the DCF model using current market data may produce results that understate what investors' required returns will be when interest rates move higher, as expected. Additionally, some companies distribute cash to shareholders through buybacks of shares rather than through dividends. When that is the case, the dividend yield under-estimates the cash yield shareholders get.[16]

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[14] Michigan Public Service Commission, Order for Case No. U-18999, September 13, 2018, p. 53.

[15] Michigan Public Service Commission, Order for Case No. U-20162, May 2, 2019, pp. 67-68.

[16] This is currently not an important consideration for the sample companies.

The Federal Energy Regulatory Commission ("FERC") addressed a similar issue in a recent order, where the FERC expressed its concern about the reliability of DCF model results in the current market environment as follows.

> Under [the premise of the DCF methodology], increases in a company's actual earnings or projected growth in earnings would ordinarily be required to justify an increase in the company's stock price. Moreover, there is no evidence that investments in the utility sector have become less risky during these periods. However, it appears that during the periods at issue in these complaint proceedings, average utility stock prices have increased by more than would be justified by any increase in actual utility earnings or projected growth in earnings. From October 1, 2012 through December 1, 2017, the Dow Jones Utility Average increased from about 450 to 762.59, an increase of almost 70 percent. However, utility earnings did not increase by nearly the same amount, as demonstrated in Figure 3 below, which shows the substantial increase in utilities' price to earnings (PE) ratio during the same period. Moreover, average IBES three to five year growth projections appear not to have increased during that period. Thus, there has not been an increase in either current or projected utility earnings that would justify the substantial increase in utility stock prices.[17]

The FERC concluded from this discussion that recent investor behavior with respect to utility stocks appears to have diverged from the DCF model's predictions, a factor that informs FERC's decision (discussed in Section III.C) to reconsider its primary reliance on the DCF in favor of giving equal weight to four different and complementary models. Similarly, this concern informs the way I consider the results of the DCF models as well as the CAPM and Risk Premium models in selecting my recommendation.

IV. CAPITAL MARKET CONDITIONS AND THE COST OF CAPITAL

Q22. Why do you discuss capital market conditions in testimony aimed at determining DTE Gas' ROE?

A22. This section discusses important market conditions that affect the inputs to the cost of equity models. Because the risk-free rate is an input to the CAPM, recent and expected developments in risk-free government interest rates are important to assess the validity

[17] Coakley v. Bangor Hydro-Electric Co., 165 FERC ¶61,030, October 2018 ("NETO Briefing Order"), paragraph 45 (citations omitted).

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of any measure of the risk-free rate. Similarly, the Market Risk Premium ("MRP") is an input to the CAPM, so factors that affect the MRP (*e.g.*, volatility and changes in investors risk perception) are vital for an accurate determination of the ROE.

As to DCF model inputs, developments in the economy in general affect growth rates and utility stock prices. Consequently, the capital market developments affect the growth rates, dividend yield, and general assessment of the estimates' reasonableness.

Finally, the Tax Cuts and Jobs Act of 2017 ("TCJA") affected utilities differently than other companies in that tax reductions generally flow to customers and, consequently, impact the utility's credit metrics and earnings volatility. As a result, it is necessary that the allowed ROE and appropriate equity capital structure ratio for DTE Gas fulfill the requirements set forth by *Hope* and *Bluefield* once the implications of the TCJA are considered.

Q23. Please summarize how your analysis of capital market conditions affects your conclusions.

A23. First, I conclude that interest rates are unusually low and expected to increase over the next few years. This supports my reliance on forecasts of long-term U.S. Treasury yields for the risk-free rate during the time DTE Gas' rates will be in effect.

Second, there are several indicators that the forward-looking estimates of the MRP are above the historical average. I base this conclusion on several observations. The forecasts from Bloomberg and the forecasts that result from using the methodology relied upon by the FERC in its recent NETO Briefing Order find a MRP above the historical average. Further, the spread between utility bond yields and Treasury bonds of the same maturity is elevated by approximately 42 basis points relative to the historical spread prior to the 2008 financial crisis.

The elevation in the spread between utility bond yields and treasury bond yields is an indication that monetary policy has put downward pressure on risk-free rates or that the MRP has increased. Under the first explanation, risk-free rates are downward biased.

Alternatively, the increased yield spread is an indication that investors require a higher premium to hold assets that are not risk-free. Under that explanation, the historical MRP is downward biased relative to the current or forward-looking MRP. Consequently, I consider two scenarios. In Scenario I, I rely on the forecasted yield on the 10-year treasury as of March 2019, the latest Blue Chip forecast for 2021 I have, plus 50 basis points that account for the maturity premium between a 20-year and a 10-year government bond. I combine this forecast with the historical average arithmetic MRP. In Scenario II, I use the most recent forecast on the 10-year Treasury bond from CBO plus 50 basis points to account for the maturity premium.[18] I combine this risk-free rate with a forecasted MRP of 7.91%, which is in between the Bloomberg forecasted rate and that obtained using the FERC methodology to determine the MRP.[19] Alternatively, the Scenario II MRP can be viewed as accounting for the increase in yield spread, as an increase in the yield spread of 25 basis points would relate to an increase in the MRP of about 1 percent as explained in Appendix B.

Further, I conclude that because (all else equal) the TCJA results in reduced cash flows and increased volatility of cash flows for DTE Gas, it is appropriate to consider the impact on the cost of equity for DTE Gas.

A. Interest Rate Developments

Q24. What are the relevant developments regarding interest rates?

A24. Interest rates, including the long-term government bond yields that are typically used to represent the risk-free rate in the context of regulated utility ratemaking, have remained

[18] Blue Chip Economic Indicators, March 2019 forecast the 10-year yield at 3.1% in 2021, while the Congressional Budget Office in August 2019 forecast the year-end 2021 10-year yield at 2.7%; https://www.cbo.gov/about/products/budget-economic-data#4
The use of the CBO forecast is a deviation from my practice of using the most recent Blue Chip forecast, but given the decline in actual and forecast interest rates and the lack of a recent forecast for 2021, I find the use of an alternate source justified. For the same reason, I did not add any portion of the current yield spread to the Scenario I risk-free rate.

[19] Bloomberg reported a forward-looking MRP of approximately 7.3% over 20-year government bonds as of August 19, 2019 and I calculated a forward-looking MRP of 9.34% (over my forecasted risk-free rate of 3.35%) as of June 30, 2019 using FERC's methodology in the NETO Briefing Order.

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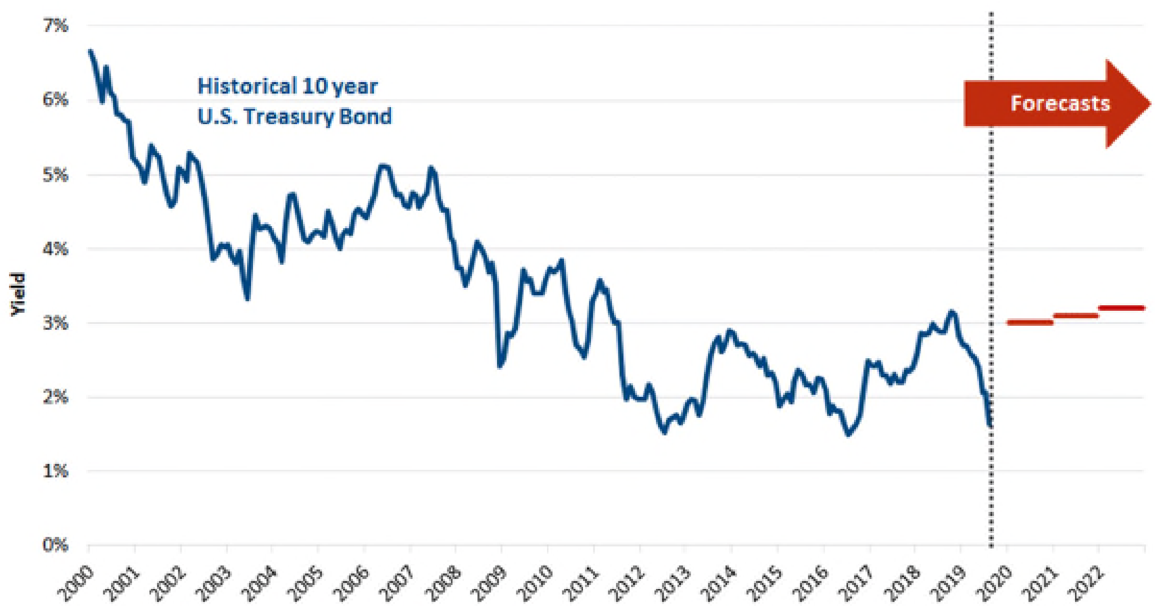
extremely low in the years since the global financial crisis of 2008. While current yields are very low with the 20-year government bond yield around the 2 percent mark,[20] the yield is expected to increase over the next few months or years. Blue Chip Economic Indicators, Consensus Forecasts, and the CBO expect the 10-year yield to increase to 2.1 – 2.3 percent in 2020 for a 20-year government bond yield of 2.6 to 2.8 percent.[21] This is an increase of 60 to 80 basis points. The 2021 yield on government bond is expected to increase additionally. Figure 4 below shows the development in 10-year government bond yields as well as the forecasts for 2020 through 2022. The yield on 20-year government bonds is expected to be higher by about 50 basis points.

Figure 4
Historical and Projected Ten-Year Treasury Bond Yields



Source: Historical data from Bloomberg. Forecasts from Blue Chip Economic Indicators March 2019 issue.

[20] As of September 20, 2019, the Federal Reserve of St. Louis reported the 20-year yield at 1.99 percent.

[21] Blue Chip Economic Indicators, August 10, 2019 expect the 10-year government bond yield at 2.1%; Consensus Forecast, August 12, 2019 expects the 10-year government bond yield at 2.2% and CBO expects the 10-year government bond yield at 2.2 – 2.3% in 2020. Adding to that 50 basis points for the maturity premium, the 20-year government bond yield is expected to be 2.6 to 2.8 percent.

Q25. What forces contributed to the sustained period of very low interest rates over the decade following the 2008 financial crisis?

A25. The monetary policy actions of the Federal Reserve (the "Fed") in response to the financial crisis were a key driver of the low interest rates. The Fed's Federal Open Market Committee ("FOMC") undertakes market actions to influence interest rates—especially the so-called "federal funds rate"[22]—subject to its statutory mandate to maximize employment and keep inflation under control. In response to the financial crisis, the FOMC drastically reduced its target federal funds rate from 5.25 percent in August 2007 to 0.00 – 0.25 percent starting in December 2008.[23] The Fed's zero interest rate policy remained in effect for the next seven years, ending in December 2015 when the FOMC finally raised its federal funds target to 0.25 - 0.50 percent.[24]

Concurrent with its sustained monetary policy actions related to the short-term federal funds rate, the Fed also implemented several unprecedented policy interventions with the explicit goal of reducing interest rates on long-term borrowing instruments. This "quantitative easing" program of long-term government bonds served to keep Treasury yields at very low levels for an extended period of time. Importantly, even after the FOMC ceased buying securities, it maintained trillions of dollars' worth of Treasuries and government-backed mortgage backed securities on its balance sheet, continuing to reinvest the principal when the assets matured.[25]

Global economic conditions also contributed to the unprecedented low rates on U.S. government debt. For example, at the height of the European sovereign debt crisis in 2011-2012, flight from European bonds and yield-lowering actions by the European

[22] The federal funds rate is the rate at which large banks lend and borrow funds in the short-term. It is therefore influential in determining market interest rates throughout the economy.

[23] See FOMC Statements issued August 7, 2007 and December 16, 2008 accessed at https://www.federalreserve.gov/monetarypolicy/fomc_historical.htm

[24] See FOMC Statement, December 16, 2015 accessed at https://www.federalreserve.gov/monetarypolicy/fomccalendars.htm

[25] As of June 30, 2019, the Fed's long-term Treasury and Agency securities balance was at $3.8 trillion. See Board of Governors of the Federal Reserve System, Credit and Liquidity Programs and the Balance Sheet, accessed at https://www.federalreserve.gov/aboutthefed/files/quarterly-report-20190630.pdf.

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Central Bank ("ECB") spurred increased demand for U.S. Treasury bonds—thus driving up prices and bringing yields down. This pattern repeated in 2016 in the period leading up to, and especially following, the "Brexit" vote. Indeed, on July 10, 2016, shortly after Great Britain officially voted to leave the European Union, the ten-year U.S. Treasury Yield reached its all-time low of 1.37%.[26]

Q26. How does current interest rates relate?

A26. As shown in Figure 4 above, U.S. Treasury bond yields have recently declined. Following an upward trajectory from mid-2016 through year-end 2018, the yield on 10-year Treasury bonds (as well as that of other government bonds) started to decline, so that the current yield on the 10-year Treasury bond is below 2 percent and the yield on the 20-year Treasury bond is right around 2 percent.[27]

At the same time the Federal Reserve has lowered the federal funds rate twice in recent months – most recently on September 18, 2019, when the Federal Reserve lowered the funds rate to 1¾ to 2 percent.[28] Interest rate forecasts have similarly changed, so that Blue Chip Economic Indicators as well as, for example, the CBO have lowered the forecasted rate relative to late 2018 and forecast a slow albeit steady increase in the risk-free rate. As a result, I am conservatively using a forecasted risk-free rate of 3.35 and 3.60 percent for the 20-year treasury yield in 2021.

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26 Yield from Bloomberg. See also "U.S. 10-Year Treasury Yield Closes at Record Low" (July 5, 2016) The Wall Street Journal, accessed at https://www.wsj.com/articles/government-bond-yields-in-u-s-europe-hit-historic-lows-1467731411.

27 Federal Reserve, Fred, Accessed October 2, 2019; https://fred.stlouisfed.org/graph/?id=DGS20,

28 Federal Reserve Press Release, "Federal Reserve Issued FOMC Statement," September 18, 2019; https://www.federalreserve.gov/newsevents/pressreleases/monetary20190918a.htm

B. Risk Premiums and Yield Spreads

Q27. What is the Market Risk Premium?

A27. In general, a risk premium is the amount of "excess" return—above the risk-free rate of return—that investors require to compensate them for taking on risk. As illustrated above in Figure 2, the riskier the investment, the larger the risk premium investors will require.

The MRP is the risk premium associated with investing in the market as a whole. Since the so-called "market portfolio" embodies the maximum possible degree of diversification for investors,[29] the MRP is a highly relevant benchmark indicating the level of risk compensation demanded by capital market participants. It is also a direct input necessary to estimating the cost of equity using the CAPM and other risk-positioning models.

Q28. Do you have any data on how estimates of the MRP have evolved over the time leading up to and since the 2008 financial crisis?

A28. Yes. Bloomberg publishes a forward-looking estimate of the MRP based on market prices and expected dividends for U.S. stocks.[30] Figure 5 displays the development of Bloomberg's forecasted MRP since 2006.

The Bloomberg MRP increased substantially with the onset of the financial crisis and has remained elevated relative to pre-crisis levels, though the August 2019 average forward-looking MRP reported by Bloomberg is in line with the long-term historical

[29] In finance theory, the "market portfolio" describes a value-weighted combination of all risky investment assets (e.g., stocks, bonds, real estate) that can be purchased in markets. In practice, academics and financial analysts nearly always use a broad-based stock market index, such as the S&P 500, to represent the overall market.

[30] Bloomberg's calculation of the expected market return is based on an implementation of a multi-stage DCF model (see Section V.C below) applied to all dividend paying stocks in the S&P 500 index; Bloomberg calculates the MRP by subtracting the current ten-year Treasury bond yield from the estimated expected market return, however, it is also possible to calculate the MRP measured relative to a 20-year Treasury bond yield. This is the calculation I perform for ease of comparison to historical average risk premiums calculated by comparing the Ibbotson data on stock market returns in excess income returns on long-term U.S. Treasury yields with an approximate average maturity of 20 years.

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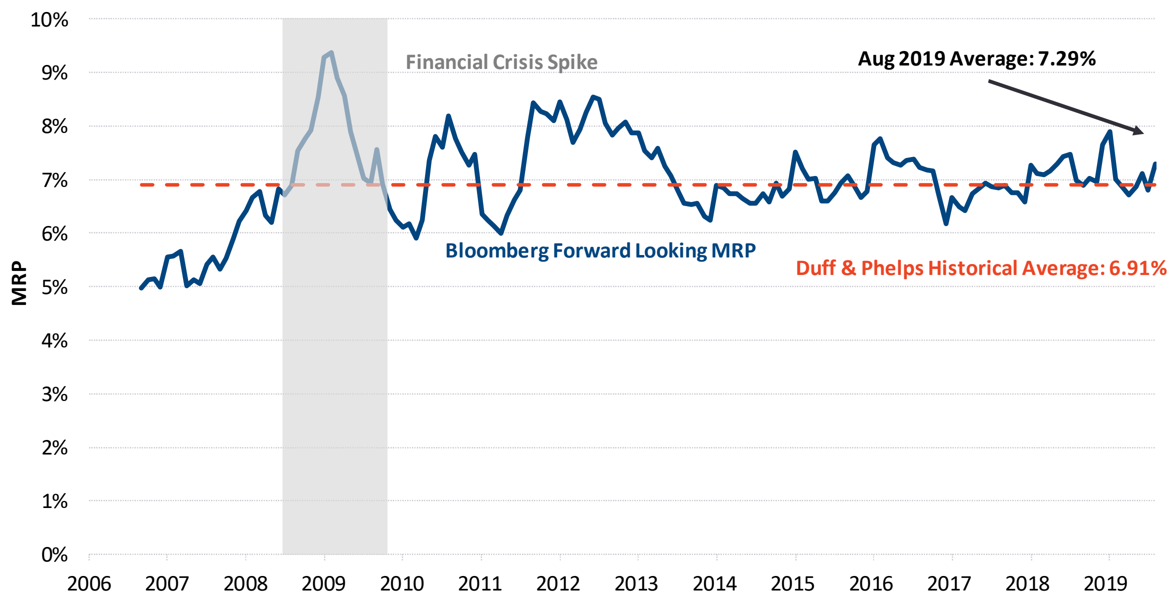
average MRP.[31] While the MRP has moderated since the financial crisis, it has been above the historical average almost every month since the financial crisis.[32]

Figure 5
Bloomberg Forward looking MRP (2006-2019)



Source: Bloomberg as of 8/31/2019.

A somewhat higher result is obtained if I, instead of looking to Bloomberg, consider the MRP that results from implementing the DCF model on the S&P 500 using growth forecasts from the Institutional Brokers' Estimation System ("IBES")[33] and current dividend yields as the FERC did in its NETO Briefing Order.[34] This resulted in a forecasted MRP of 9.34 percent at the end of Q2, 2019 (over my forecasted risk-free

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[31] As noted below, the historical average MRP calculated using the long-established Ibbotson stock and bond market data currently published by Duff & Phelps is 6.91 percent.

[32] Average of Bloomberg forecasted MRP (relative to 20-year Treasury Bonds) for the U.S. from January 2009 - August 2019. Bloomberg as of August 31, 2019.

[33] Institutional Brokers' Estimation System ("IBES") is a database that gathers and compiles the different estimates made by stock analysts on the future earnings for the majority of U.S. Publicly traded companies.

[34] See Exhibit D5.18.

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rate).[35] The FERC Staff in a recent filing presented an MRP of 7.65 percent over the 30-year Treasury bond or the equivalent of approximately 7.9 to 8.15 percent over the 20-year Treasury bond although this calculation did not follow the FERC's NETO Briefing Order.[36] Consequently, empirical evidence suggests that the forward-looking MRP is substantially higher than the historical average MRP and some regulators are considering these results.[37]

Q29. Are these observations supported by academic research?

A29. Yes, a study by Duarte and Rosa of the Federal Reserve of New York aggregates the results of many models of the required MRP in the U.S. and tracks them over time. The study finds a very high MRP following the financial crisis.

The analysis estimates the MRP that results from a range of models each year from 1960 through the present.[38] The analysis then reports the average as well as the first principal component of results.[39] The analysis then finds that the models used to determine the risk premium are converging to provide estimates that are more comparable. They also find that the average annual estimate of the MRP was at an all-time high in 2013. These estimates show a persistent elevation of the MRP over the historical figure. Figure 6 below replicates Duarte and Rosa's summary findings.

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[35] The FERC in its NETO Briefing Order seemingly endorsed a forward-looking MRP of the type estimated here.

[36] Affidavit of Trial Staff Witness Robert J. Keyton in Dockets Nos. EL11-66-001 et al., January 11, 2019, p. 28. The MRP over a 20-year Treasury bond was calculated using the spread between 30-year and 20-year treasury bond yields as of April 4, 2019 and the average since 1990, respectively.

[37] FERC has issued a Notice of Inquiry to re-examine its policies on the appropriate inputs to and approach for measuring the ROE for public utilities: https://www.ferc.gov/media/news-releases/2019/2019-1/03-21-19-E-2.asp#.XOgrRaHsaHs.

[38] Fernando Duarte and Carlo Rosa, "The Equity Risk Premium: A Review of Models," Federal Reserve Bank of New York, December 2015 (Duarte & Rosa 2015).

[39] Duarte & Rosa emphasize the "first principal component" of the 20 models. This means that the authors used statistics to compute the weighted average combination of the models that captures the most variability among the 20 models over time.

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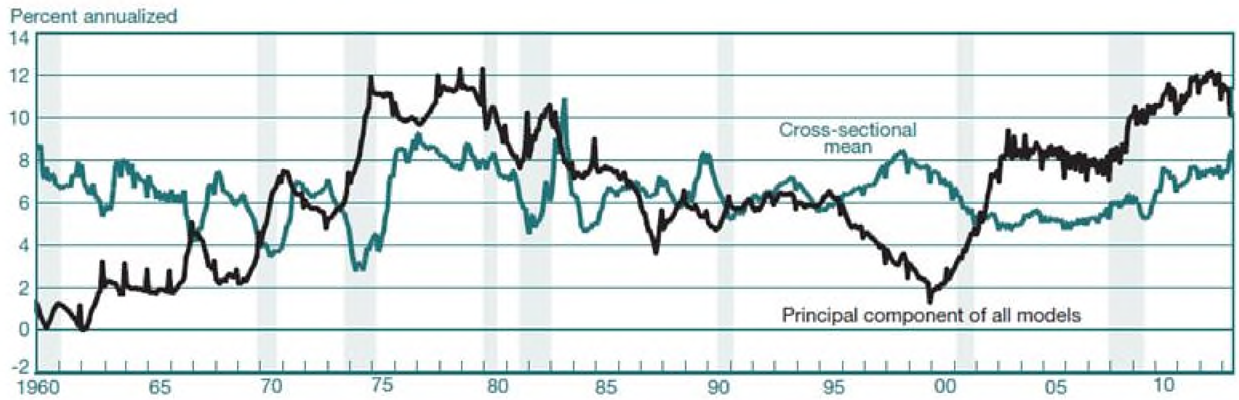
Figure 6
Duarte and Rosa's Chart 3
One-Year Ahead MRP and Cross-Sectional Mean of Models



Q30. Is there any other market evidence concerning risk premiums?

A30. Yes. One observable risk premium is the spread between yields on risk-free Treasury bonds and yields on corporate bonds of the same maturity. Unlike U.S. government bonds, debt instruments issued by corporate entities come with some probability of default and have some associated level of systematic risk. To compensate for this risk, corporate bonds—including utility bonds—offer higher expected returns (as measured by the market yield) than do government bonds.

Figure 7 plots the yield spread for BBB-rated utility bonds compared to Treasury bonds for the longest period of available data. As the figure shows, utility yield spreads spiked dramatically with the onset of the financial crisis and have remained elevated to their pre-crisis average level.

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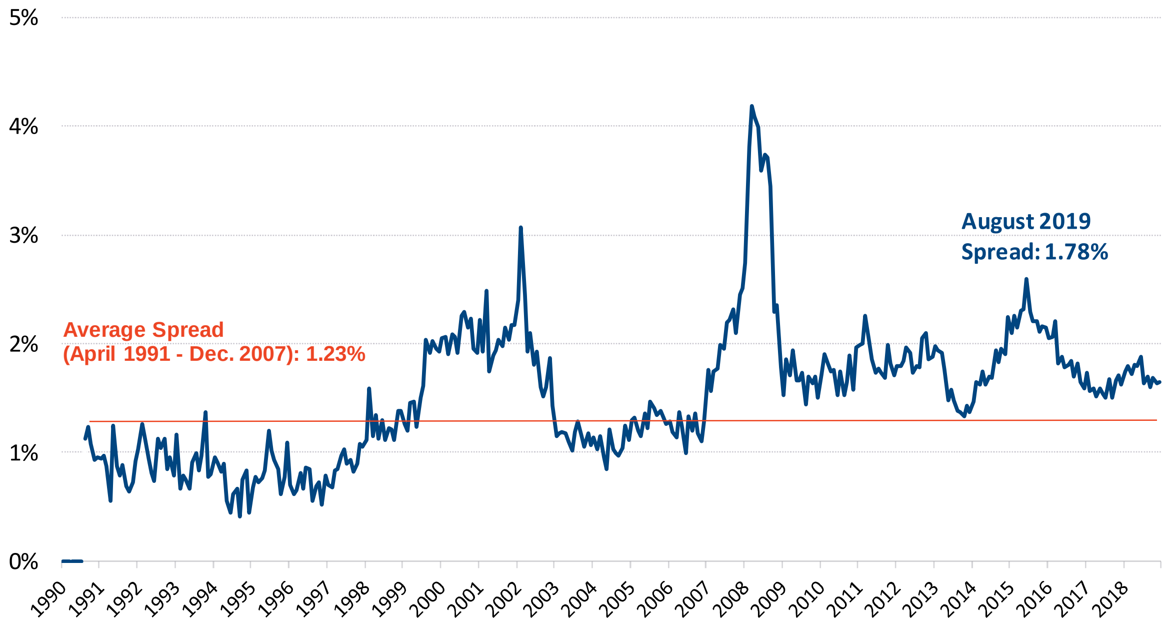
Figure 7
Spread between 20-year BBB-rated Utility Bond and 20-year Treasury Bond Yields



Source: Bloomberg as of 8/31/2019.

Q31. What are the implications of elevated yield spreads to the cost of equity?

A31. The yield spread is simply one form of risk premium, albeit for assets (corporate bonds) that are relatively lower risk compared to equity securities (*i.e.*, stock). Consequently, one explanation for the elevated yield spread is that investors are requiring a higher premium to take on market risk than they did on average prior to the financial crisis.[40] This would indicate an elevated MRP compared to the historical average.

An alternative explanation for the elevated yield spread is that the yield on Treasury bills remains artificially low due to the lingering after-effects of the Fed's unprecedented monetary policy over the last decade. Under this explanation, the yield spread would be expected to return to its historical average level as the risk-free rate returns to more normal levels over an extended period of time.

[40] See "Explaining the Rate Spread on Corporate Bonds," Edwin J. Elton, Martin J. Gruber, Deepak Agarwal, and Christopher Mann, The Journal of Finance, February 2001, pp. 247-277.

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As discussed in Appendix B, an increase in yield spread indicates an increase in the risk premium investors require to hold securities that are not risk free. Market Volatility

Q32. How does the stock market's volatility relate to the cost of capital?

A32. Academic research has found that investors expect higher risk premiums during more volatile periods,[41] indicating that the MRP may increase when market volatility is high, even when investors' level of risk aversion remains unchanged. This is relevant to estimating the Company's cost of equity because increased volatility suggests higher risk premiums and therefore higher market-required ROE.

A measure of the market's expectations for volatility is the VIX index, which measures the 30-day implied volatility of the S&P 500 index.[42] These indices are also referenced as the "market's fear gauge."[43] While the VIX has recently been trading below its long term historical average of approximately 19.2, it spiked substantially above that level in December 2018 and again in early August 2019, each time concurrent with a significant drop in the stock market.[44] The VIX averaged 11.1 in 2017, increased to average 16.6 in 2018, and has averaged 18.8 in August 2019 – close to its long-run average and up from the level in the last two years.

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[41] See, e.g., K. French, W. Schwert and R. Stambaugh (1987), "Expected Stock Returns and Volatility," *Journal of Financial Economics*, Vol. 19, p. 3:

> We find evidence that the expected market risk premium (the expected return on a stock portfolio minus the Treasury bill yield) is positively related to the predictable volatility of stock returns. There is also evidence that unexpected stock returns are negatively related to the unexpected change in the volatility of stock returns. This negative relation provides indirect evidence of a positive relation between expected risk premiums and volatility.

[42] *See*, *e.g.*, Chicago Board Option Exchange at http://www.cboe.com/micro/VIX/vixintro.aspx

[43] CNBC, "VIX, the Market's Fear Gauge Plunges in Historic One-Week Move," July 5, 2016.

[44] See, for example, Yahoo Finance.

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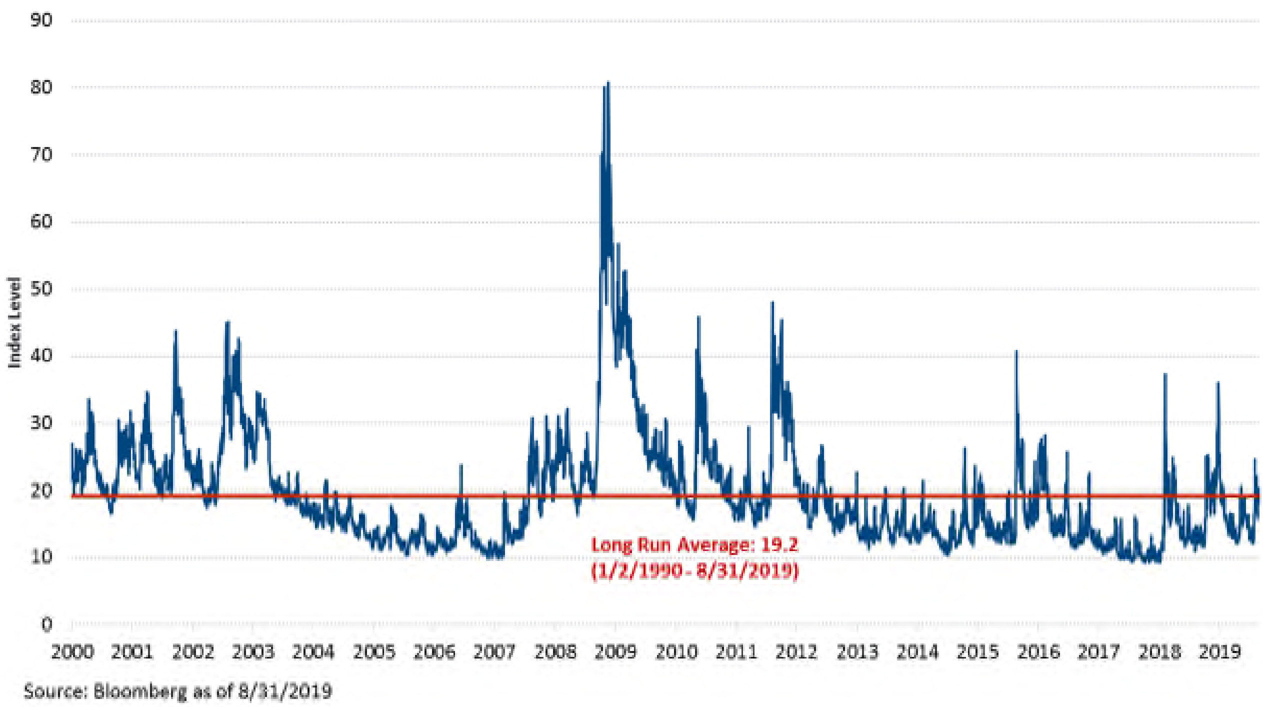
Figure 8
VIX Index



Q33. Do you look at any other indexes regarding market volatility?

A33. Yes. The SKEW index, which measures the market's willingness to pay for protection against negative "black swan" stock market events (*i.e.*, sudden substantial downturns),[45] offers a reason to be cautious of interpreting recent low VIX levels as an indicator of improved capital market certainty over the long term. A SKEW value of 100 indicates outlier returns are unlikely, but as the SKEW increases, the probability of outlier returns becomes more significant. Figure 9 shows that the SKEW currently averaged approximately 121 to-date in 2019, while the index has averaged 119.5 since January 1990. This indicates that investors are willing to pay for protection against downside risk and thus are exhibiting signs of elevated risk aversion concerns of downside tail risk.

The SKEW was on an upward trend until late 2018 but has since oscillated around the long-run average of about 120. The SKEW averaged 134.8 in 2017, declined slightly to

[45] See, for example, http://www.cboe.com/products/vix-index-volatility/volatility-indicators/skew.

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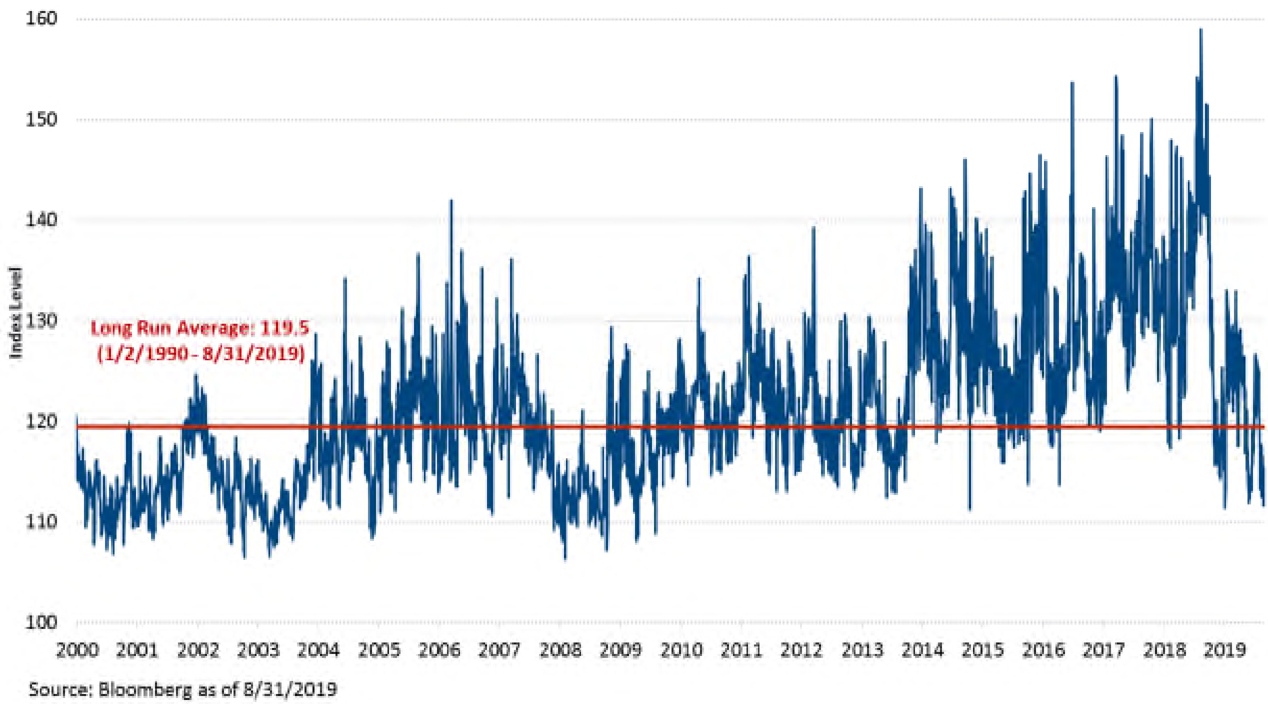
132.6 in 2018, and has been slightly above the long-run average at an average of 121.2 to-date in 2019.

Figure 9
SKEW Index



Q34. Are there reasons why capital markets may exhibit high volatility going forward?

A34. Yes. A few contributing factors in recent capital market volatility include notably the shut-down of the federal government, challenging tariff negotiations between the U.S. and its trading partners, the uncertainty regarding Brexit, which is expected to happen at the end of October 2019, substantial uncertainty in the Middle East, and other geopolitical events. Lastly, the slow-down in Europe and the lower-than-expected growth in the first few months of 2019 could result in market interruptions.

C. Implications of the Tax Cuts and Jobs Act of 2017 ("TCJA")

Q35. How does implementation of the TCJA affect regulated utilities?

A35. The TCJA reduced the federal corporate marginal tax rate from 35% to 21%. Although the TCJA is likely to be a net positive for investors in unregulated companies, for the

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Company, the vast majority (if not all) of the benefits will flow to customers. This is because the savings in income taxes will flow through to customers in the form of lower rates. At the same time, the implementation of the TCJA (including its treatment by utility regulators in a ratemaking context) will likely increase the risks facing regulated companies because they will experience (i) a near-term decrease in cash flows and (ii) an increase in the variability of after-tax earnings (and cash flows). This is a particularly important point for utilities, who are at risk for downgrades (such as DTE) or utilities with potentially large risks.

Q36. How does the lower corporate tax rate under the TCJA affect the expected volatility of cash flows for regulated companies?

A36. For regulated companies, as for unregulated corporate taxpayers, the change in the income tax allowance will result in greater volatility of net income (and cash flow) because the income tax provides a "buffer" against the impact of variations in expected costs and expected revenue on net income. In other words, the Company now absorbs more of the loss from negative impacts (and benefit from more of the gain from positive impacts) under a lower tax rate than it did under the higher tax rate. Consider for example the effect on net income of a 10% increase in operating expenses. All else equal, net income would decrease by about 20% for a 35% income tax rate, but would decrease by 24% for a 21% income tax rate. The change would be similar and symmetrical for a positive impact (such as a decrease in operating costs). See Figure 10 below illustrating an increase to operating expenses.

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Figure 10
Impact of 10% Increase in Operating Costs on Income Statement
Illustrated for $1,000 of New Utility Plant Investment
Financed with 50% Equity / 50% Debt

		35% Tax Rate				21% Tax Rate			
		Base	+10% Operating Costs	Dollar Impact	Pct Change	Base	+10% Operating Costs	Dollar Impact	Pct Change
		[1]	[2]	[3]	[4]	[5]	[6]	[7]	[8]
Revenue	[a]	$285	$285	$0	0%	$272	$272	$0	0%
Operating Costs	[b]	$150	$165	$15	10%	$150	$165	$15	10%
EBITDA	[c]: [a] - [b]	$135	$120	-$15	-11%	$122	$107	-$15	-12%
Depreciation	[d]: 1,000 / 30	$33	$33	$0	0%	$33	$33	$0	0%
EBIT	[e]: [c] - [d]	$102	$87	-$15	-15%	$88	$73	-$15	-17%
Interest Expense	[f]: 500 * 5%	$25	$25	$0	0%	$25	$25	$0	0%
EBT	[g]: [e] - [f]	$77	$62	-$15	-20%	$63	$48	-$15	-24%
Tax Allowance	[h]: [g] x tax rate	$27	$22	-$5	-20%	$13	$10	-$3	-24%
Net Income	[i]: [g] - [h]	$50	$40	-$10	-20%	$50	$38	-$12	-24%

Notes:
[3]: [2] - [1]
[4]: [2] / [1] - 1
[7]: [6] - [5]
[8]: [6] / [5] - 1

Further, the amplified variability in net income due to the lower corporate tax rate is likely to amplify systematic risk, because variations in revenue are generally related to variations in the broader economy that affect the value of all risky assets, not just tax-paying corporations. Since systematic risk is the type of risk that affects the cost of capital, it is reasonable to expect that the TCJA will, all else equal, contribute to higher required returns for corporate equity holders, including those in regulated utilities.

Importantly, while this increase in variability of income applies to all corporate tax-paying entities, unlike unregulated corporations, regulated utilities do not benefit from after-tax higher profits under the new lower tax rate, because the revenue requirement is adjusted to pass the tax savings on to customers.[46]

[46] This discussion assumes that the revenue requirement has been adjusted to account for the lower corporate income tax rate.

Q37. How will the TCJA affect a regulated company's credit metrics?

A37. Credit metrics are negatively affected by regulatory ratemaking treatment of the TCJA, because such treatment causes a near-term reduction in the regulated utilities' cash flow and related cash flow metrics that are closely observed by debt rating agencies. As discussed further below, the expected refunds of excess deferred taxes and lower tax deferrals associated with new investment due to the lower tax rate and loss of bonus depreciation under the TCJA will reduce cash flow. This is especially true for utilities with a large capital investment program such as DTE Gas.[47] Yet the tax reform has no impact on the amount of assets needed for reliability and to serve customers, a portion of which will be debt-financed. Decreases in key cash flow metrics, such as the cash flow to debt ratios that inform the credit rating agencies' credit opinions, have negatively affected the credit profile of many regulated utilities, and will continue to do so.[48]

Q38. Please illustrate how implementation of the TCJA reduces utility cash flows.

A38. Figure 11 below illustrates the impact of TCJA on incremental after-tax cash flows generated by a new investment in utility rate base. It compares the pre-TCJA status quo (*i.e.*, a 35% corporate tax rate and 40% year-1 bonus depreciation that was scheduled to be permitted for new utility investment in 2019 under the prior tax code) with the new situation, namely 21% tax rate and only the standard year-1 Modified Accelerated Capital Recovery System ("MACRS") tax depreciation deduction.[49] As shown, the funds from

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[47] See Schedule D5.18 and

[48] See Moody's Investor Service, Global Credit Research, "Moody's changes outlooks on 25 US regulated utilities primarily impacted by tax reform," January 19, 2018; Sector Comment, "Tax reform is credit negative for sector, but impact varies by company," January 24, 2018; Regulated Utilities - U.S., "2019 outlook shifts to negative due to weaker cash flows, continued high leverage," June 18, 2018; and Regulated Utilities - U.S., "2019 outlook negative amid growing debt and stagnant cash flow," November 8, 2018. See also S&P Global Ratings, Rating Direct, "U.S. Tax Reform: For Utilities' Credit Quality, Challenges Abound," January 24, 2018 and Fitch Ratings, Special Report, "Tax Reform Impact on the U.S. Utilities, Power & Gas Sector: Tax Reform Creates Near-Term Credit Pressure for Regulated Utilities and Holding Companies," January 24, 2018.

[49] For illustrative purposes, the figure posits a hypothetical $1 million investment in new utility assets with a 30-year economic life for depreciation purposes and qualifying for accelerated tax depreciation according to the 20-year MACRS schedule. The investment in rate base is assumed to be financed with 50.00% debt / 50.00% equity and receive a 10.00% allowed ROE.

operations ("FFO")[50] measure of cash flow is dramatically lower under the new tax regime compared to what utilities would have forecasted for new rate base investments prior to the TCJA taking effect. In turn, the incremental impact of new capital expenditures on utilities' cash flow to debt ratios is diminished by the new law.[51]

Figure 11
TCJA Impact on Year-1 Incremental Cash Flow and Credit Metrics
Illustrated for $1,000 of New Utility Plant Investment
Financed with 50% Equity / 50% Debt

		No TCJA - 35% tax rate with bonus depreciation	TCJA - 21% tax rate without bonus depreciation	Difference
		[1]	[2]	[3] = [2] - [1]
Net Income	[a] = 500 * 10%	$50.0	$50.0	-
Depreciation	[b] = 1,000 / 30	$33.3	$33.3	-
Deferred income Taxes				
Tax Depreciation	[c]	$422.5	$37.5	($385.0)
Book Depreciation	[d] = [b]	$33.3	$33.3	-
Temporary Difference	[e] = [c] - [d]	$389.2	$4.2	($385.0)
Deferred Income Taxes	[f] = [e] * tax rate	$136.2	$0.9	($135.3)
Funds From Operations	[g] = [a] + [b] + [f]	$219.5	$84.2	($135.3)
FFO-to-Debt (%)	[h] = [g] / 500	43.9%	16.8%	-27.1%

Notes:
[1] [c] = 1,000 * 42.25%; Represents year-1 deduction from 20-year MACRS schedule with 40% bonus depreciation.
[2] [c] = 1,000 * 3.75%; Represents year-1 deduction from 20-year MACRS schedule.

I note that while Figure 11 focuses on the impact of TCJA for new investment, the combined effect of differences in on-going tax deferrals and EDIT amortization is to reduce cash flow and cash flow-to-debt metrics associated with many pre-existing rate base assets also. Indeed, Moody's has evaluated all components of the TCJA as a drag

[50] For purposes of this example, FFO is defined as the result of adding back depreciation expense and deferred taxes (which are non-cash expenses) to net income. All credit rating agencies consider an after-tax cash flow measure of this type for purposes of calculating cash flow to debt ratios.

[51] Under standard depreciated original cost ratemaking and absent the effects of accelerated tax depreciation, the incremental impact of a given rate base asset to the FFO-to-debt metric is lowest when the asset is new and improves as the asset depreciates; accelerated tax depreciation, and especially bonus depreciation, mitigates or even reverses this trend by providing more cash flow in early years.

on credit quality across the regulated utility industry, estimating that the average reduction in the ratio of cash flow to debt for utilities due to implementing the new tax law is 150-250 bps.[52]

Q39. What are the implications of the reduced cash flows and increased volatility of cash flows in the context of these proceedings?

A39. These effects suggest that it would be appropriate to increase either the allowed ROE or the amount of equity in the capital structure (or possibly both) to help compensate for the increased financial risk imposed on regulated utilities by the TCJA.

While the uncertainty surrounding the passage of the TCJA has been removed, it is unlikely that impacts on the cost of capital will immediately appear in the estimation models. The TCJA has not yet been in place for one complete fiscal year, and the regulatory treatments in various jurisdictions have been in effect for an even shorter period. A longer period of market data is needed before the cost of capital estimation models can be expected to fully reflect impacts of the TCJA on investors' required returns.[53]

Decreases in cash flow metrics and increased volatility of earnings both increase financial risk in ways that may not be reflected in the cost of capital model results. The impact of the TCJA is larger for a utility with a large capital expenditure program as the dollar difference between regulatory and tax treatment of depreciation is larger. I consider these impacts due to the TCJA along with the cost of capital model estimates in order to determine a reasonable range for the allowed ROE. These increases in financial

[52] Moody's Investor Service, "Moody's Changes Outlook on 25 US Regulated Utilities Primarily Impacted by Tax Reform," January 19, 2018. The average reflects bonus depreciation and the impact on cash flow and financing of both new and pre-existing assets. See also Moody's Investor Service, Regulated Utilities - U.S., "2019 outlook shifts to negative due to weaker cash flows, continued high leverage," June 18, 2018 and "2019 outlook negative amid growing debt and stagnant cash flow," November 8, 2018.

[53] For example, Value Line betas, which many analysts use in the Capital Asset Pricing Model rely on five years of data. Thus, a law passes in late 2017 will not be fully reflected in beta until late 2022 or later as the treatment of the deferred income taxes was or still is subject to regulatory review.

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risk due to the TCJA warrant an increase in the allowed ROE for DTE Gas and further support my recommended ROE.

V. ESTIMATING THE COST OF EQUITY

A. PROXY GROUP SELECTION

Q40. How do you identify proxy companies of comparable business risk to DTE Electric?

A40. DTE Gas is primarily engaged in the regulated natural gas distribution business. The business risk associated with these endeavors depends on many factors, including the specific characteristics of the service territory and regulatory environment in which the provider of these services operates. Consequently, it is not possible to identify publicly traded proxy companies that replicate every aspect of DTE Gas' risk profile. However, selecting companies with business operations concentrated in regulated industries or having similar lines of business and/or business environments is an appropriate starting point for selecting one or more proxy groups of comparable risk to DTE gas. As a second step, I must evaluate DTE Gas or Michigan-specific risks to ensure that the Company's ROE was placed appropriately relative to the sample companies.

To this end, I have selected a sample of natural gas distribution utilities and water utilities. Jointly these companies comprise the "Full Sample." I also report results for the gas distribution utilities that are included in the Full Sample and refer to that sample as the Gas Sample. The proxy companies are similar to DTE Gas in that they are rate regulated by state utility commissions, provide customers a product through a network of pipeline assets, and rely on substantial capital to provide service; i.e., they are capital intensive as is DTE Gas.

It is important that a proxy group used to assess the cost of equity for DTE Gas (absent of any unique Michigan or Company characteristics) is regulated, because regulation tends to place substantial requirements and also protections on the companies. I also believe the physical characteristics of the industry – e.g., network, capital intensive, serving many different customers – is a characteristic of DTE Gas and of the selected natural gas distribution and water utilities. The network characteristic implies that assets cannot readily be employed in a different capacity, capital intensity affects the operating risks through the split between fixed and variable costs, and the customer composition affects the demand risk. For example, natural gas and water utilities all face declining per-customer demand due to conservation.

Q41. Why are you including water utilities when evaluating the cost of capital for a natural gas distribution utility?

A41. For several reasons. First, the natural gas distribution industry is expected to undergo substantial changes as customers, regulators and the legislature focus on carbon reductions. This means that initiatives in a specific state influences stock prices and analysts' evaluations along with more fundamental operating and market conditions.[54] I therefore select a group of water utilities, where there are no carbon considerations, to assess whether the estimates from the gas LDCs are reasonable. Second, investors make comparisons across regulated companies, so it becomes important to consider whether the returns awarded DTE Gas are comparable not only to other natural gas utilities but also to other similar risk benchmarks – I consider a broader sample of natural gas and water utilities a reasonable such benchmark. Third, natural gas and water utilities generally share not only regulators but also the characteristics of being (a) capital-intensive, (b) network industries, and (c) having an obligation to serve and interfacing with the local community. I therefore believe these companies provide a useful benchmark when evaluating the cost of equity for DTE Gas.

Q42. Please summarize how you selected the members of the Full Sample and the Gas Sample.

A42. To identify companies suitable for inclusion in the Full Sample, I started with the universe of publicly traded companies in the natural gas and water utility industry as

[54] For example, currently no new customers will receive gas distribution services in part of New York state and the City of Berkeley in California recently banned natural gas. Sources: ConEdison Press Release, "About the Westchester Natural Gas Moratorium," (https://www.coned.com/en/save-money/convert-to-natural-gas/westchester-natural-gas-moratorium/about-the-westchester-natural-gas-moratorium) and San Francisco Chronicle, "Berkeley becomes first U.S. city to ban natural gas in new homes," July 21, 2019.

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identified by *Value Line Investment Analyzer* (*"Value Line")*. I started with Value Line's list of publicly traded companies classified as gas LDCs or water utilities. Next, I reviewed business descriptions and financial reports of these companies and eliminated companies that had less than 50 percent of their assets dedicated to regulated utility activities in their industry; e.g., natural gas or water utility services.[55]

With this group of companies, I applied further screening criteria to eliminate companies that have had recent significant events that could affect the market data necessary to perform cost of capital estimation. Specifically, I identified companies that have cut their dividends or engaged in substantial merger and acquisition ("M&A") activities over the relevant estimation window.[56] I eliminated companies with such dividend cuts because the announcement of a cut may produce disturbances in the stock prices and growth rate expectations in addition to potentially being a signal of financial distress. I generally eliminated companies with significant M&A activities because such events typically affect a company's stock price in ways that are not representative of how investors perceive its business and financial risk characteristics. For example, a utility's stock price will commonly jump upon the announcement of an acquisition to match the acquirer's bid.

Further, I require companies have an investment grade credit rating[57] and fundamentally, requirement is that the proxy companies have the necessary data available for estimation.

Q43. What are the characteristics of the Gas and Water Utility Proxy Group?

A43. The Gas and Water Utility Proxy Group is comprised of gas and water utilities whose primary source of revenues and majority of assets are subject to regulation. The final proxy group consists of the nine gas and five water utilities listed in Figure 12 below.

55 I calculate the share of assets devoted to regulated activities using information from the companies' 10-Ks for the gas and water utilities.

56 As described in Sections V.B, the CAPM requires five years of historical data, while the DCF relies on current market data.

57 In some cases, a proxy company does not have a credit rating from any of the major rating agencies. However, if they were to be rated, they would receive an investment grade rating. In these instances, I assign the company the average credit rating of the rest of the proxy group.

All companies are engaged in the distribution of a commodity to end customers through a network of pipes and mains. While the product differ across gas and water utilities, they are all focused on distribution, a mix of residential, commercial and industrial customers and all are regulated. Further, the proxy group companies have credit ratings in the range of BBB to A+, which is consistent with DTE's credit rating albeit the average for the proxy companies is slightly higher.

Figure 12 reports the proxy companies' annual revenues for the most recent four quarters as of Q2, 2019 and also reports the market capitalization, credit rating, beta and growth rate. The annual revenue as well as the market cap was obtained from Bloomberg. The credit ratings are reported by Bloomberg. The growth rate estimate is a weighted average between estimates from Thomson Reuters and *Value Line*. Betas were obtained from *Value Line*.

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Figure 12
Gas and Water Proxy Group

Company	Annual Revenue (Q2 2019) ($MM)	Regulated Assets	Market Cap. (Q2 2019) ($MM)	S&P Credit Rating	Long-Term Growth Estimate	Value Line Beta
	[1]	[2]	[3]	[4]	[5]	[6]
Atmos Energy	$2,903	M	$12,430	A	6.6%	0.60
Chesapeake Utilities	$700	R	$1,538	A-	9.3%	0.65
New Jersey Resources	$2,760	R	$4,491	A-	6.6%	0.70
NiSource Inc.	$5,237	R	$10,787	BBB+	5.6%	0.55
Northwest Natural	$727	M	$2,094	A	6.9%	0.60
ONE Gas Inc.	$1,654	R	$4,782	A	6.7%	0.65
South Jersey Inds.	$1,796	R	$3,070	BBB	13.1%	0.80
Southwest Gas	$3,001	M	$4,830	BBB+	7.3%	0.70
Spire Inc.	$1,966	R	$4,288	A-	4.4%	0.65
Amer. States Water	$462	R	$2,735	A+	9.0%	0.65
Amer. Water Works	$3,521	R	$21,123	A	7.5%	0.60
California Water	$692	R	$2,414	A+	8.4%	0.70
Middlesex Water	$136	R	$992	A	3.3%	0.70
York Water Co. (The)	$50	R	$453	A-	11.5%	0.75

Sources and Notes:
[1]: Bloomberg as of August 30, 2019.
[2]: Key R - Regulated (More than 80% of assets regulated).
M - Mostly Regulated (50%-80% of assets regulated).
D - Diversified (Less than 50% of assets regulated).
Source: Calculations based on EEI definitions and Company 10-Ks.
[3]: See Schedule No. BV-3 Panels A through I.
[4]: Bloomberg as of August 30, 2019.
[5]: See Schedule No. BV-5.

Q44. How do the proxy companies compare to DTE gas in terms of financial metrics?

A44. DTE Gas regulated operations expects to generate revenues of $175-$183 in 2019 according to DTE's investor presentation.[58] Compared to the annual revenues of the proxy companies, DTE Gas is smaller than all but two of the water utilities. DTE Gas' unsecured credit rating at BBB+ is towards the lower end of the comparable companies. Lastly, as noted above, DTE Gas is a regulated distribution company as is the proxy companies.

58 https://s24.q4cdn.com/970999156/files/doc_quarterly_earnings/2019/q2/Q2.19-presentation-FINAL-(1).pdf

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Q45. What regulatory capital structure did you use for DTE Gas?

A45. As recommended by DTE Gas, I use a capital structure including 52 percent equity in my recommendation.

B. THE CAPM BASED COST OF EQUITY ESTIMATES

Q46. Please briefly explain the CAPM.

A46. CAPM assumes the collective investment decisions of investors in capital markets will result in equilibrium prices for all risky assets such that the returns investors expect to receive on their investments are commensurate with the risk of those assets relative to the market as a whole. The CAPM posits a risk-return relationship known as the Security Market Line (see Figure 2 in Section III), in which the required expected return on an asset (above the risk-free return) is proportional to that asset's relative risk as measured by that asset's beta.

More precisely, the CAPM states that the cost of capital for an investment, S (*e.g.*, a particular common stock), is determined by the risk-free rate plus the stock's systematic risk (as measured by beta) multiplied by the market risk premium. Mathematically, the relationship is given by the following equation:

$$\boldsymbol{r_s = r_f + \beta_s \times MRP} \qquad (1)$$

- $\boldsymbol{r_S}$ is the cost of capital for investment S;
- $\boldsymbol{r_f}$ is the risk-free interest rate;
- $\boldsymbol{\beta_S}$ is the beta risk measure for the investment S; and
- $\boldsymbol{MRP}$ is the market equity risk premium.

The CAPM is a "risk-positioning model," which operates on the principle (corroborated by empirical data) that investors price risky securities to offer a higher expected rate of return than safe securities. It says that an investment, whose returns do not vary relative to market returns, should receive the risk-free interest rate (that is the return on a zero-risk security, the y-axis intercept in Figure 2), whereas investments of the same risk as the overall market (*i.e.*, those that by definition have average systematic market risk) are

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priced so as to expect to return the risk-free rate plus the MRP. Further, it says that the risk premium of a security over the risk-free rate equals the product of the beta of that security and the MRP.

1. Inputs to the CAPM

Q47. What inputs does your implementation of the CAPM require?

A47. As demonstrated by equation (1), estimating the cost of equity for a given company requires a measure of the risk-free rate of interest and the MRP, as well as a measure of the stock's beta. There are several choices and sources of data that inform the selection of these inputs. I discuss these issues below. (Additional technical detail, along with a discussion of the finance theory underlying the CAPM is provided in Appendix B.)

Q48. What value did you use for the risk-free rate of interest?

A48. I use the yield on a 20-year U.S. Treasury bond as the risk-free asset for purposes of my analysis. I rely on a forecast of what Treasury bond yields will be in 2021. Specifically, *Blue Chip Economic Indicators* project that the yield on a ten-year Government Bond will be 3.1 percent by 2021.[59] I adjust this value upward by 50 basis points ("bps"), which is my estimate of the representative historical maturity premium for the 20-year over the ten-year Government Bond. This produces a basic risk-free rate of 3.6 percent for 2021.

I consider this a conservative estimate as the spread between the yield on A-rated (BBB-rated) utility bonds and the 20-year Treasury bond is elevated by approximately 40 (55) basis points relative to the spread's long-run average as shown in Appendix B, Figure B-1. Thus, an adjustment for yield spread might be warranted. However, because the forecasted risk-free rate has declined in recent months, I conservatively do not add such spread.

Alternatively, the increase in yield spread can be viewed as an increase in the return investors require to hold assets that are not risk-free; i.e., an increase in the Market Risk Premium ("MRP"). I consider this possibility in a second scenario, where I rely on a

[59] Blue Chip Economic Indicators, March 2019, p. 3.

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forecasted MRP and in turn subtract 25 basis points from the risk-free rate reported by Blue Chip and adjusted for the maturity premium. I do this because the CBO as of August 2019 forecast a lower yield on the 10-year Treasury bond going forward than does Blue Chip Economic Indicators.[60] In this scenario, I consider the plausible elevation in the MRP using three benchmarks: (i) I evaluate what increase in the MRP the 41 bps increase in the yield spread indicates, (ii) look to Bloomberg's forecasted MRPs and (iii) look to the forecasted MRP using FERC's methodology. All three considerations shown an increase in the MRP over and above the historical average at between 38 basis points (Bloomberg) and over 243 basis points (FERC Method). Consequently, I consider an increase of 100 basis points in Scenario II, which is below that indicated by the increase in yield spread and the FERC methodology. This increase in the MRP is in turn consistent with a reduction in the risk-free rate of 25 basis points – details are in Appendix B, pp. 8-9.

Q49. What value did you use for the MRP?

A49. Like the cost of capital itself, the MRP is a forward-looking concept. It is by definition the premium above the risk-free interest rate that investors can expect to earn by investing in a value-weighted portfolio of all risky investments in the market. The premium is not directly observable. Rather, it must be inferred or forecasted based on known market information. One commonly used method for estimating the MRP is to measure the historical average premium of market returns over the income returns on government bonds a long historical period.[61] The average market risk premium from 1926 to the present (2018) is 6.91 percent.[62] I use this value of the MRP along with a risk-free rate of 3.60 percent in one of my CAPM scenarios.

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60 This is a deviation from my prior practices and was done to ensure I took current forecasts into account as Blue Chip has yet to publish an update to its March 2019 forecasts. I.e., the use of the CBO forecast to reduce the risk-free forecast relative to that obtained from Blue Chip is conservative.

61 The longest period for which Duff & Phelps reports data is 1926 to current. Based on financial textbooks such as Ross, Westerfield and Jaffe, "*Corporate Finance*," 10'th Edition, 2013, pp. 324-327, I use the longest period for which reliable estimates are available – in this case 1926 to 2018.

62 Duff & Phelps, *Ibbotson SBBI 2019 Valuation Yearbook* 10-21.

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I also use a forward-looking MRP of 7.91 percent, which I use in combination with a lower risk-free rate of 3.35 percent.

The 7.91 percent MRP was chosen by looking to forecasted MRPs and the increase in yield spread discussed above. Specifically, Bloomberg's forward-looking market-implied MRP is currently estimated at approximately 7.29 percent (when expressed relative to 20-year bond yields)[63] and was above the 6.91 percent long-term historical average.[64] At the same time, I recently estimated a MRP of 9.34 percent using the methodology in FERC's NETO Briefing Order.[65]

Lastly, the increase in yield spread can be used to provide a quantitative benchmark for the implied increase in MRP based on a paper by Edwin J. Elton, et al., which documents that the yield spread on corporate bonds is normally a combination of a default premium, a tax premium, and a systematic risk premium.[66] Of these components, it is the systematic risk premium that likely explains the vast majority of the yield spread increase. In other words, unless the risk-free rate is underestimated as described above, the market equity risk premium has increased relative to its "normal" level.[67] For example, assuming a beta of 0.25 for A rated debt[68] means that an increase in the MRP of one percentage point

[63] See Figure 5 above.

[64] As noted earlier, the reliance on a forecasted MRP based on the methodology used in the NETO Remand Order would result in a higher MRP of about 9.34% over my forecasted risk-free rate, while the FERC Staff witness recommendation corresponds to an MRP of 7.9 to 8.15% over the 20-year Treasury Bond.

[65] Attached as Exhibit D5.18.

[66] "Explaining the Rate Spread on Corporate Bonds," Edwin J. Elton, Martin J. Gruber, Deepak Agarwal, and Christopher Mann, *The Journal of Finance*, February 2001, pp. 247-277.

[67] In theory, some of the increase in yield spread for A rated debt may be due to an increase in default risk, but the increase in default risk for A rated debt is undoubtedly very small because utilities with A range rated debt have a low default risk. This means that the vast majority—if not all—of the increase in A rated yield spreads is due to a combination of the increased systematic risk premium and the downward pressure on the yields of government debt. Although there is no increase in the tax premium discussed in the Elton et al. paper due to coupon payments, there may be some increase due to a small tax effect resulting from the probability of increased capital gains taxes when the debt matures.

[68] Elton, *et al*. estimates the average beta on BBB-rated corporate debt as 0.26 over the period of their study, and A-rated debt will have a slightly lower beta than BBB-rated debt. I note that 0.25 is a conservatively high estimate of the beta on A-rated utility debt. Most academic estimates, including those presented in *Berk & Demarzo* that I utilize for my Hamada adjustments are significantly lower: in the range of 0.0 – 0.1 percent and would result in a substantially higher MRP estimate.

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translates into a ¼ percentage point increase in the risk premium on A rated debt (i.e., 0.25 (beta) times 1 percentage point (increase in MRP) = ¼ percentage point increase in yield spread). Thus, a 25 bps increase in the yield spread is therefore consistent with a 1.0 percentage point increase in the MRP ($\frac{0.25\%}{0.25} = 1.0\%$). Thus, there is evidence that the current MRP is higher than the historical MRP of 6.91 percent.[69]

The fact that recent forward-looking estimates of the MRP exceeded the historical average level is consistent with the broader body of evidence that risk premiums have remained elevated relative to their pre-financial crisis levels. (See Section IV above.)

Therefore, I believe the 6.91 percent long-term historical average MRP value I rely on is a low-end estimate of what the market risk premium will be during the period at issue in this proceeding. I similarly believe that the 7.91 percent I rely on for my Scenario 2, a 100 basis point increase relative to the MRP in Scenario 1, is a good approximation for the forward-looking MRP.

Q50. Please summarize the parameters of the scenarios and variations you considered in your CAPM and ECAPM analyses.

A50. The parameters are displayed in Figure 13 below. As discussed above, I consider two scenarios; in each case, the risk-free interest rate represents Blue Chip Economic Indicators projection for the ten-year Treasury Yield to prevail in 2020, adjusted to a 20-year horizon. However, I consider that the elevated spread between the yield on A rated utility bonds and 20-year Treasury bonds could either be reflected predominantly in the risk-free rate (Scenario 1) on in the MRP (Scenario 1). The MRP is the long-term historical arithmetic average of annual realized premiums of U.S. stock market returns over long-term (approximately 20-year maturity) Treasury bond income returns from 1926 to 2018 as reported by Duff and Phelps in Scenario 1. In Scenario 2, I look to the forecasted yield from Bloomberg, recent forecasts using FERC's recently suggested

[69] While this analysis indicate an increase of upward 40/25 or 160 basis points in the MRP, I chose to increase the MRP by only 100 basis point and consistently with that reduced the risk-free rate by 25 basis points.

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methodology, and looking to reflecting the yield spread in the MRP rather than in the risk-free rate.

Figure 13
Parameters in Risk Positioning Analyses

	Scenario 1	**Scenario 2**
Risk-Free Interest Rate	3.60%	3.35%
Market Risk Premium	6.91%	7.91%

Q51. What betas did you use for the companies in your proxy groups?

A51. I used *Value Line* betas, which are estimated using the most recent five years of weekly historical returns data.[70] The *Value Line* levered equity betas are reported in Figure 12 above. Importantly, as explained in Section III.B above, these betas—which are measured (by *Value Line*) using the market stock return data of the proxy companies—reflect the level of financial risk inherent in the proxy companies' market value leverage ratios over the estimation period. Because DTE Electric's regulatory capital structure includes a substantially higher proportion of debt financing compared to the proxy companies, the financial risk associated with an equity investment in DTE Electric's rate base is correspondingly greater than the financial risk borne by investors in the proxy companies' publicly traded stock.[71]

Consequently, standard textbook techniques are applied to unlever the *Value Line* betas reported in Figure 12 above and relever the resulting asset betas at DTE Gas' regulatory capital structure. See Exhibit A-14 Schedules D5.13 and D5.15.[72]

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[70] See Value Line Glossary, accessible at http://www.valueline.com/Glossary/Glossary.aspx

[71] A further detailed discussion is contained in Appendix B, Section III.

[72] The Technical Appendix (Appendix B) to this testimony provides a detailed description of the standard textbook formulas used to implement the "Hamada" technique for unlevering measured equity betas based on the proxy companies' capital structures to calculate "asset betas" that measure the proxy companies' business risk independent of the financial risk impact of differing capital structures. The proxy group average asset betas are then relevered at the target capital structure (i.e., DTE's regulatory capital structure), with the precise relevered beta depending on the specific version of the unlevering/relevering formula employed.

2. The Empirical CAPM

Q52. What other equity risk premium model do you use?

A52. Empirical research has long shown that the CAPM tends to overstate the actual sensitivity of the cost of capital to beta: low-beta stocks tend to have higher risk premiums than predicted by the CAPM and high-beta stocks tend to have lower risk premiums than predicted.[73] A number of variations on the original CAPM theory have been proposed to explain this finding, but the observation itself can also be used to estimate the cost of capital directly, using beta to measure relative risk by making a direct empirical adjustment to the CAPM.

The second variation on the CAPM that I employ makes use of these empirical findings. It estimates the cost of capital with the equation,

$$\boldsymbol{r_S = r_f + \alpha + \beta_S} \times (\boldsymbol{MRP - \alpha}) \qquad (2)$$

where $\boldsymbol{\alpha}$ is the "alpha" adjustment of the risk-return line, a constant, and the other symbols are defined as for the CAPM (see equation (2) above).

I label this model the Empirical Capital Asset Pricing Model, or "ECAPM." The alpha adjustment has the effect of increasing the intercept but reducing the slope of the Security Market Line in Figure 2, which results in a Security Market Line that more closely matches the results of empirical tests. This adjustment is portrayed in Figure 14 below. In other words, the ECAPM produces more accurate predictions of eventual realized risk premiums than does the CAPM.

[73] *See* Figure B-2 in Appendix B for references to relevant academic articles.

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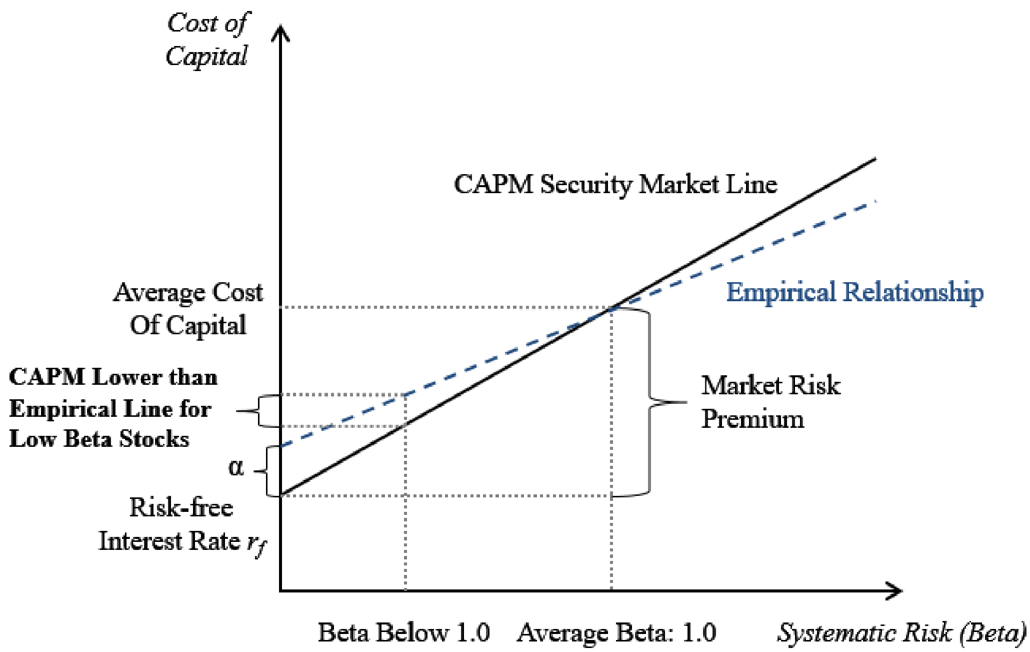
Figure 14
The Empirical Security Market Line



Q53. Why do you use the ECAPM?

A53. Academic research finds that the CAPM has not generally performed well as an empirical model. One of its short-comings is directly addressed by the ECAPM, which recognizes the consistent empirical observation that the CAPM underestimates the cost of capital for low beta stocks. In other words, the ECAPM is based on recognizing that the actual observed risk-return line is flatter and has a higher intercept than that predicted by the CAPM. The alpha parameter (α) in the ECAPM adjusts for this fact, which has been established by repeated empirical tests of the CAPM. In summary, these studies estimate alpha parameters that range between 1%[74] and 7.32%.[75] I apply an alpha parameter of 1.5% in my application of the ECAPM. Appendix B Section II.C provides further

[74] Black, Fischer. Beta and Return. *The Journal of Portfolio Management* 20 (Fall): 8-18.

[75] Fama, Eugene F. and Kenneth R. French. 1992. The Cross-Section of Expected Stock Returns. *Journal of Finance* 47 (June): 427-465.

discussion of the empirical findings that have tested the CAPM and also provides documentation for the magnitude of the adjustment, α.

3. Results from the CAPM Based Models

Q54. Please summarize the results of the CAPM-based models.

A54. The results of CAPM and ECAPM estimation for the two proxy groups are presented in Figure 15 below. The ranges of results for each model (CAPM and ECAPM) reflect the application of different specific versions of the textbook formulas used to account for the impact of different financial leverage on financial risk.

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Figure 15
CAPM / ECAPM Summary at 52% Equity

Estimated Return on Equity	Scenario 1 [1]	Scenario 2 [2]
Gas Sample		
Financial Risk Adjusted Method		
CAPM	9.7%	10.2%
ECAPM (α = 1.5%)	10.3%	10.8%
Hamada Adjustment Without Taxes		
CAPM	9.3%	9.8%
ECAPM (α = 1.5%)	9.5%	10.1%
Hamada Adjustment With Taxes		
CAPM	9.0%	9.6%
ECAPM (α = 1.5%)	9.4%	9.9%
Water Sample		
Financial Risk Adjusted Method		
CAPM	10.7%	11.3%
ECAPM (α = 1.5%)	11.4%	12.0%
Hamada Adjustment Without Taxes		
CAPM	10.1%	10.8%
ECAPM (α = 1.5%)	10.2%	10.9%
Hamada Adjustment With Taxes		
CAPM	9.7%	10.3%
ECAPM (α = 1.5%)	9.9%	10.5%

Sources and Notes:
[1]: Long-Term Risk Free Rate of 3.60%, Long-Term Market Risk Premium of 6.91%.
[2]: Long-Term Risk Free Rate of 3.35%, Long-Term Market Risk Premium of 7.91%.

Q55. How do you interpret the results of your CAPM and ECAPM Analyses?

A55. Looking to Figure 15 above, the results range from 9.0 percent to 12.0 percent with a majority of the results in the range of 9.5 to 10.75 percent.[76] As discussed above, the established academic evidence indicates that the traditional CAPM tends to understate the cost of equity for lower-than-average risk companies such as those in Figure 12

[76] I round to the nearest 0.25% when determining ranges of reasonable results. Clearly, there are numbers below 9% and numbers above 10.75% in the table, but if rounding to the nearest .25%, I have a small number of observations above and below the range (2 below and 4 above, while 18 are within the range).

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above, so the ECAPM may be more applicable. In recognition of the decision in U-18999, I emphasize that the exclusion of figures above 10.75 percent eliminates the high end of the range that was determined applying the financial risk adjusted method to the water sample. Thus, considering the Hamada methodology only a range of 9.5 to 10.0 percent representative for the Gas Sample, while the Water Sample indicates a range of 9.75 to 10.75 percent. I consider both samples informative.

C. DCF BASED ESTIMATES

Q56. Can you describe the DCF model's approach to estimating the cost of equity?

A56. The DCF model attempts to estimate the cost of capital for a given company directly, rather than based on its risk relative to the market as the CAPM does. The DCF method assumes that the market price of a stock is equal to the present value of the dividends that its owners expect to receive. The method also assumes that this present value can be calculated by the standard formula for the present value of a cash flow—literally a stream of expected "cash flows" discounted at a risk-appropriate discount rate. When the cash flows are dividends, that discount rate is the cost of equity capital:

$$\boldsymbol{P_0} = \frac{\boldsymbol{D_1}}{\boldsymbol{1+r}} + \frac{\boldsymbol{D_2}}{\boldsymbol{(1+r)^2}} + \frac{\boldsymbol{D_3}}{\boldsymbol{(1+r)^3}} + \cdots + \frac{\boldsymbol{D_T}}{\boldsymbol{(1+r)^T}} \qquad (3)$$

Where,

$\boldsymbol{P_0}$ is the current market price of the stock;

$\boldsymbol{D_t}$ is the dividend cash flow expected at the end of period $\boldsymbol{t}$;

$\boldsymbol{T}$ is the last period in which a dividend cash flow is to be received; and

$\boldsymbol{r}$ is the cost of equity capital.

Importantly, this formula implies that if the current market price and the pattern of expected dividends are known, it is possible to "solve for" the discount rate r that makes the equation true. In this sense, a DCF analysis can be used to estimate the cost of equity capital implied by the market price of a stock and market expectations for its future dividends.

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Many DCF applications assume that the growth rate lasts into perpetuity, so the formula can be rearranged algebraically to directly estimate the cost of capital. Specifically, the implied DCF cost of equity can then be calculated using the well-known "DCF formula" for the cost of capital:

$$\boldsymbol{r} = \frac{\boldsymbol{D_1}}{\boldsymbol{P_0}} + \boldsymbol{g} = \frac{\boldsymbol{D_0}}{\boldsymbol{P_0}} \times (\boldsymbol{1} + \boldsymbol{g}) + \boldsymbol{g} \quad (4)$$

where $\boldsymbol{D_0}$ is the current dividend, which investors expect to increase at rate $\boldsymbol{g}$ by the end of the next period, and over all subsequent periods into perpetuity.

Equation (4) says that if equation (3) holds, the cost of capital equals the expected dividend yield plus the (perpetual) expected future growth rate of dividends. I refer to this as the single-stage DCF model; it is also known as the Gordon Growth model, in honor of its originator, Professor Myron J Gordon.

Q57. Are there other versions of the DCF model?

A57. Yes. There are many alternative versions, notably (i) multi-stage models, (ii) models that use cash flow rather than dividends, or versions that combine aspects of (i) and (ii).[77] One such alternative expands the Gordon Growth model to three stages. In the multistage model, earnings and dividends can grow at different rates, but must grow at the same rate in the final, constant growth rate period.[78]

In my implementation of the multi-stage DCF, I assume that companies grow their dividend for five years at the forecasted company-specific rate of earnings growth, with that growth then tapering over the next five years toward the growth rate of the overall economy (*i.e.*, the long-term GDP growth rate forecasted to be in effect ten years or more into the future). I note that the multi-stage DCF model likely understates the cost of

77 The Surface Transportation Board uses a cash flow based model with three stages. See, for example, Surface Transportation Board Decision, "STB Ex Parte No. 664 (Sub-No. 1)," Decided January 23, 2009.

78 See Appendix B, Section I for further discussion of the various versions of the DCF model, as well as the details of the specific versions I implement in this proceeding.

equity as it is plausible the payout ratio changes and a company reaches steady-state growth. The model ignores that possibility.

1. DCF Inputs and Results

Q58. What growth rate information do you use?

A58. The first step in my DCF analysis (either constant growth or multi-stage formulations) is to examine a sample of investment analysts' forecasted earnings growth rates for companies in my proxy group. For the single-stage DCF and for the first stage of the multi-stage DCF, I use investment analyst forecasts of company-specific growth rates sourced from *Value Line* and Thomson Reuters *IBES*.

For the long-term growth rate for the final, constant-growth stage of the multistage DCF estimates, I use the long-term U.S. GDP growth forecast of 4.0 from Blue Chip Economic Indicators.[79] Thus, the long-run (or terminal) growth rate in the multi-stage model is nominal GDP growth.

Q59. What are the pros and cons of the input data?

A59. Both the Gordon Growth and single-stage DCF models require forecast growth rates that reflect investor expectations about the pattern of dividend growth for the companies over a sufficiently long horizon, but estimates are typically only available for three - five years. In the multi-stage version, I taper these growth rates toward a stable growth rate corresponding to a forecast of long-term GDP growth for all companies.

One issue with the data is that it includes solely dividend payments as cash distributions to shareholders, while some companies also use share repurchases to distribute cash to shareholders. To the extent that companies distribute cash to shareholders via share repurchases, a DCF model that uses dividends as the payment to shareholders will under-estimate the cost of equity capital.

[79] See Blue Chip Economic Indicators, March 2019, p. 14.

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Q60. Please summarize the DCF-based cost of equity estimates for the proxy groups.

A60. The results of the DCF based estimation for the proxy groups are displayed below in Figure 16.

Figure 16
DCF Model Results at 52% Equity

	Simple	Multi-stage
	[1]	[2]
Gas Sample	12.1%	8.7%
Water Sample	13.4%	8.1%

Q61. How do you interpret the results of your DCF analyses?

A61. The DCF models are estimated based on dividend yields that may be expected to increase as interest rates continue to rise in the coming months and years. As Price / Earnings ratios change with interest rates, so does the dividend yield (assuming a reasonable constant payout ratio). As a consequence, the dividend yield is more likely to be under estimated than over estimated going forward. At the same time, the Blue Chip forecasted GDP growth is well below the GDP growth the U.S. recently has experienced, so if the 2018 and first half of 2019 GDP growth pattern continues, the multi-stage model will incorporate a GDP growth that is too low.[80] Therefore, I believe the multi-stage DCF model is downward biased in that it suffers from both of these effects. As a result I acknowledge that the single-stage DCF model makes the strong assumption that current three-to-five year Earnings Per Share growth expectations will persist into perpetuity, I conclude that a reasonable low-end estimate is higher than the multi-stage DCF model's results, while the high end is lower than the single-stage DCF model's results. Looking

[80] Blue Chip's forecasted GDP growth was 4.0% at the time of estimation, while the realized nominal GDP growth for 2018 per the Bureau of Economic Analysis is 5.2% (real GDP of 2.9% plus inflation of 2.3%). The 2019 GDP growth to date has been approximately 4.9%. Source: https://www.bea.gov/system/files/2019-05/gdp1q19_2nd_0.pdf.

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to the gas sample, I find a range of 9.25 to 11.0 percent reasonable, while the water sample indicates a higher range.[81]

D. Risk Premium Model Estimates

Q62. Did you estimate the cost of equity that results from an analysis of risk premiums implied by allowed ROEs in past utility rate cases?

A62. Yes. In this type of analysis, sometimes called the "risk premium model," the cost of equity capital for utilities is estimated based on the historical relationship between allowed ROEs in utility rate cases and the risk-free rate of interest at the time the ROEs were granted. These estimates add a "risk premium" implied by this relationship to the relevant (prevailing or forecast) risk-free interest rate:

$$Cost\ of\ Equity = r_f + Risk\ Premium \tag{5}$$

Q63. What are the merits of this approach?

A63. First, it estimates the cost of equity from regulated entities as opposed to holding companies, so that the relied-upon figure is directly applicable to a rate base. Second, the allowed returns are readily observable to market participants, who will use this one data input in making investment decisions, so that the information is at the very least a good check on whether the return is comparable to that of other investments. Third, I analyze the spread between the allowed ROE at a given time and the then-prevailing interest rate to ensure that I properly consider the interest rate regime at the time the ROE was awarded. This implementation ensures that I can compare allowed ROE granted at different times and under different interest rate regimes.

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81 9.25 percent is equivalent to the multi-stage result plus 50 bps, while 11.0 percent is equivalent to the single-stage result minus 100 bps. The average of the DCF results is 10.4 percent for the gas sample and 10.75 percent for the water sample. These are reasonable point estimate for the DCF model.

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Q64. How did you use rate case data to estimate the risk premiums for your analysis?

A64. The rate case data from 1990 through Q2 2019 is derived from Regulatory Research Associates.[82] Using this data, I compared (statistically) the average allowed rate of return on equity granted by U.S. state regulatory agencies in electric utility and electric distribution rate cases to the average 20-year Treasury bond yield that prevailed in each quarter.[83] I calculated the allowed utility "risk premium" in each quarter as the difference between allowed returns and the Treasury bond yield, since this represents the compensation for risk allowed by regulators. Then I used the statistical technique of ordinary least squares ("OLS") regression to estimate the parameters of the linear equation:

$$Risk\ Premium = A_0 + A_1 \times (Treausury\ Bond\ Yield) \quad (6)$$

I derived my estimates of A_0 and A_1 using standard statistical methods (OLS regression) and found that the regression has a high degree of explanatory power in a statistical sense. I report my results for the respective classifications of rate cases below in Figure 17.[84] I note that the results displayed in Figure 17 below shows that the risk premium model fits the data well as the R-squared is above 80% and R-squared is a measure of how well the data fits the model. An R-squared above 0.8 indicates a solid result.

Figure 17
Implied Risk Premium Model Estimates

	R Squared	Estimate of A_0	Estimate of A_1	Implied Cost of Equity Range	
	[1]	[2]	[3]	[4]	[5]
Natural Gas Utility	0.853	8.40%	-0.545	9.9%	10.0%

Sources and Notes
[1]-[3]: Estimated using SNL Rate Case data as of 7/31/2019 and Bloomberg Treasury yield data as of 8/30/2019.
[4]: Risk-free Rate of 3.35% (includes utility yield spread adjustment of -0.25%).
[5]: Risk-free Rate of 3.60% (includes utility yield spread adjustment of 0.00%).

82 SNL Financial as of September 2019.

83 I rely on the 20-year government bond to be consistent with the analysis using the CAPM to avoid confusion about the risk-free rate. While it is important to use a long-term risk-free rate to match the long-lived nature of the assets, the exact maturity is a matter of choice.

84 Exhibit A-14, Schedule D5.16 contains my risk premium analysis.

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The negative slope coefficient reflects the empirical fact that regulators grant smaller risk premiums when risk-free interest rates (as measured by Treasury bond yields) are higher. This is consistent with past observations that the premium investors require to hold equity over government bonds increases as government bond yields decline. In the regression described above the risk premium declined by less than the increase in Treasury bond yields. Therefore, the allowed ROE on average declined by less than 100 bps when the government bond yield declined by 100 bps. Based on this analysis, I find that the current market conditions are consistent with an ROE of 9.9 to 10.0 percent for natural gas distribution utilities.

Q65. What conclusions did you draw from you risk premium analysis?

A65. The results in Figure 17 indicate a ROE of 9.9 to 10.0 percent for an average gas distribution utility based on the risk premium model, which is consistent with the middle of my estimates. While the risk premium model based on historical allowed returns is not underpinned by fundamental finance principles in the manner of the CAPM or DCF models, I believe that this analysis, when properly designed and executed and placed in the proper context, is a valid and useful approach to estimating utility ROE. Because the risk premium analysis as implemented takes into account the interest rate prevailing during the quarter the decision that granted an ROE used in the analysis was issued, it provides a useful benchmark for the cost of equity in any interest environment. Because it relies on the returns for regulated utilities, I believe this method provides a good way to directly assess whether the ROE is commensurate with that available to alternative regulated investments of similar risk.

Q66. Please summarize your results before considering where to place DTE Gas.

A66. Figure 18 below summarizes the reasonable ranges of results I obtained above with the risk premium results focused on natural distribution utilities and the CAPM results based on the Hamada as opposed to the financial risk adjusted methods.

Figure 18
Summary of Reasonable Ranges

	Gas Sample			Full Sample		
CAPM	9.25%	-	9.75%	9.50%	-	10.25%
ECAPM	9.50%		10.00%	9.50%		10.75%
DCF	9.25%	-	11.00%	9.25%	-	11.25%
Risk Premium	9.90%	-	10.00%	na	-	na
Average	9.48%	-	10.19%	9.42%	-	10.75%

VI. DTE GAS SPECIFIC CIRCUMSTANCES AND ROE RECOMMENDATION

A. BUSINESS RISK CHARACTERISTICS

Q67. Are there any differences in the regulatory environment in which the comparable companies and DTE Gas operates?

A67. Like many of the sample companies, DTE Gas benefits from certain regulatory policies that reduce regulatory lag, including a forward test year for rate cases, and an annual recovery mechanism for expenses such as fuel. DTE Gas also has a decoupling mechanism. However, many of these mechanisms are similar to those of the majority of the sample companies. For example, SNL reports that more than half of U.S. jurisdictions use decoupling mechanisms and all have a fuel recovery mechanism.[85]

Q68. Are there any specific area in which DTE Gas has higher risk than the sample?

A68. Yes. As discussed in, for example, the MBA text of Brealey, Myers and Allen, discuss how operating leverage – the proportion of fixed cost in its cost structure – affect business risk.[86] Additionally, undertaking construction projects is challenging and can add risk to the utility. Therefore, I examined the capital intensity and the capital expenditures of the sample companies and DTE Gas. Figure 19 below summarizes the capital expenditures since 2012 for DTE Gas and the median of the sample companies, while Figure 20 provides data for the individual sample companies.

[85] SNL, "RRA Regulatory Focus: Adjustment Clauses – A State-by-State Overview," September 28. 2018.

[86] Brealey, Myers & Allen, "Principles of Corporate Finance," 10th Edition, 2011, pp. 248-249

It is clear from the figures below that DTE Gas is engaged in a relatively larger capital expenditure program than the sample companies in recent years. This is confirmed in Exhibit A-14, Schedule D5.17, which shows revenues to property, plant, and equipment ("PP&E") for both DTE Gas and the sample companies. Here it is shown that DTE Gas is relatively more capital intensive meaning that it has lower revenue to total PP&E than the sample companies. Specifically, while DTE on average has revenue of $0.307 for each dollar of PP&E, the sample on average has revenue of $0.348 for each dollar of PP&E. Looking to the gas utilities, they have on average revenues of more than 42 cents for each dollar of PP&E as compared to DTE Gas' 30.7 cents.

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Figure 19: Median Capital Expenditures for Sample and DTE

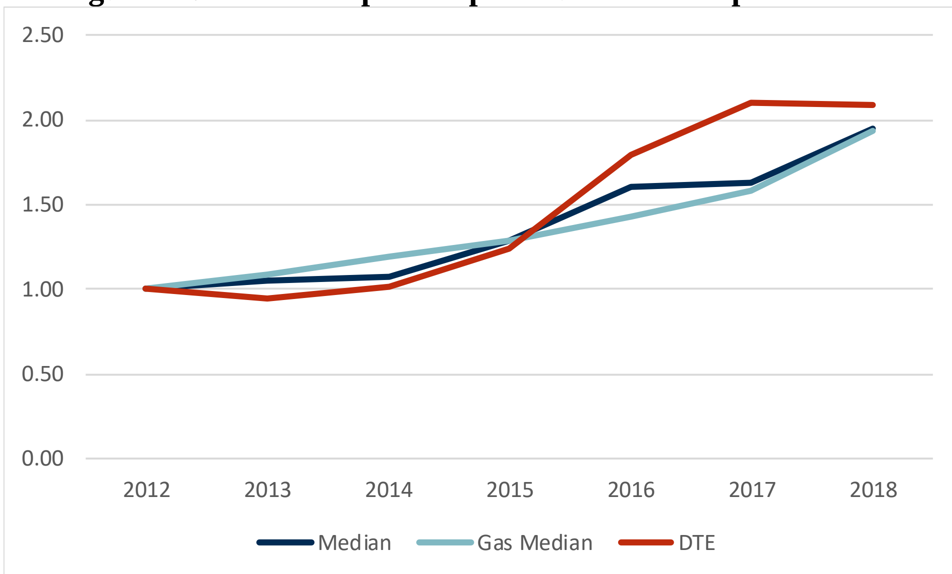
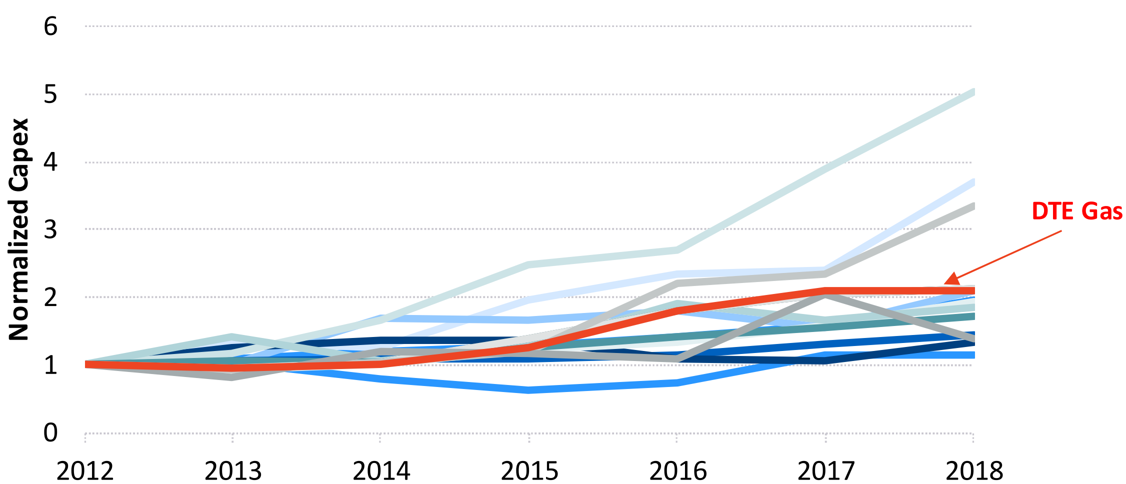


Figure 20: Detailed Capital Expenditure Summary



Source: DTE data and CapIQ.

Q69. How does the capital intensity and capital expenditure affect DTE Gas' business risk?

A69. All else equal the higher capital expenditures and capital intensity makes DTE Gas more risky than its peers.

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Q70. How does the business risk of DTE Gas compare to that of the sample?

A70. Like the sample companies, DTE Gas' business is concentrated in regulated gas distribution industry. It also has a credit rating (BBB+) that is comparable to slightly below that of the sample companies.

Regulatory policy plays a role in the business risk of the Company. In the current environment of declining energy demand and an emphasis on decreasing carbon emissions, there is some uncertainty about DTE's future demand. Additionally, DTE Gas has relatively a higher capital intensity and capital expenditure program than the sample companies.

Q71. How does the state of the economy in DTE Gas' service territory affect the Company's business risk?

A71. The economy of Detroit has improved over the last few years. However, the risk of under-recovery of DTE Gas' fixed costs due to its reliance on volumetric charges to recover fixed costs is increased by the state of Michigan's economy relative to the other companies in the sample and this is magnified by DTE Gas' relatively higher PP&E to revenue.

Michigan's economy is heavily dependent upon the auto industry, and Detroit's economy in particular is currently weak. The City of Detroit ("City"), which was in bankruptcy until December 10, 2014, is recovering, but it continues to experience a high unemployment rate and according to recent census data, Detroit is among the poorest cities in the country.[87] The City has experienced falling population year-over-year since 2005.

The weak local economic conditions and declining population and industrial activity in the Company's service territory contribute to and exacerbate the effect of declining sales, which—in conjunction with a rate structure that relies on volumetric charges to recover

[87] https://www.mlive.com/news/2019/09/flint-and-detroit-among-nations-top-5-poorest-cities-new-census-data-shows.html

fixed costs—increases the downside risk that DTE Gas may not be able to earn its authorized return.

Q72. Can you please summarize your assessment of DTE Gas' business risk relative to the sample?

A72. Compared to the sample, DTE Gas is engaged in the same line of business, has a comparable credit rating and access to similar regulatory mechanisms. However, DTE Gas has relatively higher capital intensity, higher capital expenditure in recent years and operates in a challenging locality. As a result, DTE Gas is more risky than the average or median of the sample profile.

VII. COST OF CAPITAL RECOMMENDATION

Q73. Please summarize your conclusions regarding DTE Gas' risk and the necessary return.

A73. I find that DTE gas to be of higher than average risk relative to the sample companies and merits placement in the upper end of the reasonable range that I summarized in Figure 18 above. I therefore recommend that DTE Gas be placed in the upper end of the reasonable range.

Q74. What do you recommend for DTE Gas' cost of equity in this proceeding?

A74. I find a range of approximately 9.5 to 10.75 percent to be the reasonable range for DTE Gas and recommend that DTE Gas be placed towards the upper end of that range. Specifically, I recommend an allowed ROE of 10.5 percent. This recommendation is at the upper end of the reasonable range I obtained from the DCF, CAPM and Risk Premium models, considering both the Gas Sample and the Full Sample.

Q75. Does this conclude your direct testimony?

A75. Yes, it does.

FitchRatings

RATING ACTION COMMENTARY

Fitch Affirms DTE Energy and Subs. Following Plans to Spin-off GSP Business

Tue 27 Oct, 2020 - 5:38 PM ET

Fitch Ratings - New York - 27 Oct 2020: Fitch Ratings has affirmed DTE Energy Co.'s (DTE) Long-Term Issuer Default Rating (IDR) at 'BBB' following the Oct. 27, 2020 announcement that DTE will spin off its Gas, Storage and Pipeline (GSP) business into a separate standalone publicly traded entity by mid-2021. In addition, Fitch has affirmed the Long-Term IDRs of DTE Electric (DTEE) at 'A-' and DTE Gas (DTEG) at 'BBB+.' The Rating Outlooks for DTE, DTEE and DTEG are Stable.

The announced transaction will result in a positive shift in DTE's risk profile with state-regulated operations expected to comprise around 90% of the company's EBITDA compared to 75%-80% prior to the transaction.

Fitch expects parent debt to decline over the forecast period, as the GSP spin-off entity contemplates issuing around $2.9 billion of debt. The proceeds will be used to pay down debt at the DTE parent level. This should result in a parent debt reduction to about 28% of total debt post 2021. The reduction is well below Fitch's previous projections of about 37%, but still elevated for a company with the 90% of projected utility- derived EBITDA.

Nonetheless, Fitch projects that DTE's funds from operations (FFO) leverage will modestly weaken to 5.0x-5.1x during 2022-2023, above previous pre-spin projections of around 4.7x-4.8x, but still remain comfortably below Fitch's current negative sensitivity threshold. Following a successful spin-off and a pay down of parent-level debt in line with the current projections, Fitch expects a modest improvement in the Fitch's FFO sensitivity thresholds to reflect a lower predominately utility business risk profile.

The ratings and Outlooks also consider uncertainty regarding the impact of the coronavirus pandemic at DTE's regulated and unregulated businesses. DTE Energy has fully offset any negative impacts of the pandemic on its commercial and industrial sales, with O&M cuts and significantly higher residential usage than anticipated, partially caused by very favourable weather. Fitch believes, DTE Energy, DTE Electric and DTE Gas are strongly positioned to weather any further lingering impact of the pandemic in 2021.

KEY RATING DRIVERS

Spin-Off of Gas, Storage and Pipeline Business: On Oct. 27, 2020, DTE announced its plan to spin off its GSP business into a separate standalone publicly traded entity. The GSP spin-off entity contemplates issuing around $2.9 billion of debt (the plan is to issue 4x EBITDA debt at the new GSP entity, with the current 2021 EBITDA guidance of $710 million-$750 million) and to use the proceeds to pay down debt at the DTE parent level. All the debt to finance GSP segment was being issued at the parent level prior to the announcement of this transaction. DTE does not expect to allocate any proceeds to equity repurchases. DTE is also expected to reduce the dividend by about 20% to keep the pay-out ratio around 60%-65%, in line with the earnings reduction following the spin-off. Going forward, dividend is expected to grow in line with earnings, at about 5%-7% annually. The GSP spin-off transaction is expected to be tax free and to close in mid-2021, subject to regulatory approvals and favourable conditions in capital markets.

Credit Metrics Modestly Weaker: Fitch estimates consolidated FFO leverage will be 5.0x-5.1x in 2022-2023, following the completion of the spin-off. Although slightly weaker than previously estimated leverage of 4.7x-4.8x it is still comfortably below Fitch's current negative sensitivity threshold. Fitch expects parent debt to decline following the transaction to about 28% of total debt by 2023. This is well below previous assumption of about 37%, but still elevated for a company with the 90% of projected utility-derived EBITDA. Fitch does not assign equity credit to the equity units, which are converting into equity in 2022 and would contribute to an improvement in leverage.

Improved Business Mix: Fitch views the GSP segment as riskier than the regulated utilities. The GSP segment contributed about 17% of operating earnings in 2019, and is projected to increase to around 22% in 2020. Prior to the announcement of the spin-off, Fitch expected regulated utilities to remain around 75%-80% of EBITDA, contributing to predictable earnings and cash flow, and the non-utility segments, through organic growth and smaller bolt-on acquisitions, to contribute around 20%-25% of consolidated EBITDA through 2023. Following the spin-off of the GSP segment, Fitch expects DTE will derive around 90% of its EBITDA from two regulated utilities in Michigan. Following a successful spin-off and a pay down of parent-level debt, Fitch expects a modest improvement in the Fitch's FFO sensitivity thresholds to 4.8x-5.4x from the current 4.7x-5.3x range to reflect a lower predominately utility business risk profile.

Constructive Utility Regulatory Environment: The Michigan regulatory environment remains constructive from a credit perspective, evidenced by general rate case (GRC) outcomes, in which the Michigan Public Service Commission (MPSC) recently approved authorized ROEs of 9.9%, which are above industry averages for electric and gas utilities. The regulatory framework allows full pass through of fuel and purchased power costs, forward-looking test years and a timely 10-month review period for GRC resolution. Fitch believes recent DTEE and DTEG orders are constructive and supportive of current credit ratings and significant capital investment. The value of a supportive regulatory environment will be even more important for the stability of credit ratings once most of DTE's cash flow are derived from its two utilities.

Utility-Focused Capex Program: Current DTE's $19 billion capital program in 2020-2024 is 80% utility-oriented. DTE plans to spend $17 billion over 2021-2025 period on its utility investment, which represents more than 90% of the total capex, and a 13% increase vs. previous 2020 plan. The plan excludes any potential GSP investment prior to the spin-off in 2021. The utilities are investing in distribution, environmental compliance projects, gas generation, pumped storage, and wind and solar generation. The spending is expected to render DTE's FCF negative in the intermediate term. Fitch expects the program to be funded with internal cash flow, debt and equity from the parent to maintain the utilities' regulatory capital structure.

Effects from the Coronavirus: The coronavirus pandemic has caused unprecedented disruptions to state and local economies, as well as financial markets. While the situation remains fluid, DTE has been very successful in managing any potential negative exposure from lower industrial and commercial sales. Operational savings and a significant increase in residential sales, partially helped by favourable weather, with much higher margins, were more than sufficient to offset a reduction in commercial and industrial sales. YTD the sales decline due to the pandemic have been lower than management projections due to significantly higher residential demand. Most of the O&M reduction is expected to be only temporary but should provide cash flow and earnings protection in the near term. DTE Electric Company (DTEE; A-/Stable) derives approximately 33% of MWh sales from residential customers, 38% from commercial and 22% from industrial.

The uncollectible expense is expected to rise but should remain manageable. DTEE has a bad debt reserve in the rate structure of about $92 million. In addition, Michigan utilities received approval to begin deferring uncollectible expense in excess of the amount in base rates starting March 2020.

Parent/Subsidiary Linkage: Fitch applied a bottom-up approach in rating DTE and its subsidiaries. DTE's Long-Term IDR reflects a consolidated credit profile. The linkage between the parent and subsidiaries follows a weak parent/strong subsidiary approach. Fitch considers DTEE stronger than DTE due to the low-risk business-regulated utility operations and predictable cash flow. Legal ties are weak, as DTE does not guarantee the debt obligations of the subsidiaries and no cross defaults exist among DTE and its subsidiaries.

Operational and strategic ties are robust and DTEE remains the primary driver of earnings and cash flow to support parent-level dividends. DTEG also has operational and strategic ties to DTE but does not contribute as large a portion of cash flow to its parent. Fitch has determined moderate linkage exists between DTE, DTEE and DTEG, and would limit the notching difference between the Long-Term IDRs of DTE and its subsidiaries to one to two notches.

DTE Electric

Constructive Regulatory Environment: The Michigan regulatory environment for electric utilities remains constructive from a credit perspective, evidenced by general rate case (GRC) outcomes, in which the Michigan Public Service Commission (MPSC) approved authorized ROEs of 9.9%, above industry averages. The regulatory framework allows full pass-through of fuel and purchased power costs, forward-looking test years and timely 10-month review period for GRC resolution. DTEE's May 2020 rate order is constructive, with a $188 million rate increase, versus $351 million requested, earning a 9.9% ROE on a 38.30% equity structure and a $17.9 billion rate base.

Rate Case Deferred: DTEE received approval in July 2020 to delay a new rate case filing to 2021, and keep electric base rates unchanged until 2022. The MPSC's order approved DTEE's request to accelerate amortization of the $126 million regulatory liability for non-plant-related accumulated deferred income tax balances. DTEE will amortize its regulatory liability by YE2021, instead of April 2033, without changing customer rates, allowing DTEE to defer its rate case filing previously set for July 2020 to at least March 1, 2021. The order also approves DTEE's request to file a securitization financing application and request for financing order in 2021 for tree trimming and accelerated River Rouge coal plant shut down. Fitch believes the order is constructive and although the absence of a rate increase will modestly pressure cash flows in 2021, it should be offset by proceeds from the securitization and expected further O&M cost management and pull forward of some of the O&M into 2020. Fitch projects credit metrics will remain comfortably below its negative FFO leverage sensitivity level.

Elevated Capital Program: DTEE plans to invest approximately $14 billion during 2021-2025, a $2 billion or a 17% increase versus previous plan for 2020-2024 . The large capital program reflects DTEE's goals to reduce carbon emissions by investing in distribution and environmental-compliance projects and gas and wind generation. The investments will render the company CF-negative in the intermediate term. Fitch expects internal cash flows to fund the program, with debt and equity support from DTE to maintain the utility's regulatory capital structure.

Transition to Clean Energy Generation: The utility is retiring coal-fired generation and replacing it with wind and natural-gas plants to meet its environmental targets and exceed Michigan's 15% Renewable Portfolio Standard by 2021. Under the Integrated Resource Plan (IRP) approved in April 2020, the company pledged to reduce CO2 emissions by 50% in 2030 and 80% by 2040 and shut down all coal-fired plants by 2040. The next IRP will be filed in 2023 and should address potential early retirements of remaining coal units. The current plan calls for three coal-fired plants with 2GW capacity to be retired by 2022 and replaced with the 1,100MW Blue Water Energy Center natural-gas-fired plant, costing around $1 billion; an $800 million upgrade of the Ludington Pumped Storage Power Plant half owned by DTEE; and additional renewable projects. DTEE received an order in July 2020 on its renewable energy filing that approved 353MW of additional renewable energy by 2022, with 225MW of wind and 125MW of solar. Fitch believes these projects over the next five years will not present major technological or execution risks.

Solid Financial Profile: Fitch estimates FFO leverage of 3.9x-4.0x through 2023, reflecting moderate pressure from high capital spending. Fitch believes the credit metrics are consistent with the current rating. Debt maturities are manageable, and Fitch expects DTEE to have continued access to capital markets.

DTE Gas

Constructive Regulatory Environment: Fitch Ratings views the regulatory environment for natural gas utilities in Michigan as constructive. The regulatory framework allows full pass-through of fuel costs, forward-looking test years and timely resolution of rate proceedings. DTEG's currently authorized ROE of 9.9% compares favourably with industry averages. Furthermore, revenue-decoupling and an infrastructure recovery mechanism (IRM) helps DTEG reduce exposure to regulatory lag.

Rate Case Settlement Approved: DTEG filed a general rate case (GRC) in November 2019, asking for a rate increase of about $200 million based on a 10.5% ROE. The final order was issued in September 2020, approving an allowed ROE of 9.9% and $110 million rate increase, in line with Fitch's expectations. DTEG tends to a file rate case every other year, and the next rate case filing is expected in 2021.

Utility-Focused Capex Program: DTEG plans to spend $3.5 billion on capital investments in 2021-2025, which includes $500 million of additional opportunities, and is $500 million higher than the 2020 plan. Capital projects are focused on distribution system enhancements, main renewals and pipeline integrity programs. The timely cost-recovery mechanism provided under the IRM is used for about 55% of the projects. The investments will render FCF negative in the intermediate term. Fitch expects the program will be funded with internal cash flow, debt and equity support to maintain DTEG's balanced capital structure.

Solid Operating Performance: DTEG's current and projected credit measures are supportive of its current rating. Fitch estimates adjusted debt/EBITDAR and FFO leverage to increase in 2020 to 4.6x and 4.8x, respectively, due to the increase in the capital program vs. previous years, and improve to 4.2x and 4.5x, respectively, by 2023. Concerns over the modest increase in leverage are mitigated by the utility's IRM.

DERIVATION SUMMARY

DTE's credit profile is weaker than peers, Dominion Energy, Inc. (DEI; BBB+/Stable) and Sempra Energy (BBB+/Stable), which are parent holding companies anchored by regulated utility operations and midstream assets. All have significant parent-level debt. DTE's consolidated operations are smaller than Dominion's and Sempra's.

In terms of cash flow from regulated utilities, DTE's regulated cash flow of about 78% in 2019 is higher than Dominion's, whose regulated cash flow was around 70% in 2019. Post-closing of the announced GSP spin-off, Fitch expects approximately 90% of DTE's EBITDA to come from a single- state regulated utility businesses over the forecast period. This is close to DEI's approximately 85%-90% of EBITDA expected to come from state-regulated utility businesses following sales of the gas transmission assets, and higher than Sempra's at around 80%. In addition, DTE's parent- level debt is expected to decrease, although still stay at an elevated level, to about 28%, following the spin-off and parent debt paydown. This is lower than 35%-40% projected for DEI post the asset sale. Following the transaction DTE's business model and leverage should resemble more closely CMS Energy (CMS; BBB, Stable), a Michigan single-state regulated utility, with a small contribution from non-utility business, and an elevated parent-level debt of about quarter of its total debt.

Fitch anticipates FFO leverage of 5.0x-5.1x in 2022 and 2023, which is similar to Dominion with FFO leverage projected at around 5.0x and less favorable to Sempra at 4.5x after 2020, with Cameron LNG, LLC online. CMS's FFO leverage, is similar to DTE's and projected to average around 5.0x over the forecast period.

DTEE compares favorably with peers Consumers Energy Company (A-/Stable) and Northern States Power Company-Wisconsin (NSP; A-/Stable). All are regulated electric utilities with supportive regulatory environments and favorable recovery mechanisms. DTEE and Consumers both operate in Michigan and are similarly sized, while NSP is smaller and also operates in a single state under one regulator. DTEE's financial profile compares favorably with Consumers' but less so with NSP's. DTEE's leverage is modestly rising as it progresses through its elevated capital program, which is in line with its peers'. Fitch forecasts FFO-adjusted leverage to average 3.9x-4.0x at DTEE through 2023, slightly weaker than 3.8x at Consumers and 3.5x-3.8x at NSP.

DTEG's business risk profile compares well to peers Southwest Gas Corporation (SWG; A-/Stable) and Wisconsin Gas LLC (A-/Stable) as regulated local distribution companies (LDC). Fitch views LDCs as a low-risk business. Each benefit from supportive regulatory environments and favorable recovery mechanisms. SWG's business profile is more favorable than its peers, stemming from regulatory diversity in three states and above-average customer growth. DTEG's Long-Term IDR is lower than peers due to its higher leverage driven by a large capex program. DTEG's financial profile is slightly weaker than peer WI Gas and in line with SWG. DTEG and SWG forecast FFO leverage around 4.5x-4.8x during the 2020-2023 forecast period. WI Gas has a more favorable financial profile with forecast leverage metrics around 4.7x in 2020 and improving to 4.1x by 2022.

KEY ASSUMPTIONS

--Spin off of the GSP segment in mid-2021, with removal of all related earnings and cash flow mid-year.

--Pay down of about $2.9 billion of parent-level debt following the spin-off.

--Dividend reduction to reflect reduced earnings and maintain around 65% pay-out ratio.

--Constructive regulatory environment in Michigan with 9.9% ROE for DTEE and DTEG in line with recent rate case decision.

--Capex program totaling $17 billion at utilities in 2021-2025.

--O&M reduction in 2020 to offset the negative effects of the economic slowdown on sales.

--Industrial and commercial sales decline in 2020 due to the economic effects of the coronavirus, offset by an increase in residential sales with recovery to normal levels in 2021 and beyond.

--Capital structure commensurate with regulatory structure.

--Reduced emission fuel (REF) projects shutdown in 2021 as tax credits expire; Cash flow from REF projects during 2019-2021 is considered non-recurring and not included in EBITDA.

RATING SENSITIVITIES

DTE

Factors that could, individually or collectively, lead to positive rating action/upgrade:

--While not anticipated at this time given the sizable capital program and elevated leverage, sustained improvement in FFO leverage of 4.7x or lower through the forecast period.

--Decrease in business risk resulting in 80% or more earnings coming from regulated utility business;

--Following the spin-off and the pay down of the parent-level debt with the transaction proceeds we would expect the positive threshold to be revised to FFO leverage of 4.8x and 90% or more of earnings coming from regulated utility business.

Factors that could, individually or collectively, lead to negative rating action/downgrade:

--A significant deviation from the current business risk with the regulated businesses comprising 60%-65% of consolidated cash flow due to growth in the non-utility businesses;

-An adverse change in Michigan's regulatory environment;

--Sustained weakening in FFO-adjusted leverage of 5.3x or higher through the forecast period;

--Following the spin-off and the pay down of the parent-level debt with the transaction proceeds we would expect the negative threshold to be revised to FFO leverage of 5.4x and an increase in current business risk with the regulated business comprising less than 90% of the consolidated cashflow.

DTEE

Factors that could, individually or collectively, lead to positive rating action/upgrade:

--Sustained FFO leverage of 3.5x or better,

--Given the linkage to DTE, any two notch upward revision to DTE's IDR.

Factors that could, individually or collectively, lead to negative rating action/downgrade:

--A two-notch downgrade at the parent DTE;

--An adverse change in Michigan's regulatory environment;

--Sustained FFO leverage greater than 4.5x.

DTEG

Factors that could, individually or collectively, lead to positive rating action/upgrade:

--Sustained FFO leverage at or below 4.0x;

Factors that could, individually or collectively, lead to negative rating action/downgrade:

--An unexpected change in the regulatory environment that limits the utility's ability to recover cost of capital investments in a timely manner;

--Sustained FFO leverage greater than 5.0x.

BEST/WORST CASE RATING SCENARIO

International scale credit ratings of Non-Financial Corporate issuers have a best-case rating upgrade scenario (defined as the 99th percentile of rating transitions, measured in a positive direction) of three notches over a three-year rating horizon; and a worst-case rating downgrade scenario (defined as the 99th percentile of rating transitions, measured in a negative direction) of four notches over three years. The complete span of best- and worst-case scenario credit ratings for all rating categories ranges from 'AAA' to 'D'. Best- and worst-case scenario credit ratings are based on historical performance. For more information about the methodology used to determine sector-specific best- and worst-case scenario credit ratings, visit https://www.fitchratings.com/site/re/10111579.

LIQUIDITY AND DEBT STRUCTURE

DTE had around $3.4 billion of available liquidity as of June 30, 2020, consisting of cash and amounts available under a revolving credit facility. DTE's LOCs and revolving credit facilities expire in 2021 and 2024, respectively and have a maximum debt/capitalization covenant of 65%. The facilities are $1.7 billion at DTE, $500 million at DTEE and $300 million at DTEG. DTE , DTEE and DTEG were compliant with consolidated debt/capitalization of 60%, 55% and 47%, respectively, as defined under the credit agreement, as of June 30, 2020.

Liquidity is adequate and was increased by a $500 million parent-funded term loan issuance in March and another $167 million unsecured term loan in June. In addition, in April 2020, DTEE entered into a total of $400 million of unsecured term loans, of which $200 million has been drawn as of June 30, 2020. In addition, in April 2020, DTEG entered into a $100 million unsecured term loan, fully drawn as of June 30, 2020. Debt maturities are manageable and Fitch expects DTE to have continued access to the capital markets.

REFERENCES FOR SUBSTANTIALLY MATERIAL SOURCE CITED AS KEY DRIVER OF RATING

The principal sources of information used in the analysis are described in the Applicable Criteria.

ESG CONSIDERATIONS

Unless otherwise disclosed in this section, the highest level of ESG credit relevance is a score of '3'. This means ESG issues are credit-neutral or have only a minimal credit impact on the entity, either due to their nature or the way in which they are being managed by the entity. For more information on Fitch's ESG Relevance Scores, visit www.fitchratings.com/esg.

RATING ACTIONS

ENTITY / DEBT	RATING			PRIOR
DTE Gas Company	LT IDR	BBB+ Rating Outlook Stable	Affirmed	BBB+ Rating Outlook Stable
	ST IDR	F2	Affirmed	F2
senior secured	LT	A	Affirmed	A
senior unsecured	ST	F2	Affirmed	F2
DTE Electric Company	LT IDR	A- Rating Outlook Stable	Affirmed	A- Rating Outlook Stable
	ST IDR	F2	Affirmed	F2

senior secured	LT A+ Affirmed	A+
DTE Energy Company	LT IDR BBB Rating Outlook Stable Affirmed	BBB Rating Outlook Stable
	ST IDR F2 Affirmed	F2
senior unsecured	LT BBB Affirmed	BBB

VIEW ADDITIONAL RATING DETAILS

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The rated entity (and/or its agents) or, in the case of structured finance, one or more of the transaction parties participated in the rating process except that the following issuer(s), if any, did not participate in the rating process, or provide additional information, beyond the issuer's available public disclosure.

APPLICABLE CRITERIA

Corporates Notching and Recovery Ratings Criteria - Effective from 14 October 2019 to 9 April 2021 (pub. 14 Oct 2019) (including rating assumption sensitivity)

Corporate Hybrids Treatment and Notching Criteria - Effective from 11 November 2019 to 12 November 2020 (pub. 11 Nov 2019)

Short-Term Ratings Criteria - Effective from 6 March 2020 to 4 February 2021 (pub. 06 Mar 2020)

Corporate Rating Criteria - Effective from 1 May 2020 to 21 December 2020 (pub. 01 May 2020) (including rating assumption sensitivity)

Parent and Subsidiary Linkage Rating Criteria - Effective from 26 August 2020 to 1 December 2021 (pub. 26 Aug 2020)

APPLICABLE MODELS

Numbers in parentheses accompanying applicable model(s) contain hyperlinks to criteria providing description of model(s).

Corporate Monitoring & Forecasting Model (COMFORT Model), v7.9.0 (1)

ADDITIONAL DISCLOSURES

Dodd-Frank Rating Information Disclosure Form

Solicitation Status

Endorsement Policy

ENDORSEMENT STATUS

DTE Electric Company	EU Endorsed
DTE Energy Company	EU Endorsed
DTE Gas Company	EU Endorsed

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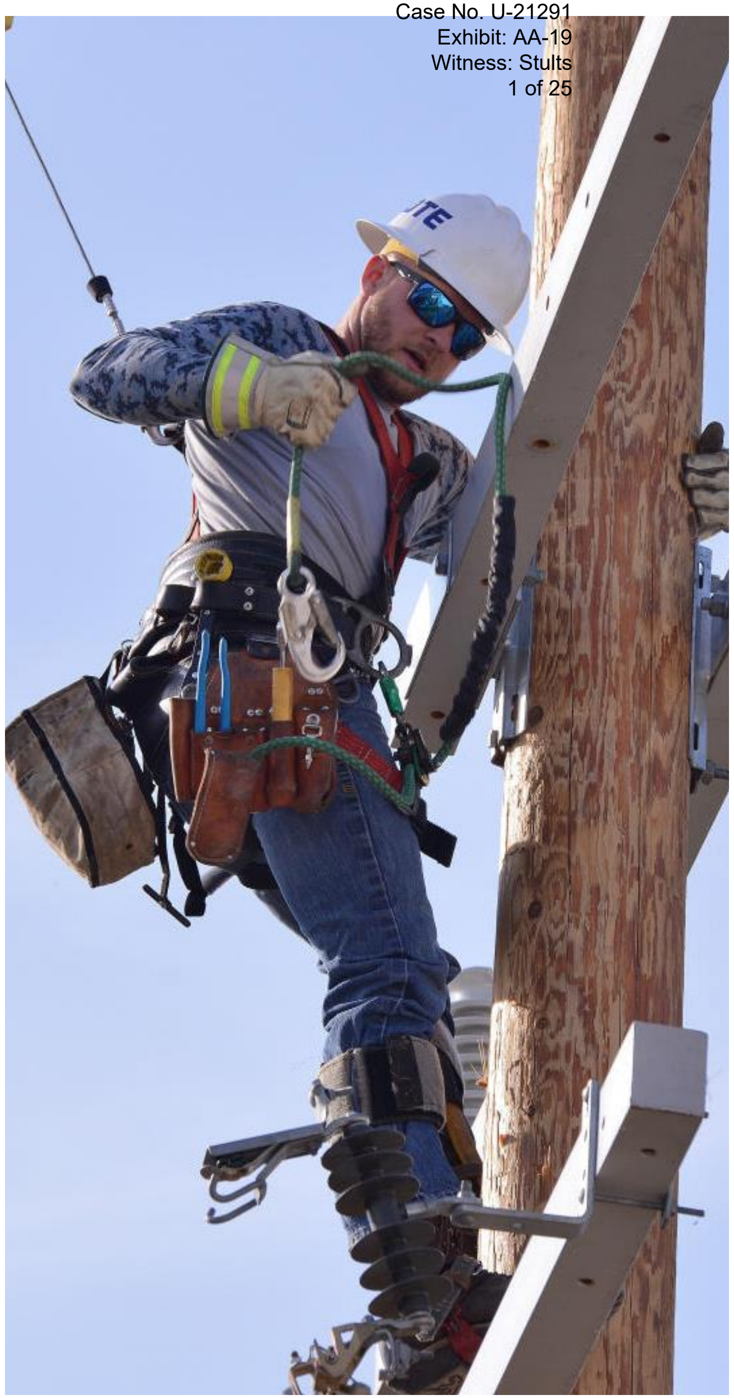


DTE

Business Update

April 2 - 3, 2024

Safe harbor statement

The information contained herein is as of the date of this document. DTE Energy expressly disclaims any current intention to update any forward-looking statements contained in this document as a result of new information or future events or developments. Words such as “anticipate,” “believe,” “expect,” “may,” “could,” “projected,” “aspiration,” “plans” and “goals” signify forward-looking statements. Forward-looking statements are not guarantees of future results and conditions but rather are subject to various assumptions, risks and uncertainties that may cause actual future results to be materially different from those contemplated, projected, estimated or budgeted. Many factors may impact forward-looking statements including, but not limited to, the following: the impact of regulation by the EPA, EGLE, the FERC, the MPSC, the NRC, and for DTE Energy, the CFTC and CARB, as well as other applicable governmental proceedings and regulations, including any associated impact on rate structures; the amount and timing of cost recovery allowed as a result of regulatory proceedings, related appeals, or new legislation, including legislative amendments and retail access programs; economic conditions and population changes in our geographic area resulting in changes in demand, customer conservation, and thefts of electricity and, for DTE Energy, natural gas; the operational failure of electric or gas distribution systems or infrastructure; impact of volatility in prices in international steel markets and in prices of environmental attributes generated from renewable natural gas investments on the operations of DTE Vantage; the risk of a major safety incident; environmental issues, laws, regulations, and the increasing costs of remediation and compliance, including actual and potential new federal and state requirements; the cost of protecting assets and customer data against, or damage due to, cyber incidents and terrorism; health, safety, financial, environmental, and regulatory risks associated with ownership and operation of nuclear facilities; volatility in commodity markets, deviations in weather and related risks impacting the results of DTE Energy’s energy trading operations; changes in the cost and availability of coal and other raw materials, purchased power, and natural gas; advances in technology that produce power, store power or reduce power consumption; changes in the financial condition of significant customers and strategic partners; the potential for losses on investments, including nuclear decommissioning trust and benefit plan assets and the related increases in future expense and contributions; access to capital markets and the results of other financing efforts which can be affected by credit agency ratings; instability in capital markets which could impact availability of short and long-term financing; impacts of inflation and the timing and extent of changes in interest rates; the level of borrowings; the potential for increased costs or delays in completion of significant capital projects; changes in, and application of, federal, state, and local tax laws and their interpretations, including the Internal Revenue Code, regulations, rulings, court proceedings, and audits; the effects of weather and other natural phenomena, including climate change, on operations and sales to customers, and purchases from suppliers; unplanned outages at our generation plants; employee relations and the impact of collective bargaining agreements; the availability, cost, coverage, and terms of insurance and stability of insurance providers; cost reduction efforts and the maximization of plant and distribution system performance; the effects of competition; changes in and application of accounting standards and financial reporting regulations; changes in federal or state laws and their interpretation with respect to regulation, energy policy, and other business issues; successful execution of new business development and future growth plans; contract disputes, binding arbitration, litigation, and related appeals; the ability of the electric and gas utilities to achieve net zero emissions goals; and the risks discussed in DTE Energy’s public filings with the Securities and Exchange Commission. New factors emerge from time to time. We cannot predict what factors may arise or how such factors may cause results to differ materially from those contained in any forward-looking statement. Any forward-looking statements speak only as of the date on which such statements are made. We undertake no obligation to update any forward-looking statement to reflect events or circumstances after the date on which such statement is made or to reflect the occurrence of unanticipated events. This document should also be read in conjunction with the Forward-Looking Statements section in DTE Energy’s public filings with the Securities and Exchange Commission.

Highly engaged team committed to delivering best-in-class results for our customers, communities and investors

Continuing best-in-class engagement, health and safety of our employees

- ✓ *Named one of Metro Detroit's Best and Brightest Companies to Work For*

Addressing our customers' most vital needs

- ✓ *Distribution Grid Plan (DGP) provides roadmap to improved reliability and accelerated automation; improved reliability by 33% in 2023 on upgraded circuits*
- ✓ *Integrated Resource Plan (IRP) supports transition to cleaner energy future while providing $2.5 billion in reduced future costs to customers*
- ✓ *Energy policy drives Michigan's clean energy future; consistent with IRP*

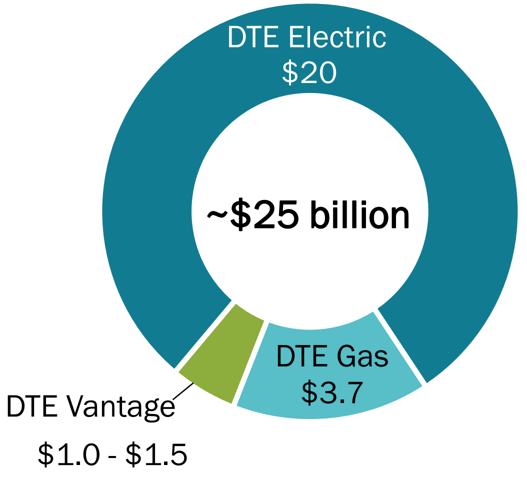
Supporting our communities

- ✓ *Received approval to construct a 220 MW, 880 MWh battery energy storage system at the site of the former Trenton Channel power plant; expected to be operational in 2026, will be the largest standalone battery energy storage project in the Great Lakes region*
- ✓ *Named one of the most community-minded companies in the U.S. with Points of Light's Civic 50 award for the 6th consecutive year*

Delivering premium shareholder returns

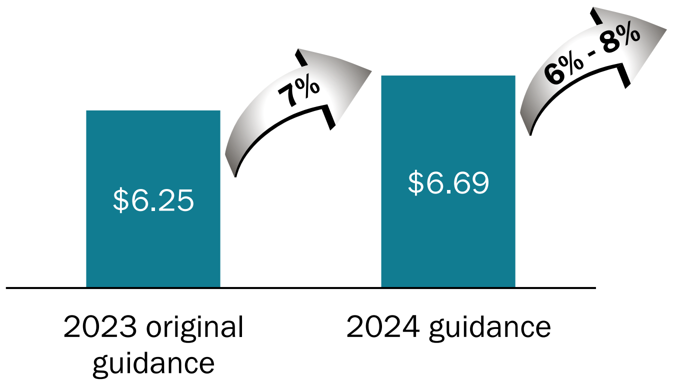
- ✓ *Increased 5-year utility capital investment by $2 billion over previous plan*
- ✓ *2024 operating EPS[1] guidance provides 7% growth from 2023 original guidance midpoint; long-term operating EPS growth rate target of 6% - 8% through 2028*

95% of 5-year investment plan in utilities 2024 - 2028
(billions)



10-year investment plan of over $50 billion

Operating EPS guidance midpoint



1. Refer to the appendix for information regarding the reconciliation of operating earnings (non-GAAP) to reported earnings

Executing customer-focused capital investment plan while maintaining affordability

Investing in customer-focused initiatives…

Modernizing electric grid

Preparing for impacts of increased extreme weather events and increased demand from vehicle electrification

Transitioning to cleaner generation

Shifting generation from coal to renewables supported by cleaner natural gas and storage

Renewing gas infrastructure

Continuing gas main renewal to maintain long-term safety and reliability and reduce GHG emissions

…while maintaining affordability

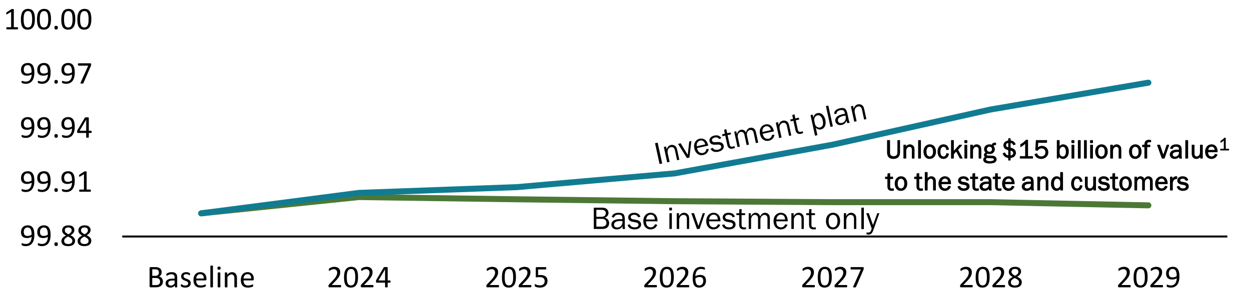
- ✓ Distinctive continuous improvement culture drives cost management
- ✓ Shift from coal to renewables and natural gas drives fuel and O&M cost reductions
- ✓ Inflation Reduction Act (IRA) supports transition to cleaner energy while supporting customer affordability goals and further enhancing DTE Vantage opportunities
- ✓ IRP reduces future costs to customers by up to $2.5 billion

Electric rate case filing underpins $9 billion grid reliability and $7 billion cleaner energy investment commitment while maintaining affordability

Committed to improve reliability…

- Creating a more reliable grid over the next five years, reducing power outages by 30% and cutting outage time in half by 2029
  - Accelerating the deployment of grid automation technology and rebuilding significant portions of aging grid
  - Upgrading existing infrastructure with equipment including stronger poles and fiberglass crossarms which can better withstand extreme weather
  - Continuing to trim trees around equipment and power lines; trees falling and damaging our equipment accounts for 50% of customer outages

Above industry median performance by 2029 for average system availability (%)

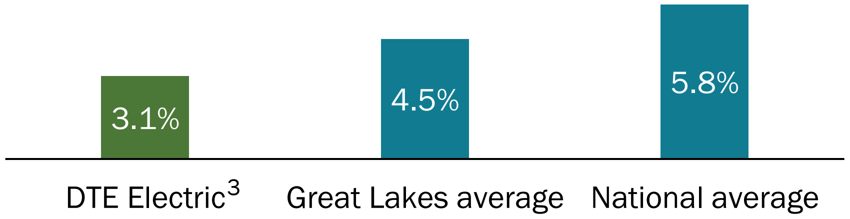


…while transitioning to cleaner energy and keeping bill increases below Great Lakes and National average

- Transitioning to cleaner energy and ending coal use in 2032 to reduce carbon emissions
  - Ceasing coal use at Belle River by 2026; converting to a natural gas peaking resource
  - Retiring two coal units at Monroe in 2028; retiring the remaining two units in 2032
  - Repurposing the former Trenton Channel power plant to a battery energy storage system; expected to be operational in 2026

Electric bill increase well below national average

Average annual residential bill growth since 2021[2]

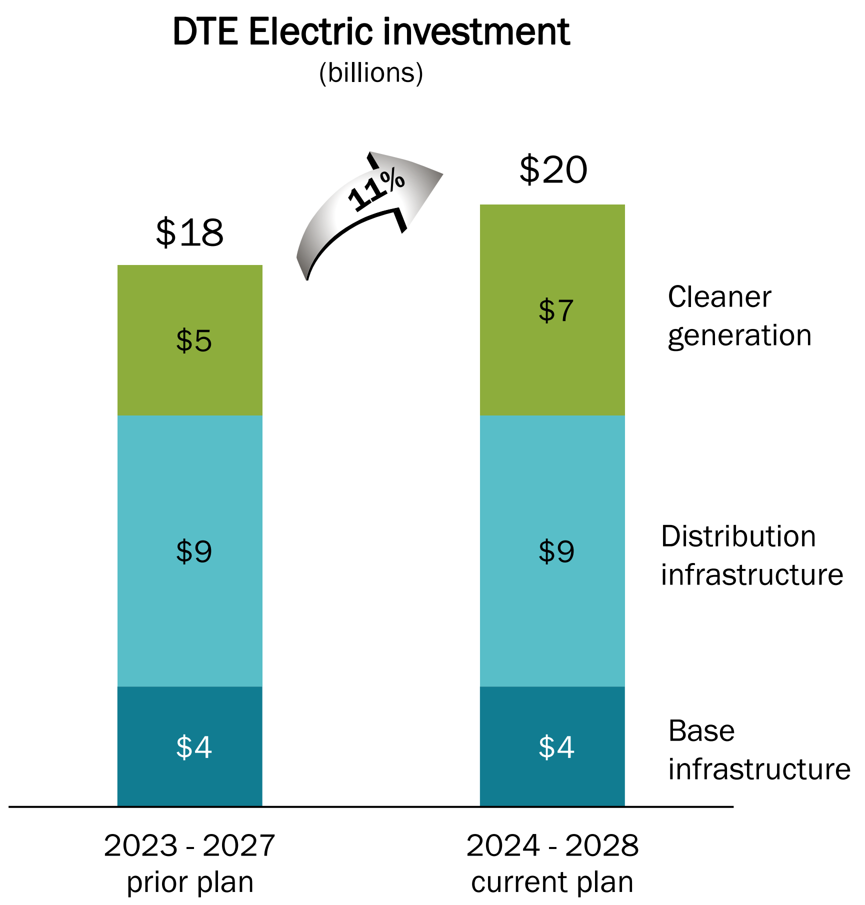


1. Source: Interruption Cost Estimate (ICE) Calculator developed by the Lawrence Berkeley National Laboratory
2. DTE forecasted through Jan 2025, peers actual through November 2023
3. Assumes rate relief of $456 million

DTE Electric: transformational investments in distribution and generation

Capital investment plan focused on building the grid of the future and transitioning to cleaner generation

- DGP outlines detailed roadmap to increase reliability by over 60% over the next 5 years
  - Continuing accelerated tree trimming; over 5,000 miles of trees trimmed in 2023
  - Continuing preventative maintenance by upgrading more than 10,000 miles of infrastructure; upgraded more than 1,300 miles in 2023
  - Advancing infrastructure rebuild by accelerating the replacement of 4.8kV system and pursuing undergrounding
  - Enhancing grid automation by accelerating installation of 10,000 smart grid devices to greatly reduce outage duration
- Transforming generation by targeting carbon emission reductions of 85% in 2032, 90% by 2040 and net zero[1] by 2050
  - Cleaner generation investment driven by expanded renewables and utility-scale energy storage; provides more affordable energy for customers over the long term
  - Renewable investment supports continued success of MIGreenPower voluntary program which allows customers to attribute up to 100% of electric use to renewable sources

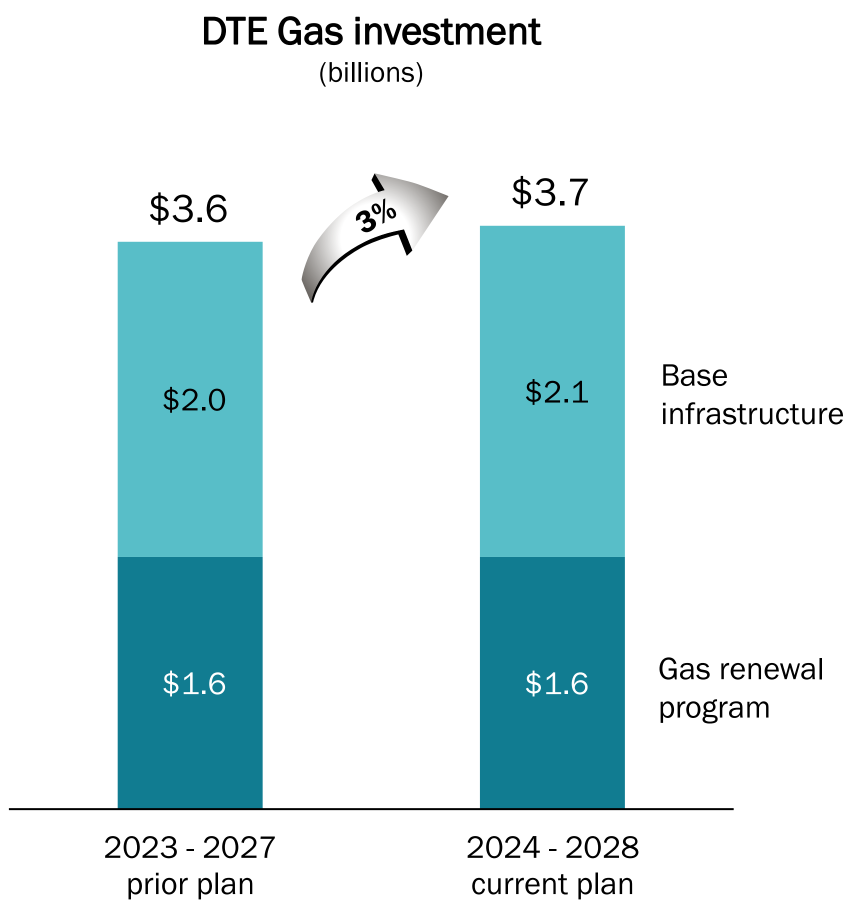


1. Definition of net zero included in the appendix

DTE Gas: replacing aging infrastructure to ensure reliability and transition to net zero emissions

Capital investment focused on infrastructure improvements and decarbonization

- Significant investment recovered through Infrastructure Recovery Mechanism (IRM) to support main renewal
  - Renewed over 1,700 miles since program inception
  - Gas renewal investments minimize leaks and reduce costs
- Base infrastructure investments enhance transmission, compression, distribution and storage
- Targeting to reduce GHG emissions by 65% by 2030, 80% by 2040 and net zero by 2050
  - Natural Gas Balance program empowers customers to manage their carbon footprint using both carbon offsets and RNG



DTE Vantage: strategic focus on decarbonization solutions for customers

Capitalizing on a growing preference for cleaner, more efficient energy

- Strong development pipeline in RNG, large custom energy solutions and carbon capture and sequestration projects
  - Expanded long-term, fixed fee custom energy solutions agreement with Ford Motor Company in Tennessee to build, own, operate and maintain its central utility plant and distribution infrastructure
  - IRA improves opportunities in decarbonization as enhanced tax credits allow carbon capture, RNG and combined heat and power to be more economic
  - Strong RNG market growth supported by the federal RFS and California's LCFS

Long-term growth driven by a combination of custom energy solutions, RNG/renewables[1] and new decarbonization opportunities

- Targeting operating earnings[2] growth of over $15 million annually
  - 2024 guidance of $125 - $135 million
  - 2028 operating earnings projection of $200 - $210 million
- $1.0 - $1.5 billion capital investment 2024 - 2028

1. Renewables includes wood and landfill gas facilities
2. Refer to the appendix for information regarding the reconciliation of operating earnings (non-GAAP) to reported earnings

Maintaining strong cash flows, balance sheet and credit profile

Strong balance sheet supports robust customer-focused investment agenda

- Investment is primarily funded with consistent, healthy cash flows
- Targeting minimal equity issuances of $0 - $100 million annually through 2026
- Effectively managing near-term debt maturities to support long-term plan
- Maintaining solid investment-grade credit ratings; targeting 15% - 16% FFO / Debt[1]

Credit ratings	S&P	Moody’s	Fitch
DTE Energy (unsecured)	BBB	Baa2	BBB
DTE Electric (secured)	A	Aa3	A+
DTE Gas (secured)	A	A1	A

1. Funds from Operations (FFO) is calculated using operating earnings, debt excludes a portion of DTE Gas’ short-term debt and considers 50% of the junior subordinated notes as equity

Appendix

2024 operating EPS[1] guidance midpoint provides 7% growth over 2023 original guidance midpoint

(millions, except EPS)

	2024 guidance
DTE Electric	$1,100 - $1,120
DTE Gas	295 - 305
DTE Vantage	125 - 135
Energy Trading	30 - 40
Corporate & Other	(195) - (185)
DTE Energy	**$1,355 - $1,415**
Operating EPS	**$6.54 - $6.83**

1. Refer to the appendix for information regarding the reconciliation of operating earnings (non-GAAP) to reported earnings

Cash flow and capital expenditures guidance

Cash flow

(billions)

	2024 guidance
Cash from operations[1]	$3.3
Capital expenditures	(4.7)
Free cash flow	**($1.4)**
Dividends	(0.8)
Other	-
Net cash	**($2.2)**
Debt financing	
Issuances	$4.3
Redemptions	(2.1)
Total debt financing	**$2.2**

Capital expenditures

(millions)

	2024 guidance
DTE Electric	
Base infrastructure	$630
New generation	1,200
Distribution infrastructure	1,550
	$3,380
DTE Gas	
Base infrastructure	$380
Gas renewal program	335
	$715
Non-utility	**$550 - $650**
Total	**$4,645 - $4,745**

1. Includes equity issued for employee benefit programs

Environmental, social and governance (ESG) efforts are key priorities; aspiring to be the best in the industry

Environment

- Transitioning towards net zero emissions at both utilities
- Accelerating transition to cleaner generation
- Protecting our natural resources

Social

- Focusing on the diversity, safety, well-being and success of employees
- Investing in communities
- Leader in volunteerism

Governance

- Focusing on the oversight of environmental sustainability, social and governance
- Ensuring board diversity
- Providing incentive plans tied to safety and customer satisfaction targets

Award-winning commitment to ESG priorities

THE CIVIC 50

Superior corporate citizenship and community involvement

THE FOREFRONT 50
TOP CORPORATIONS FOR MINORITY BUSINESSES

NMSDC Forefront 50 Top Corporations for Minority Businesses

EEI Business Diversity

2023 Edison Electric Institute Business Diversity Excellence Award

IRP outlines accelerated path to cleaner energy

First 5 years (2023 - 2027)

- Ceasing coal use at one Belle River unit in 2025 and remaining unit in 2026; converting to 1,300 MW natural gas peaking resource
- Adding 1,200 MW of solar
- Adding 350 MW of energy storage, increased from 240 MW

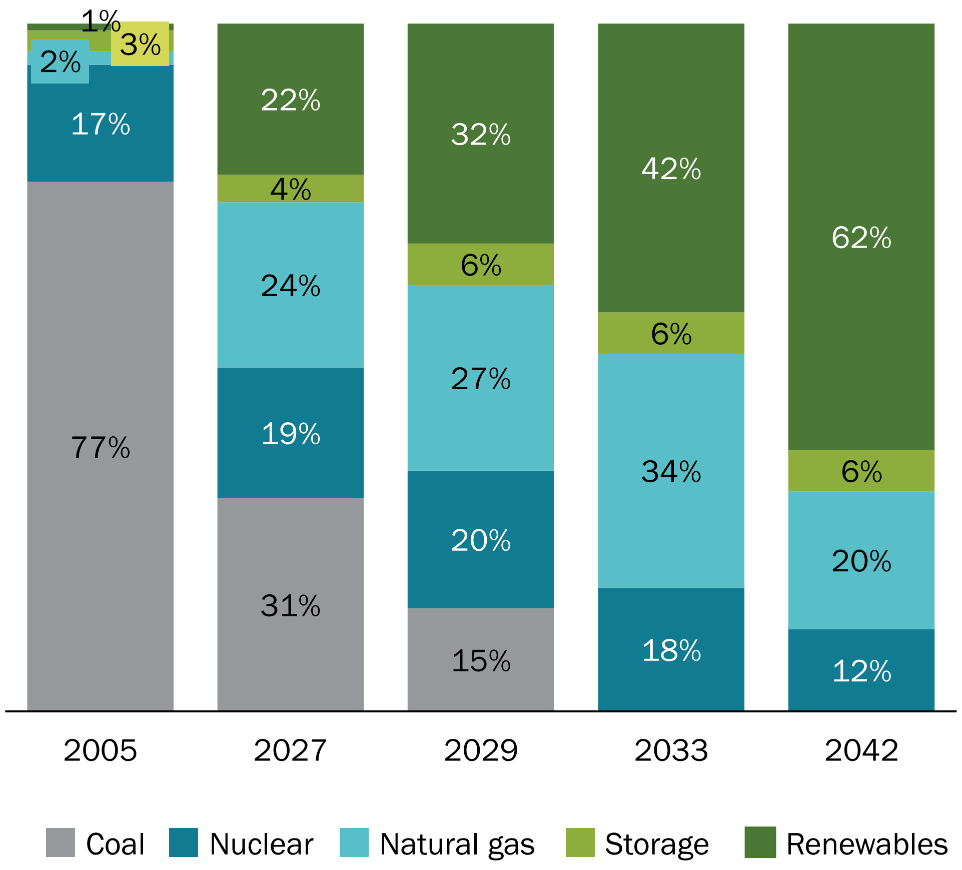
Second 5 years (2028 - 2032)

- Retiring two coal units at Monroe in 2028 and accelerating retirement of two remaining units to 2032 from 2035
- Adding 3,200 MW of solar
- Adding 1,000 MW of wind
- Adding 430 MW of energy storage

Next 10 years (2033 - 2042)

- Adding 2,100 MW of solar
- Adding 7,900 MW of wind
- Adding 1,050 MW of energy storage

Generation mix[1]
(MWh %)



1. Generation mix subject to change

IRP supports transition to cleaner energy future while focusing on reliability and affordability

Accelerating path to cleaner generation…

- Transforming generation by targeting carbon emission reductions of 85% in 2032, 90% by 2040 and net zero by 2050
- Ceasing coal use at Belle River by 2026; converting to 1,300 MW natural gas peaking resource
- Retiring two coal units at Monroe in 2028; accelerating retirement of remaining two units from 2035 to 2032; studying a range of replacement technology solutions
- Accelerating the development of energy storage, targeting 780 MW through 2030 and 1,830 MW by 2042
- Developing 6,500 MW of solar and 8,900 MW of wind by 2042

…while continuing to focus on customer affordability and economic development

- Investing over $11 billion in the next 10 years in the cleaner energy transition, supporting more than 32,000 Michigan jobs
- Developing more than 15,000 MW of Michigan-generated renewable energy by 2042, the equivalent of powering approximately 4 million homes
- Directing an additional $110 million to support most vulnerable customers
  - $70 million over the next four years for energy efficiency programs, $30 million over 15 years for bill assistance and $8 million over the next four years for home repairs to facilitate cleaner energy
- Reducing future costs to customers by up to $2.5 billion

Energy policy drives Michigan's clean energy future and supports our cleaner energy journey

- Accelerates the pace of decarbonization and deployment of renewables
  - Renewable compliance standard of 50% by 2030 and 60% by 2035
  - Clean energy standard of 80% by 2035 and 100% by 2040
  - Allows MPSC to approve emerging low and zero carbon technologies, including carbon capture and sequestration
  - Sets 2,500 MW statewide energy storage target
  - Raises energy efficiency targets and increases incentives
  - Provides flexibility in meeting targets and off-ramps for resource adequacy, excessive cost and feasibility
  - Allows financial compensation mechanism on power purchase agreements for renewable energy and energy storage
- Supportive of IRP plan and clean energy goals

Progressing on EV initiatives

Charging Forward Program

- Promoting EV education, infrastructure and adoption
- Providing residential and commercial rebates, infrastructure support and fleet advisory services
- Offering unique solutions such as home charger installation financing and EV rebates for low and moderate income customers

Program-to-date major milestones

- Over 1,800 level 2 public chargers approved and 1,270 installed
- Over 150 direct current fast charger rebates approved and over 60 installed
- 12 electric bus deployments with the local regional transit agencies
- 6 electric school buses deployed and an additional 101 buses awarded through the first and second rounds of the EPA's Clean School Bus Program

2019

program inception

1.2 million

gallons of gasoline saved

5,850

residential rebates

MIGreenPower program continues significant growth

- Allows customers to attribute up to 100% of electricity use to renewable sources
- Recognized by National Renewable Energy Laboratory as having the largest Green Tariff program in the country, fulfilling more load under contracted subscriptions than any other program
- Two largest renewable energy purchases from a utility announced with Ford Motor Company and Stellantis

Voluntary renewable customers

Ford | The Great Seal of the State of Michigan | University of Michigan | GM | Bedrock Detroit | Stellantis

1,765
business customers

98,900
residential customers

2,420 MW
subscribed

Natural Gas Balance program empowers customers to manage their carbon footprint

- Offering an affordable way to balance 25% to 100% of customers' GHG emissions
- RNG will be sourced by transforming landfill emissions and wastewater treatment plant by-products into usable gas
- Carbon offset program is focused on protecting Michigan forests that naturally absorb greenhouse gases
- Partnered with Anew, the nation's largest carbon offset developer, on the Greenleaf Improved Forest Management project in Michigan's Upper Peninsula to protect and preserve forests

2021

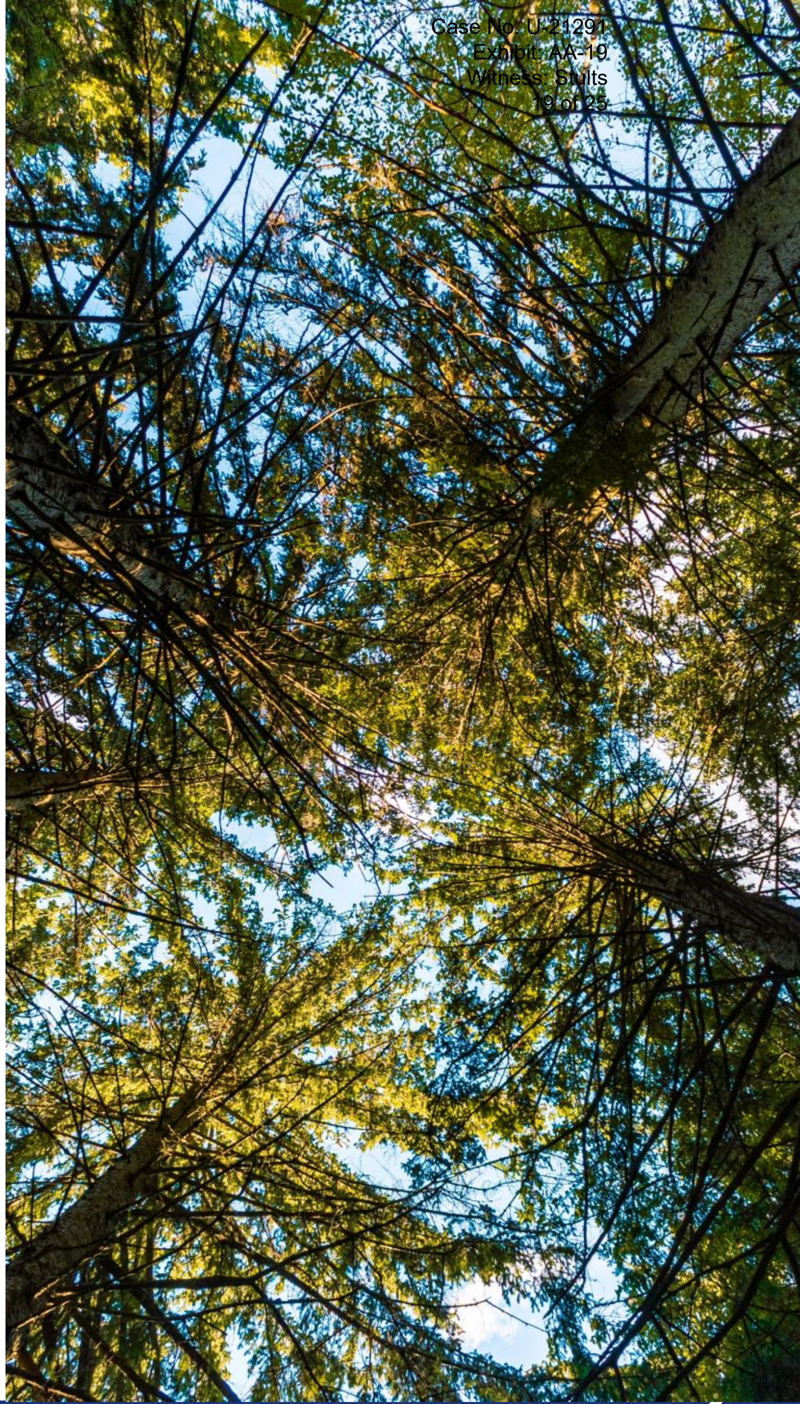
program inception

~13,000

customers subscribed

38,725

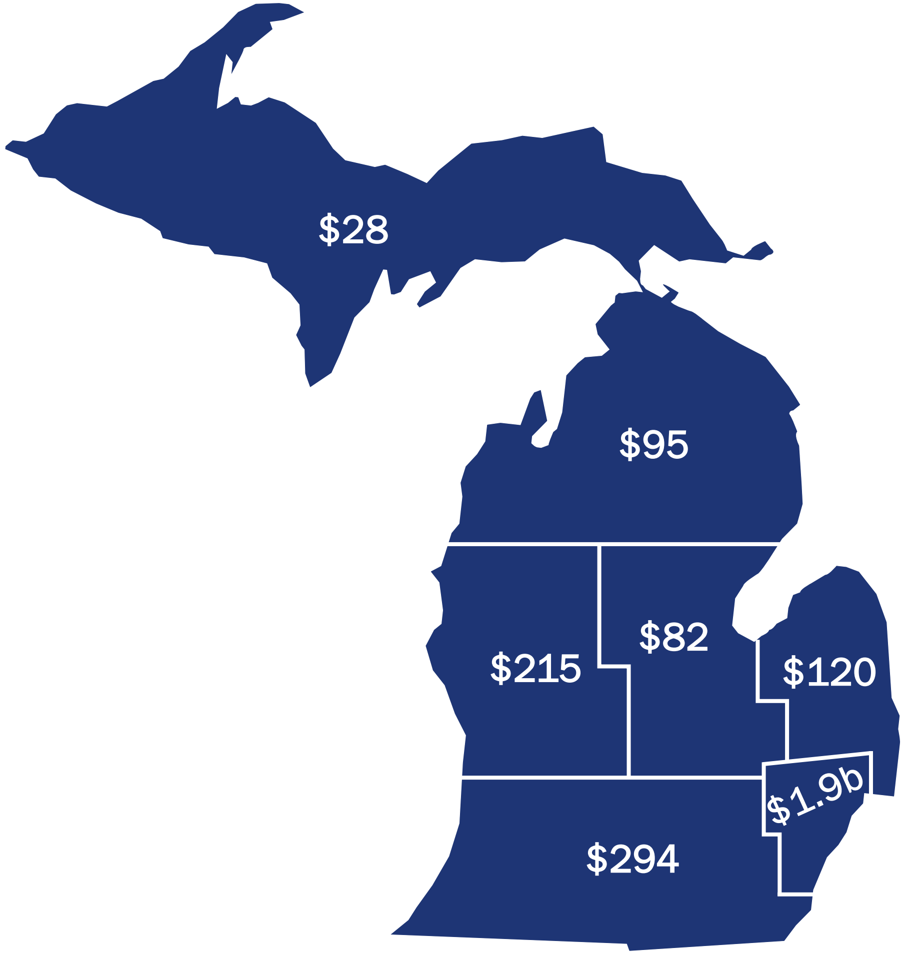
metric tons of CO2-e have been offset



Building on the momentum of the last decade, committed to Michigan investments and supplier diversity

$2.7b	invested with Michigan businesses in 2023
$890m	invested with Detroit suppliers in 2023
$990m	invested with suppliers owned by women, minorities, veterans, members of the LGBTQ+ community and disability-owned businesses in 2023
60+	supplier diversity awards earned since 2018
77,000	jobs created since 2010

2023 Michigan spend
(millions)



Economic development fuels Michigan’s growth

- ✓ Michigan ranked in the top 10 by CNBC for America’s Top States for Business in 2023
- ✓ $4 billion General Motors investment to convert an assembly plant to produce full-size electric pickup trucks, creating 2,300 jobs
- ✓ $1.7 billion LG Energy Solution investment to expand battery manufacturing facility, creating 1,200 jobs
- ✓ $1 billion in federal funding to develop a new hydrogen production plant and a refueling center, creating 1,500 jobs
- ✓ $500 million Magna International investment expanding a facility and building two additional facilities to help support the production of EVs, creating over 1,000 jobs
- ✓ $400 million Nel Hydrogen investment for a new manufacturing facility to produce green hydrogen, creating 500 jobs
- ✓ $103 million Niagara Bottling investment in a bottled water facility
- ✓ $35 million Fortescue Future Industries investment in a new manufacturing center to develop automotive batteries and hydrogen generators, creating 600 jobs

DTE Energy named one of the 2023 Top Utilities in Economic Development by Site Selection Magazine

Committed to Diversity, Equity and Inclusion (DEI); creating a safe and welcoming environment

Health and safety of our people is a priority

- Multiple safety committees spanning all levels of the company providing input into safety plans, addressing unique challenges of each business unit
- Earned Accident Prevention Certificate from the American Gas Association by achieving a DART[1] incident rate below the industry average

Commitment to create a diverse, equitable and inclusive workforce

- Office of DEI led by our CEO and key executive leaders
- Focused on sustaining a diverse workforce which is representative of the communities we serve
- Annual review of compensation practices to ensure equitable pay
- Formal training programs, including unconscious bias training, for employees and leaders

Employee groups create an inclusive environment where differences are celebrated and a sense of belonging exists for all employees

AIM
Employees with disabilities group

AMEA
Asian and Middle Eastern American group

FAMILY
Family oriented group

POP
LGBTQ+ group

REACH
Black professionals group

SOMOS
Latino and Hispanic group

SURGE
Young professionals group

VETS
Military veterans group

WOMEN OF DTE
Women's group

1. Days away, restricted or transferred

Governance framework provides shareholder rights and enables sustainable value creation

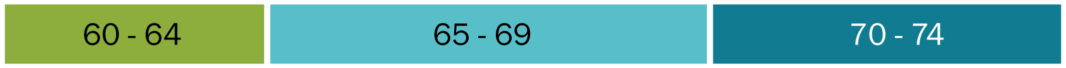
Best-in-class governance practices

- Lead Independent Director
- All board committees are composed exclusively of independent Directors
- Stock ownership guidelines for non-employee Directors
- Majority voting standard
- Annual Director elections
- Established corporate governance guidelines
- Publication of Sustainability report
- Shareholder ability to call a special meeting
- No supermajority voting provisions to approve mergers or amend charter
- Overboarding policy

Composition of DTE Board of Directors

9.5 years
average tenure

68 years
average age



Executive management compensation plan is aligned with our stakeholder priorities

Annual or long-term incentive metrics	
Our team	• Employee engagement • Employee safety
Our customers	• Customer satisfaction • System reliability
Our communities	• Customer satisfaction • System reliability
Our investors	• EPS • Cash flow • Relative total shareholder return

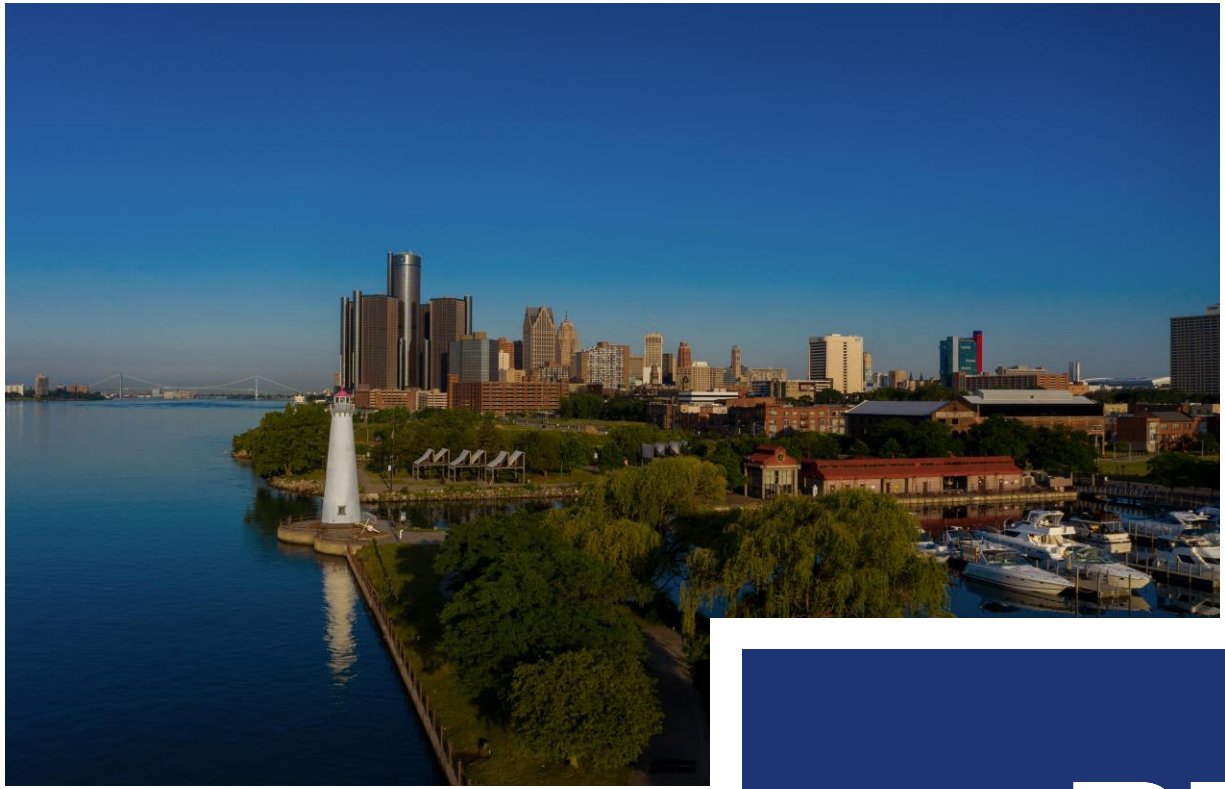
Reconciliation of reported to operating earnings (non-GAAP)

Use of Operating Earnings Information – Operating earnings exclude non-recurring items, certain mark-to-market adjustments and discontinued operations. DTE Energy management believes that operating earnings provide a meaningful representation of the company's earnings from ongoing operations and uses operating earnings as the primary performance measurement for external communications with analysts and investors. Internally, DTE Energy uses operating earnings to measure performance against budget and to report to the Board of Directors. Operating earnings is a non-GAAP measure and should be viewed as a supplement and not a substitute for reported earnings, which represents the company's net income and the most comparable GAAP measure.

In this presentation, DTE Energy provides guidance for future period operating earnings. It is likely that certain items that impact the company's future period reported results will be excluded from operating results. A reconciliation to the comparable future period reported earnings is not provided because it is not possible to provide a reliable forecast of specific line items (i.e., future non-recurring items, certain mark-to-market adjustments and discontinued operations). These items may fluctuate significantly from period to period and may have a significant impact on reported earnings.

Definition of net zero

Goal for DTE Energy's utility operations and gas suppliers at DTE Gas that any carbon emissions put into the atmosphere will be balanced by those taken out of the atmosphere. Achieving this goal will include collective efforts to reduce carbon emissions and actions to offset any remaining emissions. Progress towards net zero goals is estimated and methodologies and calculations may vary from those of other utility businesses with similar targets. Carbon emissions is defined as emissions of carbon containing compounds, including carbon dioxide and methane, that are identified as greenhouse gases.



DTE

Business Update

April 3-4, 2023

Safe harbor statement

The information contained herein is as of the date of this document. DTE Energy expressly disclaims any current intention to update any forward-looking statements contained in this document as a result of new information or future events or developments. Words such as “anticipate,” “believe,” “expect,” “may,” “could,” “projected,” “aspiration,” “plans” and “goals” signify forward-looking statements. Forward-looking statements are not guarantees of future results and conditions but rather are subject to various assumptions, risks and uncertainties that may cause actual future results to be materially different from those contemplated, projected, estimated or budgeted. Many factors may impact forward-looking statements including, but not limited to, the following: the impact of regulation by the EPA, the EGLE, the FERC, the MPSC, the NRC, and for DTE Energy, the CFTC and CARB, as well as other applicable governmental proceedings and regulations, including any associated impact on rate structures; the amount and timing of cost recovery allowed as a result of regulatory proceedings, related appeals, or new legislation, including legislative amendments and retail access programs; economic conditions and population changes in our geographic area resulting in changes in demand, customer conservation, and thefts of electricity and, for DTE Energy, natural gas; the operational failure of electric or gas distribution systems or infrastructure; impact of volatility in prices in the international steel markets and in prices of environmental attributes generated from renewable natural gas investments on the operations of DTE Vantage; the risk of a major safety incident; environmental issues, laws, regulations, and the increasing costs of remediation and compliance, including actual and potential new federal and state requirements; the cost of protecting assets and customer data against, or damage due to, cyber incidents and terrorism; health, safety, financial, environmental, and regulatory risks associated with ownership and operation of nuclear facilities; volatility in commodity markets, deviations in weather and related risks impacting the results of DTE Energy’s energy trading operations; changes in the cost and availability of coal and other raw materials, purchased power, and natural gas; advances in technology that produce power, store power or reduce power consumption; changes in the financial condition of significant customers and strategic partners; the potential for losses on investments, including nuclear decommissioning and benefit plan assets and the related increases in future expense and contributions; access to capital markets and the results of other financing efforts which can be affected by credit agency ratings; instability in capital markets which could impact availability of short and long-term financing; impacts of inflation and the timing and extent of changes in interest rates; the level of borrowings; the potential for increased costs or delays in completion of significant capital projects; changes in, and application of, federal, state, and local tax laws and their interpretations, including the Internal Revenue Code, regulations, rulings, court proceedings, and audits; the effects of weather and other natural phenomena, including climate change, on operations and sales to customers, and purchases from suppliers; unplanned outages at our generation plants; employee relations and the impact of collective bargaining agreements; the availability, cost, coverage, and terms of insurance and stability of insurance providers; cost reduction efforts and the maximization of plant and distribution system performance; the effects of competition; changes in and application of accounting standards and financial reporting regulations; changes in federal or state laws and their interpretation with respect to regulation, energy policy, and other business issues; successful execution of new business development and future growth plans; contract disputes, binding arbitration, litigation, and related appeals; the ability of the electric and gas utilities to achieve net zero emissions goals; and the risks discussed in DTE Energy’s public filings with the Securities and Exchange Commission. New factors emerge from time to time. We cannot predict what factors may arise or how such factors may cause results to differ materially from those contained in any forward-looking statement. Any forward-looking statements speak only as of the date on which such statements are made. We undertake no obligation to update any forward-looking statement to reflect events or circumstances after the date on which such statement is made or to reflect the occurrence of unanticipated events. This document should also be read in conjunction with the Forward-Looking Statements section in DTE Energy’s public filings with the Securities and Exchange Commission.

Overview

Business Update

Financial Update

Environmental, Social & Governance (ESG)

Appendix

Fully engaged team committed to delivering best-in-class results for our customers, communities and investors

Best-in-class engagement, health and safety of our employees

- *Received Gallup Great Workplace Award for 10th consecutive year, achieving top decile employee engagement*

Addressing our customers' most vital needs

- *Ranked first in residential customer satisfaction for gas by J.D. Power*
- *Trimmed more than 6,500 miles of trees and completed upgrades on more than 8,500 miles of circuits in 2022*

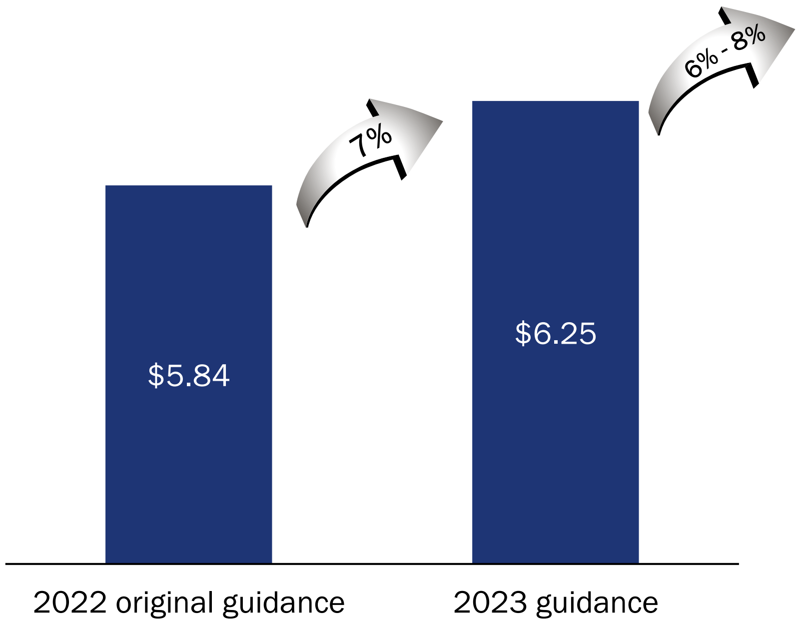
Supporting our communities

- *Skilled trade academy offering Detroiters jobs and energy efficient home repairs*
- *Invested $2.5 billion with Michigan businesses in 2022, creating and sustaining more than 11,000 jobs across the state*

Delivering premium shareholder returns

- *2023 operating EPS[1] guidance midpoint provides 7% growth from 2022 original guidance midpoint; long-term operating EPS growth rate of 6% - 8%*

Operating EPS guidance midpoint



1. Reconciliation of operating earnings (non-GAAP) to reported earnings included in the appendix

Executing on significant customer-focused capital investment plan while maintaining affordability

Investing in customer-focused initiatives…

Transitioning to cleaner generation

Shifting generation from coal to renewables supported by cleaner natural gas and storage

Modernizing electric grid

Preparing for impacts of increased extreme weather events and increased demand from vehicle electrification

Renewing gas infrastructure

Continuing gas main renewal for reducing greenhouse gas emissions and maintaining long-term safety and reliability

…while maintaining affordability

- ✓ Distinctive continuous improvement culture drives cost management
- ✓ Shift from coal to renewables and natural gas drives fuel and O&M cost reductions
- ✓ Diversified energy mix maintains flexibility to adapt to future technology advancements
- ✓ Inflation Reduction Act (IRA) supports transition to cleaner energy while supporting customer affordability goals and further enhancing DTE Vantage opportunities

DTE

Note: Gas infrastructure photo courtesy of Burns & McDonnell

Distinctive continuous improvement culture drives strong track record of managing cost and affordability

Distinctive continuous improvement embedded in our culture

- All 10,000+ employees engaged in continuous improvement and productivity efforts drive cost management

Process automation

- Shifting repeatable and repetitive process steps to automated software routines allowing employees to shift to higher-level work

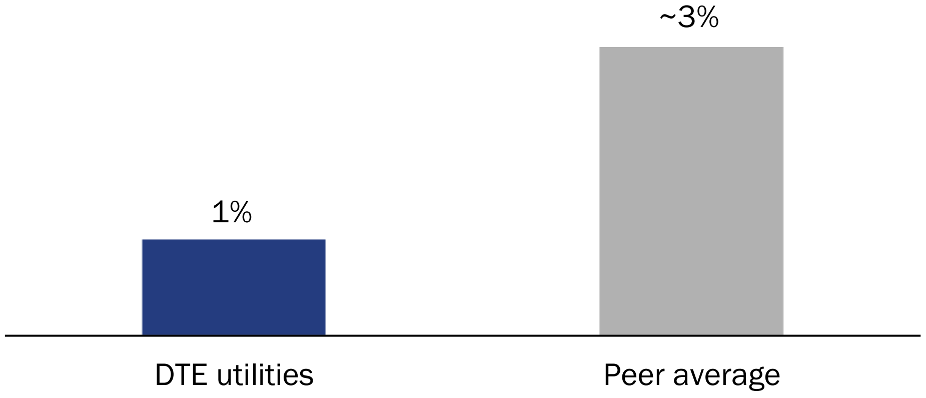
Digital solutions

- Improving scheduling to optimize crew productivity and efficiency

Clean generation

- Transitioning from coal to natural gas and renewables drives O&M reductions
- Diversifying energy mix maintains flexibility to adapt to future technology advancements and reduces fuel costs
- Integrated Resource Plan (IRP) reduces cost of our clean energy transition by $1.4 billion from previous plan

Average annual percentage change in utility O&M[1] costs 2008 - 2021



DTE

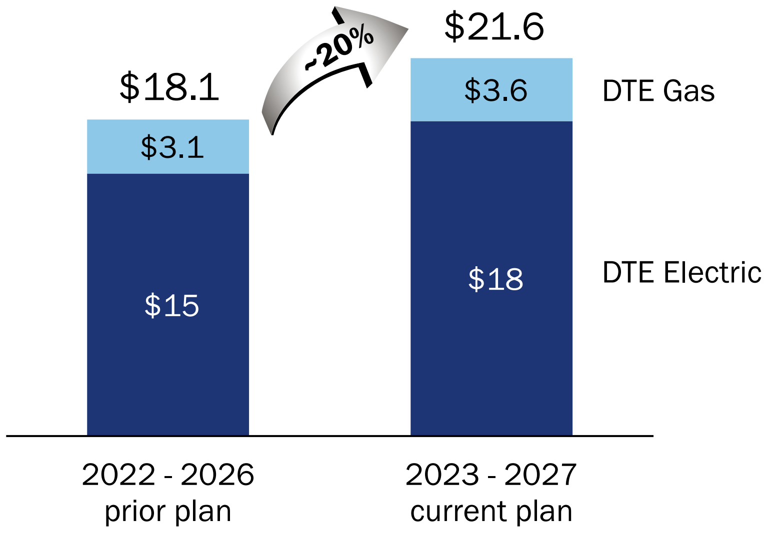
1. Source: SNL Financial, FERC Form 1 and FERC Form 2; excluding fuel and purchase power from electric O&M and production expense from gas O&M

DTE

Increased customer-focused utility investment in 5-year plan supports 6% - 8% operating EPS[1] growth through 2027

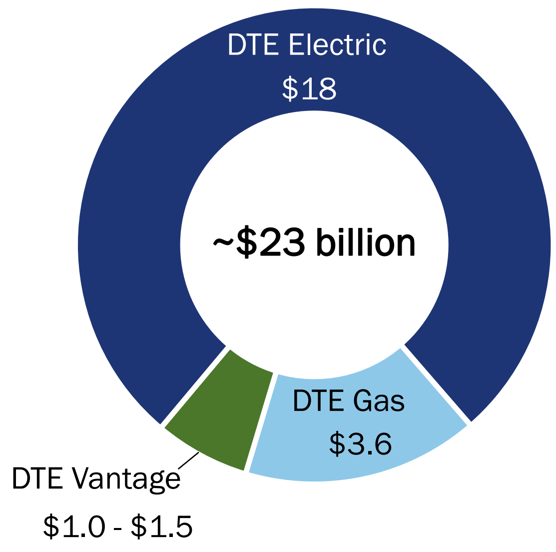
(billions)

5-year utility capital investment supports growth



10-year utility capital plan of $45 billion

95% of 5-year investment plan in utilities 2023 - 2027



1. Reconciliation of operating earnings (non-GAAP) to reported earnings included in the appendix

DTE Electric: transformational investments in generation and distribution; signed two of the largest voluntary utility contracts in the country

Significant progress on voluntary renewables in 2022

- Signed solar contracts with Ford and Stellantis; two of the largest renewable utility contracts in the country
- 2,250 MW currently subscribed to the voluntary renewables program

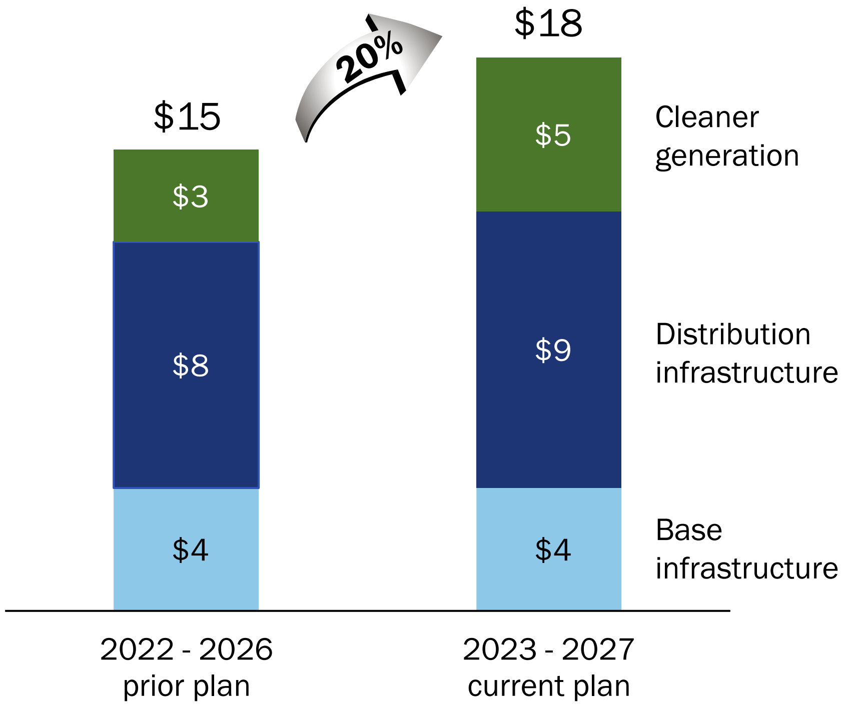
Accelerating decarbonization goals while ensuring reliability and affordability for our customers

- Two coal plant retirements in 2022 support cleaner energy future and lower O&M expense

Distribution infrastructure renewal

- Modernizing grid to support electrification, meet changing customer needs and prepare for increased extreme weather events
- Continuing reliability and resiliency investment focus

DTE Electric investment
(billions)



DTE

Significant progress on utility initiatives supports cleaner generation with focus on affordability

- IRP filing prioritizes electric reliability with a focus on decarbonization and affordability
  - Outlines generation transformation to achieve carbon reduction of 85% in 2035, 90% by 2040 and net zero[1] by 2050
  - Supports the Michigan economy and tax base with power generated in Michigan
  - Invests $9 billion over the next 10 years into Michigan's economy supporting more than 25,000 jobs
  - Reduces cost of clean energy transition by $1.4 billion from previous plan
- IRA and a distinctive culture of managing costs support customer affordability and position DTE for continued long-term growth
- Electric rate case filing underpins reliability and cleaner generation investments
  - Second general rate case filing since 2019; executed significant customer-focused investments since that date while keeping base rates essentially flat
  - Majority of filing is attributable to capital, sales and the cost of debt
  - Continue practice of pursuing settlement with all stakeholders

1. Definition of net zero included in the appendix

IRP accelerates transition to cleaner energy future while ensuring reliability

First 5 years (2023 - 2027)

- Retire one unit at Belle River in 2025 and remaining unit in 2026
  - Convert Belle River to 1,300 MW natural gas peaking resource in 2025 - 2026
- Add 800 MW of solar
- Add 240 MW of battery storage

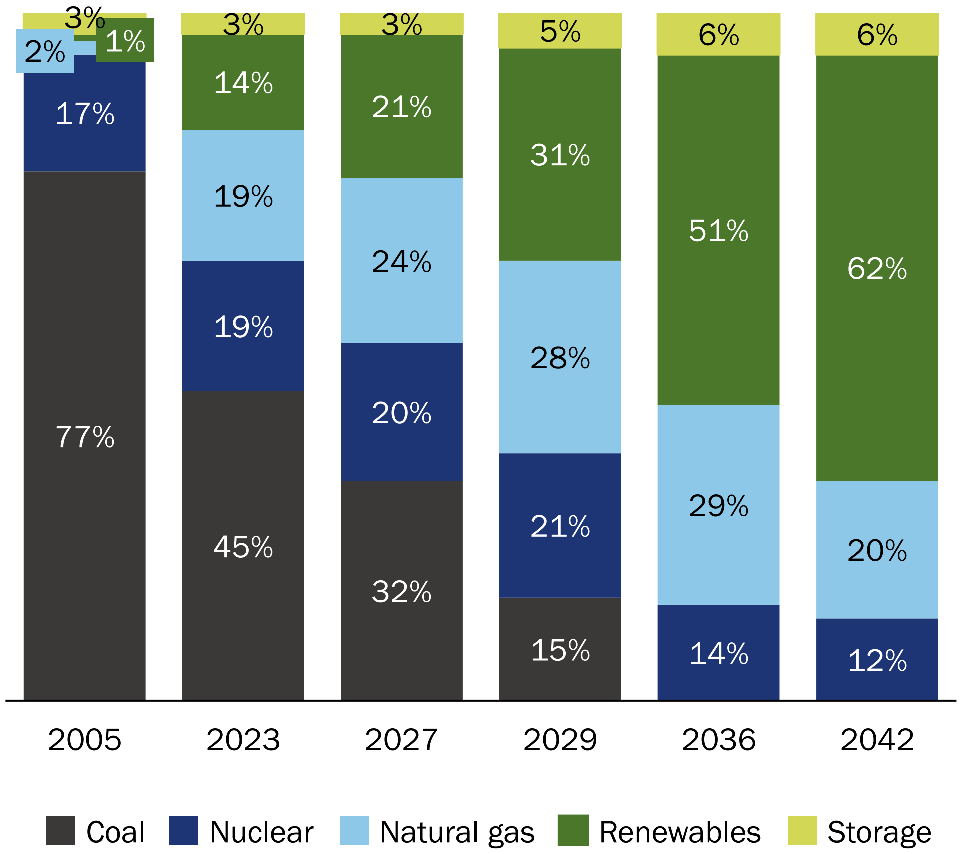
Second 5 years (2028 - 2032)

- Retire two units at Monroe in 2028
- Add 4,600 MW of renewables
- Add 520 MW of battery storage

Next 10 years (2033 - 2042)

- Retire two units at Monroe in 2035
  - Identifying dispatchable resources to replace Monroe units, including as a placeholder, a 950 MW natural gas plant with carbon capture and sequestration in 2035
- Add 10,000 MW of renewables
- Add 1,050 MW of battery storage

Generation mix[1]
(MWh %)



DTE

1. Year-end generation mix represents one potential pathway and is subject to change

DTE Gas: replacing aging infrastructure to ensure reliability and transition to net zero emissions

Successful 2022

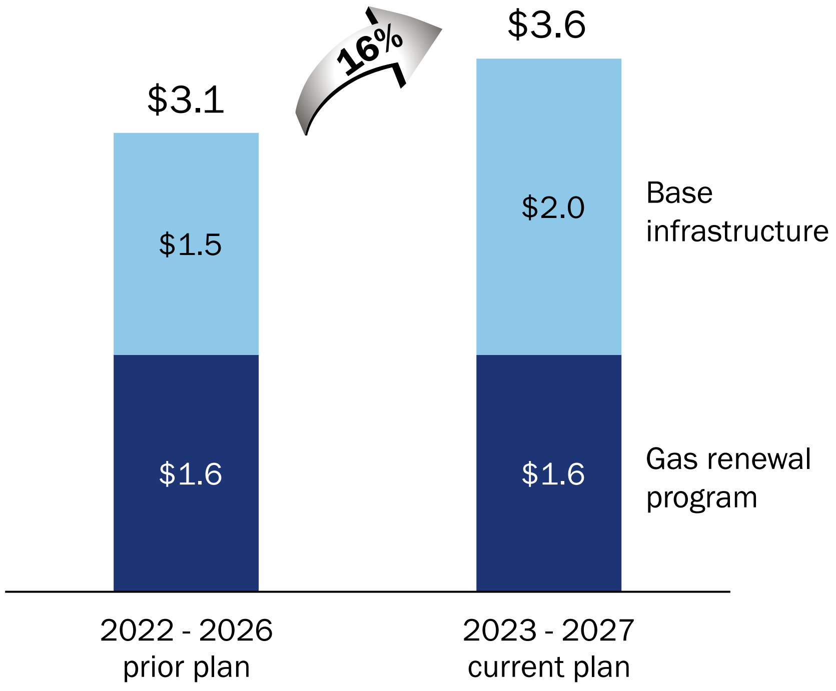
- Completed 220 miles of main renewal; on track for additional 13-year investment plan
- Ranked first for residential customer satisfaction by J.D. Power

Capital investment opportunities focus on infrastructure improvements and decarbonization

- Gas renewal investments minimize leaks and reduce costs
- Base infrastructure enhances transmission, compression, distribution and storage
- Targeting to reduce greenhouse gas emissions by 65% by 2030, 80% by 2040 and net zero by 2050
- Reducing end-use customer emissions by 35% by 2040
- CleanVision Natural Gas Balance program allows customers to lower their emissions footprint with both carbon offsets and renewable natural gas (RNG)

DTE Gas investment

(billions)



DTE

DTE Vantage: strategic focus on decarbonization solutions for customers

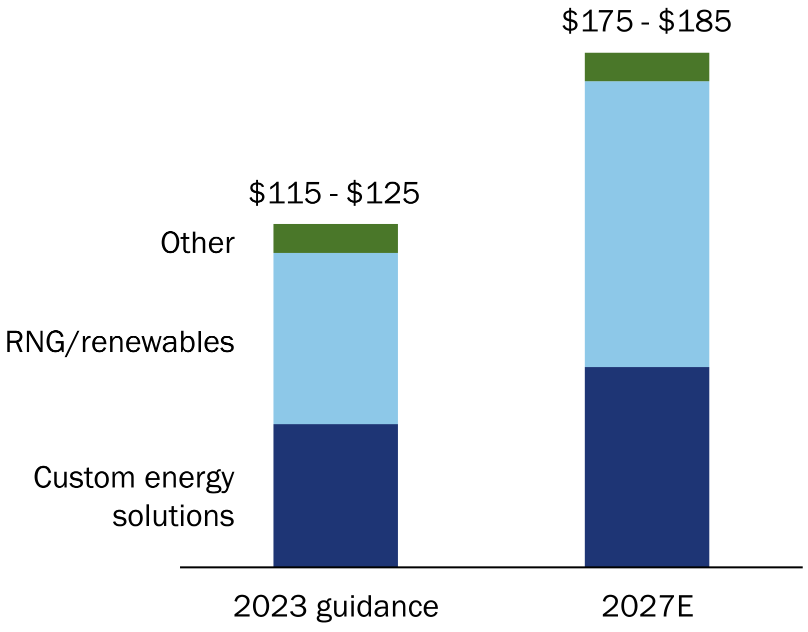
Strong project development in 2022 and 2023

- Placed one RNG project and one custom energy solutions project in service in 2022
- Placing three RNG projects and one custom energy solutions project in service in 2023
- Executed long-term, fixed-fee custom energy solutions agreement in 2022 with Ford Motor Company for its new electric vehicle and battery manufacturing complex
  - Complex will be Ford's largest EV manufacturing facility in North America; DTE to provide steam, hot and chilled water to Ford and electricity to Tennessee Valley Authority

Capitalizing on a growing preference for cleaner, more efficient energy

- Growth driven by strong development pipeline in RNG/renewables[1] and custom energy solutions while expanding into carbon capture and sequestration
  - IRA improves opportunities in decarbonization as enhanced tax credits allow carbon capture, RNG and combined heat and waste energy recovery to be more economic
  - Strong market growth supported by the federal RFS and California's LCFS

DTE Vantage operating earnings[2]
(millions)



$1.0 - $1.5 billion capital investment 2023 – 2027

DTE

1. Renewables includes wood and landfill gas facilities and new decarbonization opportunities
2. Reconciliation of operating earnings (non-GAAP) to reported earnings included in the appendix

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Environmental, Social & Governance (ESG)

Appendix

DTE

2023 operating EPS[1] guidance midpoint provides 7% growth over 2022 original guidance midpoint

(millions, except EPS)

	2023 guidance	Drivers / comments
DTE Electric	$1,010 - $1,030	Distribution and cleaner generation investments
DTE Gas	262 - 272	Continued main renewal and other infrastructure improvements
DTE Vantage	115 - 125	New projects in service in 2H
Energy Trading	20 - 30	Quarterly variances[2] expected due to revenue recognition timing of contracted transactions
Corporate & Other	(150) - (136)	Interest expense
DTE Energy	**$1,257 - $1,321**	
Operating EPS	**$6.09 - $6.40**	

DTE

1. Reconciliation of operating earnings (non-GAAP) to reported earnings included in the appendix
2. Energy Trading earnings are expected to be negative by approximately $20 - $30 million in 1Q due to timing that trues up later in the year

Maintaining strong cash flow, balance sheet and credit profile

Continued balance sheet strength…

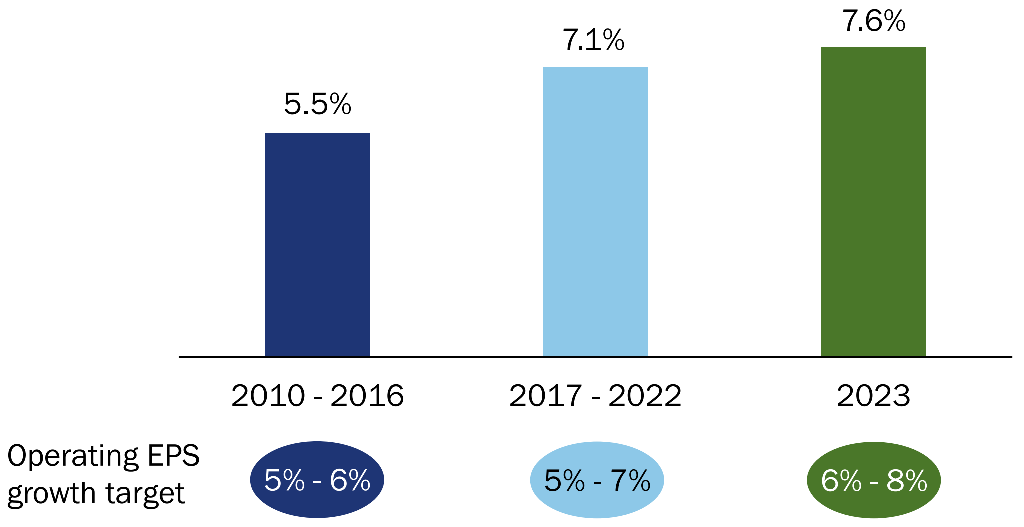
- Targeting equity issuances of $0 - $100 million annually through 2025
- Maintaining solid investment-grade credit ratings
  – Targeting 15% - 16% FFO[1] / Debt[2]

Credit ratings	S&P	Moody's	Fitch
DTE Energy (unsecured)	BBB	Baa2	BBB
DTE Electric (secured)	A	Aa3	A+
DTE Gas (secured)	A	A1	A

…while providing a healthy dividend

- Increased 2023 annualized dividend 7.6% to $3.81 per share
- Over 100 consecutive years of paying a cash dividend and 14th consecutive annual increase
- Future dividend growth[3] in line with operating EPS[4] growth

Average annual dividend increase



1. Funds from Operations (FFO) is calculated using operating earnings
2. Debt excludes a portion of DTE Gas' short-term debt and considers 50% of the junior subordinated notes as equity
3. Subject to Board approval
4. Reconciliation of operating earnings (non-GAAP) to reported earnings included in the appendix; 2023 - 2027 operating EPS average annual growth rate forecasted at 6% - 8%

DTE

DTE

Environmental, social and governance efforts are key priorities; aspiring to be the best in the industry

Environment

- Transitioning towards net zero emissions at both utilities
- Accelerating transition to cleaner generation
- Protecting our natural resources

Social

- Focusing on the diversity, safety, well being and success of employees
- Revitalizing neighborhoods and investing in communities
- Leader in volunteerism

Governance

- Focusing on the oversight of environmental sustainability, social and governance
- Ensuring board diversity
- Providing incentive plans tied to safety and customer satisfaction targets

Award-winning commitment to ESG priorities

THE CIVIC 50

Superior corporate citizenship and community involvement

AMERICA'S GREATEST WORKPLACES FOR DIVERSITY 2023 Newsweek

America's Greatest Workplaces for Diversity 2023

THE FOREFRONT 50
TOP CORPORATIONS FOR MINORITY BUSINESSES

NMSDC Forefront 50 Top Corporations for Minority Businesses

Gallup Great Workplace Award 10 consecutive years

AMERICA'S MOST RESPONSIBLE COMPANIES 2023 Newsweek statista

America's Most Responsible Companies 2023

DTE

MIGreenPower program continues significant growth

- Allows customers to purchase up to 100% of electricity needs generated from renewable sources
- One of the largest voluntary renewable programs in the nation
- Largest renewable energy purchase from a utility announced with Ford Motor Company
  - 650 MW project to be completed in 2025

Voluntary renewable customers

Ford | State of Michigan | University of Michigan | GM | Bedrock Detroit | Detroit Diesel

900
business customers

85,000
residential customers

2,250 MW
subscribed

DTE

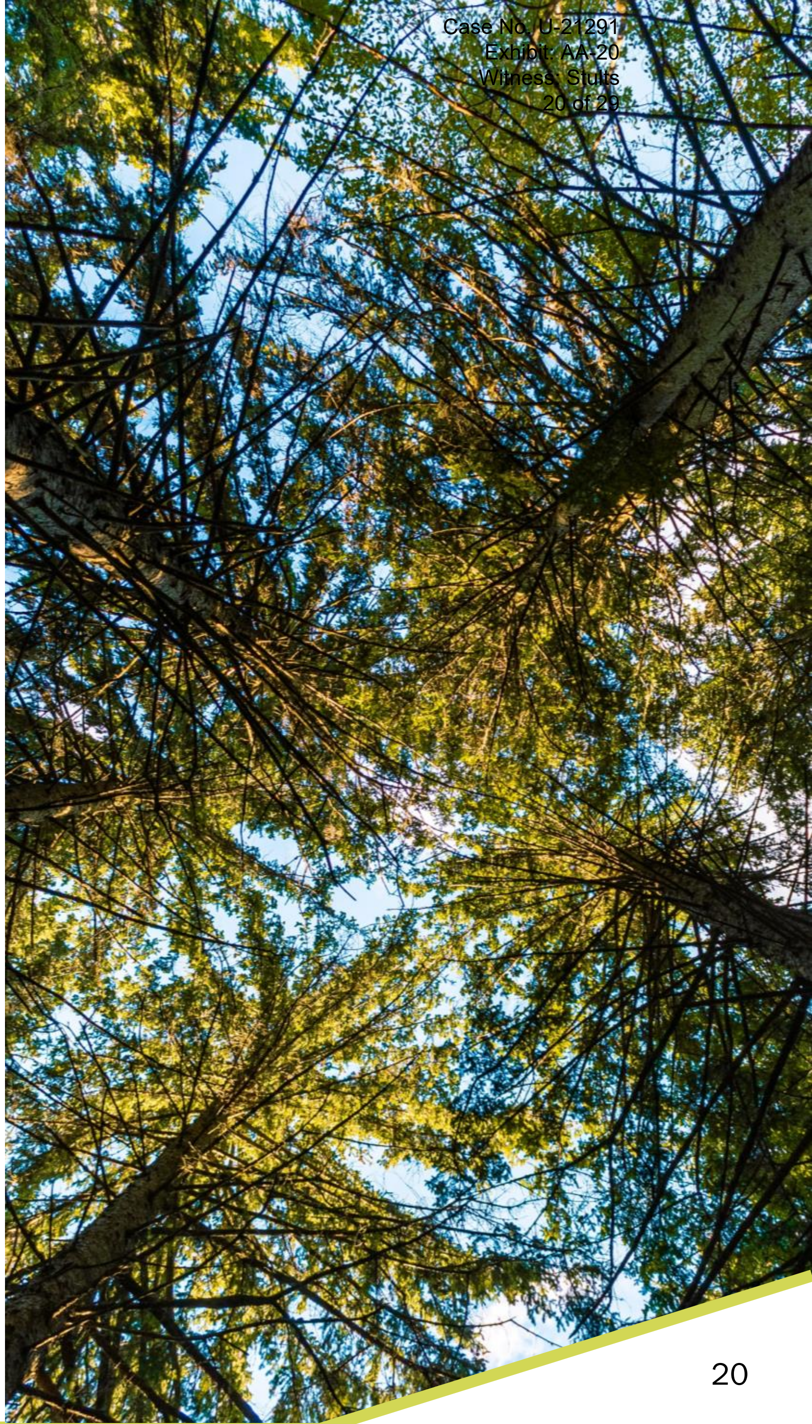
Natural Gas Balance program reducing GHG emissions

- Offering an affordable way to offset 25% to 100% of customers' GHG emissions from an average home's natural gas use
- RNG will be sourced by transforming landfill emissions and wastewater treatment plant by-products into usable gas
- Carbon offset program is focused on protecting Michigan forests that naturally absorb greenhouse gases
- Partnered with Anew, the nation's largest carbon offset developer, on the Greenleaf Improved Forest Management project in Michigan's Upper Peninsula to protect and preserve forests

2021
program inception

11,200
customers subscribed

6.1 million
metric tons of GHG[1] reduced by 2050



DTE

1. Reduction from 2005 base

Progressing on EV initiatives

Charging Forward Program

- Promoting EV education, infrastructure and adoption
- Providing residential and commercial rebates, infrastructure support and fleet advisory services

Program-to-date major milestones

- 1,240 Level 2 public chargers approved and 800 installed
- 130 direct current fast charger rebates approved and 50 installed
- 12 electric bus deployments with the local regional transit agencies
- 6 electric school bus deployments with another 66 awarded from the first round of the EPA's Clean School Bus Program
- Received regulatory approval for eFleets program

2019
program inception

660,000+
gallons of gasoline saved

2,750
residential rebates

DTE

Committed to diversity, equity and inclusion; creating a safe and welcoming environment

Health and safety of our people is a priority

- Multiple safety committees spanning all levels of the company providing input into safety plans, addressing unique challenges of each business unit
- Received American Gas Association Safety Achievement Award for excellence in employee safety

Office of Diversity, Equity and Inclusion

- Led by our CEO and key executive leaders, including a Director of Diversity, Equity and Inclusion
- Focused on sustaining a diverse workforce which is representative of the communities we serve

Commitment to create a diverse, equitable and inclusive workforce

- Annual review of compensation practices to ensure equitable pay
- Formal training programs, including unconscious bias training, for employees and leaders

Employee groups create an inclusive environment where differences are celebrated and a sense of belonging exists for all employees

AIM
Differently-abled group

AMEA
Asian and Middle Eastern group

FAMILY
Family oriented group

POP
LGBTQ+ group

REACH
Black professionals group

SOMOS
Latinx professionals group

SURGE
Young professionals group

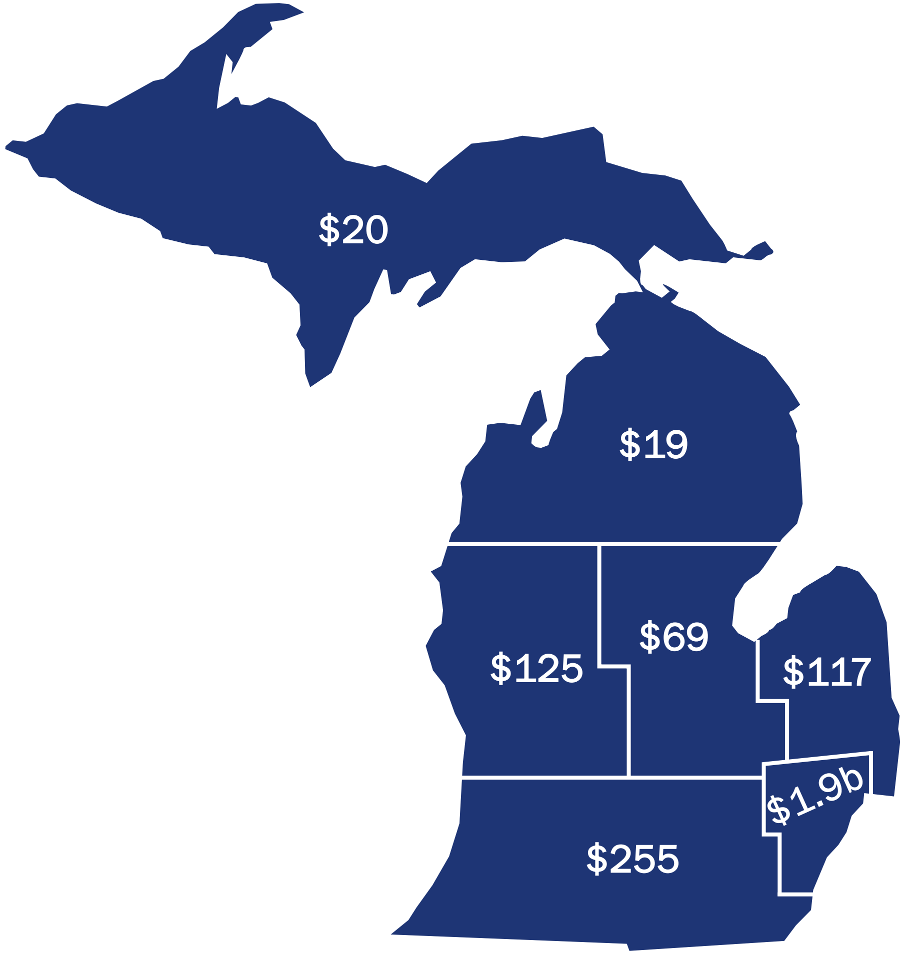
VETS
Veteran empowerment group

WOMEN OF DTE
Women's group

Building on the momentum of the last decade, committed to Michigan investments and supplier diversity

$2.5b	invested in Michigan businesses in 2022
65,000	jobs created since 2010
$900m	invested with Detroit suppliers in 2022
$895m	invested with suppliers owned by women, minorities, veterans, members of the LGBTQ+ community and disability-owned businesses in 2022
50+	supplier diversity awards earned since 2018

2022 Michigan spend
(millions)

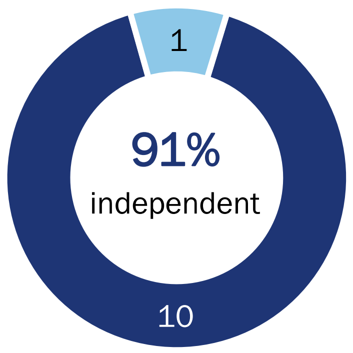


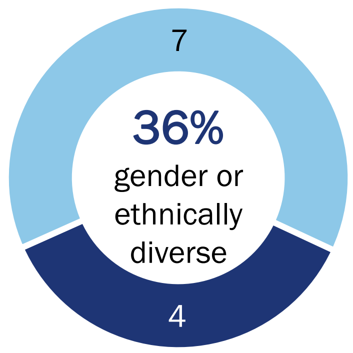
DTE

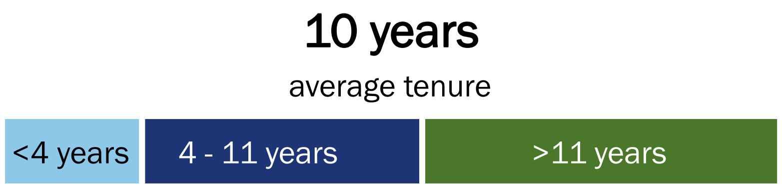
Governance framework provides shareholder rights and enables sustainable value creation

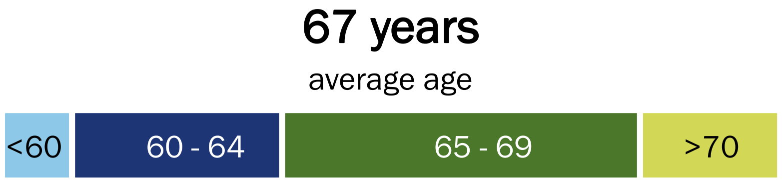
Best-in-class governance practices

- Lead Independent Director
- All board committees are composed exclusively of independent Directors
- Stock ownership guidelines for non-employee Directors
- Majority voting standard
- Annual Director elections
- Established corporate governance guidelines
- Publication of Sustainability report
- Shareholder ability to call a special meeting
- No supermajority voting provisions to approve mergers or amend charter
- Overboarding policy









DTE

Executive management compensation plan is aligned with our stakeholder priorities

Annual or long-term incentive metrics	
Our team	• Employee engagement • Employee safety
Our customers	• Customer satisfaction • Customer complaints • System reliability
Our communities	• Customer satisfaction • Customer complaints • System reliability
Our investors	• EPS • Cash flow • Relative total shareholder return • Balance sheet health

DTE

Overview

Business Update

Financial Update

Environmental, Social & Governance (ESG)

Appendix

DTE

IRA supports cleaner energy transition and customer affordability

Supports accelerated clean energy transition and customer affordability and eliminates the need for tax equity structures

- Wind and solar production tax credit
- Production tax credit for existing nuclear generation
- Clean fuel production tax credits and biogas investment tax credits for RNG
- Investment tax credits for combined heat and waste energy recovery and stand-alone energy storage
- Increased tax credit for carbon capture and sequestration

No material impact to our plan from corporate minimum tax

- Accelerated depreciation
- Tax credit carryforwards

DTE

2023 cash flow and capital expenditures guidance

Cash flow

(billions)

	2023 guidance
Cash from operations[1]	$3.2
Capital expenditures	(4.2)
Free cash flow	**($1.0)**
Dividends	(0.8)
Other	-
Net cash	**($1.8)**
Debt financing	
Issuances	$2.6
Redemptions	(0.7)
Total debt financing	**$1.9**
Cash on hand	$0.1

Capital expenditures

(millions)

	2023 guidance
DTE Electric	
Base infrastructure	$1,200
New generation	500
Distribution infrastructure	1,500
	$3,200
DTE Gas	
Base infrastructure	$375
Gas renewal program	310
	$685
Non-utility	**$300 - $400**
Total	**$4,185 - $4,285**

DTE

1. Includes equity issued for employee benefit programs

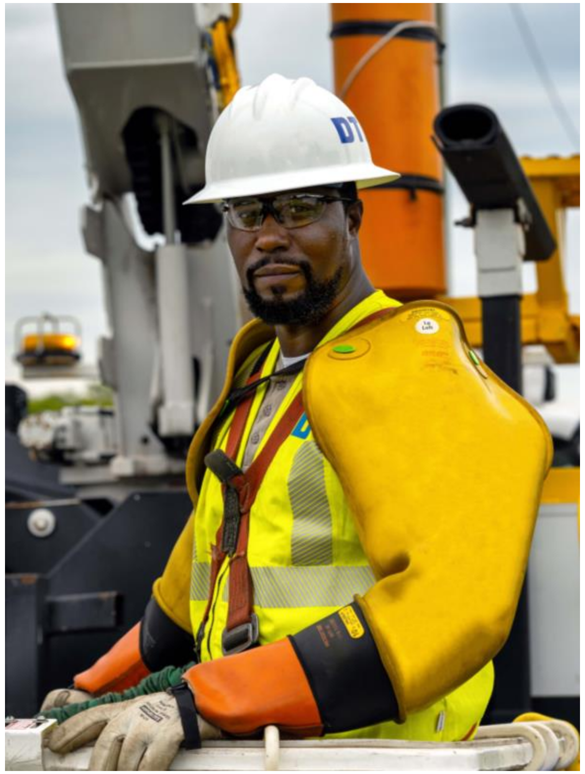
Reconciliation of reported to operating earnings (non-GAAP)

Use of Operating Earnings Information – Operating earnings exclude non-recurring items, certain mark-to-market adjustments and discontinued operations. DTE Energy management believes that operating earnings provide a meaningful representation of the company's earnings from ongoing operations and uses operating earnings as the primary performance measurement for external communications with analysts and investors. Internally, DTE Energy uses operating earnings to measure performance against budget and to report to the Board of Directors. Operating earnings is a non-GAAP measure and should be viewed as a supplement and not a substitute for reported earnings, which represents the company's net income and the most comparable GAAP measure.

In this presentation, DTE Energy provides guidance for future period operating earnings. It is likely that certain items that impact the company's future period reported results will be excluded from operating results. A reconciliation to the comparable future period reported earnings is not provided because it is not possible to provide a reliable forecast of specific line items (i.e., future non-recurring items, certain mark-to-market adjustments and discontinued operations). These items may fluctuate significantly from period to period and may have a significant impact on reported earnings.

Definition of net zero

Goal for DTE Energy's utility operations and gas suppliers at DTE Gas that any carbon emissions put into the atmosphere will be balanced by those taken out of the atmosphere. Achieving this goal will include collective efforts to reduce carbon emissions and actions to offset any remaining emissions. Progress towards net zero goals is estimated and methodologies and calculations may vary from those of other utility businesses with similar targets. Carbon emissions is defined as emissions of carbon containing compounds, including carbon dioxide and methane, that are identified as greenhouse gases.



DTE ENERGY BUSINESS UPDATE

JANUARY 10-12, 2022

Safe harbor statement

The information contained herein is as of the date of this document. DTE Energy expressly disclaims any current intention to update any forward-looking statements contained in this document as a result of new information or future events or developments. Words such as “anticipate,” “believe,” “expect,” “may,” “could,” “would,” “projected,” “aspiration,” “plans” and “goals” signify forward-looking statements. Forward-looking statements are not guarantees of future results and conditions but rather are subject to various assumptions, risks and uncertainties. This document contains forward-looking statements about DTE Energy’s financial results and estimates of future prospects, and actual results may differ materially. Many factors impact forward-looking statements including, but not limited to, the following: risks related to the spin-off of DT Midstream, including that providing DT Midstream with the transition services previously negotiated could adversely affect our business, and that the transaction may not achieve some or all of the anticipated benefits; the duration and impact of the COVID-19 pandemic on DTE Energy and customers, impact of regulation by the EPA, the EGLE, the FERC, the MPSC, the NRC, and for DTE Energy, the CFTC and CARB, as well as other applicable governmental proceedings and regulations, including any associated impact on rate structures; the amount and timing of cost recovery allowed as a result of regulatory proceedings, related appeals, or new legislation, including legislative amendments and retail access programs; economic conditions and population changes in our geographic area resulting in changes in demand, customer conservation, and thefts of electricity and, for DTE Energy, natural gas; the operational failure of electric or gas distribution systems or infrastructure; impact of volatility in prices in the international steel markets on DTE Vantage’s (formerly Power and Industrial Projects) operations; the risk of a major safety incident; environmental issues, laws, regulations, and the increasing costs of remediation and compliance, including actual and potential new federal and state requirements; the cost of protecting assets and customer data against, or damage due to, cyber incidents and terrorism; health, safety, financial, environmental, and regulatory risks associated with ownership and operation of nuclear facilities; volatility in commodity markets, deviations in weather, and related risks impacting the results of DTE Energy’s energy trading operations; changes in the cost and availability of coal and other raw materials, purchased power, and natural gas; advances in technology that produce power, store power or reduce power consumption; changes in the financial condition of significant customers and strategic partners; the potential for losses on investments, including nuclear decommissioning and benefit plan assets and the related increases in future expense and contributions; access to capital markets and the results of other financing efforts which can be affected by credit agency ratings; instability in capital markets which could impact availability of short and long-term financing; the timing and extent of changes in interest rates; the level of borrowings; the potential for increased costs or delays in completion of significant capital projects; changes in, and application of, federal, state, and local tax laws and their interpretations, including the Internal Revenue Code, regulations, rulings, court proceedings, and audits; the effects of weather and other natural phenomena on operations and sales to customers, and purchases from suppliers; unplanned outages; employee relations and the impact of collective bargaining agreements; the availability, cost, coverage, and terms of insurance and stability of insurance providers; cost reduction efforts and the maximization of plant and distribution system performance; the effects of competition; changes in and application of accounting standards and financial reporting regulations; changes in federal or state laws and their interpretation with respect to regulation, energy policy, and other business issues; contract disputes, binding arbitration, litigation, and related appeals; and the risks discussed in DTE Energy’s public filings with the Securities and Exchange Commission. New factors emerge from time to time. We cannot predict what factors may arise or how such factors may cause results to differ materially from those contained in any forward-looking statement. Any forward-looking statements speak only as of the date on which such statements are made. We undertake no obligation to update any forward-looking statement to reflect events or circumstances after the date on which such statement is made or to reflect the occurrence of unanticipated events. This document should also be read in conjunction with the Forward-Looking Statements section of the joint DTE Energy and DTE Electric 2020 Form 10-K and 2021 Forms 10-Q (which sections are incorporated by reference herein), and in conjunction with other SEC reports filed by DTE Energy and DTE Electric.

DTE

Focusing on our team, customers and communities while delivering for investors

Our Team

Ensuring the health and safety of our employees

Recognized as a Gallup Great Workplace for the ninth consecutive year

Customers

Addressing our customers’ most vital needs

Investing an additional $90 million to combat extreme weather-related power outages with no impact to customer bills

Communities

Providing safe, reliable and cleaner energy

Building first MIGreenPower community solar project in Washtenaw County

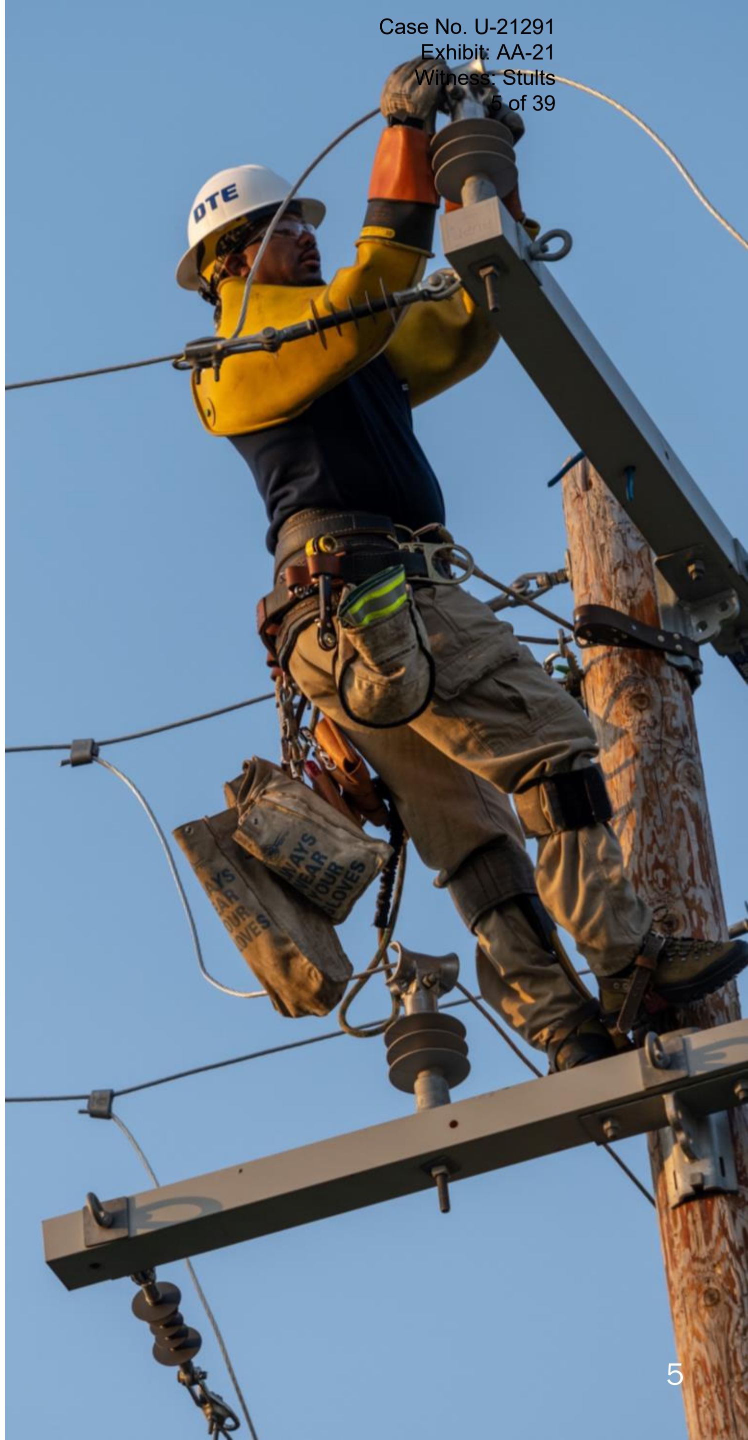
Investors

Delivering premium shareholder returns

Strong track record of delivering results and well-positioned for future growth

Solidifying future growth with updated plan; continuing 5% - 7% operating EPS[1] growth through 2026

- ✓ **Targeting higher end of 5% - 7%** operating EPS growth from 2021 original guidance midpoint to 2022 early outlook
- ✓ **7% dividend growth** extended to 2022, consistent with high end of operating EPS growth target
- ✓ **Accelerating generation transition** and preparing to file updated **Clean Vision Plan (IRP)** in October 2022, one year earlier than planned
  - Ceasing coal use at Belle River Power Plant two years earlier than planned and evaluating the opportunity for conversion to a cleaner fuel source
  - Evaluating the opportunity to exit coal use at Monroe Power Plant earlier than 2040
- ✓ Utility 5-year capital investment is **$1 billion higher** than previous plan; ~$40 billion investment plan over the 10-year period
  - Capital investment plan modernizes and prepares the grid for additional growth from electrification and supports accelerated carbon reduction
- ✓ Announced **strategic focus on decarbonization at DTE Vantage**



DTE

1. Reconciliation of operating earnings (non-GAAP) to reported earnings included in the appendix

Operating in a highly constructive regulatory environment

MPSC members

Dan Scripps
Chair
Term ending July 2, 2023

Katherine Peretick
Commissioner
Term ending July 2, 2027

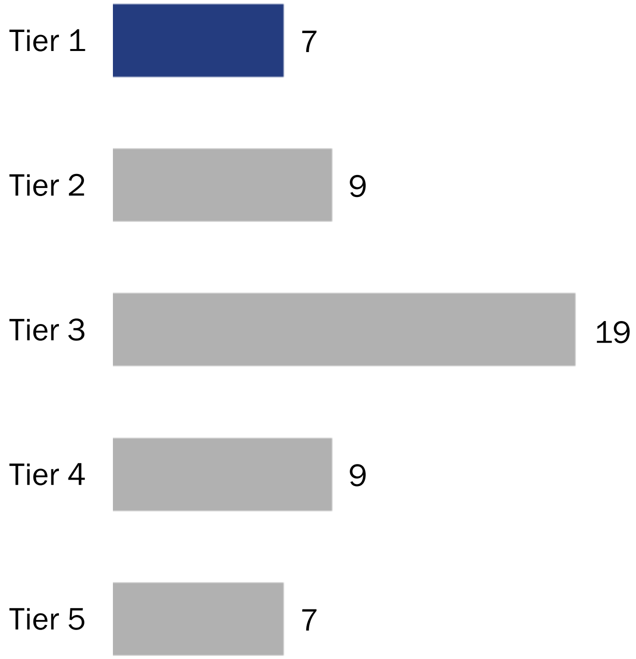
Tremaine Phillips
Commissioner
Term ending July 2, 2025

MPSC key objectives

- Empower customers to make informed utility choices
- Assure safe, secure and reliable utility services and infrastructure
- Assure accessible and affordable utility services through regulatory oversight
- Cultivate open and diverse communication and education

Ranking of U.S. regulatory jurisdictions[1]

(Michigan in tier 1)



1. UBS, December 2021 (50 states and Washington, D.C.)

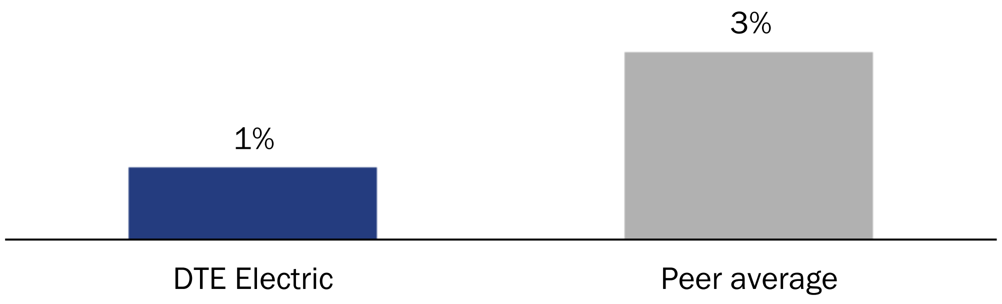
Distinctive continuous improvement culture drives strong track record of cost management vs. peer average

All 10,000+ employees engaged in CI to surface and solve problems

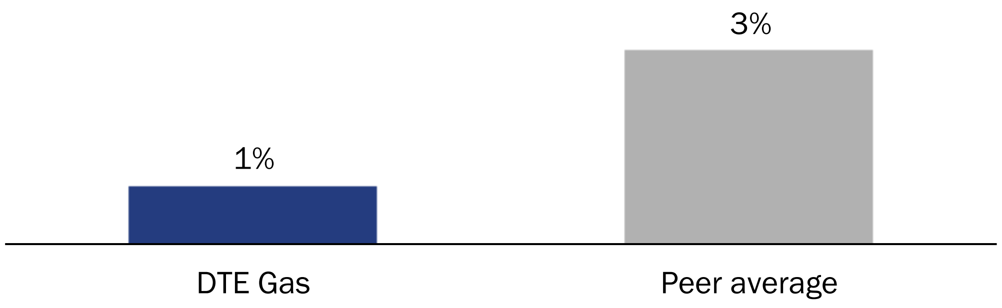
- Controlling costs while improving the customer experience and maintaining affordability
  - Productivity enhancements
  - Technology innovations
  - Automation
  - Infrastructure replacements
  - Transition to cleaner energy

Average annual percentage change in O&M costs 2008 - 2020

Electric utility[1]



Gas utility[1]



1. Source: SNL Financial, FERC Form 1 and FERC Form 2; excluding fuel and purchase power from electric O&M and production expense from gas O&M

Overview

Business Update

Environmental, Social & Governance (ESG)

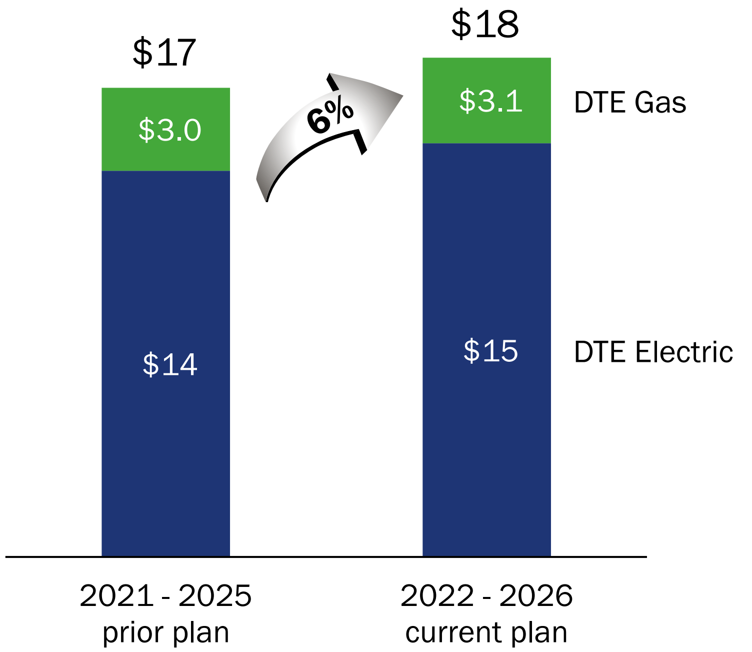
Appendix

DTE

Increased utility investment in 5-year plan supports 5% - 7% operating EPS[1] growth through 2026

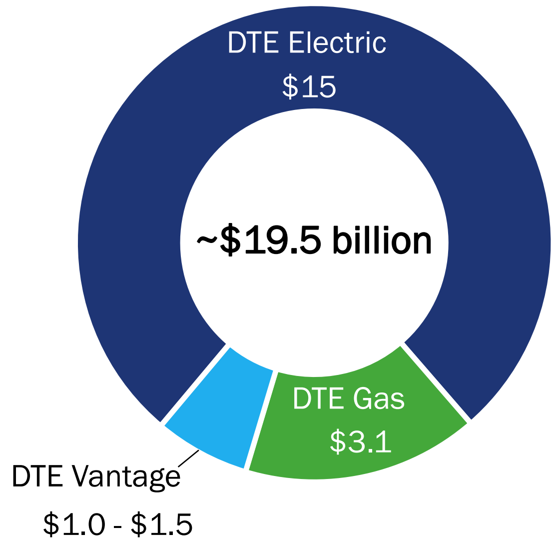
(billions)

Capital investment increased in 5-year plan



- Utility investment $1 billion higher than previous plan

DTE 5-year investment plan 2022 - 2026



- Over 90% of DTE's total investment in utilities

DTE

1. Reconciliation of operating earnings (non-GAAP) to reported earnings included in the appendix

DTE Electric: transformational investments in generation and distribution provide customers cleaner, more reliable energy

Cleaner generation

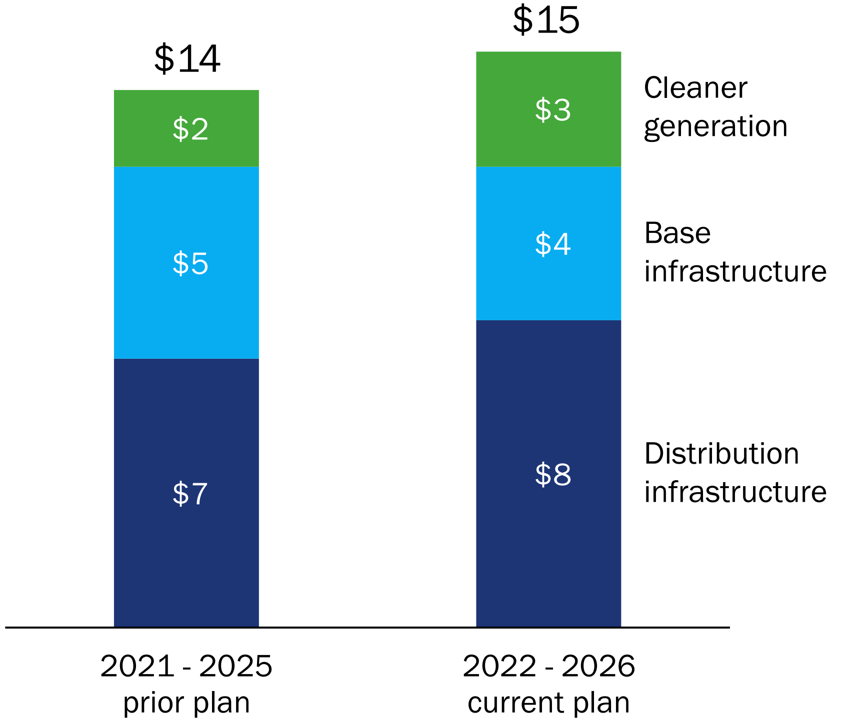
- Accelerating carbon reduction plan
  - Ceasing coal use at Belle River Power Plant and reducing carbon emissions by 50% by 2028, two years earlier than originally planned
  - Filing updated IRP in October 2022, one year earlier than planned
  - Evaluating the opportunity to exit coal use at Monroe Power Plant earlier than 2040
- Expanding voluntary renewables program, one of the largest in the nation

Distribution infrastructure renewal

- Supporting increased electrification and load growth through infrastructure redesign and modernization
- Improving reliability and reducing restoration times through system resilience and hardening
- Enabling a smarter, more resilient grid through advanced technology and automation

Targeting 7% - 8% long-term operating earnings[1] growth from 2021 original guidance

DTE Electric investment plan
(billions)



DTE

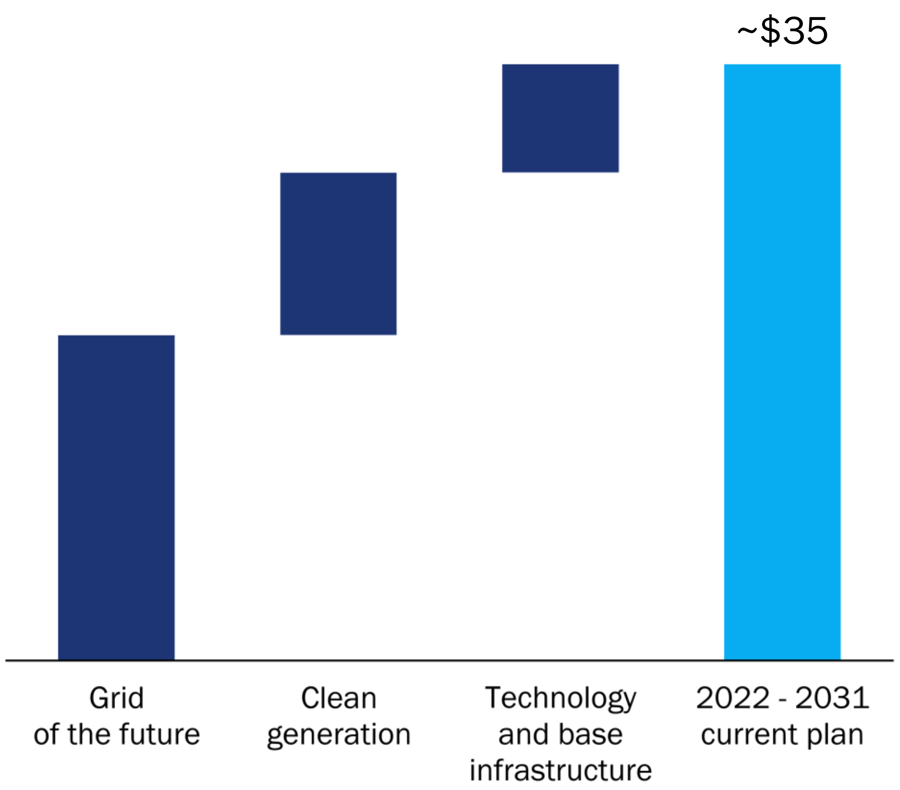
1. Reconciliation of operating earnings (non-GAAP) to reported earnings included in the appendix

Clean energy transformation and building the grid of the future creates $35 billion of investment opportunity over the next 10 years

- Future investments could accelerate net zero emissions target from 2050
- Accelerating the cessation of coal use at Belle River and Monroe Power Plants will create the need for considerable replacement investment
  - Renewable resources
  - Short and long duration storage
  - Demand response
  - Dispatchable carbon free resources[1]
- Pace of electric vehicle (EV) adoption could significantly increase the need for resources and assets

Provides large inventory of potential capital investment pull forwards into subsequent 5-year plans

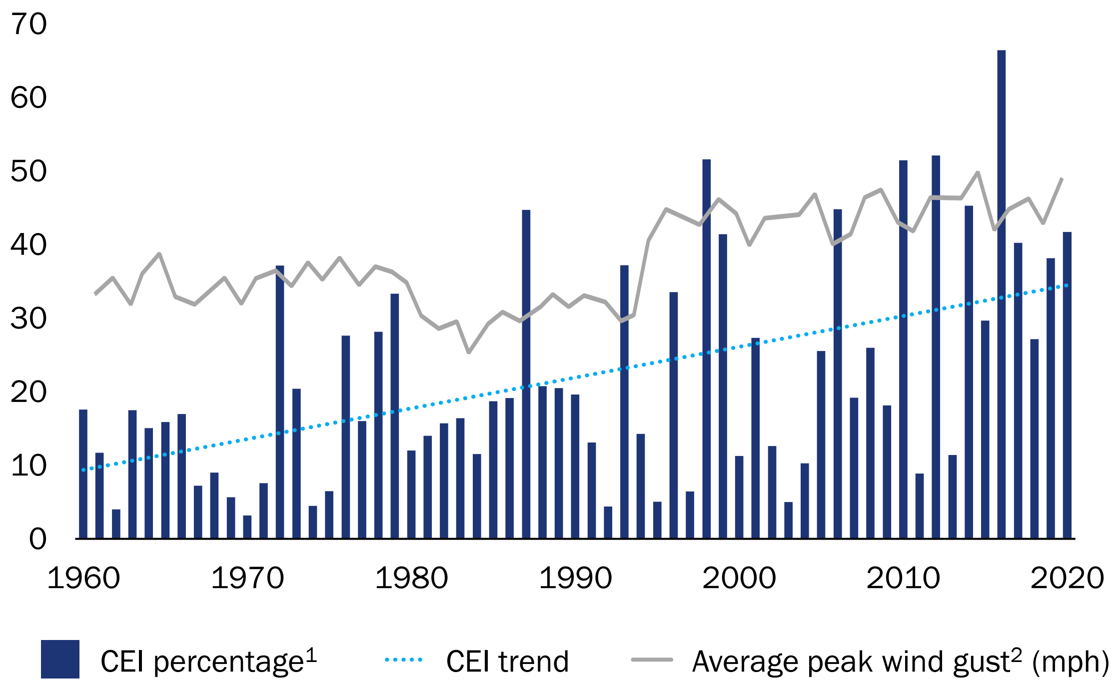
DTE Electric 10-year investment plan
(billions)



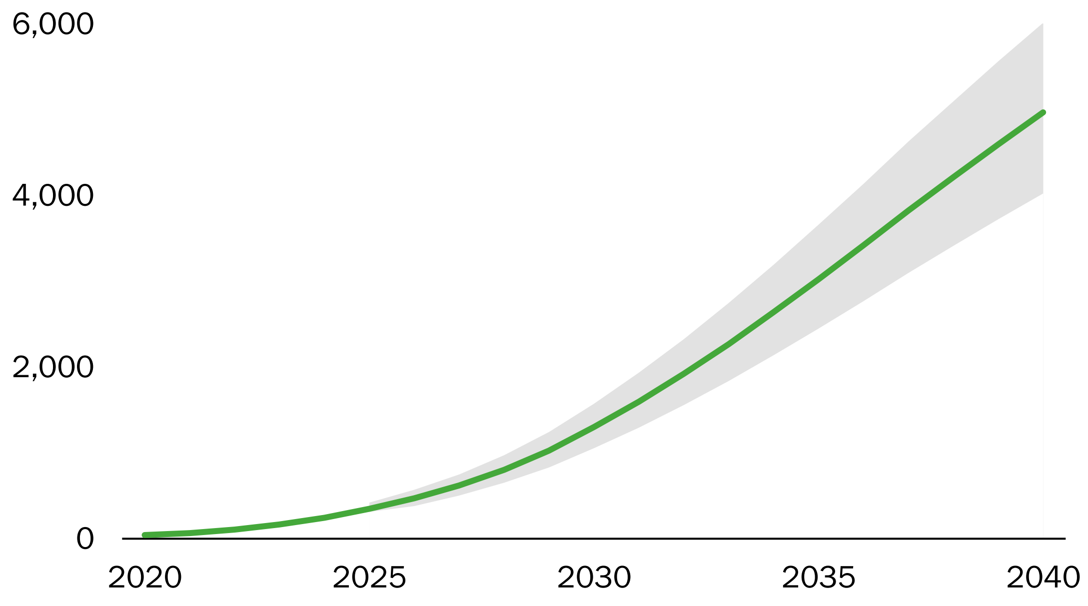
1. Examples include combined cycle plant with carbon capture and storage, hydrogen and small modular nuclear

Investment opportunities exist over the next 10 years due to the need for a modern, reliable grid and clean, affordable generation

Upper Midwest climate extremes index (CEI) and wind 1960 - 2020



DTE Electric load from vehicle electrification[3]
(GWh)



Climate change, increasing number of high wind events and EV adoption drive both load growth and a need for a reliable grid investment

1. National Oceanic and Atmospheric Administration reports
2. Wind data gathered from several locations near Detroit (Detroit Metro and Willow Run airports) at various methods of measurement
3. Not including underlying macroeconomic conditions including energy efficiency programs

Robust investment opportunities for the grid of the future; driving capital opportunity in 10-year investment plan

Infrastructure hardening and resilience

Hardening the system, enhancing pole top maintenance and increasing the pace of asset replacement

Technology and automation

Advanced Distribution Management System will provide a complete and integrated view of multiple systems

Infrastructure redesign and modernization

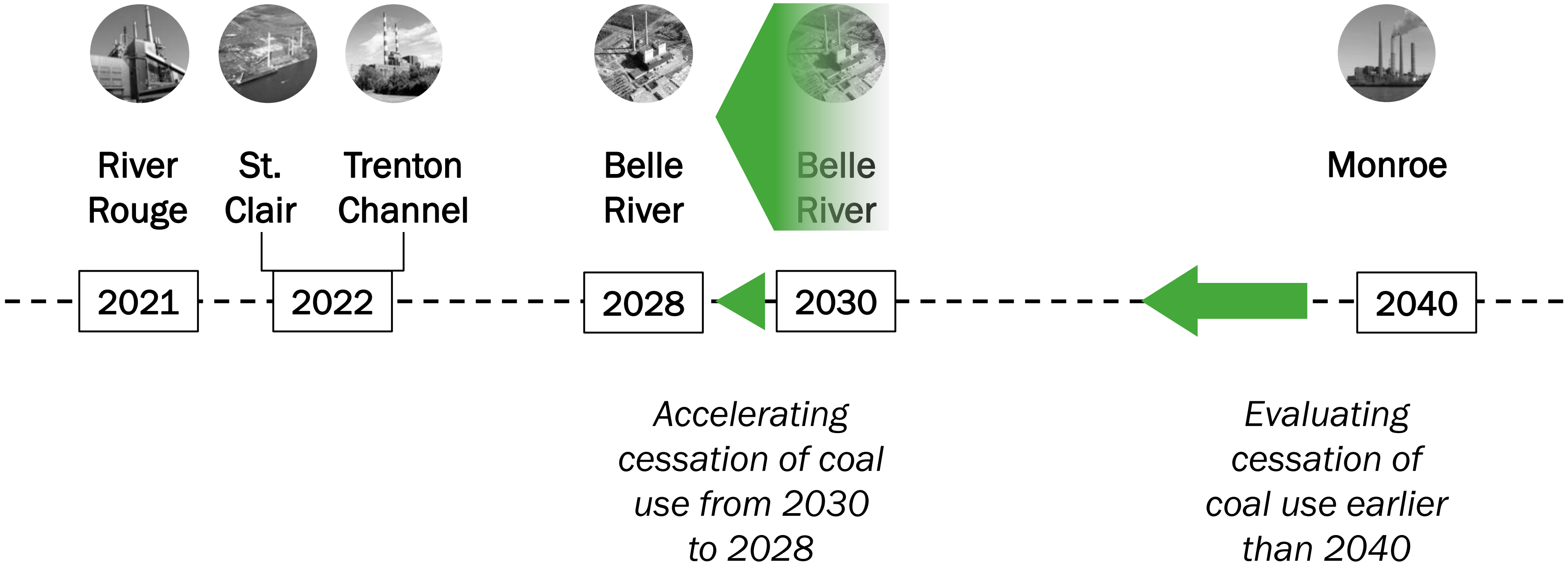
Rebuilding sub-transmission, substations and circuits to provide additional capacity, improve reliability and resilience

Vegetation management

Circuits that have been trimmed have 60% fewer outages, shorter outage durations and fewer wire downs

Investments ensure best-in-class grid performance

Continuing to evaluate the cessation of coal use to further accelerate decarbonization plan



- Stakeholder engagement has started and will provide meaningful input into our detailed plan to ensure our goals of clean, reliable and affordable energy are achieved
- Details of the plan and associated investments will be provided with the filing of the Clean Vision Plan (IRP) in October 2022

DTE

DTE Gas: replacing aging infrastructure to reduce greenhouse gas emissions

Main renewal

- Minimizes leaks, both reducing costs and improving customer satisfaction

Base infrastructure

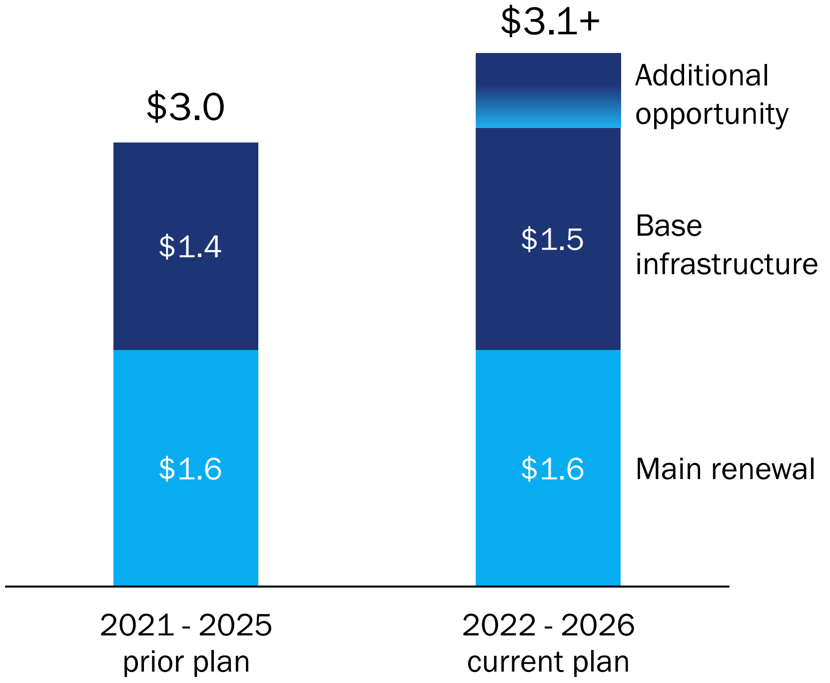
- Enhances transmission, compression, distribution and storage

Additional opportunity

- Accelerates the modernization of the transmission system

Targeting 9% long-term operating earnings[1] growth from 2021 original guidance

DTE Gas investment plan
(billions)



DTE

1. Reconciliation of operating earnings (non-GAAP) to reported earnings included in the appendix

DTE Vantage: strategic focus on decarbonization solutions for customers

Renewable natural gas (RNG)

- Commenced construction on new Wisconsin RNG project and secured additional project in New York
- One of the largest dairy RNG suppliers based on installed capacity
- Strong market growth supported by the federal Renewable Fuel Standard and California's Low Carbon Fuel Standard; future demand from additional states pursuing low carbon fuel standards

Industrial energy services

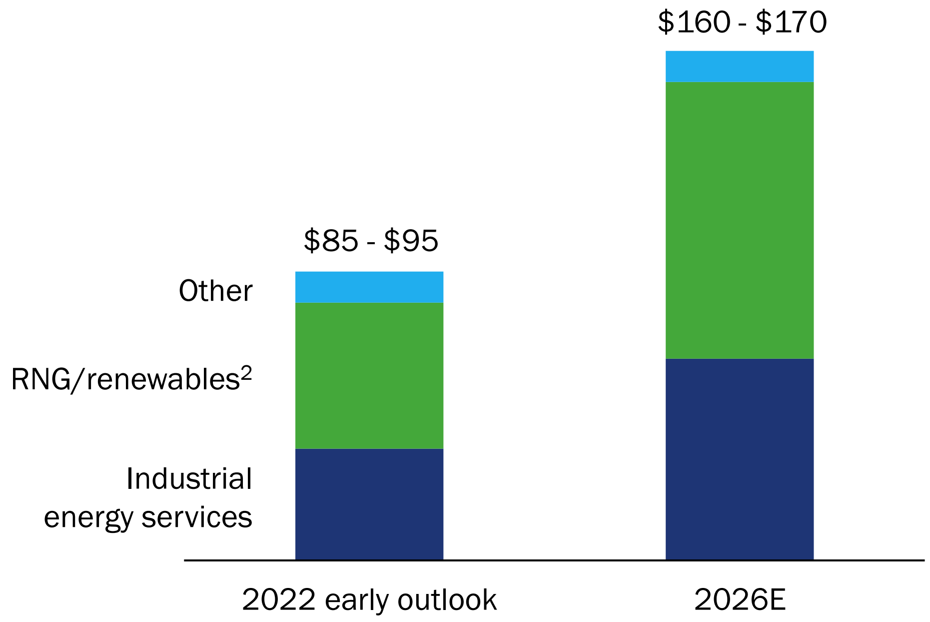
- Uniquely positioned to capitalize on a growing preference for efficient energy with opportunity to implement power and steam cogeneration systems

Exploring additional decarbonization opportunities

- Well-positioned to capitalize on future carbon capture and storage projects

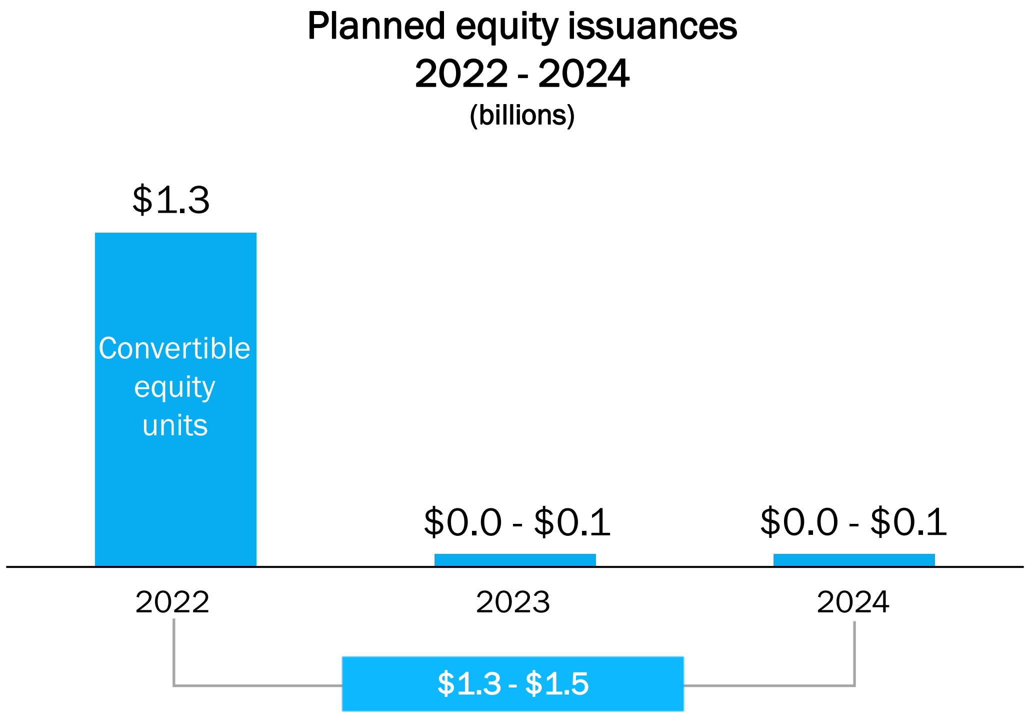
$1.0 - $1.5 billion capital investment 2022 - 2026; 80% of operating earnings derived from decarbonization related projects

DTE Vantage operating earnings[1]
(millions)



1. Reconciliation of operating earnings (non-GAAP) to reported earnings included in the appendix
2. Renewables includes wood and landfill gas facilities and new decarbonization opportunities

Maintaining strong cash flow, balance sheet and credit profile; minimal equity issuances outside of convertible equity units



- Strong investment-grade credit rating
  – Targeting ~16% FFO[1] / Debt[2]
- Increased 2022 annualized dividend 7% to $3.54 per share
  – Over 100 years of consecutive dividend payments
- Completed liability management plan following spin of DTM
  – Retired $2.6 billion of long-term debt with funds from DTM's debt issuance
  – NPV positive, immediately operating EPS[3] accretive and supports long-term growth

Credit ratings	S&P	Moody's	Fitch
DTE Energy (unsecured)	BBB	Baa2	BBB
DTE Electric (secured)	A	Aa3	A+
DTE Gas (secured)	A	A1	A

$1 billion utility capital investment increase with minimal equity issuances in the 5-year plan

DTE

1. Funds from Operations (FFO) is calculated using operating earnings
2. Debt excludes a portion of DTE Gas' short-term debt and considers 50% of the junior subordinated notes and 100% of the convertible equity units as equity
3. Reconciliation of operating earnings (non-GAAP) to reported earnings included in the appendix

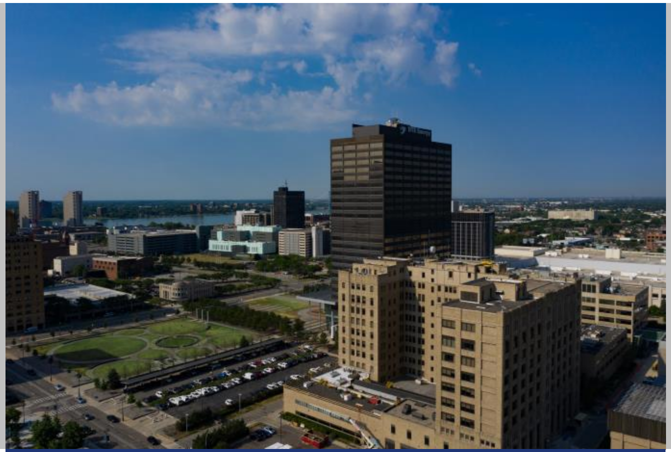
Environmental, social and governance efforts are key priorities; aspiring to be the best in the industry

Environment

- Transitioning towards net zero emissions at both utilities
- Accelerating transition to cleaner generation
- Protecting our natural resources

Social

- Focusing on the diversity, safety, well-being and success of employees
- Revitalizing neighborhoods and investing in communities
- Leader in volunteerism



Governance

- Focusing on the oversight of environmental sustainability, social and governance
- Ensuring board diversity
- Providing incentive plans tied to safety and customer satisfaction targets

Outperforming industry average in ESG metrics; AA score from MSCI and top quartile for Sustainalytics

DTE Electric targeting net zero carbon emissions by 2050

- Advancing our clean energy investments and plan to accelerate the modernization of our electric grid
- Retiring coal-fired power plants
- Accelerating voluntary renewables program, one of the largest in the nation
- Adding thousands of megawatts of wind and solar power
- Advocating for constructive public policy
- Assessing new and emerging technology; increasing energy efficiency and demand response

2023	2028	2040	2050
32%	50%	80%	Net zero
12 million metric tons of CO_2 reduced	19 million metric tons of CO_2 reduced	30 million metric tons of CO_2 reduced	38 million metric tons of CO_2 reduced

Note: CO_2 reduction from 2005 base

DTE Gas targeting net zero greenhouse gas (GHG) emissions by 2050

- Advancing our clean energy investments and upgrading and replacing aging infrastructure
- Growing CleanVision Natural Gas Balance program, the nation's first program to include both carbon offsets and RNG
- Progressing on major transmission renewal project
- Continuing main renewal upgrades and operational improvements

2020	2030	2040	2050
45%	65%	80%	Net zero

DTE

Note: reduction from 2005 base

MIGreenPower program providing affordable renewable energy solutions

- One of the largest voluntary renewable programs in the nation
- Average net cost to residential customer
  - Wind & solar program: 2.7 cents/kWh
  - Wind program: 1.9 cents/kWh
- An average business customer using 1,000 kWh/month can attribute 100% of their energy use to renewable resources for ~$23/month

Voluntary renewable customers

Ford | The Great Seal of the State of Michigan | University of Michigan
GM | Bedrock Detroit | Detroit Diesel

2017
program inception

46,000
residential customers subscribed

1,000+ MW
large business customers subscribed

DTE

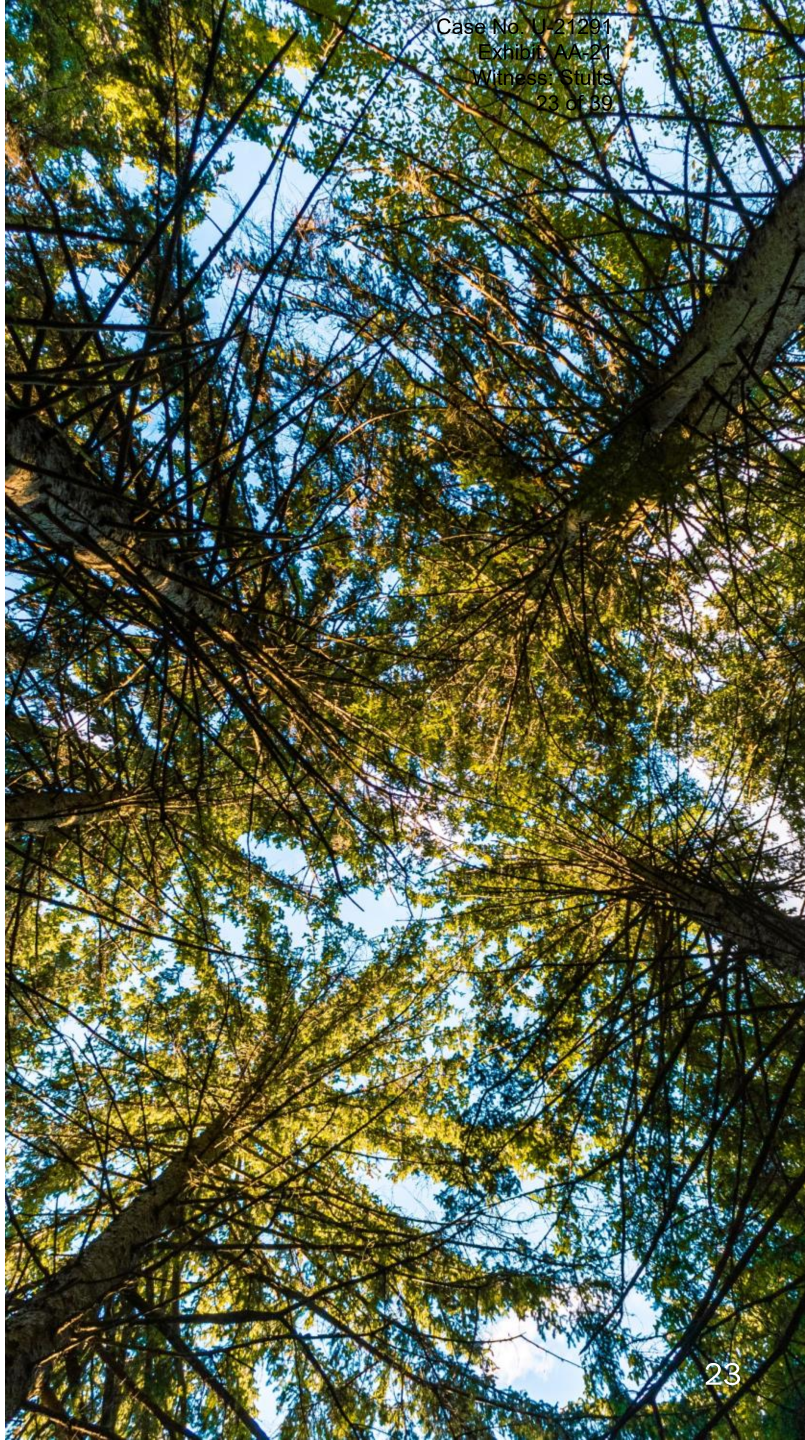
Natural Gas Balance program reducing GHG emissions

- Offering a way to affordably offset 25% to 100% of customers' greenhouse gas emissions from an average home's natural gas use
- RNG will be sourced by transforming landfill emissions and wastewater treatment plant by-products into usable gas
- Carbon offset program is focused on protecting Michigan forests that naturally absorb greenhouse gases
- Partnering with suppliers and customers across the natural gas chain
- Partnered with Bluesource, the nation's largest carbon offset developer, on the Greenleaf Improved Forest Management project in Michigan's Upper Peninsula to protect and preserve forests

2021
program inception

5,000+
customers subscribed

6.1 million
metric tons of GHG reduced by 2050

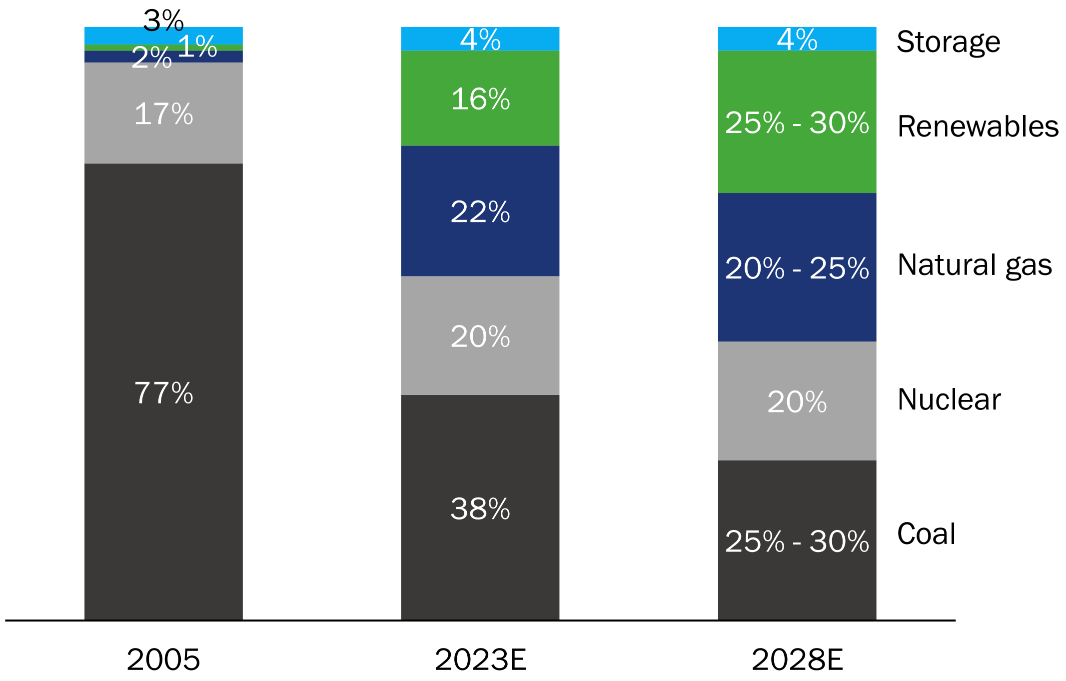


DTE

Note: GHG reduction from 2005 base

Marching toward net zero carbon emissions with an accelerated plan

Cleaner generation mix[1]
(MWh %)



DTE

1. Generation mix represents one potential pathway and is subject to change

Robust renewables energy portfolio

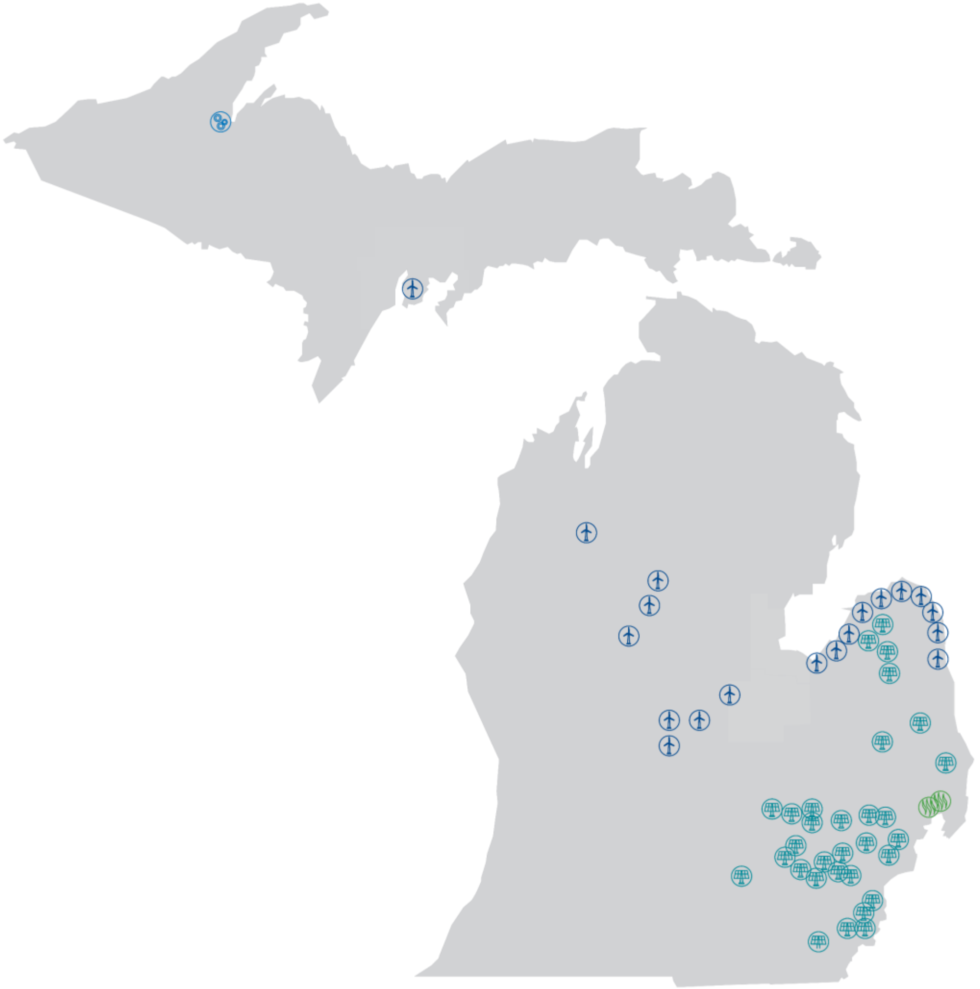
1,694 MW wind

144 MW solar

6 MW landfill

17 MW biomass

Renewable energy portfolio
1,860 MW capacity



DTE owned renewables 1,301 MW and PPAs 560 MW

Progressing on EV initiatives

Charging Forward Program

- Promoting EV education, infrastructure and adoption
- Offering residential charger rebates and infrastructure incentives

2021 major milestones

- 930 residential rebates approved and installed
- 1,000 public level 2 chargers approved and over 360 installed
- 90 direct current fast charger rebates approved across 40 sites and 26 installed
- Deployed two Blue Water Area Transit electric buses and six electric school buses

2019
program inception

140,000
gallons of gasoline saved

10,500
metric tons of CO_2 emissions reduced

DTE

Environmental sustainability is critical to creating long-term shareholder value

Driving collaboration in the fight against climate change

- Leading by example with aggressive goal to achieve net zero carbon emissions by 2050
- Key participant in the governor’s Michigan Council on Climate Solutions to develop and implement pathways to meet the state of Michigan’s economy-wide climate goals
- Leading EEI’s strategic plan for effective federal climate policy
- Member of the Michigan Advisory Council on Environmental Justice supporting development of long-term, sustainable solutions

Protecting our natural resources

- Targeting a 25% reduction of energy, water and waste at our facilities by 2022 compared to 2016 levels
- Providing habitats for hundreds of species of birds, mammals, fish and insects in our service territory
- Over 35 sites certified under the Wildlife Habitat Council
- Corporate-wide certification to the ISO14001 Standard for Environmental Management Systems

Committed to diversity, equity and inclusion; creating a safe and welcoming environment

Health and safety of our people is a priority

- Multiple safety committees spanning all levels of the company providing input into safety plans, addressing unique challenges of each business unit
- Received American Gas Association Safety Achievement Award for excellence in employee safety

Office of Diversity, Equity and Inclusion

- Led by our CEO and key executive leaders, including a Director of Diversity, Equity and Inclusion
- Focused on sustaining a diverse workforce which is representative of the communities we serve

Commitment to create a diverse, equitable and inclusive workforce

- Annual review of compensation practices to ensure equitable pay
- Formal training programs including unconscious bias training for employees and leaders
- Hiring people with disabilities and returning citizens

Employee resource groups promote a safe and welcoming environment and offer professional development, networking, mentoring and support

AIM
Differently-abled group

AMEA
Asian and Middle Eastern group

FAMILY
Family oriented group

POP
LGBTQ group

REACH
Black professionals group

SOMOS
Latinx professionals group

SURGE
Young professionals group

VETS
Veteran empowerment group

WOMEN OF DTE
Women's group

Leader in volunteerism and strengthening ties with our communities

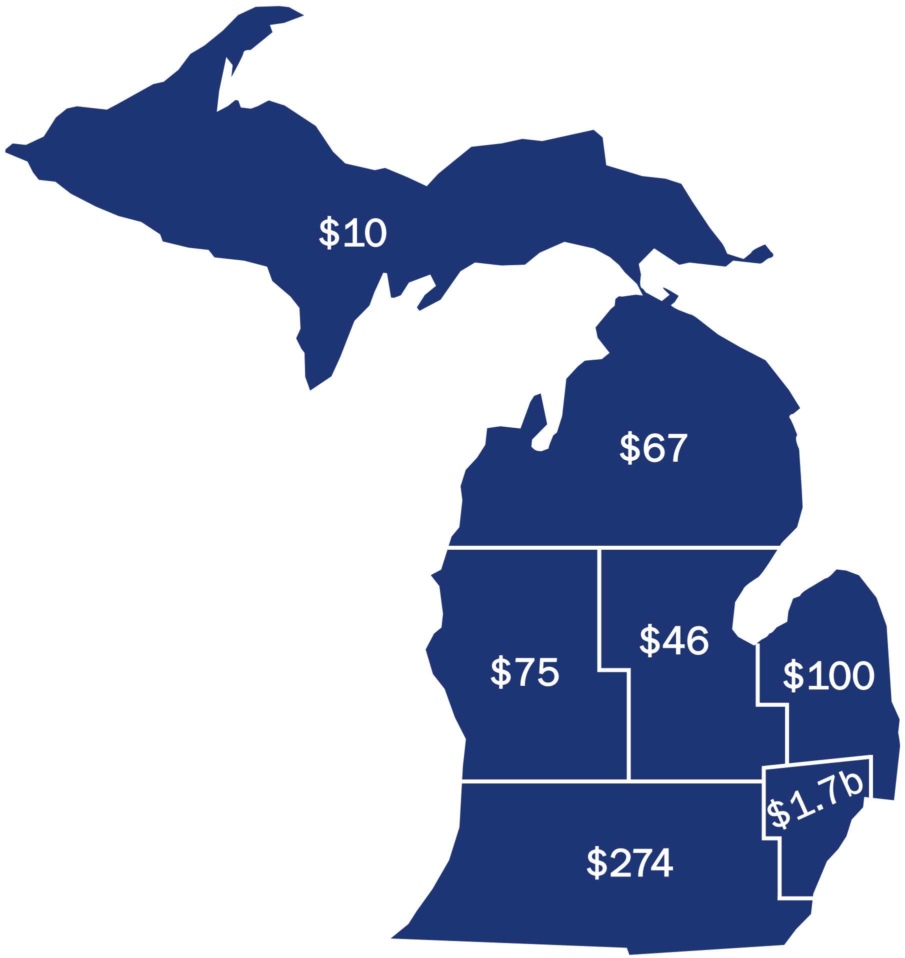
2,900	volunteers
47,000	hours volunteered
779	nonprofits helped
$90m	awarded for energy assistance
1,400	students employed at DTE through programs statewide
16,000	customers enrolled in low-income self-sufficiency plans

DTE

Building on the momentum of the last decade, DTE is committed to Michigan investments and supplier diversity

$2.2b	invested in Michigan businesses in 2020
44,000	jobs created since 2010
$969m	invested with Detroit suppliers in 2020
$744m	invested with diverse women and minority owned suppliers in 2020
149	certified diverse suppliers
32	supplier diversity awards earned since 2018

2020 Michigan spend
(millions)



DTE

Award-winning commitment to being a top ESG employer in the country

Corporate citizenship awards

Veteran friendly employer

Gallup Great Workplace Award 9 consecutive years

Ambassadors Championing Excellence Award for commitment to supporting minority businesses

Overall excellence in diversity

America's Most Responsible Companies 2021

Supplier diversity awards

Superior corporate citizenship and community involvement

Inclusion of women-owned businesses in their supply chains

Top supplier diversity program

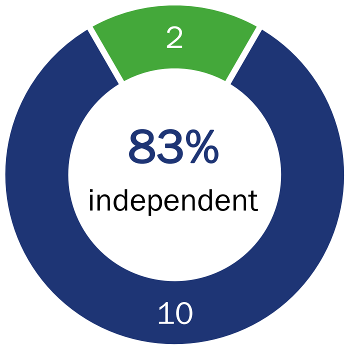
Top employer
Top supplier diversity program

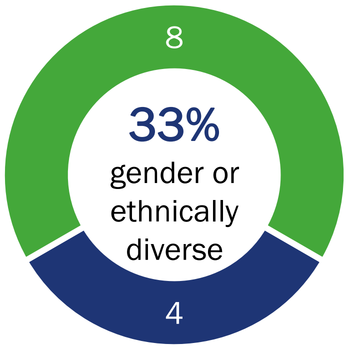
Top supplier diversity program

Governance framework provides shareholder rights and enables sustainable value creation

Best-in-class governance practices

- Lead Independent Director
- All board committees are composed exclusively of independent Directors
- Stock ownership guidelines for non-employee Directors
- Majority voting standard
- Annual Director elections
- Established corporate governance guidelines
- Publication of Environmental, Social, Governance and Sustainability report
- Shareholder ability to call a special meeting
- No supermajority voting provisions to approve mergers or amend charter
- Overboarding policy





9 years

average tenure

67 years

average age

Executive management compensation plan is aligned with our core priorities

Priorities	Performance-based compensation elements	
	Annual incentive metrics	**Long-term metrics**
Highly engaged employees	• Employee engagement • Employee safety	
Top decile customer satisfaction	• Customer satisfaction • Customer complaints	
Distinctive continuous improvement capability	• Utility operating excellence • Customer satisfaction improvement	
Strong political & regulatory context	• Customer satisfaction improvement • Utility operating excellence index	
Clear growth & value creation strategy		• Relative TSR
Superior & sustainable financial performance	• EPS • Cash flow	• Balance sheet health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DTE INVESTOR RELATIONS
2021 ESG REPORT
DTE

Overview

Business Update

Environmental, Social & Governance (ESG)

Appendix

Targeting higher end of 5% - 7% operating EPS[1] growth from 2021 original guidance midpoint to 2022 early outlook

(millions, except EPS)

	2022 early outlook
DTE Electric	$915 - $929
DTE Gas	227 - 237
DTE Vantage	85 - 95
Energy Trading	15 - 25
Corporate & Other	(127) - (117)
DTE Energy	**$1,115 - $1,169**
Operating EPS from continuing operations	**$5.70 - $5.97**

1. Reconciliation of operating earnings (non-GAAP) to reported earnings included in the appendix

DTE Electric and DTE Gas regulatory update

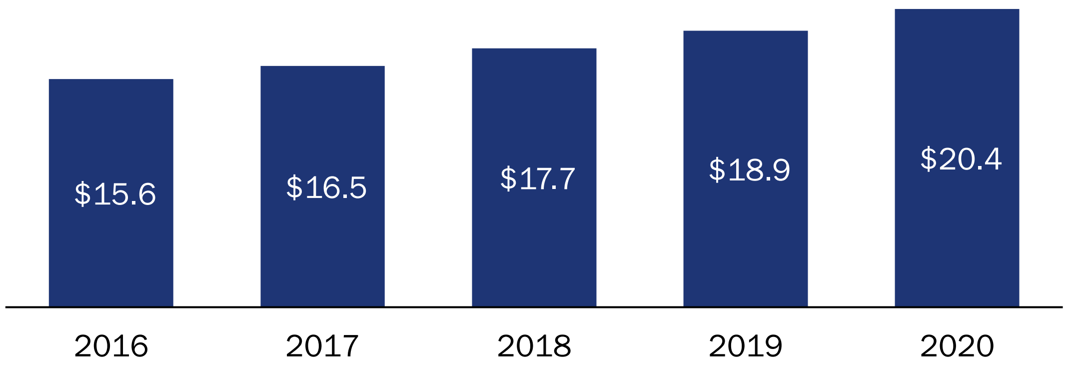
	General rate order	Received order	Effective	Rate recovery	ROE	Capital structure	Rate base
DTE Gas	General rate order (U-20940)	December 2021	January 1, 2022	$84 million	9.9%	51% equity 49% debt	$5.5 billion

	Order	Received order	Additional details
DTE Electric	Renewable energy plan (U-18232)	July 2020	350 MW of additional renewable energy by 2022 (225 MW of wind and 125 MW of solar)
	Alternative rate case strategy (U-20835)	April 2021	Delays rate case filing to 2022 $102 million
	Voluntary renewable plan (U-20713)	June 2021	Additional 420 MW in 2022; additional 380 MW from 2023 - 2025 Program offerings to provide low-income customers greater access to renewable energy
	Innovative, one-time customer refund regulatory liability (U-20921)	December 2020	$30 million voluntary refund
	Securitization filing (U-21015)	June 2021	$73.2 million for River Rouge retirement and $156.9 million for vegetation management program Funding planned for March 2022
	Innovative, one-time vegetation management refund regulatory liability (U-21128)	December 2021	$90 million total investment (2022 – 2024) to combat extreme weather-related power outages with no impact to customer bills
DTE Gas	Voluntary emissions offset plan (U-20839)	October 2020	Comprised of a combination of both carbon offsets and RNG 95% of planned emissions reduction is carbon emissions 5% of planned emissions reduction is RNG

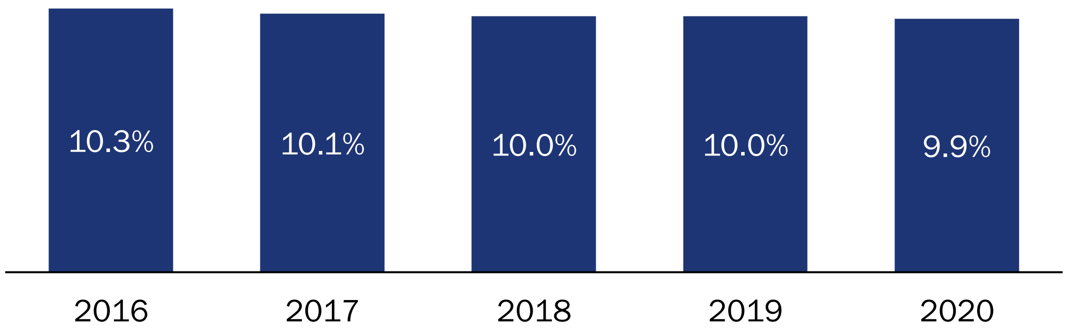
DTE

Utilities have provided solid rate base growth

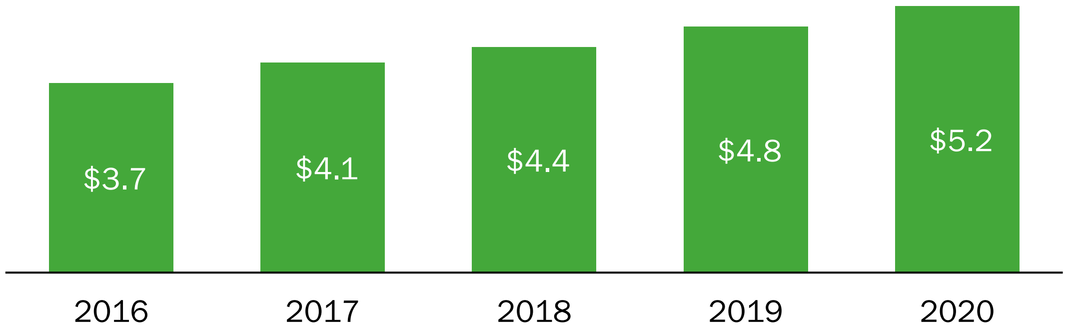
DTE Electric rate base[1]
(billions)



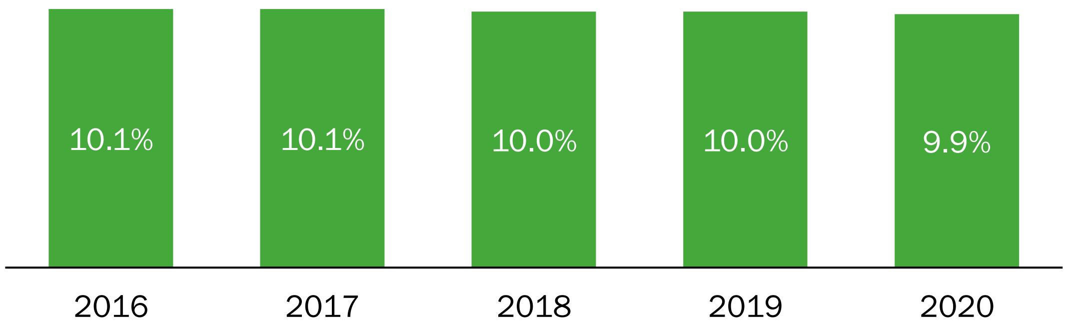
DTE Electric authorized ROE



DTE Gas rate base[1]
(billions)



DTE Gas authorized ROE



1. Year-end balances; Electric rate base includes renewables investment

Reconciliation of reported to operating earnings (non-GAAP)

Use of Operating Earnings Information – Operating earnings exclude non-recurring items, certain mark-to-market adjustments and discontinued operations. DTE Energy management believes that operating earnings provide a more meaningful representation of the company's earnings from ongoing operations and uses operating earnings as the primary performance measurement for external communications with analysts and investors. Internally, DTE Energy uses operating earnings to measure performance against budget and to report to the Board of Directors.

In this presentation, DTE Energy provides guidance for future period operating earnings. It is likely that certain items that impact the company's future period reported results will be excluded from operating results. A reconciliation to the comparable future period reported earnings is not provided because it is not possible to provide a reliable forecast of specific line items (i.e. future non-recurring items, certain mark-to-market adjustments and discontinued operations). These items may fluctuate significantly from period to period and may have a significant impact on reported earnings.

DTE ENERGY BUSINESS UPDATE

SEPTEMBER 20-21, 2021

DTE

Safe harbor statement

The information contained herein is as of the date of this document. DTE Energy expressly disclaims any current intention to update any forward-looking statements contained in this document as a result of new information or future events or developments. Words such as “anticipate,” “believe,” “expect,” “may,” “could,” “would,” “projected,” “aspiration,” “plans” and “goals” signify forward-looking statements. Forward-looking statements are not guarantees of future results and conditions but rather are subject to various assumptions, risks and uncertainties. This document contains forward-looking statements about DTE Energy’s financial results and estimates of future prospects, and actual results may differ materially. Many factors impact forward-looking statements including, but not limited to, the following: risks related to the spin-off of DT Midstream, including that providing DT Midstream with the transition services previously negotiated could disrupt or adversely affect our business, results of operations and financial condition; the duration and impact of the COVID-19 pandemic on DTE Energy and customers, impact of regulation by the EPA, the EGLE, the FERC, the MPSC, the NRC, and for DTE Energy, the CFTC and CARB, as well as other applicable governmental proceedings and regulations, including any associated impact on rate structures; the amount and timing of cost recovery allowed as a result of regulatory proceedings, related appeals, or new legislation, including legislative amendments and retail access programs; economic conditions and population changes in our geographic area resulting in changes in demand, customer conservation, and thefts of electricity and, for DTE Energy, natural gas; the operational failure of electric or gas distribution systems or infrastructure; impact of volatility in prices in the international steel markets on DTE Energy’s power and industrial projects operations; the risk of a major safety incident; environmental issues, laws, regulations, and the increasing costs of remediation and compliance, including actual and potential new federal and state requirements; the cost of protecting assets against, or damage due to, cyber incidents and terrorism; health, safety, financial, environmental, and regulatory risks associated with ownership and operation of nuclear facilities; volatility in commodity markets, deviations in weather, and related risks impacting the results of DTE Energy’s energy trading operations; changes in the cost and availability of coal and other raw materials, purchased power, and natural gas; advances in technology that produce power, store power or reduce power consumption; changes in the financial condition of significant customers and strategic partners; the potential for losses on investments, including nuclear decommissioning and benefit plan assets and the related increases in future expense and contributions; access to capital markets and the results of other financing efforts which can be affected by credit agency ratings; instability in capital markets which could impact availability of short and long-term financing; the timing and extent of changes in interest rates; the level of borrowings; the potential for increased costs or delays in completion of significant capital projects; changes in, and application of, federal, state, and local tax laws and their interpretations, including the Internal Revenue Code, regulations, rulings, court proceedings, and audits; the effects of weather and other natural phenomena on operations and sales to customers, and purchases from suppliers; unplanned outages; employee relations and the impact of collective bargaining agreements; the availability, cost, coverage, and terms of insurance and stability of insurance providers; cost reduction efforts and the maximization of plant and distribution system performance; the effects of competition; changes in and application of accounting standards and financial reporting regulations; changes in federal or state laws and their interpretation with respect to regulation, energy policy, and other business issues; contract disputes, binding arbitration, litigation, and related appeals; and the risks discussed in DTE Energy’s public filings with the Securities and Exchange Commission. New factors emerge from time to time. We cannot predict what factors may arise or how such factors may cause results to differ materially from those contained in any forward-looking statement. Any forward-looking statements speak only as of the date on which such statements are made. We undertake no obligation to update any forward-looking statement to reflect events or circumstances after the date on which such statement is made or to reflect the occurrence of unanticipated events. This document should also be read in conjunction with the Forward-Looking Statements section of the joint DTE Energy and DTE Electric 2020 Form 10-K and 2021 Form 10-Q (which sections are incorporated by reference herein), and in conjunction with other SEC reports filed by DTE Energy and DTE Electric.

Focusing on our employees, customers and communities while delivering for investors

Employees

- Recognized as a Gallup Great Workplace for the ninth consecutive year
- Building on our diversity, equity and inclusion focus with acceleration of commitment to build an even better workplace

Customers

- Continued successfully growing our voluntary renewables program with 1,300 MW approved and 950 MW subscribed; increasing affordability and access to low-income customers
- Partnered with Ford Motor Company on new rooftop solar installation and battery storage technology

Community

- Named to the Civic 50 by Points of Light for the fourth consecutive year
- Launched Tree Trim Academy to create 200 high-paying jobs in Detroit

Investors

- Strong 2Q results; raised 2021 operating earnings[1] guidance
- Dividend payout to be consistent with pure-play utility peers

1. Reconciliation of operating earnings (non-GAAP) to reported earnings included in the appendix

Continuing to deliver successful operational results

DTE Electric

- Targeting net zero carbon emissions by 2050
  - Retired River Rouge Power Plant in 2Q 2021
- Voluntary renewables program MIGreenPower is one of the largest in the country with over 35,000 customers and 950 MW of subscriptions

DTE Gas

- Targeting net zero greenhouse gas emissions by 2050
- Began second phase of construction on major transmission renewal project in Northern Michigan
- CleanVision Natural Gas Balance Program announced in 2021 and growing rapidly with over 3,000 customers

Power & Industrial Projects

- Began construction on new RNG facility in South Dakota; in-service 3Q 2022
- Advanced discussions on new industrial energy and RNG projects
- Received The Association of Union Contractors Project of the Year award for the Ford Dearborn cogeneration project

DTE

Maintaining 5% - 7% long-term operating EPS[1] growth target

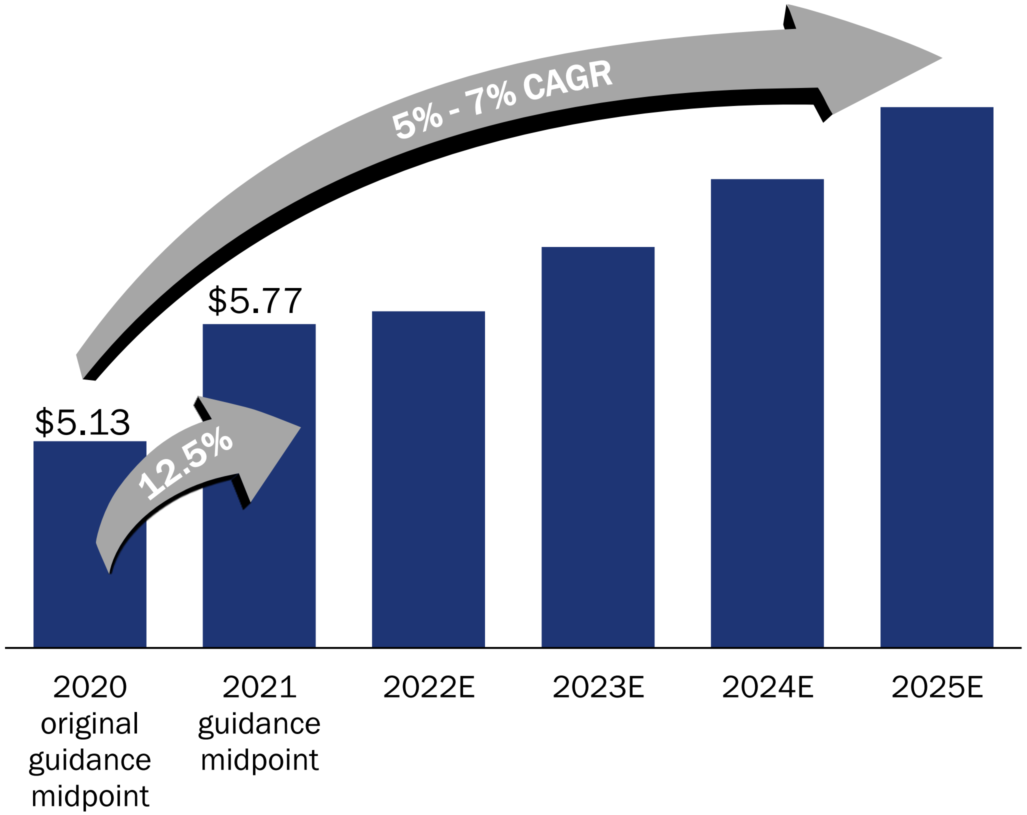
Continued strength in 2021

- ✓ Increased 2021 operating EPS guidance from a midpoint of $5.51 per share to $5.77 per share
- ✓ Positioning DTE for future success
- ✓ Confirming 5% - 7% operating EPS growth rate from 2020 original guidance to 2025

Long-term growth driven by strength of utilities

- ✓ Generating 90% of operating earnings from regulated utilities with $17 billion investment in 5-year plan
- ✓ Utility investment focused on clean generation and improving reliability and the customer experience

DTE annualized operating EPS from continuing operations

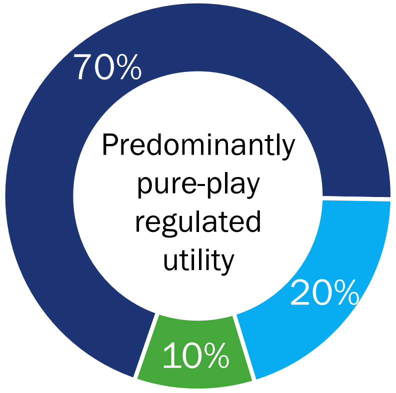


1. Reconciliation of operating earnings (non-GAAP) to reported earnings included in the appendix

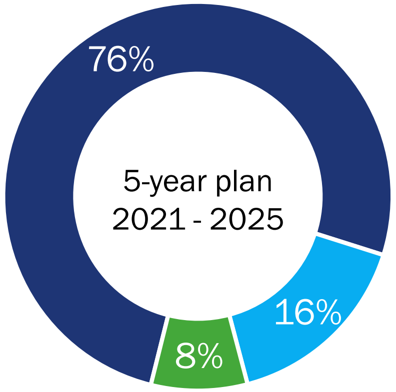
DTE Energy benefits from being a predominantly pure-play regulated utility

Enhanced strategic focus	✓ Premier, predominantly pure-play regulated electric and natural gas utility
Investments in growth opportunities	✓ Substantially growing rate base with $17 billion of utility growth capital investment, a 13% increase over prior plan ✓ Aligned with aggressive ESG targets, net zero greenhouse gas emissions by 2050
Distinguished growth profiles	✓ 5% - 7% operating EPS[1] growth target from 2020 original guidance midpoint
Improved investor alignment	✓ Attracts shareholders desiring predictable, low-risk growth associated with regulated utilities
Seasoned management team	✓ Track record of providing clean, safe, reliable and affordable energy to our customers and being a force for growth in the communities where we live and serve
Competitive dividends	✓ Targeting dividend growth and payout ratio consistent with pure-play utility peers

Operating earnings



Capital investment



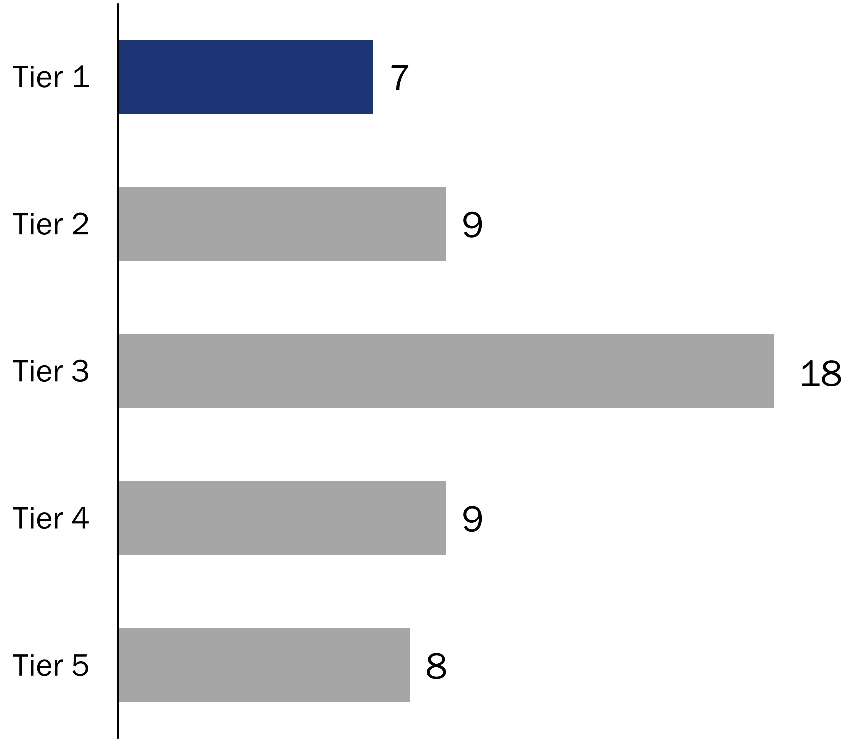
Electric utility   Gas utility   Non-utility

DTE

1. Reconciliation of operating earnings (non-GAAP) to reported earnings included in the appendix

Two high-quality utilities operating in a constructive regulatory environment

Ranking of U.S. regulatory jurisdictions[1]
(Michigan in tier 1)



10-month rate cases supported by legislation; recovery mechanisms for renewables and gas infrastructure; 5-year distribution planning

Michigan Public Service Commission

Dan Scripps
Chair

Katherine Peretick
Commissioner

Tremaine Phillips
Commissioner

2021 - 2025 MPSC key objectives

- ✓ Empower customers to make informed utility choices
- ✓ Assure safe, secure and reliable utility services and infrastructure
- ✓ Assure accessible and affordable utility services through regulatory oversight
- ✓ Cultivate open and diverse communication and education

DTE

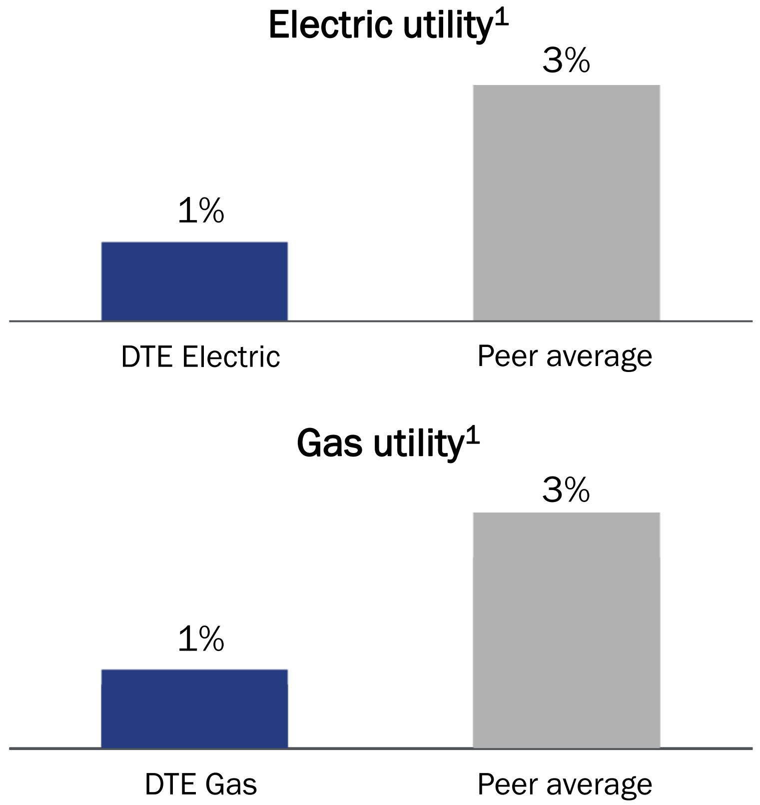
1. UBS, December 2020 (50 states and Washington, D.C.)

Distinctive continuous improvement culture drives strong track record of cost management vs. peer average

All 10,000+ employees engaged in CI to surface and solve problems

- Controlling costs while improving the customer experience and targeting rate increases below 3%
  - Productivity enhancements
  - Technology innovations
  - Automation
  - Infrastructure replacements
  - Transition to cleaner energy
- Lowered average electric industrial customer rate 11% since 2012

Average annual percentage change in O&M costs 2008 - 2020



1. Source: SNL Financial, FERC Form 1 and FERC Form 2; excluding electric fuel and purchase power and gas production expense

DTE Electric progressing on key initiatives; accelerating distribution and generation investments

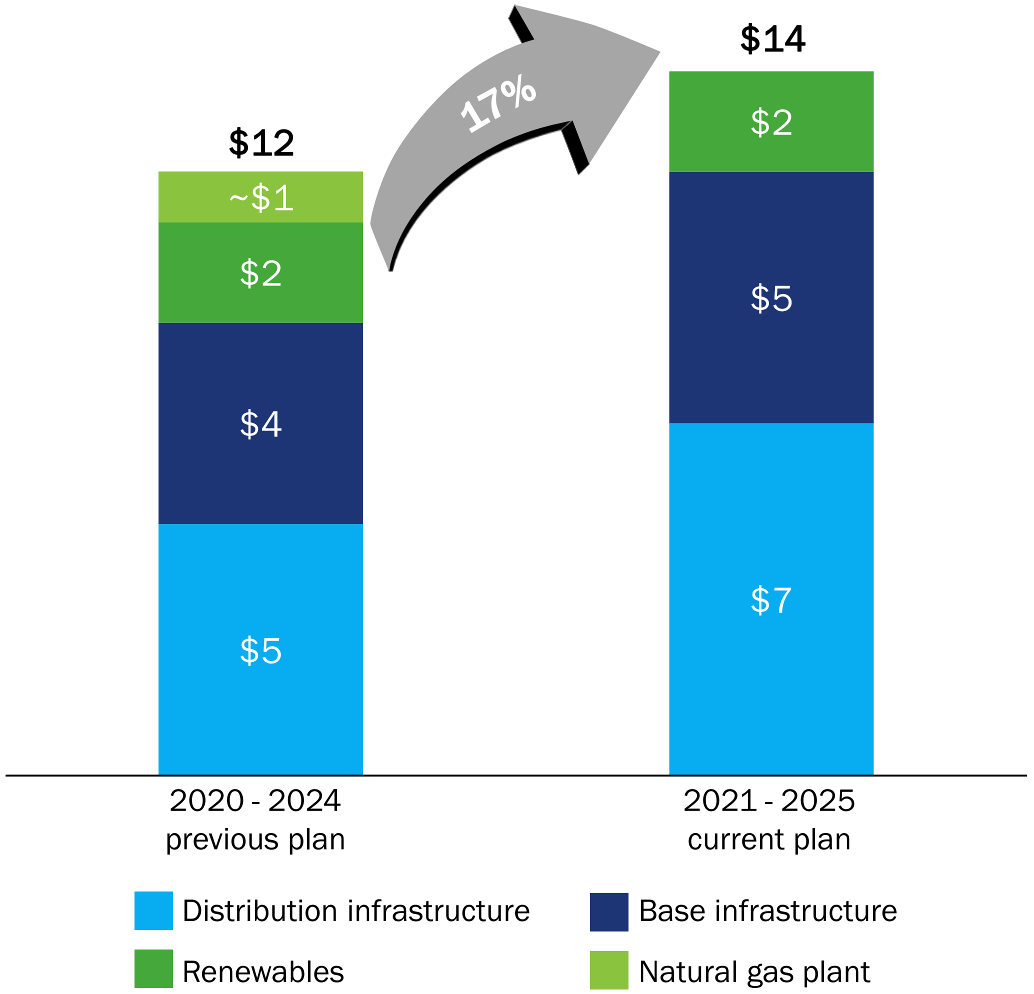
Advancing our clean energy investments and plan to accelerate the modernization of our electric grid

- Progressing toward net zero carbon emissions target by 2050
- Accelerating voluntary renewables program, one of the largest in the industry
- Announced commitment to build extensive electric vehicle charging network

Targeting 7% - 8% long-term operating earnings[1] growth from 2020 original guidance midpoint

- Investing in generation and distribution for clean and reliable energy
- Upgrading substations for load growth and to address aging infrastructure

Electric investment
(billions)



DTE

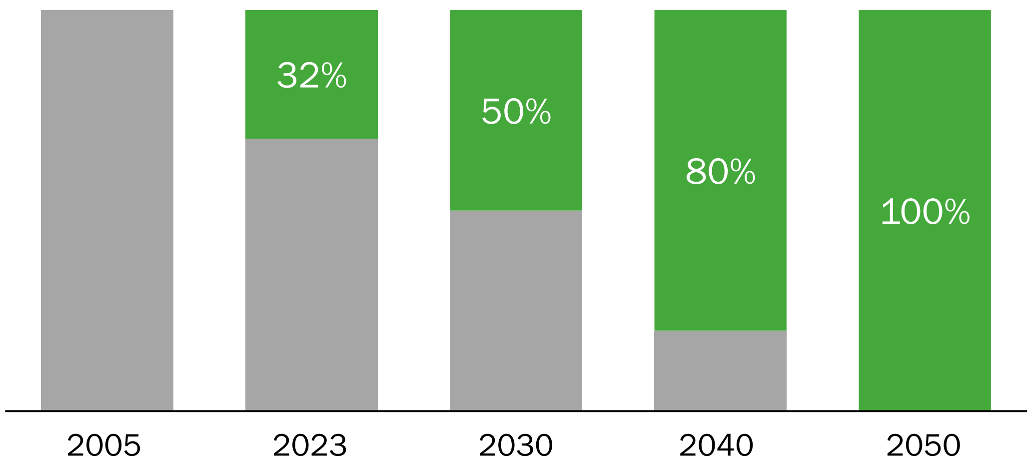
1. Reconciliation of operating earnings (non-GAAP) to reported earnings included in the appendix

MIGreenPower offers DTE Electric customers simple and affordable renewable energy solutions supporting wind and solar projects

DTE Electric - MIGreenPower

- Program initiation: February 2017
- 35,000 customers
- 950 MW subscribed
- Average net cost to residential customer
  - Wind & solar program: 3.1 cents/kWh
  - Wind program: 2.2 cents/kWh
- An average business customer using 1,000 kWh/month can attribute 100% of their energy use to renewable wind resources for ~$19/month

DTE Electric carbon emissions reductions



DTE

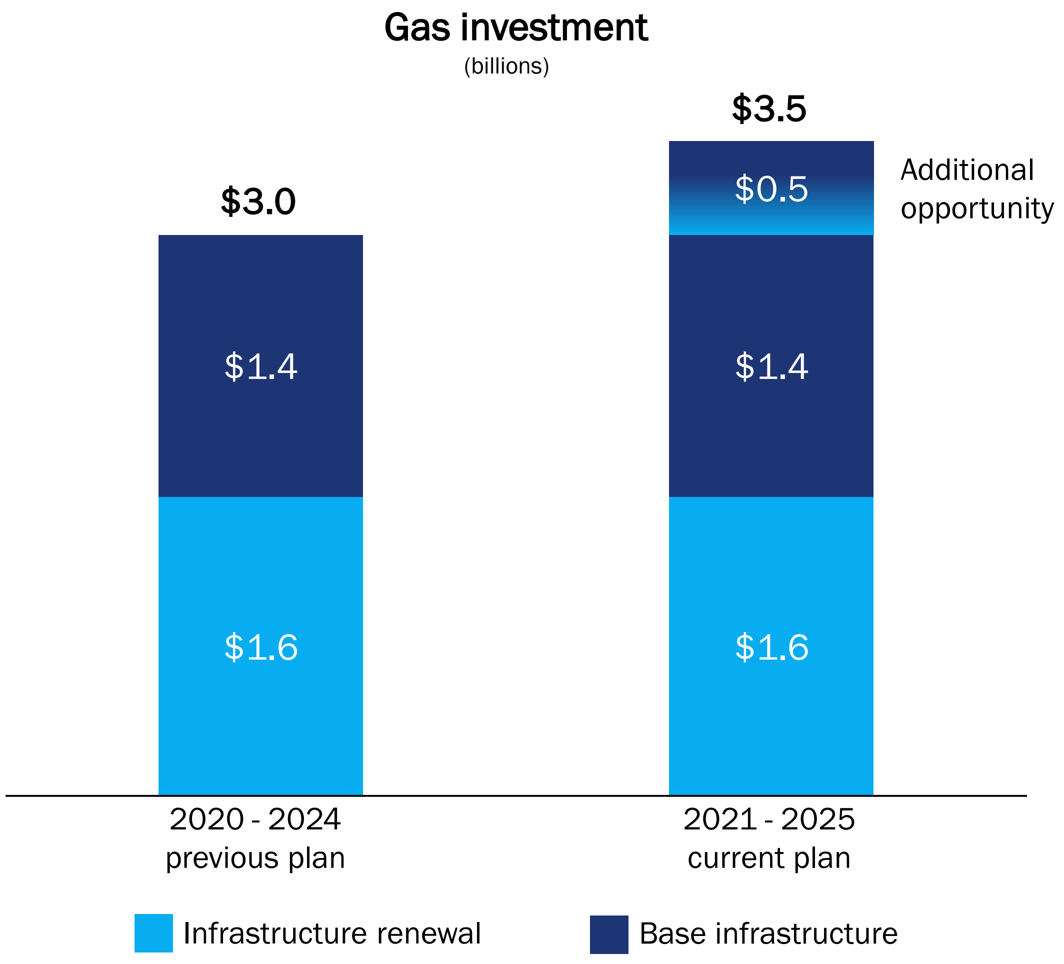
DTE Gas progressing on key initiatives; replacing aging infrastructure to reduce greenhouse gas emissions

Advancing our clean energy investments and upgrading and replacing aging infrastructure

- Targeting net zero greenhouse gas emissions by 2050
- Announced CleanVision Natural Gas Balance, the nation’s first program to include both carbon offsets and renewable natural gas; executed agreement to secure forestry carbon offsets
- Progressing on major transmission renewal project
- Continuing main renewal upgrades and operational improvements; completed 206 main renewal miles in 2020

Targeting 9% long-term operating earnings[1] growth from 2020 original guidance midpoint

- Investing in main renewal, pipeline and transmission integrity and technology innovation



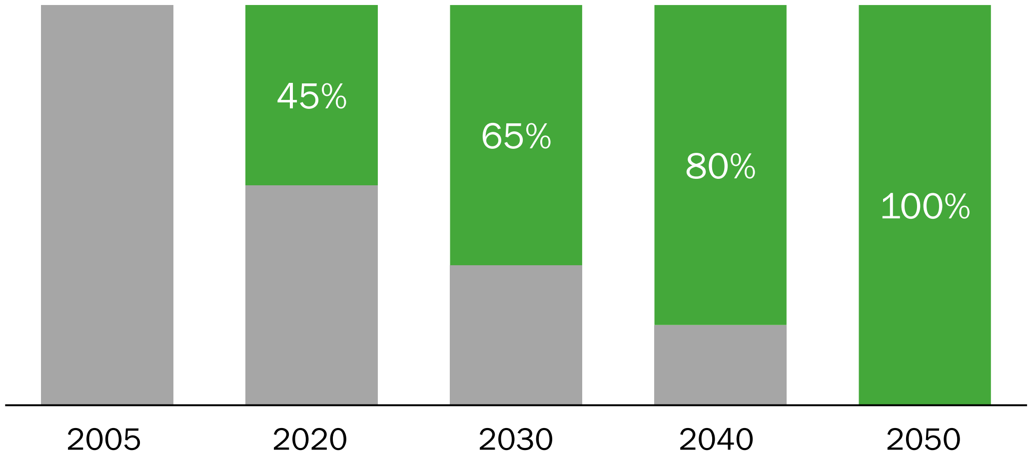
1. Reconciliation of operating earnings (non-GAAP) to reported earnings included in the appendix

CleanVision Natural Gas Balance helps reduce the carbon emissions footprint of DTE Gas customers through carbon offsets and RNG

DTE Gas - Natural Gas Balance

- Program initiation: January 2021
- Customers: 3,000+
- RNG will be sourced by transforming landfill emissions and wastewater treatment plant by-products into usable gas
- Carbon offset program is focused on protecting Michigan forests that naturally absorb greenhouse gases
- Offers customers a way to affordably offset 25% to 100% of greenhouse gas emissions from an average home's natural gas use
- Partnered with Bluesource, the nation's largest carbon offset developer, on the Greenleaf Improved Forest Management project in Michigan's Upper Peninsula to protect and preserve forests

DTE Gas greenhouse gas emissions reductions



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2021 ESG REPORT

2019 - 2020 CORPORATE CITIZENSHIP HIGHLIGHTS

DTE

Appendix

Raised 2021 operating EPS[1] guidance

(millions, except EPS)

	Original guidance	Revised guidance	Primary drivers
DTE Electric	$826 - $840	$853 - $867	Warmer than normal weather, sustained continuous improvement and uncollectible expense favorability
DTE Gas	202 - 212	202 – 212	
Power & Industrial Projects	147 - 163	152 - 168	Higher REF volumes
Energy Trading	15 - 25	30 - 40	Primarily realization of gas storage asset gains from Texas weather event
Corporate & Other	(148) - (138)	(148) - (138)	
DTE Energy	**$1,042 - $1,102**	**$1,089 - $1,149** ⬆	
Operating EPS from continuing operations	**$5.36 - $5.66**	**$5.62 - $5.92** ⬆	

Strong 2021 financial results allow for increased guidance and positions DTE for future success

DTE

1. Reconciliation of operating earnings (non-GAAP) to reported earnings included in the appendix

Revised 2021 cash flow and capital expenditures guidance to reflect DTM spin impacts

Cash flow

(billions)	Original guidance	Revised guidance
Cash from operations[1]	$3.0	$2.7
Capital expenditures	(4.2)	(3.9)
Free cash flow	**($1.2)**	**($1.2)**
Dividends	(0.8)	(0.8)
Net cash	**($2.0)**	**($2.0)**
Debt financing		
Impacts to continuing operations		
Issuances	$2.1	$2.3
Redemptions	(0.5)	(0.7)
Impacts due to spin of DTM		
DTM distribution	-	3.0
Spin-related redemptions[2]	-	(3.0)
Total debt financing	**$1.6**	**$1.6**
Change in cash on hand	**($0.4)**	**($0.4)**

Capital expenditures

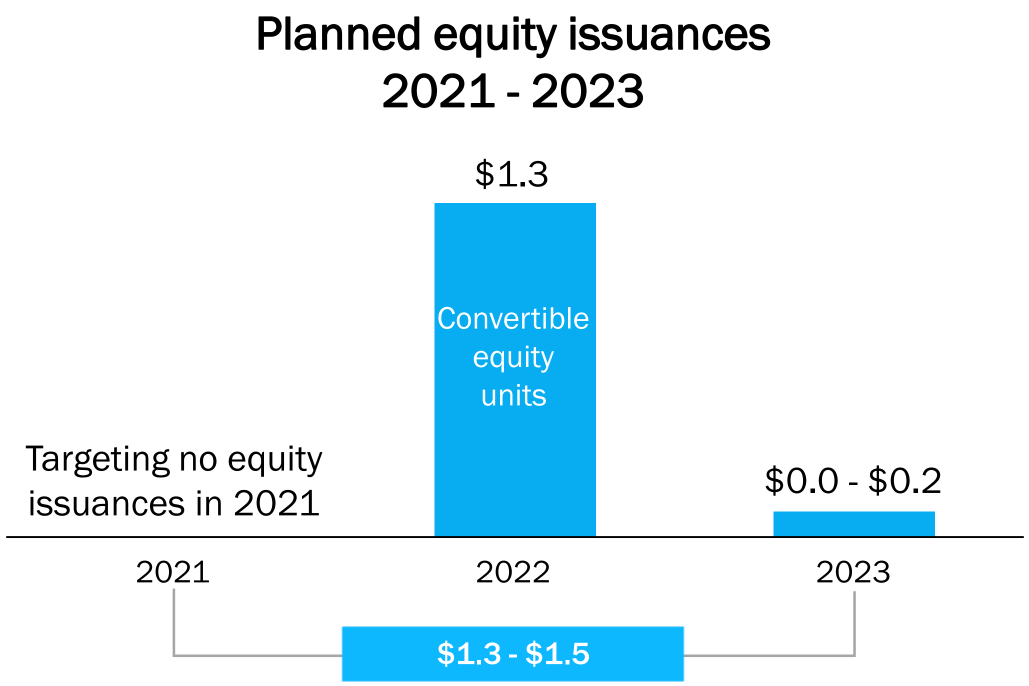
(millions)	Original guidance	Revised guidance
DTE Electric		
Base infrastructure	$1,030	$1,030
New generation	950	950
Distribution infrastructure	1,030	1,030
	$3,010	**$3,010**
DTE Gas		
Base infrastructure	$325	$325
Main renewal	295	295
	$620	**$620**
Non-utility	**$500 - $700**	**$200 - $350**
Total	**$4,130 - $4,330**	**$3,830 - $3,980**

DTE

1. Includes equity issued for employee benefit programs
2. Includes $0.4 billion of debt breakage fees

Maintaining strong cash flow, balance sheet and credit profile

(billions)



- Issued $1 billion in green bonds in 2021; $2 billion issued in total in the past four years
- Strong investment-grade credit rating
  - Targeting ~16% FFO[1] / Debt[2]
- Significant debt paydown with proceeds from DTM debt raise
  - Retired ~$2.6 billion of long-term parent debt

Credit ratings	S&P	Moody's	Fitch
DTE Energy (unsecured)	BBB	Baa2	BBB
DTE Electric (secured)	A	Aa3	A+
DTE Gas (secured)	A	A1	A

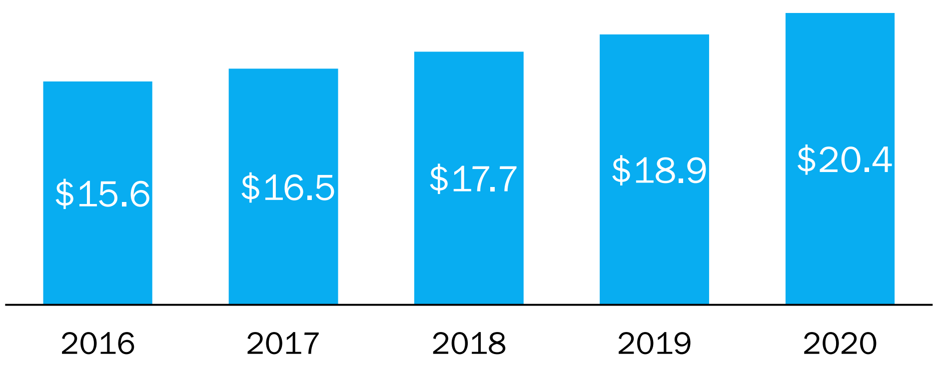
Strong cash flows have reduced equity needs in plan

DTE

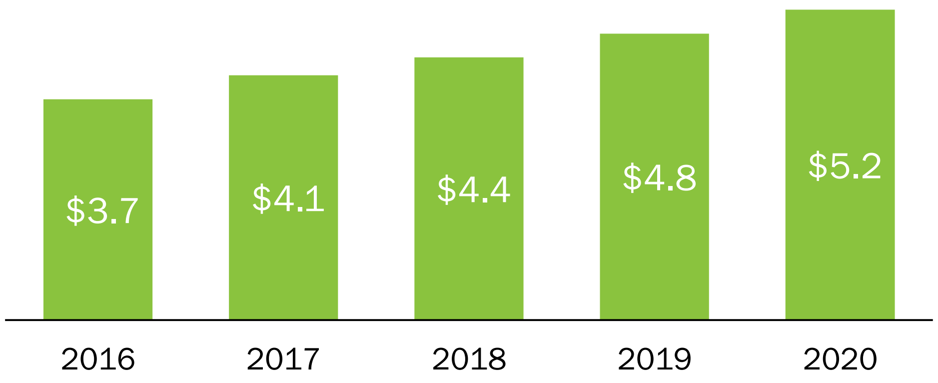
1. Funds from Operations (FFO) is calculated using operating earnings
2. Debt excludes a portion of DTE Gas' short-term debt and considers 50% of the junior subordinated notes and 100% of the convertible equity units as equity

Utilities have provided solid rate base growth while achieving authorized returns

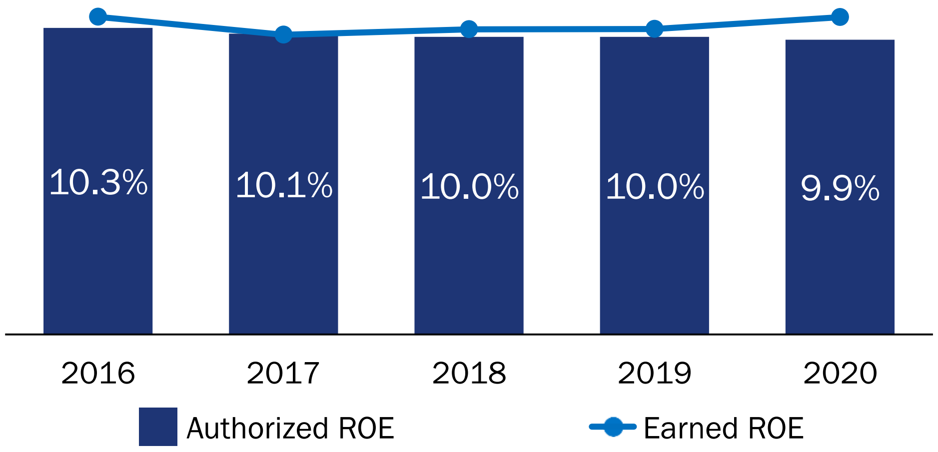
DTE Electric rate base
(billions)



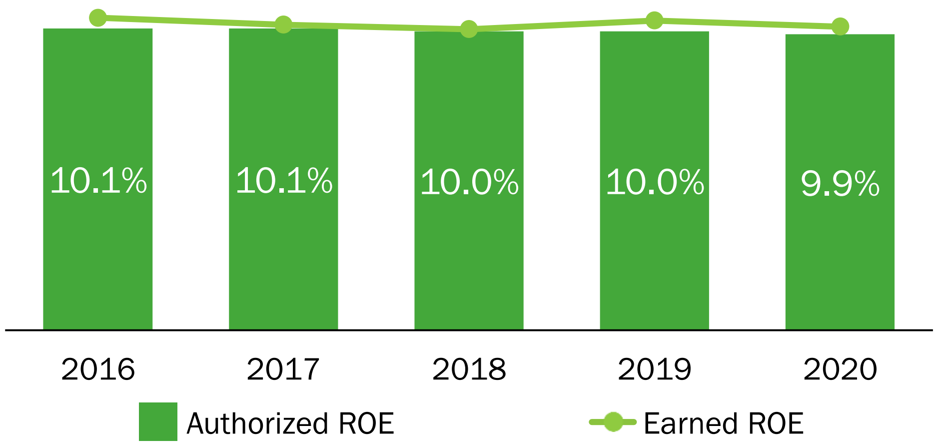
DTE Gas rate base
(billions)



DTE Electric ROE



DTE Gas ROE



DTE

DTE Electric and DTE Gas regulatory update

DTE Electric

- Renewable energy plan (U-18232)
  - Received order: July 2020
  - 350 MW of additional renewable energy by 2022 (225 MW of wind and 125 MW of solar)
- Innovative, one-time customer refund regulatory liability (U-20921)
  - Received order: December 2020
  - $30 million voluntary refund
- Alternative rate case strategy (U-20835)
  - Received order: April 2021
  - Delays rate case filing to October 2021 or later
- Voluntary renewable plan (U-20713)
  - Received order: June 2021
  - Additional 420 MW in 2022; additional 380 MW from 2023 - 2025
  - Program offerings to provide low-income customers greater access to renewable energy
- Securitization filing (U-21015)
  - Received order: June 2021
  - $73.2 million for River Rouge retirement and $156.9 million for vegetation management program

DTE Gas

- General rate case filed February 2021 (U-20940)
  - Effective: January 1, 2022
  - Rate request: $195 million
  - ROE: 10.25%
  - Capital structure: 52% equity, 48% debt
  - Rate base: $5.6 billion
  - Proposal for decision expected: September 2021
- Voluntary emissions offset plan (U-20839)
  - Received order: October 2020
  - Comprised of a combination of both carbon offsets and Renewable Natural Gas (RNG)
  - 95% of planned emissions reduction is carbon emissions
  - 5% of planned emissions reduction is RNG

Environmental, social and governance efforts are key priorities; aspiring to be the best in the industry

Environmental

Transitioning towards net zero greenhouse gas emissions

Delivering clean and reliable energy to customers

Protecting our natural resources

Social

Focusing on the diversity, safety, well-being and success of our employees

Committing to a strong culture provides a solid framework for success

Revitalizing neighborhoods and investing in communities

World-class volunteerism

Governance

Focusing on the oversight of environmental sustainability, social and governance

Ensuring board diversity

Providing incentive plans tied to safety and customer satisfaction targets

DTE

Award-winning commitment to being a top ESG employer in the country

Superior corporate citizenship and community involvement

Ambassadors Championing Excellence Award for commitment to supporting minority businesses

Veteran friendly employer

America's Most Responsible Companies 2021

Gallup Great Workplace Award 9 consecutive years

Inclusion of women-owned businesses in their supply chains

Overall excellence in diversity

Environmental sustainability is critical to the creation of long-term shareholder value

Driving collaboration in the fight against climate change

- Leading by example with aggressive goal to achieve net zero carbon emissions by 2050
- Active participant in coalitions that advocate for strong environmental public policies
- Key participant in Governor Whitmer's initiative to develop and implement pathways to meet the state of Michigan's economy-wide climate goals
- Leading EEI's strategic plan for effective federal climate policy

Protecting our natural resources and promoting environmental sustainability through stewardship and conservation

- Targeting a 25% reduction of energy, water and waste at our facilities by 2022 compared to 2016 levels
- Providing habitats for hundreds of species of birds, mammals, fish and insects in our service territory
- Over 35 sites certified under the Wildlife Habitat Council
- Received Corporate Conservation Leadership award from the Wildlife Habitat Council for leadership in wildlife management
- Corporate-wide certification to the ISO14001 Standard for Environmental Management Systems

DTE

Continuing the journey to provide clean and reliable energy to customers

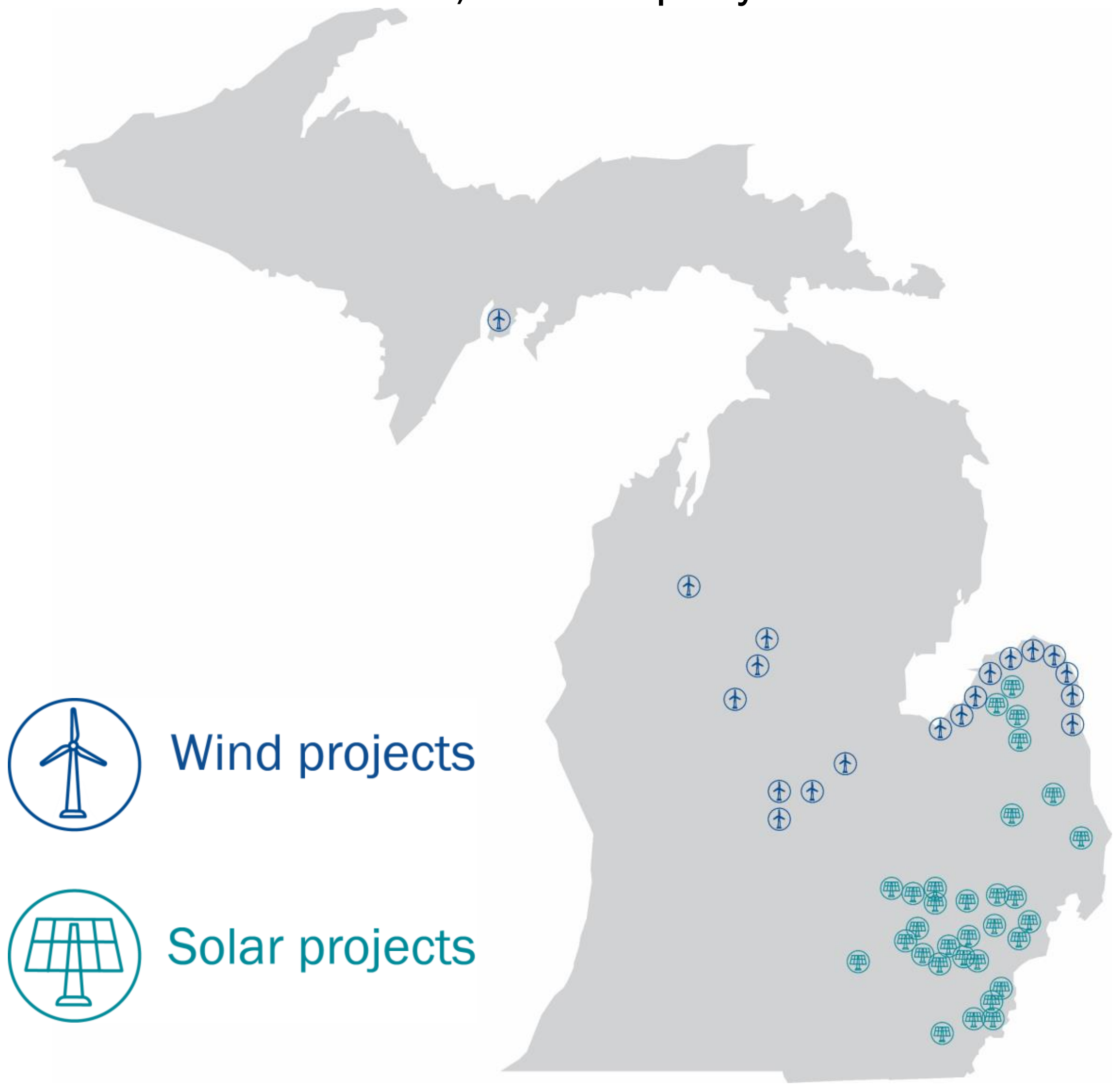
Planned capacity additions 2020 - 2025[1]

- Wind: 850 MW
- Solar: 935 MW
- Blue Water Energy Center: 1,100 MW

Planned coal capacity retirements 2020 - 2025

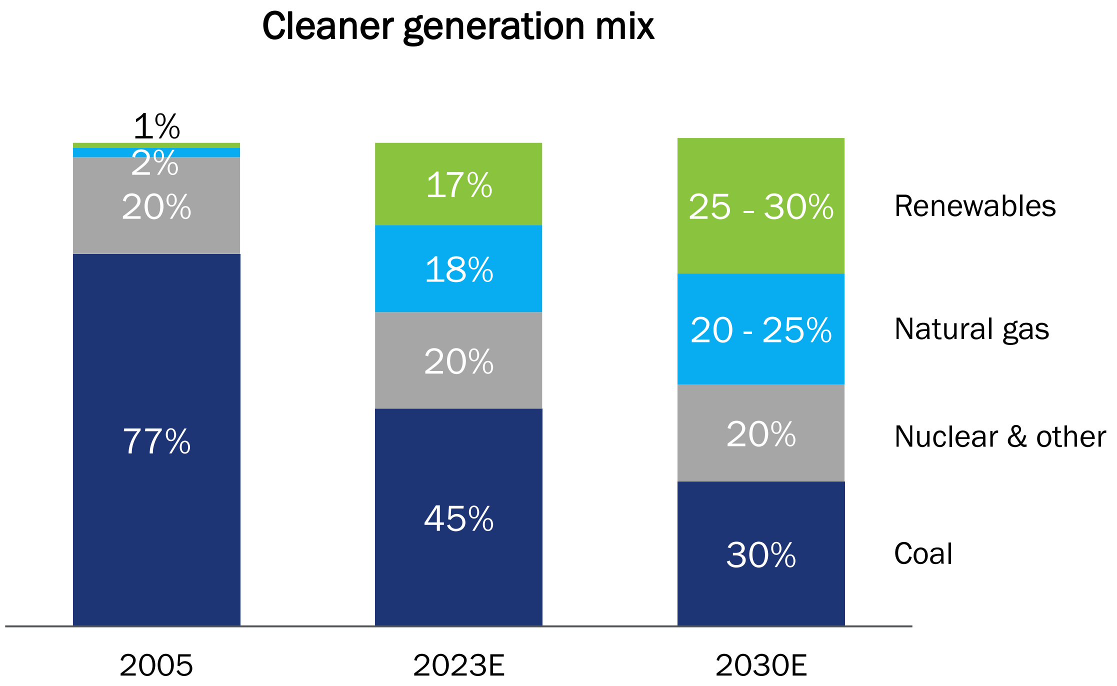
- 2021 River Rouge: 272 MW[2]
- 2022 St. Clair: 1,065 MW
- 2022 Trenton Channel: 495 MW

Current renewable energy portfolio
1,800 MW capacity



1. Timing and mix subject to change
2. Majority retired in 2020 with remaining capacity retired in 2021

More than doubling renewable energy by 2024




River Rouge


St. Clair


Trenton Channel


Belle River


Monroe

2021 - - - 2022 - - - - - - - - - - - - 2030 - - - - - - - - - - - - - - - 2040

DTE

A force for growth and prosperity in the Michigan communities we serve

World class volunteerism improves our communities and contributes to employee engagement

Consistently recognized as a top employer

Our efforts include education and mentoring programs

Partnering with a correctional facility to train inmates to become tree trimmers upon their release

1,700
high school and college students hired or sponsored in 2019, providing experience in different office or skilled trade careers

1,000
individuals with multiple barriers to employment committed to be hired over the next five years

Revitalizing neighborhoods and investing in communities

$11 billion
purchased from Michigan businesses since 2010

34,000
local jobs have been created as a result of our investments into our communities

DTE's commitment to community involvement has led to increasing customer satisfaction ratings and DTE being named #1 utility in the "Civic 50" by Points of Light

50
companies nationwide received this honor from Points of Light

Only
company in Michigan to be recognized

Health and safety of our people is a priority

- **Multiple safety committees** spanning all levels of the company providing input into seasonal safety plans, addressing unique challenges of each business unit
- **Regular employee safety training** with culture that everyone at DTE is 100% accountable for their own safety and 100% accountable for the safety of everyone around them
- **Received American Gas Association Safety Achievement Award** for excellence in employee safety
- **Recognized in the top 2%** of companies surveyed in company safety culture by the National Safety Council
- **Led the development of statewide COVID-19 prevention campaign** aimed at young adults

Committed to diversity, equity and inclusion; creating an environment where all are welcome

Office of Diversity, Equity and Inclusion

- Led by our CEO and key executive leaders, including a Director of Diversity, Equity and Inclusion
- Focused on sustaining a diverse workforce which is representative of the communities we serve

Commitment to create a diverse, equitable and inclusive workforce and supplier base influences our hiring strategies and business practices

- Annual review of compensation practices to ensure equitable pay
- Formal training programs including unconscious bias training for employees and leaders
- Hiring people with disabilities and returning citizens
- Over $700 million invested with diverse suppliers in 2020 as part of our award-winning supplier diversity program
- Public advocacy and financial support
  - Michigan civil rights reform
  - Removing the digital divide
  - Equity funding for schools

Employee resource groups promote a safe and welcoming environment and offer professional development, networking, mentoring and support

AIM
Differently-abled group

AMEA
Asian and Middle Eastern group

FAMILY
Family oriented group

POP
LGBTQ group

REACH
Black professionals group

SOMOS
Latinx professionals group

SURGE
Young professionals group

VETS
Veteran empowerment group

WOMEN OF DTE
Women's group

Building on the momentum of the last decade, DTE is committed to Michigan investments and supplier diversity

$2.2 billion
spent with Michigan businesses in 2020

$969 million
spent with Detroit suppliers

$744 million
diverse spend in 2020, a **288%** increase since 2010

24.5%
of spend

Diverse spend

$552 million in direct spending

$192 million subcontracted through direct suppliers

$500 million → $1 billion
increase in diverse spending by 2026

149 certified diverse suppliers

32 supplier diversity awards earned since 2018

Championing supplier diversity since
1982

20+ outreach events annually

Governance framework provides shareholder rights and enables sustainable value creation

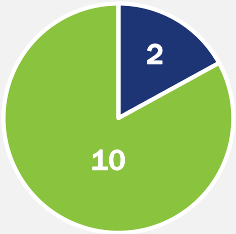
Best-in-class governance practices

- ✓ Lead Independent Director
- ✓ Stock ownership guidelines for non-employee Directors
- ✓ Majority voting standard
- ✓ Annual Director elections
- ✓ Established corporate governance guidelines
- ✓ Publication of Environmental, Social, Governance and Sustainability report
- ✓ Shareholder ability to call a special meeting
- ✓ No supermajority voting provisions to approve mergers or amend charter
- ✓ Overboard policy

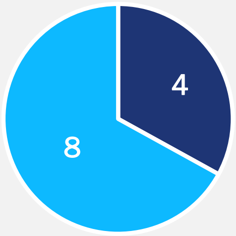
~9yr average tenure

3 Directors added since 2018

Board diversity



83% independent



33% gender or ethnically diverse

Executive management compensation plan is aligned with our core priorities

Priorities	Performance-based compensation elements: Annual incentive metrics	Performance-based compensation elements: Long-term metrics
Highly engaged employees	• Employee engagement • Employee safety	
Top decile customer satisfaction	• Customer satisfaction • Customer complaints	
Distinctive continuous improvement capability	• Utility operating excellence • Customer satisfaction improvement	
Strong political & regulatory context	• Customer satisfaction improvement • Utility operating excellence index	
Clear growth & value creation strategy		• Relative TSR
Superior & sustainable financial performance	• EPS • Cash flow	• Balance sheet health

DTE

Reconciliation of reported to operating earnings (non-GAAP)

Use of Operating Earnings Information – Operating earnings exclude non-recurring items, certain mark-to-market adjustments and discontinued operations. DTE Energy management believes that operating earnings provide a more meaningful representation of the company's earnings from ongoing operations and uses operating earnings as the primary performance measurement for external communications with analysts and investors. Internally, DTE Energy uses operating earnings to measure performance against budget and to report to the Board of Directors.

In this presentation, DTE Energy provides guidance for future period operating earnings. It is likely that certain items that impact the company's future period reported results will be excluded from operating results. A reconciliation to the comparable future period reported earnings is not provided because it is not possible to provide a reliable forecast of specific line items (i.e. future non-recurring items, certain mark-to-market adjustments and discontinued operations). These items may fluctuate significantly from period to period and may have a significant impact on reported earnings.

MPSC Case No: U-21384	
Requester: AA	
Question No.: AADG-1.8a	
Respondent: K. M. Fedele	
Page: 1 of 1	

Question: Please confirm or deny the following statements. If the response is anything other than confirm, please explain:

(a) The Company does not believe that achieving the climate goals of DTE Energy will result in its assets being used for less than their estimated physical useful life.

Answer: At this time, no impact has been identified as to the useful lives of DTE Gas's assets as a result of its climate goals. See exhibit A-12 Schedule B5.6, DTE Gas's Delivery Plan, in case number U-21291.

Attachment: None.

MPSC Case No: U-21384	
Requester: AA	
Question No.: AADG-1.7a	
Respondent: Z. Gatia	
Page: 1 of 1	

Question: Please respond to the following questions:

(a) Has the Company analyzed the potential to securitize natural gas assets that may not be used for their entire service life?

Answer: No. The proposed depreciation rates in this depreciation rate case are based, in part, on the expected useful and remaining lives of DTE Gas plant assets as of December 31, 2022. There are no events or changes in circumstances that would indicate that the natural gas assets will not be used for their entire service life. Therefore, consideration for an alternative means of cost recovery is not required at this time.

Attachment: None.

MPSC Case No: U-21384	
Requester: AA	
Question No.: AADG-1.7b	
Respondent: T. Lepczyk	
Page: 1 of 1	

Question: Please respond to the following questions:

(b) Has the Company considered altering the debt-to-equity ratio to account for gas assets which may not be useful over their entire life?

Answer: Please see 1.7a. Since no natural gas assets have been identified as not being useful over their entire life, no such consideration has been given.

Attachment: None.

MPSC Case No: U-21291	
Requester: MNSC	
Question No.: MNSCDG-5.10a	
Respondent: E. D. Janness	
Page: 1 of 1	

Question: 10. Has DTE identified which assets (or types of assets) on its gas system are most likely or least likely to remain used and useful in the event of widespread electrification of gas- fueled end uses (such as space and water heating)?

a. If so, please describe the assets (or types of assets) identified.

Answer: No.

Attachment: None

MPSC Case No: U-21291
Requester: AA
Question No.: AADG-1.6a
Respondent: S. N. Kehoe
Page: 1 of 1

Question: Please indicate whether the Company takes the following into consideration when determining the method for remediation of a gas leak:

(a) The climate goals of DTE Energy.

Answer: No, see pages 34-35 of U-21291 Exhibit A-12 Schedule B5.6 for discussion of distribution leaks and climate goals.

Attachment: None

MPSC Case No: U-21291	
Requester: AA	
Question No.: AADG-1.6b	
Respondent: S. N. Kehoe	
Page: 1 of 1	

Question: Please indicate whether the Company takes the following into consideration when determining the method for remediation of a gas leak:

(b) The stated climate goals of its customers.

Answer: No, see pages 34-35 of U-21291 Exhibit A-12 Schedule B5.6 for discussion of distribution leaks and climate goals.

Attachment: None

MPSC Case No: U-21291	
Requester: AA	
Question No.: AADG-1.6c	
Respondent: S. N. Kehoe	
Page: 1 of 1	

Question: Please indicate whether the Company takes the following into consideration when determining the method for remediation of a gas leak:

(c) The stated climate goals of the State of Michigan.

Answer: No, see pages 34-35 of U-21291 Exhibit A-12 Schedule B5.6 for discussion of distribution leaks and climate goals.

Attachment: None

STATE OF NEW YORK
PUBLIC SERVICE COMMISSION

At a session of the Public Service
Commission held in the City of
Albany on May 12, 2022

COMMISSIONERS PRESENT:

Rory M. Christian, Chair
Diane X. Burman, concurring in part and dissenting in part
James S. Alesi
Tracey A. Edwards
John B. Howard
David J. Valesky
John B. Maggiore

CASE 20-G-0131 – Proceeding on Motion of the Commission in Regard to Gas Planning Procedures.

CASE 12-G-0297 – Proceeding on Motion of the Commission to Examine Policies Regarding the Expansion of Natural Gas Service.

ORDER ADOPTING GAS SYSTEM PLANNING PROCESS

(Issued and Effective May 12, 2022)

BY THE COMMISSION:

INTRODUCTION

On February 12, 2021, Staff of the Department of Public Service (Staff) submitted a Gas System Planning Process Proposal (Planning Proposal) in Case 20-G-0131 (the Gas Planning Proceeding). By this Order, the Public Service Commission (Commission) adopts the natural gas system planning process set forth in the Planning Proposal, as modified in the discussion below. Accordingly, through this Order, the Commission adopts modernized long-term natural gas planning procedures to ensure that the State, customers, stakeholders, and all other interested entities have the opportunity to understand and engage in the future of natural gas infrastructure in the State.

BACKGROUND

Gas utilities in the State, also referred to as Local Distribution Companies (LDCs), have recently claimed natural gas supply constraints that prevent or otherwise create a concern about the ability to accept applications for new firm gas service in several regions of New York State. These constraints are generally location specific, can be limited to one or several municipalities, and do not apply to non-firm customer load.[1] Certain LDCs have also invoked moratoria on new service connections in specific locations, leading, in some cases, to customer hardships. For example, New York State Electric & Gas Corporation (NYSEG) invoked a moratorium in the Town of Lansing in Tompkins County in 2015, which remains in effect today.[2] Additionally, on January 17, 2019, Consolidated Edison Company of New York, Inc. (Con Edison) notified the Commission of a moratorium on new firm gas service in most of Westchester County, commencing March 15, 2019. That moratorium also remains in effect.

Finally, beginning in November 2018, The Brooklyn Union Gas Company d/b/a National Grid NY (KEDNY), serving Brooklyn and parts of Queens, and KeySpan Gas East Corporation d/b/a National Grid (KEDLI) (collectively, National Grid) began

[1] Non-firm service, also known as interruptible service, is the provision of natural gas service subject to interruption for situations such as high demand, emergencies, or where system reliability is threatened, and is only available to very large customers. In comparison, firm service is intended to be available at all times during an agreed period.

[2] Case 17-G-0432, Petition of NYSEG Regarding a Natural Gas Compressor Pilot Project in Tompkins County (filed July 19, 2017), Appendix A to Petition, p. 2.

informing large applicants for new service that National Grid would be unable to provide firm service unless a pending supply project was approved. On or about May 15, 2019, National Grid stated that it would not fulfill applications for new firm service connections, or requests for additional firm load from existing customers in the part of its service area that includes Long Island, Queens and Brooklyn. Based on a settlement adopted and approved by the Commission, National Grid ended its moratorium as of November 26, 2019.[3] However, National Grid retained discretion, subject to Commission review, to reimpose the moratorium after September 1, 2021, if it determines that extension of service to new customers, or expanded use by existing customers, would create an unacceptable risk to its ability to continue providing safe and reliable service.[4]

As seen from the recent utility activity, moratoria can create adverse customer impacts because, by their very nature, they prevent applicants from receiving new or expanded firm gas service. While some types of development projects and customers may have access to viable alternatives to firm gas service, others may have more difficulty without it. Reliance on alternatives can also have positive or adverse emissions impacts. Reduced emissions may result where the alternative to natural gas is efficient use of clean electricity, while

[3] Case 19-G-0678, Proceeding on Motion of the Commission to investigate Denials of Service by National Grid, Order Adopting and Approving Settlement (issued November 26, 2019); Case 19-G-0678, supra, Confirming Order (issued December 12, 2019).

[4] Case 19-G-0678, supra, Order Adopting and Approving Settlement (issued November 26, 2019), Exhibit A, §2(b). The settlement also required KEDNY and KEDLI to develop a "Long-Term Capacity Report" to address the long-term capacity constraints affecting their operations. Id., §4.

increased emissions may result where the alternative to natural gas is oil or propane.

These invocations of moratoria demonstrate that natural gas planning and operational practices need to adapt to recent developments and demands on energy systems. The Commission directed Staff to propose a modernized gas planning process to build on recent experience and adopt improved planning and operational practices to enable the LDCs to meet current and future customer needs and expectations in a transparent and equitable way, while minimizing infrastructure investments, maintaining safe and reliable service, and, where necessary, implement, maintain, and revoke moratoria in a fair and consistent manner.

Additionally, planning must be conducted in a manner consistent with the recently enacted Climate Leadership and Community Protection Act (CLCPA).[5] On December 30, 2021, the New York State Climate Action Council (CAC) released its Draft Scoping Plan. The Draft Scoping Plan states that "emission reductions are needed from all sectors of the economy to achieve the goals and requirements of the [CLCPA]."[6] While the CLCPA does not impose specific requirements on the State's gas distribution system, rationally, meeting the CLCPA's emissions reductions targets for the entire economy will require emissions reductions from the gas distribution system. Indeed, the CAC's Draft Scoping Plan includes a chapter focused on gas system transition.[7] Further, the Draft Scoping Plan also discusses the gas system in the chapters dealing with Buildings and Electricity. The CAC states that its final Scoping Plan will

[5] Chapter 106 of the Laws of 2019.

[6] Draft Scoping Plan, p. 22.

[7] Draft Scoping Plan, Ch. 18 Gas System Transition, pp. 264-271.

identify and make recommendations on regulatory measures and other state actions that will ensure the attainment of the CLCPA's requirements. The Commission recognizes the role of natural gas in greenhouse gas (GHG) emissions and takes action in this proceeding to prepare for the CAC recommendations to the benefit of all New Yorkers.

To ensure that residents of New York can continue to meet their energy needs, the public interest demands that gas utilities provide information to and communicate with customers in a way that promotes effective customer planning, reduces confusion, and avoids inequities or the appearance of inequities. Similarly, the public interest requires that gas utilities provide information to the Department, other government entities and agencies, and stakeholders related to the promotion of effective planning and consideration of gas alternatives, thereby reducing costs and emissions while minimizing impacts upon economic development.

More broadly, incomplete or insufficiently transparent planning can lead to adverse consequences beyond moratoria. They can lead to infrastructure expenditures that are costly to customers; unneeded, misplaced, or misaligned capital development; and use of fuel choices both at odds with State energy policies and that results in increased emissions.

Based upon the above, and in furtherance of the Commission's statutory mandates, the Commission issued an Order on March 19, 2020, directing: (1) LDCs to file locational supply and demand analyses; (2) LDCs to file proposals for moratorium management issues within 120 days; (3) Staff to file a proposal for modernizing gas system planning processes within 150 days;

and (4) LDCs to file status reports and any useful proposals to address areas of supply/demand imbalance within 150 days.[8]

Order Instituting Proceeding

In the Order Instituting Proceeding, the Commission noted the ongoing concerns with moratoria and associated planning issues, expressed its concerns related to these issues, and established eight multi-point issues for consideration as follows:

- First, the Order required the utilities to conduct a locational constraint analysis, so that the utilities, stakeholders, Staff, and the Commission are aware of and can focus planning efforts on areas with immediate or potential constraints.
- Second, the Order required Staff to propose a modernized gas system planning process. It emphasized that the modernized process will enable alignment with the State's policies, including the emergence of new and modified technologies and the impact and importance of the CLCPA.
- Third, the Order encouraged the use of non-pipe alternatives (NPAs) to potentially reduce or eliminate the need for gas infrastructure and investments. Examples of NPAs include temporary supply, energy efficiency, electrification, and clean demand response. The Order provided that LDCs should integrate NPAs into their standard gas system planning processes, both in the context of specific avoidable projects in a particular area of the distribution system, and system-wide to reduce overall demand and the need for infrastructure investment.
- Fourth, the Order required that the LDCs to propose criteria for reliance on peaking services, such as compressed natural gas and delivered services. The LDCs currently rely on peaking services to varying degrees and would need to increase that reliance to serve new load in the near term in the absence of other solutions.

[8] Case 20-G-0131, Order Instituting Proceeding (issued March 19, 2020) (Order Instituting Proceeding).

- Fifth, the Order required the utilities to propose standards governing moratoria. In doing so, the Commission noted that recent experience has shown that the specific manner in which moratoria are declared and managed can itself create or mitigate hardship and inequity. Following the LDCs' filing, Staff issued in this case a Moratorium Management Proposal on February 12, 2021. The Commission will address this proposal by a separate order.

- Sixth, the Order identified the need to explore methods of demand response and peak reduction. The Order noted the LDCs' use of interruptible rates as the principal historical method of reducing peak demand. Customers on interruptible rates generally rely on alternative fuels, such as oil, when their gas service is interrupted. The Order emphasized the need to develop other methods of demand response that do not rely on oil, can avoid emissions, and decrease the need for new infrastructure.

- Seventh, the Order recognized the need to avoid or mitigate emissions of criteria pollutants. Where oil or propane are combusted in place of gas, for example, these emissions can have material local impacts.

- Eighth, the Order recognized that some of the issues raised in the proceeding may require revisions to LDCs' tariffs, the adoption of new tariffs, or revisions of 16 New York Codes, Rules and Regulations (NYCRR) Part 230. Part 230 sets forth the rights, requirements, and responsibilities of the LDCs and applicants for gas service, including the provision of some amount of main and/or service line extension at no direct cost to the applicant.

In sum, the Order Instituting Proceeding set forth a broad array of issues for consideration, often interrelated, and noted that the Gas Planning Proceeding may address additional issues. Recognizing the foundational importance of a modernized gas system planning process, the Commission prioritized its creation by directing Staff to issue a proposal on that issue in particular. Additionally, given recent experience with moratoria, the Commission required the LDCs to file locational constraint analyses and proposals for moratoria management.

additions represent. We expect that Staff will develop a proposal for revisions to Part 230 within 60 days of receipt of the LDCs' reports regarding the costs of the 100-foot rule.

3. Depreciation

The Staff Proposal recommends that the LDCs provide an alternative bill impact analysis that assumes the full value of any new gas assets is depreciated by 2050 as part of the long-term plan filing. EDF urged the Commission to require each utility to do a new depreciation study that accounts for CLCPA on average service lives, to be filed in a rate case or the long-term plan. The City requests that we initiate a generic statewide depreciation study to inform gas planning. The City's proposed study would reflect the CLCPA's emission objectives, look at methods used in other jurisdictions and sectors, and identify novel approaches being developed and analyzed within academic or industry settings. RHN states that the Commission should take on depreciation issues in a much more comprehensive and direct way. Pace comments that accelerating depreciation would likely increase the BCA results of NPAs. Pace further states that assuming full depreciation of new gas infrastructure by 2050 should be the default. The PIOs state that depreciation schedules that are longer than the actual operating life of an asset will unduly reduce the cost of that asset and result in a skewed BCA result in favor of that asset.

Conversely, the Business Council states that there may yet be a future role for infrastructure that currently carries pipeline gas. MI and the JLDCs urge the Commission to limit any consideration of the accelerated depreciation of gas assets to informational purposes only. MI adds that infrastructure projects fully depreciated by 2050 will appear more costly than currently is the case, thereby improving the relative performance of NPAs in such evaluation. The JLDCs add that the

Commission should continue to use rate cases to act on matters related to depreciation, noting that the CAC has not addressed the issue of early or accelerated depreciation of natural gas infrastructure.

We recognize that the role of natural gas infrastructure in a low-carbon future has yet to be determined. NYSEG and RG&E recently filed an analogous depreciation study in compliance with their most recent rate plans.[25] Their study featured various scenarios to modify depreciation, including a business-as-usual case, an updated study that does not incorporate the impacts of CLCPA, shortening the average service lives of certain plant accounts by five years, shortening those lives by ten years, an equal life group procedure, and recovering the costs of all assets by 2050. Rate impacts for the latter scenario are the highest, resulting in increases of between nine and 15 percent.

We recognize that failure to fully depreciate assets in a timely fashion while LDCs still have robust customer bases may lead to stranded costs. The Commission thus agrees with those commenters calling for a study that examines both the structure of accelerated depreciation and its potential impacts on ratepayers. The Commission thus directs the LDCs to file depreciation studies with the following scenarios: (1) a scenario that fully depreciates all new gas plant installed beginning in 2022 by 2050; (2) a scenario that fully depreciates all gas plant by 2050; and (3) a scenario that assumes 50 percent of gas customers exit the gas system by 2040 and that 10 percent of gas customers remain after 2050. For each scenario, the LDCs shall include the revenue requirement impact and

[25] Cases 19-G-0379 and 19-G-0381, NYSEG and RG&E – Rates, Depreciation Study: Potential Impacts of Climate Change Policies and Laws (filed March 15, 2022).

approximate bill impacts for residential and commercial customers. The LDCs shall file 180 days after the issuance of this Order. These studies will be able to inform future discussions of how best to recover the costs of assets and reduce potential stranded costs in the LDCs' respective rate proceedings. The Commission is sensitive to imposing burdensome requirements on Corning and SLG, which have fewer resources than the other larger LDCs, and they are exempt from filing these depreciation studies. We expect that, if Corning and SLG are required to conduct such studies in the future, they will be able to apply lessons learned from the studies filed by the other LDCs and from subsequent related actions.

4. Avoided Cost of Gas Working Group

The Planning Proposal recommended that the Commission establish an ACG "best practices" working group, open to all interested stakeholders but requiring participation of the LDCs, Staff and NYSERDA. The Planning Proposal identified several of the known differences between electric and gas BCAs but maintained that the current BCA Framework Order applies wholly to NPAs, and that there should not be new cost or benefit categories. The Planning Proposal also acknowledged the need for more work in refining how certain indices are calculated, but also explained that work around demand response, energy efficiency, and NPAs has already utilized the BCA Framework Order to arrive at reasonable cost and benefit estimates. Principally, the Planning Proposal identified the lack of a centralized or transparent clearing house for commodity or capacity similar to what is done at the New York Independent System Operator, the lack of sufficiently disaggregated marginal cost of service studies, and what environmental or other factors should be applied to nontraditional methane to qualify a source as "renewable gas." The Staff Proposal recommended addressing these issues through the ACG "best practices" working group.

Many comments addressed this recommendation, representing a wide array of viewpoints proffering many solutions. While comments were at many times at odds with each other regarding specific calculations, no party suggested that an ACG working group would not be beneficial. The JDLCs in their reply comments suggested that Staff issuing a proposal on this subject would be more beneficial than a working group.

This uniformity in acknowledging the need for continued work regarding avoided gas costs reinforces the need to address these issues in a deliberative fashion. Accordingly, the Commission finds that establishing an ACG working group, and leveraging the significant work done to date, will be integral to producing accurate estimates of costs and benefits going forward. The Commission directs Staff to convene this group within 60 days of the issuance of this Order. This working group will address many of the aforementioned issues including, but not limited to: commodity, peaking, and pipeline capacity costs; the marginal cost of gas related to transmission and distribution facilities; gas for company use; and system losses. The Commission expects the ACG working group to produce a report outlining settled issues and, if necessary, recommendations regarding future work. The Commission expects that the working group will produce a report describing recommended calculations and specific elements for each LDC, which will then be issued for comment from stakeholders.

5. Topics for Future Phases

The Commission recognizes that there are issues, such as the role of hydrogen in decarbonizing the natural gas distribution system, rate design that can contribute to demand response, and the cost of electrification of heating load for residential and commercial customers that warrant further investigation. The CAC is expected to finalize its recommendations by 2023, and some of the CAC's work will necessarily inform this proceeding. For that and other reasons we will consider future phases of this proceeding when more guidance is available.

CONCLUSION

By this Order, the Commission adopts a modernized gas system planning process. This new process encourages and enables stakeholder participation. Further it provides a foundation upon which we can take further actions to ensure that New York continues to reduce GHG emissions in the face of climate change. Further this new paradigm improves the Commission's, Staff's, and stakeholders' ability to scrutinize LDCs' long-term gas system plans to ensure those plans are cost-effective for ratepayers and consistent with state policies. By this Order we also direct the next steps in this proceeding, including assessing potential changes to regulations regarding the extension of gas facilities to new customers and the depreciation of gas infrastructure.

The Commission orders:

1. Consolidated Edison Company of New York, Inc.; The Brooklyn Union Gas Company d/b/a National Grid NY; KeySpan Gas East Corporation d/b/a National Grid; Orange and Rockland Utilities, Inc.; Central Hudson Gas & Electric Corporation; Niagara Mohawk Power Corporation d/b/a National Grid; New York State Electric & Gas Corporation; Rochester Gas and Electric Corporation; National Fuel Gas Distribution Corporation; Liberty Utilities (St. Lawrence Gas) Corp.; and Corning Natural Gas Corporation shall comply with the gas system planning process

set forth in the Department of Public Service Staff proposal dated February 12, 2021, consistent with the modifications and discussion in the body of this Order.

2. National Fuel Gas Distribution Corporation shall file its initial long-term plan by December 15, 2022.

3. Consolidated Edison Company of New York, Inc. shall file its initial long-term plan by May 31, 2023.

4. Orange and Rockland Utilities, Inc. shall file its initial long-term plan by May 31, 2023.

5. New York State Electric & Gas Corporation shall file its initial long-term plan by September 30, 2023.

6. Rochester Gas and Electric Corporation shall file its initial long-term plan by September 30, 2023.

7. Central Hudson Gas & Electric Corporation shall file its initial long-term plan by January 15, 2024.

8. KeySpan Gas East Corporation d/b/a National Grid shall file its initial long-term plan by May 31, 2024.

9. The Brooklyn Union Gas Company d/b/a National Grid NY shall file its initial long-term plan by May 31, 2024.

10. Niagara Mohawk Power Corporation d/b/a National Grid shall file its initial long-term plan by May 31, 2024.

11. Corning Natural Gas Corporation shall file its initial long-term plan by September 30, 2024.

12. Liberty Utilities (St. Lawrence Gas) Corp. shall file its initial long-term plan by January 31, 2025.

13. Consolidated Edison Company of New York, Inc.; The Brooklyn Union Gas Company d/b/a National Grid NY; KeySpan Gas East Corporation d/b/a National Grid; Orange and Rockland Utilities, Inc.; Central Hudson Gas & Electric Corporation; Niagara Mohawk Power Corporation d/b/a National Grid; New York State Electric & Gas Corporation; Rochester Gas and Electric Corporation; National Fuel Gas Distribution Corporation; Liberty

Utilities (St. Lawrence Gas) Corp.; and Corning Natural Gas Corporation shall file with the Secretary to the Commission, within 90 days of the date of this Order, proposals for Non-Pipe Alternative Screening Criteria and Non-Pipe Alternative Suitability Criteria, consistent with the discussion in the body of this Order.

14. Consolidated Edison Company of New York, Inc.; The Brooklyn Union Gas Company d/b/a National Grid NY; KeySpan Gas East Corporation d/b/a National Grid; Orange and Rockland Utilities, Inc.; Central Hudson Gas & Electric Corporation; Niagara Mohawk Power Corporation d/b/a National Grid; New York State Electric & Gas Corporation; Rochester Gas and Electric Corporation; National Fuel Gas Distribution Corporation; Liberty Utilities (St. Lawrence Gas) Corp.; and Corning Natural Gas Corporation shall file with the Secretary to the Commission, within 90 days of the date of this Order, proposals for Non-Pipe Alternative cost recovery procedures and a Non-Pipe Alternative Incentive Mechanism, consistent with the discussion in the body of this Order.

15. Case 12-G-0297, Proceeding on Motion of the Commission to Examine Policies Regarding the Expansion of Natural Gas Service, is closed.

16. Consolidated Edison Company of New York, Inc.; The Brooklyn Union Gas Company d/b/a National Grid NY; KeySpan Gas East Corporation d/b/a National Grid; Orange and Rockland Utilities, Inc.; Central Hudson Gas & Electric Corporation; Niagara Mohawk Power Corporation d/b/a National Grid; New York State Electric & Gas Corporation; Rochester Gas and Electric Corporation; National Fuel Gas Distribution Corporation; Liberty Utilities (St. Lawrence Gas) Corp.; and Corning Natural Gas Corporation shall file with the Secretary to the Commission, within 90 days of the date of this Order, reports on the costs

of extending service to new customers, consistent with the discussion in the body of this Order.

17. Consolidated Edison Company of New York, Inc.; The Brooklyn Union Gas Company d/b/a National Grid NY; KeySpan Gas East Corporation d/b/a National Grid; Orange and Rockland Utilities, Inc.; Central Hudson Gas & Electric Corporation; Niagara Mohawk Power Corporation d/b/a National Grid; New York State Electric & Gas Corporation; Rochester Gas and Electric Corporation; and National Fuel Gas Distribution Corporation, shall file with the Secretary to the Commission, within 180 days of the date of this Order, depreciation studies, consistent with the discussion in the body of this Order.

18. Department of Public Service Staff shall convene the Avoided Cost of Gas Working Group within 60 days of the date of this Order.

19. In the Secretary's sole discretion, the deadlines set forth in this Order may be extended. Any request for an extension must be in writing, must include a justification for the extension, and must be filed at least three days prior to the affected deadline.

20. Case 20-G-0131 is continued.

By the Commission,

(SIGNED) MICHELLE L. PHILLIPS
Secretary

D.P.U. 20-80-B December 6, 2023

Investigation by the Department of Public Utilities on its own Motion into the role of gas local distribution companies as the Commonwealth achieves its target 2050 climate goals.

ORDER ON REGULATORY PRINCIPLES AND FRAMEWORK

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SUMMARY

The Department of Public Utilities ("Department") announces a regulatory framework intended to set forth its role and that of the Massachusetts gas local distribution companies ("LDCs") in helping the Commonwealth achieve its target of net-zero greenhouse gas ("GHG") emissions by 2050. Global Warming Solutions Act, St. 2008, c. 298 ("GWSA"); Executive Office of Energy and Environmental Affairs Determination of Statewide Emissions Limit for 2050 (April 22, 2020). The Department seeks to enable the Commonwealth to move into its clean energy future while simultaneously safeguarding ratepayer interests and maintaining affordability for customers; ensuring safe, reliable, and cost-effective natural gas service; minimizing the burden on low- and moderate-income households as the transition proceeds; and facilitating a just workforce and energy infrastructure transition.

In this proceeding, the Department reviewed eight potential decarbonization "pathways" to achieving the target of a 90 percent gross reduction in GHG emissions by 2050 as compared to 1990 levels, as well as interim GHG emissions reductions targets of 50 percent by 2030 and 75 percent by 2040. The decarbonization pathways are designed to reflect different futures for the LDCs and their customers, ranging from ongoing use of the LDCs' distribution networks to 100-percent decommissioning of gas distribution infrastructure in the Commonwealth. The Department makes no findings as to a preferred pathway or technology; rather, our aim is to create and promote a regulatory framework that is flexible, protects consumers, promotes equity, and provides for fair consideration of the current and future technologies and commercial applications required to meet the Commonwealth's clean energy objectives.

The Department considered six regulatory design recommendations intended to facilitate the Commonwealth's transition: (1) support customer adoption of and conversion to electrified and decarbonized heating technologies; (2) blend renewable gas supply into gas-resource portfolios; (3) pilot and deploy innovative electrification and decarbonized technologies; (4) manage gas embedded infrastructure investments and cost recovery; (5) evaluate and enable customer affordability; and (6) develop LDC transition plans and chart future progress. The Department makes specific findings about each of these regulatory design recommendations as detailed in the Order.

As to supporting customer adoption of and conversion to electrified and decarbonized heating technologies, the Department finds that to achieve the Commonwealth's climate targets, there must be a significant increase in the use of electrified and decarbonized heating technologies. The Department and LDCs can play a pivotal role by enhancing incentives and expanding the Mass Save energy efficiency programs to facilitate customer use of heat pumps. The Department also addresses the critical need to minimize costs for customers, including through pursuit of outside funding sources, and prioritizing workforce development to enable a just transition framework for gas industry workers as well as customers.

The Department rejects the recommendation to change its current gas supply procurement policy to support the addition of renewable natural gas ("RNG") to LDC supply portfolios due to concerns regarding the costs and availability of RNG as well as its uncertain

status as zero-emissions fuel. The Department does support the option for customers to be able to purchase RNG from their LDC or a supplier at full cost to the customer.

Given the critical importance of significantly decarbonizing the heating sector, the Department considered the proposal that the LDCs pilot and deploy the following four technologies: (1) networked geothermal; (2) targeted electrification; (3) hybrid heating systems; and (4) renewable hydrogen. As detailed in the Order, the Department views networked geothermal projects as those with the most potential to reduce GHG emissions, and expresses support for targeted electrification as well.

The Department seeks to dissuade gas customer expansion and to align rate design with the Commonwealth's climate objectives. To achieve this, the Department instructs gas utilities to revise their per-customer revenue decoupling mechanism to a decoupling approach based on total revenues. Removing the incentive to add new customers aligns the LDCs' rate design with climate objectives and GHG emissions reductions targets. The Department finds it must examine the issue of depreciation, i.e., the period of time over which a capital investment is recovered, and stranded assets. As an initial step, the Department directs all LDCs to conduct a comprehensive review that includes a forecast of the potential magnitude of stranded investments, and to identify the impacts of accelerated depreciation proposals, as well as potential alternatives to accelerated depreciation.

The Department finds that consideration of non-gas pipeline alternatives ("NPAs"), defined broadly to include electrification, thermal networked systems, targeted energy efficiency and demand response, and behavior change and market transformation, is necessary to minimize investments in the gas pipeline system that may be stranded costs in the future as decarbonization measures are implemented. Going forward, the Department states that as part of future cost recovery proposals, LDCs will bear the burden of demonstrating that NPAs were adequately considered and found to be non-viable or cost prohibitive to receive full cost recovery.

The Department agrees with suggestions that the standards for investments to serve new customers be examined. The Department therefore directs the LDCs to begin reviewing existing tariffs, policies, and practices related to new service connections to determine: (1) the number of *de facto* free extension allowances; (2) whether current models and policies accurately reflect the anticipated income and timeframe over which the capital investments will be recovered; and (3) whether existing state policies are inconsistent with current practices by incentivizing new customers to join the gas distribution system and allowing LDCs to extend their systems through plant additions. Further, in reviewing future applications for new service, the Department will examine the appropriateness of the existing standard—that there be no adverse impacts on existing natural gas customers—in the context of a broader climate mandate.

The Department observes that there are numerous concerns regarding affordability for customers, including the upfront costs required for customers to convert appliances and heating systems from natural gas to electricity, and also higher rates for customers who remain on the system. Cost shifting between migrating and non-migrating customers and between rate classes, and potential disproportionate impacts on low-income customers and customers from environmental justice populations, present equity challenges as well.

Finally, the Department finds that the clean energy transition will require coordinated planning between LDCs and electric distribution companies, monitoring progress through LDC reporting, and aligning existing Department practices with climate targets. To that end, the Department orders LDCs to submit individual Climate Compliance Plans to the Department every five years beginning in 2025, and to propose climate compliance performance metrics in their upcoming performance-based regulation filings, ensuring a proactive approach to achieving climate targets.

I. INTRODUCTION

The Department of Public Utilities ("Department") opened this inquiry on October 29, 2020, to examine the role of Massachusetts gas local distribution companies ("LDCs") in helping the Commonwealth achieve its 2050 climate targets, and to identify strategies for enabling the Commonwealth to move into its net zero greenhouse gas ("GHG") emissions energy future while simultaneously safeguarding ratepayer interests; ensuring safe, reliable, and cost-effective natural gas service; and potentially recasting the role of LDCs in the Commonwealth. Investigation by the Department of Public Utilities on its own Motion into the Role of Gas Local Distribution Companies as the Commonwealth Achieves its Target 2050 Climate Goals, D.P.U. 20-80, Vote and Order Opening Investigation at 1 (2020) ("Vote and Order"). The Department specifically sought to develop a regulatory and policy framework to guide the evolution of the gas distribution industry in the context of a clean energy transition that requires the Department to consider new policies and structures to protect ratepayers as the Commonwealth reduces its reliance on natural gas. D.P.U. 20-80, at 4. This proceeding is necessarily one step—not the first and certainly not the last—as we endeavor to chart a path forward that enables the Commonwealth to achieve its target of net zero GHG emissions by 2050. Global Warming Solutions Act, St. 2008, c. 298 ("GWSA"); Executive Office of Energy and Environmental Affairs Determination of Statewide Emissions Limit for 2050 (April 22, 2020), available at https://www.mass.gov/doc/final-signed-letter-of-determination-for-2050-emissions-limit/download (last visited November 29, 2023). The Department docketed this matter as D.P.U. 20-80.

Through this investigation, the Department has gathered a significant body of information from the LDCs and a wide range of institutional and individual stakeholders, evincing the need for an evolving, multifaceted, broadly coalitional, and responsive process as we seek to define and meet the significant challenges and potential opportunities that are presented not only by the Commonwealth's climate targets, but also by the threat and reality of the climate crisis itself. The Department acknowledges and appreciates the time, commitment, and thoughtful contributions provided by many stakeholders throughout this proceeding. In this Order, we first enunciate a set of regulatory principles that will guide our decision-making in this and future dockets. We then address in more detail the reports and analyses produced by the LDCs and their consultants, as well the comments and analyses submitted by stakeholders. Our purpose here never has been to dictate one path forward, but to gather information and identify existing and potential means within our authority to remove barriers to the clean energy transition and find ways for the Department to facilitate and accelerate pursuit of our 2050 climate targets. To that end, in this Order we identify future areas of inquiry that will be explored and note those future proceedings (including technical conferences, adjudications, and additional investigations) where we will investigate and implement the issues and principles identified herein.

In enunciating regulatory principles, our intent is that these foundational propositions will inform many of the Department's processes and proceedings through a "whole of DPU" approach, not limited to those matters such as this where climate and GHG-reduction policies explicitly are at issue, but also inform rate design and other more traditional Department functions within our authority. We also note areas in which the Department cannot (or cannot yet) act unilaterally, observing where legislative change or other agency action is required as we seek to pursue vigorously our role in a "whole of government" response to the climate crisis. The Department is one governmental actor working toward the clean energy transition, and we anticipate necessary future legislative action, as well as implementation from the Executive Office of Energy and Environmental Affairs ("EEA"), Massachusetts Department of Energy Resources ("DOER"), Massachusetts Department of Environmental Protection ("MassDEP"), and the Massachusetts Clean Energy Center ("MassCEC"), among others. Finally, in establishing these guiding principles we take care to emphasize the role of communities, neighborhoods, and individuals within the clean energy transition, as we seek to facilitate active participation in a "whole of society" approach to electrification, decarbonization, a just and equitable workforce transition, and equitable investment in communities in pursuit of our 2050 climate targets. While the Department cannot dictate the choices of individual consumers, we can and will seek to maintain a safe, reliable, and affordable system while encouraging and facilitating the thousands of small transitions that must occur on household, neighborhood, and community levels for the Commonwealth as a whole to move into its clean energy future.

II. PROCEDURAL HISTORY

On October 29, 2020, the Department voted to open an investigation into potential policies that will enable the Commonwealth to reach its target of net zero GHG emissions by we note that Section 30 does not require that the Department grant petitions in those circumstances where such a grant would not adversely impact existing customers. See D.P.U. 22-107, at 4. We also note that in D.P.U. 22-107, the Department found that the company had demonstrated that an alternative electrification approach was economically unviable, and that the expansion of services into the Town of Douglas was reasonable and consistent with the public interest. D.P.U. 22-107, at 15. While Section 30 does not expressly require a company to evaluate alternatives to expanding its gas system, going forward the Department will take the evaluation of alternatives into consideration along with any impact on achieving the state's climate targets. D.P.U. 22-107, at 15. Finally, although the adjudication of a specific standard of review is outside the scope of this proceeding, the Department anticipates that its consideration of a petition pursuant to Section 30 will presume a requirement of consistency with an LDC's Climate Compliance Plan, as discussed in Section VI.G.

c. Accelerated Depreciation

There is general consensus among the LDCs and stakeholders that the issue of depreciation and stranded assets must be examined. While stakeholders differ as to the exact approach to deal with the issue, the Department agrees that the matter is important and must be investigated. As an initial step, the Department directs all LDCs to conduct a comprehensive review that includes a forecast of the potential magnitude of stranded investments. As part of this review, the LDCs must identify the impacts of accelerated depreciation proposals and identify potential alternatives to accelerated depreciation.

The Consultants and LDCs specifically reference the "Units of Production" method of accelerated depreciation as a way of aligning cost recovery of capital investments with system utilization, noting that it is a method recognized by the National Association of Regulatory Utility Commissioners ("NARUC"), as well as the option of implementing shorter asset service lives (Regulatory Designs Report at 38). The Department notes there are various options to consider with respect to accelerated depreciation, and the LDCs should not limit their review to any one method such as the Units of Production method, as each has its own inherent benefits and limitations (see, e.g., Regulatory Designs Report at 38; NARUC Depreciation Manual at 52-53; 57-61). Accelerated depreciation methods currently are not used for regulatory purposes, with the straight-line method primarily utilized in utility depreciation studies (NARUC Depreciation Manual at 61). The Department previously has recognized, however, that there is a fundamental transition underway in the gas industry in Massachusetts, and further investigation of cost recovery of existing infrastructure investment is required. The goal of the review should be not only assessing the magnitude of stranded costs, but also to investigate ways to address cost recovery while balancing ratepayer and shareholder risk going forward in a way that adequately reflects system costs, shareholder awareness of risk, and realistic expectations of the future, while addressing customer affordability and equity concerns.

VII. CONCLUSION

The Department herein has set forth a regulatory strategy for pursuing an energy future that begins to move the Commonwealth beyond gas and toward its climate objectives. As we have detailed, this will include new reporting and analysis requirements, utilization of existing working groups and other forums, convening of technical conferences and additional working groups as necessary, and further investigation and adjudicatory proceedings within the Department. Going forward, the Department will seek to facilitate a safe, orderly, and equitable transition for the LDCs and their customers through these processes while pursuing the Commonwealth's 2050 GHG emissions reductions mandate and interim targets.

VIII. ORDER

Accordingly, after due consideration, it is

ORDERED: That the Massachusetts gas local distribution companies shall comply with the directives contained in this Order.

By Order of the Department,

James M. Van Nostrand, Chair

Cecile M. Fraser

Cecile M. Fraser, Commissioner

Staci Rubin, Commissioner

MPSC Case No: U-21291	
Requester: AA	
Question No.: AADG-3.18	
Respondent: R. M. Telang	
Page: 1 of 1	

Question: Request No. 18. What percentage of their time do the Company's government or community affairs professionals spend on lobbying local government officials, if lobbying is defined as communicating directly with an elected official in any local government (including but not limited to county commissioners, mayors, township trustees, and city council members), for the purpose of influencing governmental action? What is the average salary of individuals who undertake such activities?

Answer: DTE Gas objects to this request for the reason that the information sought is not relevant or proportional to the needs of this case. Specifically, this request seeks information that does not have any tendency to make the existence of any fact that is of consequence to the determination of this action more probable or less probable, as the referenced expenses are not in DTE Gas rates and are not sought for recovery in DTE Gas rates in this proceeding. In addition, DTE Gas objects for the reason that the request is unduly burdensome and overbroad. Subject to these objections and without waiving these objections, the Company is not in possession of the requested information.

Attachment: None.

Co-Respondent(s): Legal

Year	Project Type	Project Name	Layer	OBJECTID *	Length (Feet)	Age (Years)	Material	Coating	Does the pipe have Cathodic Protection?	# of Leak Repairs	Total Project Cost[1]
2023	GRP	AA6 (SEGRID2023AA6 #7213)	Distribution Main	116497	165	63	STL - Coated Steel	Coated and Wrapped	No	2	$ 18,804,267
2023	GRP	AA6 (SEGRID2023AA6 #7213)	Distribution Main	116498	23	66	STL - Coated Steel	Coated and Wrapped	No	0	$ 18,804,267
2023	GRP	AA6 (SEGRID2023AA6 #7213)	Distribution Main	116499	184	64	STL - Coated Steel	Coated and Wrapped	No	0	$ 18,804,267
2023	GRP	AA6 (SEGRID2023AA6 #7213)	Distribution Main	116500	106	66	STL - Coated Steel	Coated and Wrapped	No	0	$ 18,804,267
2023	GRP	AA6 (SEGRID2023AA6 #7213)	Distribution Main	116501	136	65	STL - Coated Steel	Coated and Wrapped	No	0	$ 18,804,267
2023	GRP	AA6 (SEGRID2023AA6 #7213)	Distribution Main	116503	494	63	STL - Coated Steel	Coated and Wrapped	Yes	3	$ 18,804,267
2023	GRP	AA6 (SEGRID2023AA6 #7213)	Distribution Main	116504	249	37	PLA - Plastic	N/A	No	0	$ 18,804,267
2023	GRP	AA6 (SEGRID2023AA6 #7213)	Distribution Main	116505	194	37	PLA - Plastic	N/A	No	0	$ 18,804,267
2023	GRP	AA6 (SEGRID2023AA6 #7213)	Distribution Main	116515	25	63	STL - Coated Steel	Coated and Wrapped	Yes	0	$ 18,804,267
2023	GRP	AA6 (SEGRID2023AA6 #7213)	Distribution Main	116517	22	63	STL - Coated Steel	Coated and Wrapped	Yes	0	$ 18,804,267
2023	GRP	AA6 (SEGRID2023AA6 #7213)	Distribution Main	116529	104	65	STL - Coated Steel	Coated and Wrapped	No	0	$ 18,804,267
2023	GRP	AA6 (SEGRID2023AA6 #7213)	Distribution Main	116530	172	65	STL - Coated Steel	Coated and Wrapped	No	0	$ 18,804,267
2023	GRP	AA6 (SEGRID2023AA6 #7213)	Distribution Main	116531	6	57	STL - Coated Steel	Extruded Plastic	No	0	$ 18,804,267
2023	GRP	AA6 (SEGRID2023AA6 #7213)	Distribution Main	116532	41	63	STL - Coated Steel	Coated and Wrapped	Yes	0	$ 18,804,267
2023	GRP	AA6 (SEGRID2023AA6 #7213)	Distribution Main	116533	34	63	STL - Coated Steel	Coated and Wrapped	Yes	0	$ 18,804,267
2023	GRP	AA6 (SEGRID2023AA6 #7213)	Distribution Main	116542	110	37	PLA - Plastic	N/A	No	0	$ 18,804,267
2023	GRP	AA6 (SEGRID2023AA6 #7213)	Distribution Main	116552	235	37	PLA - Plastic	N/A	No	0	$ 18,804,267
2023	GRP	AA6 (SEGRID2023AA6 #7213)	Distribution Main	116553	751	37	PLA - Plastic	N/A	No	0	$ 18,804,267
2023	GRP	AA6 (SEGRID2023AA6 #7213)	Distribution Main	116576	157	63	STL - Coated Steel	Coated and Wrapped	Yes	1	$ 18,804,267
2023	GRP	AA6 (SEGRID2023AA6 #7213)	Distribution Main	116577	461	63	STL - Coated Steel	Coated and Wrapped	Yes	1	$ 18,804,267
2023	GRP	AA6 (SEGRID2023AA6 #7213)	Distribution Main	116578	5	62	STL - Coated Steel	Extruded Plastic	Yes	0	$ 18,804,267
2023	GRP	AA6 (SEGRID2023AA6 #7213)	Distribution Main	116579	569	63	STL - Coated Steel	Coated and Wrapped	Yes	4	$ 18,804,267
2023	GRP	AA6 (SEGRID2023AA6 #7213)	Distribution Main	116580	1147	63	STL - Coated Steel	Coated and Wrapped	Yes	4	$ 18,804,267
2023	GRP	AA6 (SEGRID2023AA6 #7213)	Distribution Main	116581	528	63	STL - Coated Steel	Coated and Wrapped	Yes	0	$ 18,804,267
2023	GRP	AA6 (SEGRID2023AA6 #7213)	Distribution Main	116582	260	63	STL - Coated Steel	Coated and Wrapped	Yes	1	$ 18,804,267
2023	GRP	AA6 (SEGRID2023AA6 #7213)	Distribution Main	116583	249	63	STL - Coated Steel	Coated and Wrapped	Yes	0	$ 18,804,267
2023	GRP	AA6 (SEGRID2023AA6 #7213)	Distribution Main	116584	639	56	STL - Coated Steel	Extruded Plastic	Yes	0	$ 18,804,267
2023	GRP	AA6 (SEGRID2023AA6 #7213)	Distribution Main	116585	5	57	STL - Coated Steel	Extruded Plastic	Yes	0	$ 18,804,267
2023	GRP	AA6 (SEGRID2023AA6 #7213)	Distribution Main	116586	370	57	STL - Coated Steel	Extruded Plastic	Yes	1	$ 18,804,267
2023	GRP	AA6 (SEGRID2023AA6 #7213)	Distribution Main	116587	328	57	STL - Coated Steel	Extruded Plastic	Yes	0	$ 18,804,267
2023	GRP	AA6 (SEGRID2023AA6 #7213)	Distribution Main	116588	317	57	STL - Coated Steel	Extruded Plastic	Yes	0	$ 18,804,267
2023	GRP	AA6 (SEGRID2023AA6 #7213)	Distribution Main	116589	233	57	STL - Coated Steel	Extruded Plastic	Yes	6	$ 18,804,267
2023	GRP	AA6 (SEGRID2023AA6 #7213)	Distribution Main	116590	148	57	STL - Coated Steel	Extruded Plastic	Yes	0	$ 18,804,267
2023	GRP	AA6 (SEGRID2023AA6 #7213)	Distribution Main	116591	5	57	STL - Coated Steel	Extruded Plastic	Yes	0	$ 18,804,267
2023	GRP	AA6 (SEGRID2023AA6 #7213)	Distribution Main	116592	209	57	STL - Coated Steel	Extruded Plastic	Yes	0	$ 18,804,267
2023	GRP	AA6 (SEGRID2023AA6 #7213)	Distribution Main	116593	807	57	STL - Coated Steel	Extruded Plastic	Yes	5	$ 18,804,267
2023	GRP	AA6 (SEGRID2023AA6 #7213)	Distribution Main	116594	458	48	STL - Coated Steel	Extruded Plastic	Yes	0	$ 18,804,267
2023	GRP	AA6 (SEGRID2023AA6 #7213)	Distribution Main	116595	8	48	STL - Coated Steel	Extruded Plastic	Yes	0	$ 18,804,267
2023	GRP	AA6 (SEGRID2023AA6 #7213)	Distribution Main	116596	11	55	STL - Coated Steel	Extruded Plastic	Yes	0	$ 18,804,267
2023	GRP	AA6 (SEGRID2023AA6 #7213)	Distribution Main	116598	850	55	STL - Coated Steel	Extruded Plastic	Yes	0	$ 18,804,267
2023	GRP	AA6 (SEGRID2023AA6 #7213)	Distribution Main	116599	310	56	STL - Coated Steel	Extruded Plastic	Yes	0	$ 18,804,267
2023	GRP	AA6 (SEGRID2023AA6 #7213)	Distribution Main	116600	67	56	STL - Coated Steel	Extruded Plastic	Yes	0	$ 18,804,267
2023	GRP	AA6 (SEGRID2023AA6 #7213)	Distribution Main	117552	451	65	STL - Coated Steel	Coated and Wrapped	No	0	$ 18,804,267
2023	GRP	AA6 (SEGRID2023AA6 #7213)	Distribution Main	117553	420	65	STL - Coated Steel	Coated and Wrapped	No	2	$ 18,804,267
2023	GRP	AA6 (SEGRID2023AA6 #7213)	Distribution Main	117554	132	65	STL - Coated Steel	Coated and Wrapped	No	3	$ 18,804,267
2023	GRP	AA6 (SEGRID2023AA6 #7213)	Distribution Main	117555	19	57	STL - Coated Steel	Extruded Plastic	No	0	$ 18,804,267
2023	GRP	AA6 (SEGRID2023AA6 #7213)	Distribution Main	117556	8	62	STL - Coated Steel	Extruded Plastic	No	0	$ 18,804,267
2023	GRP	AA6 (SEGRID2023AA6 #7213)	Distribution Main	117557	4	69	STL - Coated Steel	Coated and Wrapped	No	1	$ 18,804,267
2023	GRP	AA6 (SEGRID2023AA6 #7213)	Distribution Main	117558	278	69	STL - Coated Steel	Coated and Wrapped	No	1	$ 18,804,267
2023	GRP	AA6 (SEGRID2023AA6 #7213)	Distribution Main	117559	628	69	STL - Coated Steel	Coated and Wrapped	No	2	$ 18,804,267
2023	GRP	AA6 (SEGRID2023AA6 #7213)	Distribution Main	117560	581	64	STL - Coated Steel	Coated and Wrapped	No	2	$ 18,804,267
2023	GRP	AA6 (SEGRID2023AA6 #7213)	Distribution Main	117561	2	69	STL - Coated Steel	Coated and Wrapped	No	0	$ 18,804,267
2023	GRP	AA6 (SEGRID2023AA6 #7213)	Distribution Main	117562	385	65	STL - Coated Steel	Coated and Wrapped	Yes	4	$ 18,804,267
2023	GRP	AA6 (SEGRID2023AA6 #7213)	Distribution Main	117563	54	64	STL - Coated Steel	Coated and Wrapped	No	0	$ 18,804,267
2023	GRP	AA6 (SEGRID2023AA6 #7213)	Distribution Main	117567	107	57	STL - Coated Steel	Extruded Plastic	No	0	$ 18,804,267
2023	GRP	AA6 (SEGRID2023AA6 #7213)	Distribution Main	117568	12	48	STL - Coated Steel	Extruded Plastic	Yes	0	$ 18,804,267
2023	GRP	AA6 (SEGRID2023AA6 #7213)	Distribution Main	117569	9	31	PLA - Plastic	N/A	No	0	$ 18,804,267
2023	GRP	AA6 (SEGRID2023AA6 #7213)	Distribution Main	117570	56	65	STL - Coated Steel	Coated and Wrapped	Yes	0	$ 18,804,267

2023	GRP	AA6 (SEGRID2023AA6 #7213)	Distribution Main	117571	300	63	STL - Coated Steel	Coated and Wrapped	No	1	$ 18,804,267
2023	GRP	AA6 (SEGRID2023AA6 #7213)	Distribution Main	117574	346	65	STL - Coated Steel	Coated and Wrapped	Yes	0	$ 18,804,267
2023	GRP	AA6 (SEGRID2023AA6 #7213)	Distribution Main	117575	175	66	STL - Coated Steel	Coated and Wrapped	Yes	0	$ 18,804,267
2023	GRP	AA6 (SEGRID2023AA6 #7213)	Distribution Main	117576	138	69	STL - Coated Steel	Coated and Wrapped	No	0	$ 18,804,267
2023	GRP	AA6 (SEGRID2023AA6 #7213)	Distribution Main	117577	395	62	STL - Coated Steel	Extruded Plastic	No	4	$ 18,804,267
2023	GRP	AA6 (SEGRID2023AA6 #7213)	Distribution Main	117578	10	62	STL - Coated Steel	Extruded Plastic	No	0	$ 18,804,267
2023	GRP	AA6 (SEGRID2023AA6 #7213)	Distribution Main	117579	215	69	STL - Coated Steel	Coated and Wrapped	No	0	$ 18,804,267
2023	GRP	AA6 (SEGRID2023AA6 #7213)	Distribution Main	117580	19	69	STL - Coated Steel	Coated and Wrapped	No	0	$ 18,804,267
2023	GRP	AA6 (SEGRID2023AA6 #7213)	Distribution Main	117581	4	69	STL - Coated Steel	Coated and Wrapped	No	0	$ 18,804,267
2023	GRP	AA6 (SEGRID2023AA6 #7213)	Distribution Main	117582	19	69	STL - Coated Steel	Coated and Wrapped	No	0	$ 18,804,267
2023	GRP	AA6 (SEGRID2023AA6 #7213)	Distribution Main	117583	110	69	STL - Coated Steel	Coated and Wrapped	No	1	$ 18,804,267
2023	GRP	AA6 (SEGRID2023AA6 #7213)	Distribution Main	117584	144	69	STL - Coated Steel	Coated and Wrapped	No	0	$ 18,804,267
2023	GRP	AA6 (SEGRID2023AA6 #7213)	Distribution Main	117585	137	64	STL - Coated Steel	Coated and Wrapped	No	2	$ 18,804,267
2023	GRP	AA6 (SEGRID2023AA6 #7213)	Distribution Main	117587	342	70	STL - Coated Steel	Coated and Wrapped	No	0	$ 18,804,267
2023	GRP	AA6 (SEGRID2023AA6 #7213)	Distribution Main	117588	17	70	STL - Coated Steel	Coated and Wrapped	No	0	$ 18,804,267
2023	GRP	AA6 (SEGRID2023AA6 #7213)	Distribution Main	117589	155	70	STL - Coated Steel	Coated and Wrapped	No	0	$ 18,804,267
2023	GRP	AA6 (SEGRID2023AA6 #7213)	Distribution Main	117590	7	70	STL - Coated Steel	Coated and Wrapped	No	0	$ 18,804,267
2023	GRP	AA6 (SEGRID2023AA6 #7213)	Distribution Main	117591	326	69	STL - Coated Steel	Coated and Wrapped	No	4	$ 18,804,267
2023	GRP	AA6 (SEGRID2023AA6 #7213)	Distribution Main	117592	340	69	STL - Coated Steel	Coated and Wrapped	No	2	$ 18,804,267
2023	GRP	AA6 (SEGRID2023AA6 #7213)	Distribution Main	117593	299	70	STL - Coated Steel	Coated and Wrapped	No	3	$ 18,804,267
2023	GRP	AA6 (SEGRID2023AA6 #7213)	Distribution Main	117594	3	70	STL - Coated Steel	Coated and Wrapped	No	0	$ 18,804,267
2023	GRP	AA6 (SEGRID2023AA6 #7213)	Distribution Main	117595	29	57	STL - Coated Steel	Extruded Plastic	No	0	$ 18,804,267
2023	GRP	AA6 (SEGRID2023AA6 #7213)	Distribution Main	117596	223	57	STL - Coated Steel	Extruded Plastic	No	0	$ 18,804,267
2023	GRP	AA6 (SEGRID2023AA6 #7213)	Distribution Main	117597	148	67	STL - Coated Steel	Coated and Wrapped	No	2	$ 18,804,267
2023	GRP	AA6 (SEGRID2023AA6 #7213)	Distribution Main	117598	90	69	STL - Coated Steel	Coated and Wrapped	No	0	$ 18,804,267
2023	GRP	AA6 (SEGRID2023AA6 #7213)	Distribution Main	117599	2	69	STL - Coated Steel	Coated and Wrapped	No	0	$ 18,804,267
2023	GRP	AA6 (SEGRID2023AA6 #7213)	Distribution Main	117600	3	31	PLA - Plastic	N/A	No	0	$ 18,804,267
2023	GRP	AA6 (SEGRID2023AA6 #7213)	Distribution Main	117601	97	31	PLA - Plastic	N/A	No	0	$ 18,804,267
2023	GRP	AA6 (SEGRID2023AA6 #7213)	Distribution Main	117602	908	31	PLA - Plastic	N/A	No	0	$ 18,804,267
2023	GRP	AA6 (SEGRID2023AA6 #7213)	Distribution Main	117603	3	31	PLA - Plastic	N/A	No	0	$ 18,804,267
2023	GRP	AA6 (SEGRID2023AA6 #7213)	Distribution Main	117604	323	69	STL - Coated Steel	Coated and Wrapped	No	0	$ 18,804,267
2023	GRP	AA6 (SEGRID2023AA6 #7213)	Distribution Main	117605	175	69	STL - Coated Steel	Coated and Wrapped	No	0	$ 18,804,267
2023	GRP	AA6 (SEGRID2023AA6 #7213)	Distribution Main	117606	273	65	STL - Coated Steel	Coated and Wrapped	Yes	0	$ 18,804,267
2023	GRP	AA6 (SEGRID2023AA6 #7213)	Distribution Main	117608	112	69	STL - Coated Steel	Coated and Wrapped	No	0	$ 18,804,267
2023	GRP	AA6 (SEGRID2023AA6 #7213)	Distribution Main	117609	8	69	STL - Coated Steel	Coated and Wrapped	No	0	$ 18,804,267
2023	GRP	AA6 (SEGRID2023AA6 #7213)	Distribution Main	117610	372	66	STL - Coated Steel	Coated and Wrapped	Yes	2	$ 18,804,267
2023	GRP	AA6 (SEGRID2023AA6 #7213)	Distribution Main	117611	126	69	STL - Coated Steel	Coated and Wrapped	No	2	$ 18,804,267
2023	GRP	AA6 (SEGRID2023AA6 #7213)	Distribution Main	117614	287	69	STL - Coated Steel	Coated and Wrapped	No	3	$ 18,804,267
2023	GRP	AA6 (SEGRID2023AA6 #7213)	Distribution Main	117615	10	69	STL - Coated Steel	Coated and Wrapped	No	0	$ 18,804,267
2023	GRP	AA6 (SEGRID2023AA6 #7213)	Distribution Main	117616	221	65	STL - Coated Steel	Coated and Wrapped	Yes	2	$ 18,804,267
2023	GRP	AA6 (SEGRID2023AA6 #7213)	Distribution Main	117617	414	65	STL - Coated Steel	Coated and Wrapped	Yes	0	$ 18,804,267
2023	GRP	AA6 (SEGRID2023AA6 #7213)	Distribution Main	117618	280	66	STL - Coated Steel	Coated and Wrapped	No	1	$ 18,804,267
2023	GRP	AA6 (SEGRID2023AA6 #7213)	Distribution Main	117619	37	66	STL - Coated Steel	Coated and Wrapped	No	2	$ 18,804,267
2023	GRP	AA6 (SEGRID2023AA6 #7213)	Distribution Main	117620	173	66	STL - Coated Steel	Coated and Wrapped	No	1	$ 18,804,267
2023	GRP	AA6 (SEGRID2023AA6 #7213)	Distribution Main	117621	26	69	STL - Coated Steel	Coated and Wrapped	No	0	$ 18,804,267
2023	GRP	AA6 (SEGRID2023AA6 #7213)	Distribution Main	117622	317	69	STL - Coated Steel	Coated and Wrapped	No	2	$ 18,804,267
2023	GRP	AA6 (SEGRID2023AA6 #7213)	Distribution Main	117623	303	69	STL - Coated Steel	Coated and Wrapped	No	5	$ 18,804,267
2023	GRP	AA6 (SEGRID2023AA6 #7213)	Distribution Main	117624	19	69	STL - Coated Steel	Coated and Wrapped	No	0	$ 18,804,267
2023	GRP	AA6 (SEGRID2023AA6 #7213)	Distribution Main	117625	907	69	STL - Coated Steel	Coated and Wrapped	No	3	$ 18,804,267
2023	GRP	AA6 (SEGRID2023AA6 #7213)	Distribution Main	117626	329	69	STL - Coated Steel	Coated and Wrapped	No	2	$ 18,804,267
2023	GRP	AA6 (SEGRID2023AA6 #7213)	Distribution Main	117627	298	69	STL - Coated Steel	Coated and Wrapped	No	3	$ 18,804,267
2023	GRP	AA6 (SEGRID2023AA6 #7213)	Distribution Main	117628	425	64	STL - Coated Steel	Coated and Wrapped	No	1	$ 18,804,267
2023	GRP	AA6 (SEGRID2023AA6 #7213)	Distribution Main	117629	254	64	STL - Coated Steel	Coated and Wrapped	No	0	$ 18,804,267
2023	GRP	AA6 (SEGRID2023AA6 #7213)	Distribution Main	117630	346	64	STL - Coated Steel	Coated and Wrapped	No	1	$ 18,804,267
2023	GRP	AA6 (SEGRID2023AA6 #7213)	Distribution Main	117631	9	64	STL - Coated Steel	Coated and Wrapped	No	0	$ 18,804,267
2023	GRP	AA6 (SEGRID2023AA6 #7213)	Distribution Main	117632	201	67	STL - Coated Steel	Coated and Wrapped	No	0	$ 18,804,267
2023	GRP	AA6 (SEGRID2023AA6 #7213)	Distribution Main	117633	4	67	STL - Coated Steel	Coated and Wrapped	No	0	$ 18,804,267
2023	GRP	AA6 (SEGRID2023AA6 #7213)	Distribution Main	117634	9	67	STL - Coated Steel	Coated and Wrapped	No	0	$ 18,804,267
2023	GRP	AA6 (SEGRID2023AA6 #7213)	Distribution Main	117635	38	67	STL - Coated Steel	Coated and Wrapped	No	0	$ 18,804,267
2023	GRP	AA6 (SEGRID2023AA6 #7213)	Distribution Main	117636	12	69	STL - Coated Steel	Coated and Wrapped	No	0	$ 18,804,267

2023	GRP	AA6 (SEGRID2023AA6 #7213)	Distribution Main	117637	138	63	STL - Coated Steel	Coated and Wrapped	No	0	$	18,804,267
2023	GRP	AA6 (SEGRID2023AA6 #7213)	Distribution Main	117638	158	65	STL - Coated Steel	Coated and Wrapped	No	1	$	18,804,267
2023	GRP	AA6 (SEGRID2023AA6 #7213)	Distribution Main	117639	166	71	STL - Coated Steel	Coated and Wrapped	No	2	$	18,804,267
2023	GRP	AA6 (SEGRID2023AA6 #7213)	Distribution Main	117640	176	70	STL - Coated Steel	Coated and Wrapped	No	2	$	18,804,267
2023	GRP	AA6 (SEGRID2023AA6 #7213)	Distribution Main	117641	184	69	STL - Coated Steel	Coated and Wrapped	No	0	$	18,804,267
2023	GRP	AA6 (SEGRID2023AA6 #7213)	Distribution Main	117642	170	69	STL - Coated Steel	Coated and Wrapped	No	0	$	18,804,267
2023	GRP	AA6 (SEGRID2023AA6 #7213)	Distribution Main	117643	192	66	STL - Coated Steel	Coated and Wrapped	Yes	0	$	18,804,267
2023	GRP	AA6 (SEGRID2023AA6 #7213)	Distribution Main	117644	248	63	STL - Coated Steel	Coated and Wrapped	Yes	0	$	18,804,267
2023	GRP	AA6 (SEGRID2023AA6 #7213)	Distribution Main	117646	9	66	STL - Coated Steel	Coated and Wrapped	No	0	$	18,804,267
2023	GRP	AA6 (SEGRID2023AA6 #7213)	Distribution Main	117648	3	69	STL - Coated Steel	Coated and Wrapped	No	0	$	18,804,267
2023	GRP	AA6 (SEGRID2023AA6 #7213)	Distribution Main	117649	3	69	STL - Coated Steel	Coated and Wrapped	No	0	$	18,804,267
2023	GRP	AA6 (SEGRID2023AA6 #7213)	Distribution Main	117652	10	69	STL - Coated Steel	Coated and Wrapped	No	0	$	18,804,267
2023	GRP	AA6 (SEGRID2023AA6 #7213)	Distribution Main	117653	50	69	STL - Coated Steel	Coated and Wrapped	No	0	$	18,804,267
2023	GRP	AA6 (SEGRID2023AA6 #7213)	Distribution Main	117656	265	65	STL - Coated Steel	Coated and Wrapped	Yes	4	$	18,804,267
2023	GRP	AA6 (SEGRID2023AA6 #7213)	Distribution Main	117657	3	69	STL - Coated Steel	Coated and Wrapped	No	0	$	18,804,267
2023	GRP	AA6 (SEGRID2023AA6 #7213)	Distribution Main	117658	3	69	STL - Coated Steel	Coated and Wrapped	No	0	$	18,804,267
2023	GRP	AA6 (SEGRID2023AA6 #7213)	Distribution Main	117678	110	62	STL - Coated Steel	Extruded Plastic	Yes	0	$	18,804,267
2023	GRP	AA6 (SEGRID2023AA6 #7213)	Distribution Main	117679	182	65	STL - Coated Steel	Coated and Wrapped	Yes	0	$	18,804,267
2023	GRP	AA6 (SEGRID2023AA6 #7213)	Distribution Main	117682	2	69	STL - Coated Steel	Coated and Wrapped	No	0	$	18,804,267
2023	GRP	AA6 (SEGRID2023AA6 #7213)	Distribution Main	117683	626	69	STL - Coated Steel	Coated and Wrapped	No	8	$	18,804,267
2023	GRP	AA6 (SEGRID2023AA6 #7213)	Distribution Main	117684	9	31	PLA - Plastic	N/A	No	0	$	18,804,267
2023	GRP	AA6 (SEGRID2023AA6 #7213)	Distribution Main	117685	632	69	STL - Coated Steel	Coated and Wrapped	No	5	$	18,804,267
2023	GRP	AA6 (SEGRID2023AA6 #7213)	Distribution Main	117686	3	18	PLA - Plastic	N/A	No	1	$	18,804,267
2023	GRP	AA6 (SEGRID2023AA6 #7213)	Distribution Main	117687	31	66	STL - Coated Steel	Coated and Wrapped	Yes	0	$	18,804,267
2023	GRP	AA6 (SEGRID2023AA6 #7213)	Distribution Main	117688	247	66	STL - Coated Steel	Coated and Wrapped	No	0	$	18,804,267
2023	GRP	AA6 (SEGRID2023AA6 #7213)	Distribution Main	117689	4	61	STL - Coated Steel	Coated and Wrapped	No	0	$	18,804,267
2023	GRP	AA6 (SEGRID2023AA6 #7213)	Distribution Main	117690	5	55	STL - Coated Steel	Extruded Plastic	No	0	$	18,804,267
2023	GRP	AA6 (SEGRID2023AA6 #7213)	Distribution Main	117691	43	69	STL - Coated Steel	Coated and Wrapped	No	0	$	18,804,267
2023	GRP	AA6 (SEGRID2023AA6 #7213)	Distribution Main	117692	20	67	STL - Coated Steel	Coated and Wrapped	No	0	$	18,804,267
2023	GRP	AA6 (SEGRID2023AA6 #7213)	Distribution Main	117693	114	68	STL - Coated Steel	Coated and Wrapped	No	0	$	18,804,267
2023	GRP	AA6 (SEGRID2023AA6 #7213)	Distribution Main	117694	285	67	STL - Coated Steel	Coated and Wrapped	No	3	$	18,804,267
2023	GRP	AA6 (SEGRID2023AA6 #7213)	Distribution Main	117695	825	69	STL - Coated Steel	Coated and Wrapped	No	5	$	18,804,267
2023	GRP	AA6 (SEGRID2023AA6 #7213)	Distribution Main	117696	874	69	STL - Coated Steel	Coated and Wrapped	No	4	$	18,804,267
2023	GRP	AA6 (SEGRID2023AA6 #7213)	Distribution Main	117697	743	69	STL - Coated Steel	Coated and Wrapped	No	4	$	18,804,267
2023	GRP	AA6 (SEGRID2023AA6 #7213)	Distribution Main	117698	104	69	STL - Coated Steel	Coated and Wrapped	No	2	$	18,804,267
2023	GRP	AA6 (SEGRID2023AA6 #7213)	Distribution Main	117699	257	70	STL - Coated Steel	Coated and Wrapped	No	0	$	18,804,267
2023	GRP	AA6 (SEGRID2023AA6 #7213)	Distribution Main	117700	126	69	STL - Coated Steel	Coated and Wrapped	No	1	$	18,804,267
2023	GRP	AA6 (SEGRID2023AA6 #7213)	Distribution Main	117701	1034	66	STL - Coated Steel	Coated and Wrapped	No	2	$	18,804,267
2023	GRP	AA6 (SEGRID2023AA6 #7213)	Distribution Main	117703	891	63	STL - Coated Steel	Coated and Wrapped	No	2	$	18,804,267
2023	GRP	AA6 (SEGRID2023AA6 #7213)	Distribution Main	117705	115	72	STL - Coated Steel	Coated and Wrapped	No	0	$	18,804,267
2023	GRP	AA6 (SEGRID2023AA6 #7213)	Distribution Main	117706	788	71	STL - Coated Steel	Coated and Wrapped	No	12	$	18,804,267
2023	GRP	AA6 (SEGRID2023AA6 #7213)	Distribution Main	117708	653	69	STL - Coated Steel	Coated and Wrapped	No	1	$	18,804,267
2023	GRP	AA6 (SEGRID2023AA6 #7213)	Distribution Main	117709	869	65	STL - Coated Steel	Coated and Wrapped	No	0	$	18,804,267
2023	GRP	AA6 (SEGRID2023AA6 #7213)	Distribution Main	117712	245	70	STL - Coated Steel	Coated and Wrapped	No	0	$	18,804,267
2023	GRP	AA6 (SEGRID2023AA6 #7213)	Distribution Main	117713	16	32	PLA - Plastic	N/A	No	0	$	18,804,267
2023	GRP	AA6 (SEGRID2023AA6 #7213)	Distribution Main	117716	282	71	STL - Coated Steel	Coated and Wrapped	No	4	$	18,804,267
2023	GRP	AA6 (SEGRID2023AA6 #7213)	Distribution Main	117717	640	70	STL - Coated Steel	Coated and Wrapped	No	3	$	18,804,267
2023	GRP	AA6 (SEGRID2023AA6 #7213)	Distribution Main	117719	120	55	STL - Coated Steel	Extruded Plastic	No	0	$	18,804,267
2023	GRP	AA6 (SEGRID2023AA6 #7213)	Distribution Main	117720	114	67	STL - Coated Steel	Coated and Wrapped	No	0	$	18,804,267
2023	GRP	AA6 (SEGRID2023AA6 #7213)	Distribution Main	117721	38	68	STL - Coated Steel	Coated and Wrapped	No	4	$	18,804,267
2023	GRP	AA6 (SEGRID2023AA6 #7213)	Distribution Main	117722	358	69	STL - Coated Steel	Coated and Wrapped	No	0	$	18,804,267
2023	GRP	AA6 (SEGRID2023AA6 #7213)	Distribution Main	117723	294	69	STL - Coated Steel	Coated and Wrapped	No	0	$	18,804,267
2023	GRP	AA6 (SEGRID2023AA6 #7213)	Distribution Main	117724	305	69	STL - Coated Steel	Coated and Wrapped	No	0	$	18,804,267
2023	GRP	AA6 (SEGRID2023AA6 #7213)	Distribution Main	117725	86	67	STL - Coated Steel	Coated and Wrapped	No	2	$	18,804,267
2023	GRP	AA6 (SEGRID2023AA6 #7213)	Distribution Main	117732	616	70	STL - Coated Steel	Coated and Wrapped	No	7	$	18,804,267
2023	GRP	AA6 (SEGRID2023AA6 #7213)	Distribution Main	117733	8	70	STL - Coated Steel	Coated and Wrapped	No	0	$	18,804,267
2023	GRP	AA6 (SEGRID2023AA6 #7213)	Distribution Main	117734	76	32	PLA - Plastic	N/A	No	1	$	18,804,267
2023	GRP	AA6 (SEGRID2023AA6 #7213)	Distribution Main	117735	4	32	PLA - Plastic	N/A	No	0	$	18,804,267
2023	GRP	AA6 (SEGRID2023AA6 #7213)	Distribution Main	117738	3	71	STL - Coated Steel	Coated and Wrapped	No	0	$	18,804,267
2023	GRP	AA6 (SEGRID2023AA6 #7213)	Distribution Main	117739	174	71	STL - Coated Steel	Coated and Wrapped	No	0	$	18,804,267

2023	GRP	AA6 (SEGRID2023AA6 #7213)	Distribution Main	117741	8	69	STL - Coated Steel	Coated and Wrapped	No	0	$	18,804,267
2023	GRP	AA6 (SEGRID2023AA6 #7213)	Distribution Main	117742	34	69	STL - Coated Steel	Coated and Wrapped	No	0	$	18,804,267
2023	GRP	AA6 (SEGRID2023AA6 #7213)	Distribution Main	117743	167	67	STL - Coated Steel	Coated and Wrapped	No	0	$	18,804,267
2023	GRP	AA6 (SEGRID2023AA6 #7213)	Distribution Main	117744	280	67	STL - Coated Steel	Coated and Wrapped	No	0	$	18,804,267
2023	GRP	AA6 (SEGRID2023AA6 #7213)	Distribution Main	117745	579	66	STL - Coated Steel	Coated and Wrapped	No	1	$	18,804,267
2023	GRP	AA6 (SEGRID2023AA6 #7213)	Distribution Main	117746	97	66	STL - Coated Steel	Coated and Wrapped	No	0	$	18,804,267
2023	GRP	AA6 (SEGRID2023AA6 #7213)	Distribution Main	117751	36	55	STL - Coated Steel	Extruded Plastic	No	0	$	18,804,267
2023	GRP	AA6 (SEGRID2023AA6 #7213)	Distribution Main	117752	4	55	STL - Coated Steel	Extruded Plastic	No	0	$	18,804,267
2023	GRP	AA6 (SEGRID2023AA6 #7213)	Distribution Main	117758	372	68	STL - Coated Steel	Coated and Wrapped	No	8	$	18,804,267
2023	GRP	AA6 (SEGRID2023AA6 #7213)	Distribution Main	117759	3	68	STL - Coated Steel	Coated and Wrapped	No	0	$	18,804,267
2023	GRP	AA6 (SEGRID2023AA6 #7213)	Distribution Main	117760	9	68	STL - Coated Steel	Coated and Wrapped	No	0	$	18,804,267
2023	GRP	AA6 (SEGRID2023AA6 #7213)	Distribution Main	117761	40	68	STL - Coated Steel	Coated and Wrapped	No	2	$	18,804,267
2023	GRP	AA6 (SEGRID2023AA6 #7213)	Distribution Main	117767	131	65	STL - Coated Steel	Coated and Wrapped	No	2	$	18,804,267
2023	GRP	AA6 (SEGRID2023AA6 #7213)	Distribution Main	117768	20	66	STL - Coated Steel	Coated and Wrapped	No	0	$	18,804,267
2023	GRP	AA6 (SEGRID2023AA6 #7213)	Distribution Main	117769	174	66	STL - Coated Steel	Coated and Wrapped	No	0	$	18,804,267
2023	GRP	AA6 (SEGRID2023AA6 #7213)	Distribution Main	117770	168	66	STL - Coated Steel	Coated and Wrapped	No	0	$	18,804,267
2023	GRP	AA6 (SEGRID2023AA6 #7213)	Distribution Main	117771	311	66	STL - Coated Steel	Coated and Wrapped	No	0	$	18,804,267
2023	GRP	AA6 (SEGRID2023AA6 #7213)	Distribution Main	117781	11	68	STL - Coated Steel	Coated and Wrapped	No	0	$	18,804,267
2023	GRP	AA6 (SEGRID2023AA6 #7213)	Distribution Main	117786	806	63	STL - Coated Steel	Coated and Wrapped	Yes	3	$	18,804,267
2023	GRP	AA6 (SEGRID2023AA6 #7213)	Distribution Main	117787	25	63	STL - Coated Steel	Coated and Wrapped	No	0	$	18,804,267
2023	GRP	AA6 (SEGRID2023AA6 #7213)	Distribution Main	117788	282	63	STL - Coated Steel	Coated and Wrapped	Yes	6	$	18,804,267
2023	GRP	AA6 (SEGRID2023AA6 #7213)	Distribution Main	117789	215	62	STL - Coated Steel	Coated and Wrapped	Yes	0	$	18,804,267
2023	GRP	AA6 (SEGRID2023AA6 #7213)	Distribution Main	117791	217	71	STL - Coated Steel	Coated and Wrapped	No	5	$	18,804,267
2023	GRP	AA6 (SEGRID2023AA6 #7213)	Distribution Main	117792	3	19	PLA - Plastic	N/A	No	0	$	18,804,267
2023	GRP	AA6 (SEGRID2023AA6 #7213)	Distribution Main	117793	14	66	STL - Coated Steel	Coated and Wrapped	No	0	$	18,804,267
2023	GRP	AA6 (SEGRID2023AA6 #7213)	Distribution Main	117794	383	66	STL - Coated Steel	Coated and Wrapped	Yes	0	$	18,804,267
2023	GRP	AA6 (SEGRID2023AA6 #7213)	Distribution Main	117817	15	66	STL - Coated Steel	Coated and Wrapped	No	0	$	18,804,267
2023	GRP	AA6 (SEGRID2023AA6 #7213)	Distribution Main	117844	82	32	PLA - Plastic	N/A	No	0	$	18,804,267
2023	GRP	AA6 (SEGRID2023AA6 #7213)	Distribution Main	117851	352	62	STL - Coated Steel	Coated and Wrapped	Yes	3	$	18,804,267
2023	GRP	AA6 (SEGRID2023AA6 #7213)	Distribution Main	117852	282	57	STL - Coated Steel	Extruded Plastic	Yes	1	$	18,804,267
2023	GRP	AA6 (SEGRID2023AA6 #7213)	Distribution Main	117853	11	57	STL - Coated Steel	Extruded Plastic	Yes	0	$	18,804,267
2023	GRP	AA6 (SEGRID2023AA6 #7213)	Distribution Main	117854	845	60	STL - Coated Steel	Extruded Plastic	Yes	1	$	18,804,267
2023	GRP	AA6 (SEGRID2023AA6 #7213)	Distribution Main	117855	204	60	STL - Coated Steel	Extruded Plastic	Yes	0	$	18,804,267
2023	GRP	AA6 (SEGRID2023AA6 #7213)	Distribution Main	117870	7	50	STL - Coated Steel	Extruded Plastic	Yes	0	$	18,804,267
2023	GRP	AA6 (SEGRID2023AA6 #7213)	Distribution Main	118465	11	83	STL - Coated Steel	Coated and Wrapped	Yes	0	$	18,804,267
2023	GRP	AA6 (SEGRID2023AA6 #7213)	Distribution Main	118466	157	70	STL - Coated Steel	Coated and Wrapped	Yes	0	$	18,804,267
2023	GRP	AA6 (SEGRID2023AA6 #7213)	Distribution Main	118495	169	70	STL - Coated Steel	Coated and Wrapped	No	0	$	18,804,267
2023	GRP	AA6 (SEGRID2023AA6 #7213)	Distribution Main	118496	253	70	STL - Coated Steel	Coated and Wrapped	Yes	1	$	18,804,267
2023	GRP	AA6 (SEGRID2023AA6 #7213)	Distribution Main	118511	136	66	STL - Coated Steel	Coated and Wrapped	No	0	$	18,804,267
2023	GRP	AA6 (SEGRID2023AA6 #7213)	Distribution Main	118512	373	66	STL - Coated Steel	Coated and Wrapped	No	1	$	18,804,267
2023	GRP	AA6 (SEGRID2023AA6 #7213)	Distribution Main	118518	306	70	STL - Coated Steel	Coated and Wrapped	Yes	0	$	18,804,267
2023	GRP	AA6 (SEGRID2023AA6 #7213)	Distribution Main	118519	298	70	STL - Coated Steel	Coated and Wrapped	Yes	7	$	18,804,267
2023	GRP	AA6 (SEGRID2023AA6 #7213)	Distribution Main	118520	155	70	STL - Coated Steel	Coated and Wrapped	Yes	0	$	18,804,267
2023	GRP	AA6 (SEGRID2023AA6 #7213)	Distribution Main	118522	199	45	PLA - Plastic	N/A	No	0	$	18,804,267
2023	GRP	AA6 (SEGRID2023AA6 #7213)	Distribution Main	118526	190	64	STL - Coated Steel	Coated and Wrapped	No	0	$	18,804,267
2023	GRP	AA6 (SEGRID2023AA6 #7213)	Distribution Main	118527	185	69	STL - Coated Steel	Coated and Wrapped	No	0	$	18,804,267
2023	GRP	AA6 (SEGRID2023AA6 #7213)	Distribution Main	118528	116	69	STL - Coated Steel	Coated and Wrapped	No	3	$	18,804,267
2023	GRP	AA6 (SEGRID2023AA6 #7213)	Distribution Main	118529	100	70	STL - Coated Steel	Coated and Wrapped	No	0	$	18,804,267
2023	GRP	AA6 (SEGRID2023AA6 #7213)	Distribution Main	118540	188	70	STL - Coated Steel	Coated and Wrapped	No	0	$	18,804,267
2023	GRP	AA6 (SEGRID2023AA6 #7213)	Distribution Main	118541	7	30	PLA - Plastic	N/A	No	0	$	18,804,267
2023	GRP	AA6 (SEGRID2023AA6 #7213)	Distribution Main	118546	19	30	PLA - Plastic	N/A	No	0	$	18,804,267
2023	GRP	AA6 (SEGRID2023AA6 #7213)	Distribution Main	118548	3	30	PLA - Plastic	N/A	No	0	$	18,804,267
2023	GRP	AA6 (SEGRID2023AA6 #7213)	Distribution Main	118618	39	70	STL - Coated Steel	Coated and Wrapped	Yes	1	$	18,804,267
2023	GRP	AA6 (SEGRID2023AA6 #7213)	Distribution Main	118622	341	70	STL - Coated Steel	Coated and Wrapped	No	7	$	18,804,267
2023	GRP	AA6 (SEGRID2023AA6 #7213)	Distribution Main	118623	928	70	STL - Coated Steel	Coated and Wrapped	No	1	$	18,804,267
2023	GRP	AA6 (SEGRID2023AA6 #7213)	Distribution Main	118625	203	69	STL - Coated Steel	Coated and Wrapped	No	4	$	18,804,267
2023	GRP	AA6 (SEGRID2023AA6 #7213)	Distribution Main	118627	18	39	STL - Coated Steel	Coated and Wrapped	Yes	0	$	18,804,267
2023	GRP	AA6 (SEGRID2023AA6 #7213)	Distribution Main	118628	6	39	STL - Coated Steel	Coated and Wrapped	Yes	0	$	18,804,267
2023	GRP	AA6 (SEGRID2023AA6 #7213)	Distribution Main	118629	565	69	STL - Coated Steel	Coated and Wrapped	No	4	$	18,804,267
2023	GRP	AA6 (SEGRID2023AA6 #7213)	Distribution Main	118630	462	69	STL - Coated Steel	Coated and Wrapped	No	2	$	18,804,267

2023 GRP	AA6 (SEGRID2023AA6 #7213)	Distribution Main	118631	304	55	STL - Coated Steel	Extruded Plastic	No	0	$ 18,804,267
2023 GRP	AA6 (SEGRID2023AA6 #7213)	Distribution Main	118638	299	55	STL - Coated Steel	Extruded Plastic	No	0	$ 18,804,267
2023 GRP	AA6 (SEGRID2023AA6 #7213)	Distribution Main	118639	217	55	STL - Coated Steel	Extruded Plastic	No	1	$ 18,804,267
2023 GRP	AA6 (SEGRID2023AA6 #7213)	Distribution Main	118640	704	69	STL - Coated Steel	Coated and Wrapped	No	5	$ 18,804,267
2023 GRP	AA6 (SEGRID2023AA6 #7213)	Distribution Main	118641	70	69	STL - Coated Steel	Coated and Wrapped	No	0	$ 18,804,267
2023 GRP	AA6 (SEGRID2023AA6 #7213)	Distribution Main	118642	348	69	STL - Coated Steel	Coated and Wrapped	No	0	$ 18,804,267
2023 GRP	AA6 (SEGRID2023AA6 #7213)	Distribution Main	118643	32	70	STL - Coated Steel	Coated and Wrapped	No	0	$ 18,804,267
2023 GRP	AA6 (SEGRID2023AA6 #7213)	Distribution Main	118644	258	70	STL - Coated Steel	Coated and Wrapped	No	1	$ 18,804,267
2023 GRP	AA6 (SEGRID2023AA6 #7213)	Distribution Main	118646	42	34	PLA - Plastic	N/A	No	0	$ 18,804,267
2023 GRP	AA6 (SEGRID2023AA6 #7213)	Distribution Main	118647	2	34	PLA - Plastic	N/A	No	0	$ 18,804,267
2023 GRP	AA6 (SEGRID2023AA6 #7213)	Distribution Main	118648	1	34	PLA - Plastic	N/A	No	0	$ 18,804,267
2023 GRP	AA6 (SEGRID2023AA6 #7213)	Distribution Main	118649	3	70	STL - Coated Steel	Coated and Wrapped	No	0	$ 18,804,267
2023 GRP	AA6 (SEGRID2023AA6 #7213)	Distribution Main	118651	5	55	STL - Coated Steel	Extruded Plastic	No	0	$ 18,804,267
2023 GRP	AA6 (SEGRID2023AA6 #7213)	Distribution Main	118652	5	55	STL - Coated Steel	Coated and Wrapped	No	0	$ 18,804,267
2023 GRP	AA6 (SEGRID2023AA6 #7213)	Distribution Main	118656	180	34	PLA - Plastic	N/A	No	0	$ 18,804,267
2023 GRP	AA6 (SEGRID2023AA6 #7213)	Distribution Main	118657	13	34	PLA - Plastic	N/A	No	0	$ 18,804,267
2023 GRP	AA6 (SEGRID2023AA6 #7213)	Distribution Main	118658	41	69	STL - Coated Steel	Coated and Wrapped	No	0	$ 18,804,267
2023 GRP	AA6 (SEGRID2023AA6 #7213)	Distribution Main	118659	374	69	STL - Coated Steel	Coated and Wrapped	No	2	$ 18,804,267
2023 GRP	AA6 (SEGRID2023AA6 #7213)	Distribution Main	118664	160	55	STL - Coated Steel	Extruded Plastic	No	0	$ 18,804,267
2023 GRP	AA6 (SEGRID2023AA6 #7213)	Distribution Main	118665	52	69	STL - Coated Steel	Coated and Wrapped	No	0	$ 18,804,267
2023 GRP	AA6 (SEGRID2023AA6 #7213)	Distribution Main	118666	69	71	STL - Coated Steel	Coated and Wrapped	No	0	$ 18,804,267
2023 GRP	AA6 (SEGRID2023AA6 #7213)	Distribution Main	118667	419	70	STL - Coated Steel	Coated and Wrapped	No	0	$ 18,804,267
2023 GRP	AA6 (SEGRID2023AA6 #7213)	Distribution Main	118668	100	67	STL - Coated Steel	Coated and Wrapped	No	0	$ 18,804,267
2023 GRP	AA6 (SEGRID2023AA6 #7213)	Distribution Main	118670	14	67	STL - Coated Steel	Coated and Wrapped	No	0	$ 18,804,267
2023 GRP	AA6 (SEGRID2023AA6 #7213)	Distribution Main	118671	449	67	STL - Coated Steel	Coated and Wrapped	No	1	$ 18,804,267
2023 GRP	AA6 (SEGRID2023AA6 #7213)	Distribution Main	118672	426	67	STL - Coated Steel	Coated and Wrapped	No	4	$ 18,804,267
2023 GRP	AA6 (SEGRID2023AA6 #7213)	Distribution Main	118674	10	70	STL - Coated Steel	Coated and Wrapped	No	0	$ 18,804,267
2023 GRP	AA6 (SEGRID2023AA6 #7213)	Distribution Main	118675	280	55	STL - Coated Steel	Extruded Plastic	No	0	$ 18,804,267
2023 GRP	AA6 (SEGRID2023AA6 #7213)	Distribution Main	118676	3	70	STL - Coated Steel	Coated and Wrapped	No	0	$ 18,804,267
2023 GRP	AA6 (SEGRID2023AA6 #7213)	Distribution Main	118677	3	93	STL - Coated Steel	Coated and Wrapped	No	0	$ 18,804,267
2023 GRP	AA6 (SEGRID2023AA6 #7213)	Distribution Main	118678	3	70	STL - Coated Steel	Coated and Wrapped	No	1	$ 18,804,267
2023 GRP	AA6 (SEGRID2023AA6 #7213)	Distribution Main	118684	153	63	STL - Coated Steel	Coated and Wrapped	Yes	0	$ 18,804,267
2023 GRP	AA6 (SEGRID2023AA6 #7213)	Distribution Main	118685	87	64	STL - Coated Steel	Coated and Wrapped	Yes	0	$ 18,804,267
2023 GRP	AA6 (SEGRID2023AA6 #7213)	Distribution Main	118686	3	55	STL - Coated Steel	Extruded Plastic	Yes	0	$ 18,804,267
2023 GRP	AA6 (SEGRID2023AA6 #7213)	Distribution Main	118687	437	55	STL - Coated Steel	Extruded Plastic	Yes	0	$ 18,804,267
2023 GRP	AA6 (SEGRID2023AA6 #7213)	Distribution Main	118692	85	62	STL - Coated Steel	Coated and Wrapped	Yes	1	$ 18,804,267
2023 GRP	AA6 (SEGRID2023AA6 #7213)	Distribution Main	118694	234	55	STL - Coated Steel	Extruded Plastic	Yes	0	$ 18,804,267
2023 GRP	AA6 (SEGRID2023AA6 #7213)	Distribution Main	118695	3	55	STL - Coated Steel	Extruded Plastic	No	0	$ 18,804,267
2023 GRP	AA6 (SEGRID2023AA6 #7213)	Distribution Main	118708	180	71	STL - Coated Steel	Coated and Wrapped	No	1	$ 18,804,267
2023 GRP	AA6 (SEGRID2023AA6 #7213)	Distribution Main	118709	243	72	STL - Coated Steel	Coated and Wrapped	No	1	$ 18,804,267
2023 GRP	AA6 (SEGRID2023AA6 #7213)	Distribution Main	118710	64	72	STL - Coated Steel	Coated and Wrapped	No	0	$ 18,804,267
2023 GRP	AA6 (SEGRID2023AA6 #7213)	Distribution Main	118711	213	47	PLA - Plastic	N/A	No	1	$ 18,804,267
2023 GRP	AA6 (SEGRID2023AA6 #7213)	Distribution Main	118717	494	67	STL - Coated Steel	Coated and Wrapped	No	5	$ 18,804,267
2023 GRP	AA6 (SEGRID2023AA6 #7213)	Distribution Main	118718	520	41	PLA - Plastic	N/A	No	0	$ 18,804,267
2023 GRP	AA6 (SEGRID2023AA6 #7213)	Distribution Main	118719	90	43	PLA - Plastic	N/A	No	0	$ 18,804,267
2023 GRP	AA6 (SEGRID2023AA6 #7213)	Distribution Main	118722	33	72	STL - Coated Steel	Coated and Wrapped	No	0	$ 18,804,267
2023 GRP	AA6 (SEGRID2023AA6 #7213)	Distribution Main	118723	2	71	STL - Coated Steel	Coated and Wrapped	No	0	$ 18,804,267
2023 GRP	AA6 (SEGRID2023AA6 #7213)	Distribution Main	118736	274	72	STL - Coated Steel	Coated and Wrapped	No	0	$ 18,804,267
2023 GRP	AA6 (SEGRID2023AA6 #7213)	Distribution Main	118737	57	72	STL - Coated Steel	Coated and Wrapped	No	1	$ 18,804,267
2023 GRP	AA6 (SEGRID2023AA6 #7213)	Distribution Main	118738	1	83	STL - Bare Steel	Bare Steel	No	0	$ 18,804,267
2023 GRP	AA6 (SEGRID2023AA6 #7213)	Distribution Main	118739	1	83	STL - Bare Steel	Bare Steel	No	0	$ 18,804,267
2023 GRP	AA6 (SEGRID2023AA6 #7213)	Distribution Main	118740	194	43	PLA - Plastic	N/A	No	0	$ 18,804,267
2023 GRP	AA6 (SEGRID2023AA6 #7213)	Distribution Main	118749	30	72	STL - Coated Steel	Coated and Wrapped	No	0	$ 18,804,267
2023 GRP	AA6 (SEGRID2023AA6 #7213)	Distribution Main	118750	328	72	STL - Coated Steel	Coated and Wrapped	No	0	$ 18,804,267
2023 GRP	AA6 (SEGRID2023AA6 #7213)	Distribution Main	118752	266	43	PLA - Plastic	N/A	No	0	$ 18,804,267
2023 GRP	AA6 (SEGRID2023AA6 #7213)	Distribution Main	118754	237	70	STL - Coated Steel	Coated and Wrapped	No	0	$ 18,804,267
2023 GRP	AA6 (SEGRID2023AA6 #7213)	Distribution Main	118761	56	43	PLA - Plastic	N/A	No	0	$ 18,804,267
2023 GRP	AA6 (SEGRID2023AA6 #7213)	Distribution Main	118762	4	43	PLA - Plastic	N/A	No	0	$ 18,804,267
2023 GRP	AA6 (SEGRID2023AA6 #7213)	Distribution Main	118790	1	43	PLA - Plastic	N/A	No	0	$ 18,804,267
2023 GRP	AA6 (SEGRID2023AA6 #7213)	Distribution Main	118792	3	29	PLA - Plastic	N/A	No	1	$ 18,804,267

2023 GRP	AA6 (SEGRID2023AA6 #7213)	Distribution Main	118793	13	35	PLA - Plastic	N/A	No	0	$ 18,804,267
2023 GRP	AA6 (SEGRID2023AA6 #7213)	Distribution Main	118795	431	64	STL - Coated Steel	Coated and Wrapped	Yes	0	$ 18,804,267
2023 GRP	AA6 (SEGRID2023AA6 #7213)	Distribution Main	118813	150	70	STL - Coated Steel	Coated and Wrapped	No	2	$ 18,804,267
2023 GRP	AA6 (SEGRID2023AA6 #7213)	Distribution Main	901133	915	45	PLA - Plastic	N/A	No	0	$ 18,804,267
2023 GRP	AA6 (SEGRID2023AA6 #7213)	Distribution Main	901136	25	45	PLA - Plastic	N/A	No	0	$ 18,804,267
2023 GRP	AA6 (SEGRID2023AA6 #7213)	Distribution Main	902081	5	14	PLA - Plastic	N/A	No	1	$ 18,804,267
2023 GRP	AA6 (SEGRID2023AA6 #7213)	Distribution Main	931201	447	69	STL - Coated Steel	Coated and Wrapped	No	1	$ 18,804,267
2023 GRP	AA6 (SEGRID2023AA6 #7213)	Distribution Main	931202	34	69	STL - Coated Steel	Coated and Wrapped	Yes	1	$ 18,804,267
2023 GRP	AA6 (SEGRID2023AA6 #7213)	Distribution Main	931203	339	70	STL - Coated Steel	Coated and Wrapped	No	1	$ 18,804,267
2023 GRP	AA6 (SEGRID2023AA6 #7213)	Distribution Main	931204	82	70	STL - Coated Steel	Coated and Wrapped	Yes	0	$ 18,804,267
2023 GRP	AA6 (SEGRID2023AA6 #7213)	Distribution Main	1023364	10	55	STL - Coated Steel	Extruded Plastic	No	0	$ 18,804,267
2023 GRP	AA6 (SEGRID2023AA6 #7213)	Distribution Main	1023367	27	67	STL - Coated Steel	Coated and Wrapped	No	0	$ 18,804,267
2023 GRP	AA6 (SEGRID2023AA6 #7213)	Distribution Main	1111361	4	13	PLA - Plastic	N/A	No	0	$ 18,804,267
2023 GRP	AA6 (SEGRID2023AA6 #7213)	Distribution Main	1671361	33	10	PLA - Plastic	N/A	No	0	$ 18,804,267
2023 GRP	AA6 (SEGRID2023AA6 #7213)	Distribution Main	1719685	5	11	PLA - Plastic	N/A	No	0	$ 18,804,267
2023 GRP	AA6 (SEGRID2023AA6 #7213)	Distribution Main	1719688	8	11	PLA - Plastic	N/A	No	0	$ 18,804,267
2023 GRP	AA6 (SEGRID2023AA6 #7213)	Distribution Main	1719689	4	11	PLA - Plastic	N/A	No	0	$ 18,804,267
2023 GRP	AA6 (SEGRID2023AA6 #7213)	Distribution Main	1719693	4	11	PLA - Plastic	N/A	No	0	$ 18,804,267
2023 GRP	AA6 (SEGRID2023AA6 #7213)	Distribution Main	1719694	67	11	PLA - Plastic	N/A	No	0	$ 18,804,267
2023 GRP	AA6 (SEGRID2023AA6 #7213)	Distribution Main	1719695	4	11	PLA - Plastic	N/A	No	0	$ 18,804,267
2023 GRP	AA6 (SEGRID2023AA6 #7213)	Distribution Main	1719696	20	11	PLA - Plastic	N/A	No	0	$ 18,804,267
2023 GRP	AA6 (SEGRID2023AA6 #7213)	Distribution Main	1872649	292	69	STL - Coated Steel	Coated and Wrapped	No	0	$ 18,804,267
2023 GRP	AA6 (SEGRID2023AA6 #7213)	Distribution Main	1872652	426	69	STL - Coated Steel	Coated and Wrapped	No	2	$ 18,804,267
2023 GRP	AA6 (SEGRID2023AA6 #7213)	Distribution Main	2731227	2	64	STL - Coated Steel	Coated and Wrapped	Yes	0	$ 18,804,267
2023 GRP	AA6 (SEGRID2023AA6 #7213)	Distribution Main	2953941	7	63	STL - Coated Steel	Coated and Wrapped	Yes	0	$ 18,804,267
2023 GRP	AA6 (SEGRID2023AA6 #7213)	Distribution Main	2953942	7	65	STL - Coated Steel	Coated and Wrapped	Yes	0	$ 18,804,267
2023 GRP	AA6 (SEGRID2023AA6 #7213)	Distribution Main	3157169	202	37	PLA - Plastic	N/A	No	0	$ 18,804,267
2023 GRP	AA6 (SEGRID2023AA6 #7213)	Distribution Main	3218258	7	6	PLA - Plastic	N/A	No	0	$ 18,804,267
2023 GRP	AA6 (SEGRID2023AA6 #7213)	Distribution Main	3218262	13	6	PLA - Plastic	N/A	No	0	$ 18,804,267
2023 GRP	AA6 (SEGRID2023AA6 #7213)	Distribution Main	3218263	5	6	PLA - Plastic	N/A	No	0	$ 18,804,267
2023 GRP	AA6 (SEGRID2023AA6 #7213)	Distribution Main	3987300	2	4	PLA - Plastic	N/A	No	0	$ 18,804,267
2023 GRP	AA6 (SEGRID2023AA6 #7213)	Distribution Main	3987301	3	4	PLA - Plastic	N/A	No	0	$ 18,804,267
2023 GRP	AA6 (SEGRID2023AA6 #7213)	Distribution Main	3987302	4	4	PLA - Plastic	N/A	No	0	$ 18,804,267
2023 GRP	AA6 (SEGRID2023AA6 #7213)	Distribution Main	5156017	61	55	STL - Coated Steel	Extruded Plastic	No	0	$ 18,804,267
2023 GRP	Traver Field Rec (FRMMICH22046)	Distribution Main	121003	785	95	STL - Bare Steel	Bare Steel	No	4	$ 2,359,791
2023 GRP	Traver Field Rec (FRMMICH22046)	Distribution Main	121011	870	110	WI - Wrought Iron	N/A	No	2	$ 2,359,791
2023 GRP	Traver Field Rec (FRMMICH22046)	Distribution Main	121032	104	110	WI - Wrought Iron	N/A	No	0	$ 2,359,791
2023 GRP	Traver Field Rec (FRMMICH22046)	Distribution Main	121033	86	110	WI - Wrought Iron	N/A	No	1	$ 2,359,791
2023 GRP	Traver Field Rec (FRMMICH22046)	Distribution Main	121048	130	110	WI - Wrought Iron	N/A	No	1	$ 2,359,791
2023 GRP	Traver Field Rec (FRMMICH22046)	Distribution Main	121050	460	85	STL - Bare Steel	Bare Steel	No	0	$ 2,359,791
2023 GRP	Traver Field Rec (FRMMICH22046)	Distribution Main	121055	558	70	STL - Coated Steel	Coated and Wrapped	No	0	$ 2,359,791
2023 GRP	Traver Field Rec (FRMMICH22046)	Distribution Main	121056	62	64	STL - Coated Steel	Coated and Wrapped	No	0	$ 2,359,791
2023 GRP	Traver Field Rec (FRMMICH22046)	Distribution Main	121057	80	66	STL - Coated Steel	Coated and Wrapped	No	2	$ 2,359,791
2023 GRP	Traver Field Rec (FRMMICH22046)	Distribution Main	121058	380	77	STL - Coated Steel	Coated and Wrapped	No	1	$ 2,359,791
2023 GRP	Traver Field Rec (FRMMICH22046)	Distribution Main	121059	110	77	STL - Coated Steel	Coated and Wrapped	No	2	$ 2,359,791
2023 GRP	Traver Field Rec (FRMMICH22046)	Distribution Main	121075	320	110	WI - Wrought Iron	N/A	No	0	$ 2,359,791
2023 GRP	Traver Field Rec (FRMMICH22046)	Distribution Main	121078	153	77	STL - Coated Steel	Coated and Wrapped	No	5	$ 2,359,791
2023 GRP	Traver Field Rec (FRMMICH22046)	Distribution Main	121082	79	100	STL - Bare Steel	Bare Steel	No	0	$ 2,359,791
2023 GRP	Traver Field Rec (FRMMICH22046)	Distribution Main	121084	237	96	STL - Bare Steel	Bare Steel	No	0	$ 2,359,791
2023 GRP	Traver Field Rec (FRMMICH22046)	Distribution Main	121085	301	96	STL - Bare Steel	Bare Steel	No	0	$ 2,359,791
2023 GRP	Traver Field Rec (FRMMICH22046)	Distribution Main	121086	22	96	STL - Bare Steel	Bare Steel	No	0	$ 2,359,791
2023 GRP	Traver Field Rec (FRMMICH22046)	Distribution Main	121098	179	94	STL - Bare Steel	Bare Steel	No	0	$ 2,359,791
2023 GRP	Traver Field Rec (FRMMICH22046)	Distribution Main	121099	3	94	STL - Bare Steel	Bare Steel	No	0	$ 2,359,791
2023 GRP	Traver Field Rec (FRMMICH22046)	Distribution Main	121111	9	96	STL - Bare Steel	Bare Steel	No	0	$ 2,359,791
2023 GRP	Traver Field Rec (FRMMICH22046)	Distribution Main	121112	77	96	STL - Bare Steel	Bare Steel	No	0	$ 2,359,791
2023 GRP	Traver Field Rec (FRMMICH22046)	Distribution Main	121116	851	100	STL - Bare Steel	Bare Steel	No	11	$ 2,359,791
2023 GRP	Traver Field Rec (FRMMICH22046)	Distribution Main	121117	782	100	STL - Bare Steel	Bare Steel	No	4	$ 2,359,791
2023 GRP	Traver Field Rec (FRMMICH22046)	Distribution Main	121118	394	100	STL - Bare Steel	Bare Steel	No	2	$ 2,359,791
2023 GRP	Traver Field Rec (FRMMICH22046)	Distribution Main	121119	17	100	STL - Bare Steel	Bare Steel	No	0	$ 2,359,791
2023 GRP	Traver Field Rec (FRMMICH22046)	Distribution Main	121131	174	77	STL - Coated Steel	Coated and Wrapped	No	0	$ 2,359,791

2023	GRP	Traver Field Rec (FRMMICH22046)	Distribution Main	121139	145	77	STL - Coated Steel	Coated and Wrapped	No	6	$ 2,359,791
2023	GRP	Traver Field Rec (FRMMICH22046)	Distribution Main	121140	93	77	STL - Coated Steel	Coated and Wrapped	No	0	$ 2,359,791
2023	GRP	Traver Field Rec (FRMMICH22046)	Distribution Main	121211	150	77	STL - Coated Steel	Coated and Wrapped	No	4	$ 2,359,791
2023	GRP	Traver Field Rec (FRMMICH22046)	Distribution Main	121221	52	74	STL - Coated Steel	Coated and Wrapped	No	2	$ 2,359,791
2023	GRP	Traver Field Rec (FRMMICH22046)	Distribution Main	121246	10	77	STL - Coated Steel	Coated and Wrapped	No	0	$ 2,359,791
2023	GRP	Traver Field Rec (FRMMICH22046)	Distribution Main	122431	486	62	STL - Coated Steel	Coated and Wrapped	No	0	$ 2,359,791
2023	GRP	Traver Field Rec (FRMMICH22046)	Distribution Main	122432	125	60	STL - Coated Steel	Extruded Plastic	No	0	$ 2,359,791
2023	GRP	Traver Field Rec (FRMMICH22046)	Distribution Main	122465	396	100	STL - Bare Steel	Bare Steel	No	0	$ 2,359,791
2023	GRP	Traver Field Rec (FRMMICH22046)	Distribution Main	122478	135	100	STL - Bare Steel	Bare Steel	No	0	$ 2,359,791
2023	GRP	Traver Field Rec (FRMMICH22046)	Distribution Main	122479	79	100	STL - Bare Steel	Bare Steel	No	0	$ 2,359,791
2023	GRP	Traver Field Rec (FRMMICH22046)	Distribution Main	122488	315	100	STL - Bare Steel	Bare Steel	No	1	$ 2,359,791
2023	GRP	Traver Field Rec (FRMMICH22046)	Distribution Main	122509	512	55	STL - Coated Steel	Extruded Plastic	No	0	$ 2,359,791
2023	GRP	Traver Field Rec (FRMMICH22046)	Distribution Main	122524	514	60	STL - Coated Steel	Extruded Plastic	No	0	$ 2,359,791
2023	GRP	Traver Field Rec (FRMMICH22046)	Distribution Main	122525	20	60	STL - Coated Steel	Extruded Plastic	No	0	$ 2,359,791
2023	GRP	Traver Field Rec (FRMMICH22046)	Distribution Main	122526	8	55	STL - Coated Steel	Extruded Plastic	No	0	$ 2,359,791
2023	GRP	Traver Field Rec (FRMMICH22046)	Distribution Main	122527	20	60	STL - Coated Steel	Extruded Plastic	No	0	$ 2,359,791
2023	GRP	Traver Field Rec (FRMMICH22046)	Distribution Main	3443941	34	77	STL - Coated Steel	Coated and Wrapped	No	1	$ 2,359,791
2023	GRP	Traver Field Rec (FRMMICH22046)	Distribution Main	4314338	12	100	STL - Bare Steel	Bare Steel	No	0	$ 2,359,791
2024	GRP	Ann Arbor Muni (SEGRID0225AA7013)	Distribution Main	111166	710	67	STL - Coated Steel	Coated and Wrapped	No	2	$ 1,015,197
2024	GRP	Ann Arbor Muni (SEGRID0225AA7013)	Distribution Main	111167	3	68	STL - Coated Steel	Coated and Wrapped	No	0	$ 1,015,197
2024	GRP	Ann Arbor Muni (SEGRID0225AA7013)	Distribution Main	111168	3	68	STL - Coated Steel	Coated and Wrapped	No	0	$ 1,015,197
2024	GRP	Ann Arbor Muni (SEGRID0225AA7013)	Distribution Main	111192	1	67	STL - Coated Steel	Coated and Wrapped	No	0	$ 1,015,197
2024	GRP	Ann Arbor Muni (SEGRID0225AA7013)	Distribution Main	111197	201	68	STL - Coated Steel	Coated and Wrapped	No	0	$ 1,015,197
2024	GRP	Ann Arbor Muni (SEGRID0225AA7013)	Distribution Main	111198	39	68	STL - Coated Steel	Coated and Wrapped	No	0	$ 1,015,197
2024	GRP	Ann Arbor Muni (SEGRID0225AA7013)	Distribution Main	111208	232	67	STL - Coated Steel	Coated and Wrapped	No	0	$ 1,015,197
2024	GRP	Ann Arbor Muni (SEGRID0225AA7013)	Distribution Main	111214	286	68	STL - Coated Steel	Coated and Wrapped	No	2	$ 1,015,197
2024	GRP	Ann Arbor Muni (SEGRID0225AA7013)	Distribution Main	111215	249	68	STL - Coated Steel	Coated and Wrapped	No	0	$ 1,015,197
2024	GRP	Ann Arbor Muni (SEGRID0225AA7013)	Distribution Main	111218	24	67	STL - Coated Steel	Coated and Wrapped	No	0	$ 1,015,197
2024	GRP	Ann Arbor Muni (SEGRID0225AA7013)	Distribution Main	111219	253	67	STL - Coated Steel	Coated and Wrapped	No	0	$ 1,015,197
2024	GRP	Ann Arbor Muni (SEGRID0225AA7013)	Distribution Main	111221	367	68	STL - Coated Steel	Coated and Wrapped	No	3	$ 1,015,197
2024	GRP	Ann Arbor Muni (SEGRID0225AA7013)	Distribution Main	111226	695	67	STL - Coated Steel	Coated and Wrapped	No	12	$ 1,015,197
2024	GRP	Ann Arbor Muni (SEGRID0225AA7013)	Distribution Main	111234	187	68	STL - Coated Steel	Coated and Wrapped	No	0	$ 1,015,197
2024	GRP	Ann Arbor Muni (SEGRID0225AA7013)	Distribution Main	122561	350	68	STL - Coated Steel	Coated and Wrapped	No	4	$ 1,015,197
2024	GRP	Corrosion Rec (Monroe CRMI2302)	Distribution Main	120695	6	95	STL - Bare Steel	Bare Steel	No	0	$ 281,221
2024	GRP	Corrosion Rec (Monroe CRMI2302)	Distribution Main	120716	306	95	STL - Bare Steel	Bare Steel	No	3	$ 281,221
2024	GRP	Corrosion Rec (Monroe CRMI2302)	Distribution Main	120717	5	95	STL - Bare Steel	Bare Steel	No	1	$ 281,221
2024	GRP	Corrosion Rec (Monroe CRMI2302)	Distribution Main	120718	337	95	STL - Bare Steel	Bare Steel	No	3	$ 281,221
2024	GRP	Corrosion Rec (Monroe CRMI2302)	Distribution Main	120719	7	95	STL - Bare Steel	Bare Steel	No	0	$ 281,221
2024	GRP	Corrosion Rec (Monroe CRMI2302)	Distribution Main	120737	27	95	STL - Bare Steel	Bare Steel	No	1	$ 281,221
2024	GRP	Corrosion Rec (Monroe CRMI2302)	Distribution Main	120738	3	95	STL - Bare Steel	Bare Steel	No	1	$ 281,221
2024	GRP	Corrosion Rec (Monroe CRMI2302)	Distribution Main	120767	28	96	STL - Bare Steel	Bare Steel	No	0	$ 281,221
2024	GRP	Corrosion Rec (Monroe CRMI2302)	Distribution Main	120773	305	95	STL - Bare Steel	Bare Steel	No	1	$ 281,221
2024	GRP	Corrosion Rec (Monroe CRMI2302)	Distribution Main	120786	19	96	STL - Bare Steel	Bare Steel	No	0	$ 281,221
2024	GRP	Corrosion Rec (Monroe CRMI2302)	Distribution Main	3377361	4	6	PLA - Plastic	N/A	No	0	$ 281,221
2024	GRP	Corrosion Rec (Monroe CRMI2302)	Distribution Main	3377362	9	6	PLA - Plastic	N/A	No	0	$ 281,221
2024	GRP	Corrosion Rec (Monroe CRMI2302)	Distribution Main	3377363	6	6	PLA - Plastic	N/A	No	0	$ 281,221
2024	GRP	Corrosion Rec (Monroe CRMI2302)	Distribution Main	3377364	18	6	PLA - Plastic	N/A	No	0	$ 281,221
2024	GRP	Corrosion Rec (Monroe CRMI2302)	Distribution Main	3377365	5	6	PLA - Plastic	N/A	No	0	$ 281,221
2023	Public Improvement	State Street and Liberty	Distribution Main	6664535	283	39	PLA - Plastic	N/A	No	0	$ 349,808.00
2023	Public Improvement	State Street and Liberty	Distribution Main	6613618	13	39	PLA - Plastic	N/A	No	0	$ 349,808.00
2023	Public Improvement	State Street and Liberty	Distribution Main	6586306	13	36	PLA - Plastic	N/A	No	0	$ 349,808.00
2023	Public Improvement	State Street and Liberty	Distribution Main	6586305	14	36	PLA - Plastic	N/A	No	0	$ 349,808.00
2023	Public Improvement	State Street and Liberty	Distribution Main	6741633	19	39	PLA - Plastic	N/A	No	0	$ 349,808.00
2023	Public Improvement	State Street and Liberty	Distribution Main	6613617	30	39	PLA - Plastic	N/A	No	0	$ 349,808.00
2023	Public Improvement	State Street and Liberty	Distribution Main	6588924	5	36	PLA - Plastic	N/A	No	0	$ 349,808.00
2023	Public Improvement	State Street and Liberty	Distribution Main	6588925	15	36	PLA - Plastic	N/A	No	0	$ 349,808.00
2023	Public Improvement	State Street and Liberty	Distribution Main	6588922	4	19	PLA - Plastic	N/A	No	0	$ 349,808.00
2023	Public Improvement	State Street and Liberty	Distribution Main	6588923	28	36	PLA - Plastic	N/A	No	0	$ 349,808.00
2023	Public Improvement	I-94BL - Dexter St	Distribution Main	6688993	18	27	PLA - Plastic	N/A	No	0	$ 44,085.59
2023	Public Improvement	I-94BL - Dexter St	Distribution Main	6688994	16	4	PLA - Plastic	N/A	No	0	$ 44,085.59

2023	Public Improvement	Huron St at 7th Street	Distribution Main	N/A	29	26	PLA - Plastic	N/A	No	0	$	19,511.74
2024	Public Improvement	Washtenaw and Geddes	Distribution Main	120685	61	39	PLA - Plastic	N/A	No	0	$	231,570.48
2024	Public Improvement	Washtenaw and Geddes	Distribution Main	120697	38	39	PLA - Plastic	N/A	No	0	$	231,570.48
2024	Public Improvement	Washtenaw and Geddes	Distribution Main	120679	8	39	PLA - Plastic	N/A	No	0	$	231,570.48

[1]Total Project Costs are for the entire project, not the individual pipeline segment. 2023 Total Project Costs are actuals. 2024 Total Project Costs are estimated.

MPSC Case No: U-21291	
Requester: AA	
Question No.: AADG-3.9	
Respondent: S. N. Kehoe	
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Question: Request No. 9. Please indicate whether your gas leak detection personnel look for dead, damaged, or discolored vegetation when responding to reports of a potential gas leak.

Answer: Yes, DTE Gas' policy and new hire training instructs personnel to look for indications of gas such as dead vegetation.

Attachment: None

MPSC Case No: U-21291	
Requester: AA	
Question No.: AADG-3.10	
Respondent: S. N. Kehoe	
Page: 1 of 1	

Question: Request No. 10. Please indicate whether it is standard practice when training leak detection personnel to teach them about gas damaging vegetation.

Answer: Gas damaging vegetation is discussed in new hire training and in DTE Gas Policies and Procedures.

Attachment: None

MPSC Case No: U-21291	
Requester: AA	
Question No.: AADG-3.15	
Respondent: S. N. Kehoe	
Page: 1 of 3	

Question: Request No. 15. Please fill in the tables below regarding leak surveying for each service area for each year and category of pipe (as labeled):

Answer:

2021 – Mains

Service Area	# of Miles of Main Distribution Pipeline Completed by Walking Survey	# of Miles of Main Distribution Pipeline Completed by Mobile Survey	# of Business District Miles of Main Distribution Pipeline Surveyed	Total Cost of Main Distribution Pipeline Leak Surveying
Entire Service Territory	4,339	631	Not Available – DTE does not track this	$1,885,270
City of Ann Arbor	243	0	Not Available – DTE does not track this	$31,347

2021 – Services

Service Area	# of Service Lines Completed by Walking Survey	# of Service Lines Completed by Mobile Survey	# of Business District Service Lines Surveyed	Total Cost of Service Line Leak Surveying
Entire Service Territory	413,142	0	16,280	Not Available – DTE does not track this
City of Ann Arbor	15,933	0	469	Not Available – DTE does not track this

MPSC Case No: U-21291
Requester: AA
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Respondent: S. N. Kehoe
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2022 – Mains

Service Area	# of Miles of Main Distribution Pipeline Completed by Walking Survey	# of Miles of Main Distribution Pipeline Completed by Mobile Survey	# of Business District Miles of Main Distribution Pipeline Surveyed	Total Cost of Main Distribution Pipeline Leak Surveying
Entire Service Territory	7,871	340	Not Available – DTE does not track this	$3,333,344
City of Ann Arbor	258	0	Not Available – DTE does not track this	$54,797

2022 – Services

Service Area	# of Service Lines Completed by Walking Survey	# of Service Lines Completed by Mobile Survey	# of Business District Service Lines Surveyed	Total Cost of Service Line Leak Surveying
Entire Service Territory	438,770	0	21,606	Not Available – DTE does not track this
City of Ann Arbor	15,662	0	504	Not Available – DTE does not track this

MPSC Case No: U-21291

Requester: AA

Question No.: AADG-3.15

Respondent: S. N. Kehoe

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2023 – Mains

Service Area	# of Miles of Main Distribution Pipeline Completed by Walking Survey	# of Miles of Main Distribution Pipeline Completed by Mobile Survey	# of Business District Miles of Main Distribution Pipeline Surveyed	Total Cost of Main Distribution Pipeline Leak Surveying
Entire Service Territory	8,529	212	Not Available – DTE does not track this	$5,274,228
City of Ann Arbor	22	0	Not Available – DTE does not track this	$9,224

2023 – Services

Service Area	# of Service Lines Completed by Walking Survey	# of Service Lines Completed by Mobile Survey	# of Business District Service Lines Surveyed	Total Cost of Service Line Leak Surveying
Entire Service Territory	454,518	0	47,894	Not Available – DTE does not track this
City of Ann Arbor	1,868	0	1,305	Not Available – DTE does not track this

Attachment: None

DTE CleanVision Natural Gas Balance

2023 Annual Impact Report

Michigan's cleaner energy future

It's been more than three years since DTE Energy launched the CleanVision Natural Gas Balance program – and there is a lot to celebrate! More than 13,000 DTE Gas residential and small business customers are enrolled in the program, joining us in our commitment to achieve net zero carbon emissions by 2050.

Thank you for remaining a valued member of this community. Together, we are pioneering the use and development of renewable natural gas in Michigan, protecting our state's mature trees that act as natural carbon scrubbers and addressing emissions from natural gas usage in heating, cooking, water heating and other home uses – without adjusting your energy usage.

How it works

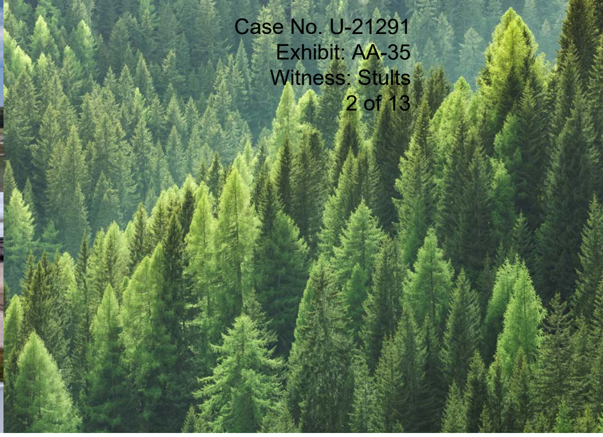
Natural Gas Balance offers DTE Gas customers an affordable, effective way to help the environment by addressing their carbon footprint. For a small monthly fee, participants can balance between 25% to 100% of greenhouse gas emissions from an average home's natural gas use.

Natural Gas Balance 2023 Impact

13,212
Customers enrolled

18,472
metric tons
Natural gas-related CO2-e emissions negated

4,396
Equivalent number of cars off the road



Carbon offsets

Trees are one of the world's most important tools against climate change. They naturally absorb greenhouse gases, helping to offset emissions produced by natural gas usage.

Through a partnership that began in 2021 with Anew, formerly Bluesource, North America's leading carbon offset developer, Natural Gas Balance is purchasing carbon offset credits to limit aggressive tree harvesting in parts of the Upper Peninsula. Greenleaf Improved Forest Management is protecting 24,000 acres of forest across 13 Michigan counties and one in Wisconsin through our partnership. These trees will scrub greenhouse gases from the atmosphere for generations to come.

BREAKING DOWN THE NUMBERS

2023 carbon offset impact

17,548 metric tons

Natural gas-related CO2-e emissions negated

Renewable natural gas

Renewable natural gas, or RNG, is derived by capturing methane gas emitted by organic waste materials in landfills, wastewater treatment plants and dairy farms. The gas is trapped, and impurities are removed, creating a renewable source of pipeline-quality gas. Natural Gas Balance sources RNG from multiple Michigan producers, including the Sauk Trail Hills landfill in Canton and a wastewater treatment facility in Grand Rapids.

BREAKING DOWN THE NUMBERS

2023 RNG impact

16,946 mcf

Renewable natural gas acquired on behalf of participating customers, negating **923.6 metric tons** of natural gas-related CO2-e emissions

"Our City Commission approved a target date of 2040 this past February for carbon neutrality.

By enrolling in CleanVision Natural Gas Balance we will be balancing 100% of the associated natural gas emissions for all our municipal buildings – and it's a natural partnership to work with DTE Energy as we took this next step in delivering on our goals."

– Doug La Fave
Deputy City Manager for East Grand Rapids

2023 Rewind – East Grand Rapids enrolls in Natural Gas Balance

East Grand Rapids joined Natural Gas Balance Custom, the companion program to Natural Gas Balance designed for DTE's large commercial and industrial customers, in July 2023. The town is the first in the state to balance their usage through the program.

Many East Grand Rapids residents were excited to follow their municipality's lead – more than 200 households enrolled after the municipality committed to the program.

2023 Rewind – West Michigan residents embrace cleaner energy

Kent and Muskegon County residents have spoken – they're ready to embrace cleaner energy!

More than 100 Kent and Muskegon County residents enrolled in Natural Gas Balance when DTE rolled out a challenge to encourage customers to sign up in August. If more than 100 residents between the two counties enrolled in Natural Gas Balance by the end of August, DTE promised to plant 10 trees in each county. Residents easily exceeded the goal – bravo!

Natural Gas Balance team members and crews from DTE's Wealthy and Muskegon service centers were on hand to plant the trees on Oct. 13. Ten trees were planted in Kent County's Wahlfield Park and the other 10 were planted in Muskegon County's Moore Park.

We're proud of what we've accomplished together so far and are excited about what's ahead.

What's next

In 2024, projects will include:

- Receive approval from the Michigan Public Service Commission to extend the pilot period as we continue to learn and grow in our knowledge of how this program fits into our customers' sustainability goals.
- Purchase additional Michigan-made carbon offsets and renewable natural gas to support the growth of this program.
- Continue educating customers on the role balancing emissions can have to grow enrollment levels in Natural Gas Balance's Level 2-4 program offerings.

DTE's commitment to sustainability

In 2020, DTE Gas was one of the first natural gas companies to announce carbon reduction goals across the natural gas industry, with net zero by 2050 goals for our own operations and gas supply, and a 35% reduction in our downstream or customer emissions by 2040. Achieving this goal could reduce annual greenhouse gas emissions by more than six million metric tons by 2050 – and we're on track to meet this goal.

- **We will reduce our own internal greenhouse gas emissions** – not just methane emissions – from utility operations and achieve carbon neutrality by continuing to replace aging pipelines, new operational improvements and the use of carbon offsets.
- **We are committed to purchasing the cleanest natural gas available from producers**, which means we expect our suppliers to be eliminating their own emissions as they produce natural gas.

Natural Gas Balance is a key component of DTE Energy's CleanVision initiative, a portfolio of bold environmental programs designed to achieve our ambitious climate action goals. It encompasses programs that support wind and solar energy, energy waste reduction, electric vehicles, appliance recycling and more.

Take your impact to the next level

Already enrolled? You can increase your impact on climate change by increasing your commitment. Consider moving up to the next level to make an even bigger difference in mitigating carbon emissions. Go to dteenergy.com/NaturalGasBalance.

CARBON EMISSIONS MITIGATED

25%	Level 1
50%	Level 2
75%	Level 3
100%	Level 4

Let's connect!

We'd like to hear from you. Send your comments, questions and suggestions to us at **NaturalGasBalance@dteenergy.com**.

DTE
CleanVision
Natural Gas Balance

DTE Gas Natural Gas Balance (NGB) U-20839

Program Update and 2023 Annual Report

Preliminary – Subject to revision

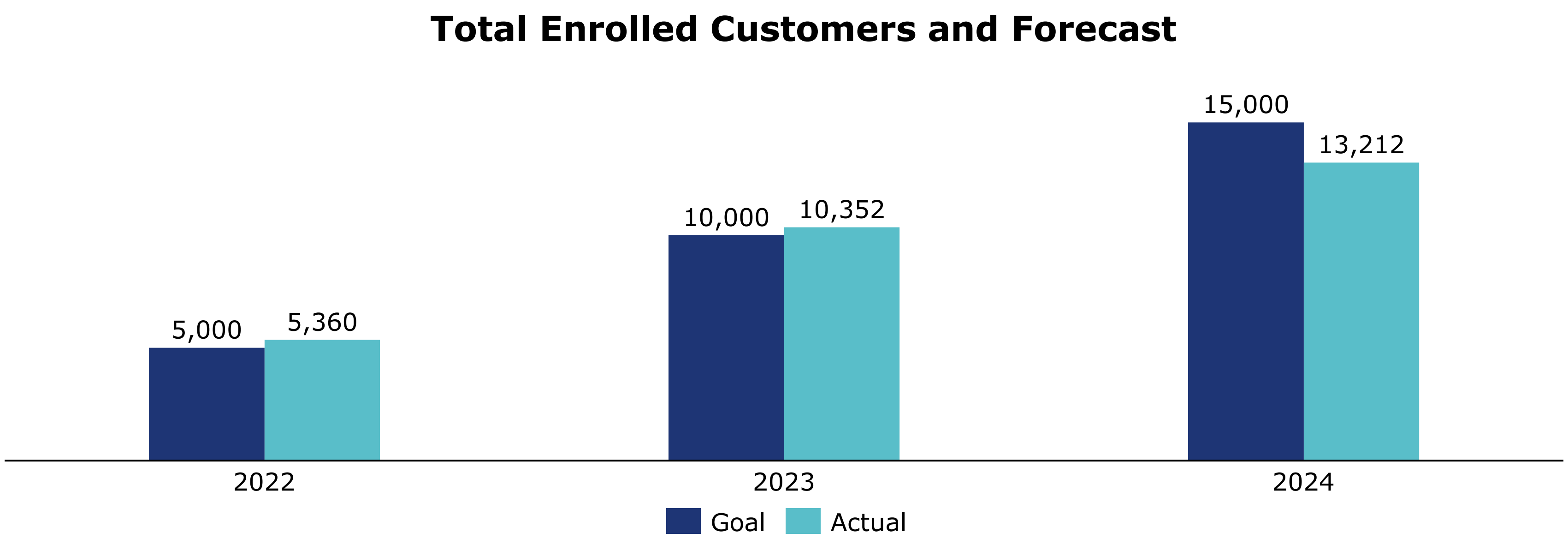
March 2024

Based off our filing, below is the set of criteria to be share with you and our customers regarding our 2023 Natural Gas Balance program performance

Required Criteria	Location in Document(s)
1. Customer enrollment levels and selected block levels	See slide 4
2. Information about projects utilized by the company to source the carbon reduction supply	See Annual Report, "Carbon offset" section
3. The quantity of total emissions negated	See Annual Report, "Natural Gas Balance 2023 Impact" section
4. Marketing and administration costs with marketing methods explained, including copies of marketing materials used and links to digital media	See slides 5 – 6
5. Quantity, source, and cost of renewable gas and carbon offsets purchased	See Annual Report "Carbon offset" and "Renewable natural gas" for supply source, slide 5 for quantity and cost
6. Customer participation forecasts	See slide 4 for annual enrollment targets
7. Marketing studies	N/A; No marketing studies have been performed
8. DTE Gas will also meet annually with the Staff to review the report and results of the program, as well as discuss the company's future plans	See Annual Report, "What's next" section
9. The company will offer a place for customers to submit questions or concerns related to the program	See website: www.dteenergy.com/naturalgasbalance

2023 Annual Report

Customer Enrollment Levels



2021

Level	# of enrollments
Legacy	1,678
Level 1	2,947
Level 2	384
Level 3	55
Level 4	296
TOTAL	**5,360**

2022

Level	# of enrollments
Legacy	1,550
Level 1	7,426
Level 2	648
Level 3	84
Level 4	644
TOTAL	**10,352**

2023

Level	# of enrollments
Legacy	1,357
Level 1	10,259
Level 2	760
Level 3	105
Level 4	731
TOTAL	**13,212**

DTE

The 2024 enrollment goal is 17,000 enrollments by year-end

NGB Income Statement and Supply Totals 2023

Natural Gas Balance Income Statement

	Jan-23	Feb-23	Mar-23	Apr-23	May-23	Jun-23	Jul-23	Aug-23	Sep-23	Oct-23	Nov-23	Dec-23	Total
Revenue													
Total Program Revenue	**$50,394**	**$46,034**	**$72,564**	**$48,643**	**$49,078**	**$47,144**	**$53,275**	**$58,707**	**$59,805**	**$61,679**	**$63,032**	**$63,465**	**$673,820**
Total Revenue	**$50,394**	**$46,034**	**$72,564**	**$48,643**	**$49,078**	**$47,144**	**$53,275**	**$58,707**	**$59,805**	**$61,679**	**$63,032**	**$63,465**	**$673,820**
Expenses													
ST Labor	($9,093)	($10,247)	($9,851)	($9,834)	($10,934)	($10,037)	($7,577)	($4,599)	($12,773)	($13,382)	($13,382)	($12,773)	($124,481)
RNG			($123,480)			($52,632)			($53,160)			($58,584)	($287,856)
Carbon Offsets			($32,408)			($34,576)			($34,912)			($38,480)	($140,376)
Contract Labor	($733)	($734)	($809)	($806)	($4,678)	($811)	($891)	($5,502)	($815)	($818)	($821)	($821)	($18,238)
Outside Services	($41,174)	($67,004)	($67,261)	($53,968)	($52,201)	($78,971)	($51,294)	($65,250)	($272,510)	($96,210)	($112,800)	($37,490)	($996,133)
Dues & Assessments	($4,660)				($3,200)		($5,000)		($7,000)	($7,000)		($5,000)	($31,860)
Other		($2,500)	($1,707)	($99,459)	$544	($1,708)	($6,320)		($7,240)	($19,100)	($77,493)	($6,950)	($221,933)
Burdern	($206)	($335)	($338)	($317)	($294)	($395)	($314)	($350)	($1,369)	($481)	($564)	($193)	($5,154)
Total Expenses	($55,865)	($80,820)	($235,854)	($164,384)	($70,764)	($179,130)	($71,395)	($75,700)	($389,778)	($136,991)	($205,059)	($160,292)	($1,826,031)
Program Net Income (Loss)	($5,471)	($34,786)	($163,289)	($115,741)	($21,686)	($131,986)	($18,120)	($16,993)	($329,973)	($75,312)	($142,027)	($96,827)	($1,152,211)

	2023 Total Supply Retirements
Carbon Offsets	17,548 (measured in metric tons per CO2-e)
Renewable Natural Gas	16,946 mcf

Natural Gas Balance continues to use marketing funds to grow enrollments, which are not included in base rates

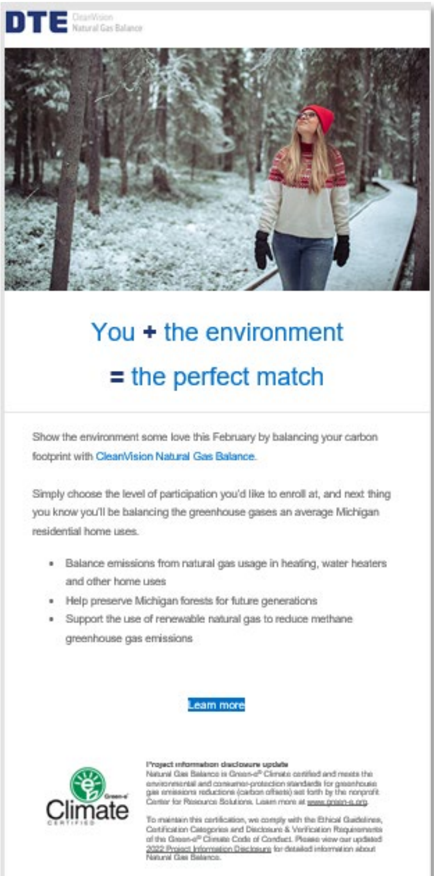
Direct Marketing & Support - $704,990

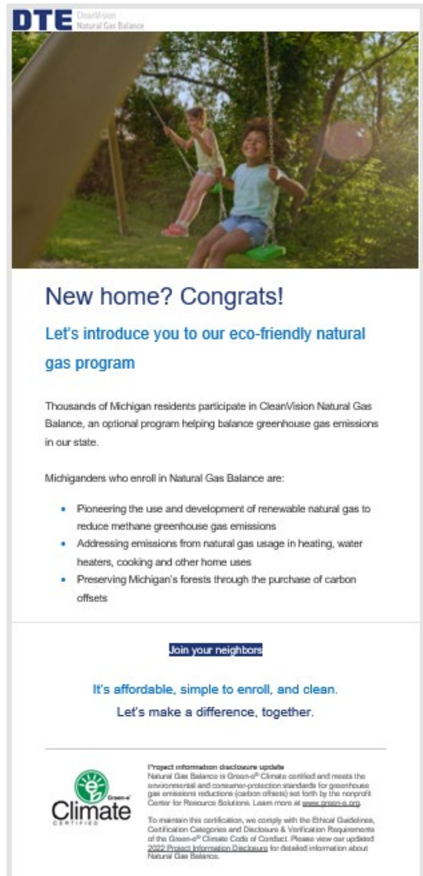
- Direct Outbound Calling Campaigns
  - Direct sales calling - $674,990
  - Inbound call center support - $30,000

Misc. Marketing - $38,400

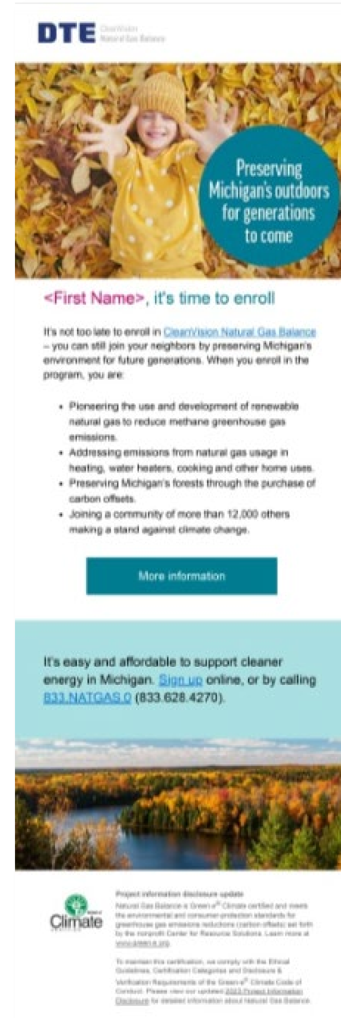
- Events - $17,500
- Legal - $8,800
- Community Incentive - $12,100

A variety of channels are used to reach our customer base





6/22 Targeted email to new DTE customers



October retargeted email

A variety of channels are used to reach our customer base

5/23 Huron River Day Event

7/20-7/22 Ann Arbor Art Festival

STATE OF MICHIGAN
BEFORE THE MICHIGAN PUBLIC SERVICE COMMISSION

In the matter of the Application of **DTE GAS COMPANY** for authority to increase its rates, amend its rate schedules and rules governing the distribution and supply of natural gas, and for miscellaneous accounting authority.	U-21291 ALJ Jonathan F. Thoits

PROOF OF SERVICE

On the date below, an electronic copy of the **Exhibit List and Exhibits of the City of Ann Arbor** was served on the following:

Name/Party	E-mail Address
Michigan Office of Administrative Hearings and Rules Jonathan F. Thoits, ALJ	thoitsj@michigan.gov
DTE Gas Company Carlton D. Watson Paula Johnson Bacon Andrea E. Hayden	mpscfilings@dteenergy.com carlton.watson@dteenergy.com paula.bacon@dteenergy.com andrea.hayden@dteenergy.com
MPSC Staff Heather M.S. Durian Alena Clark Michael J. Orris Monica M. Stephens Anna B. Stirling Lori Mayabb	durianh@michigan.gov clarka55@michigan.gov orrism@michigan.gov stephensm11@michigan.gov stirlinga1@michigan.gov mayabbl@michigan.gov
Attorney General Joel B. King Aaron Walden	ag-enra-spec-lit@michigan.gov kingj38@michigan.gov WaldenA1@michigan.gov
Michigan Environmental Council / Citizens Utility Board of Michigan / Sierra Club / Natural Resources Defense Council Christopher M. Bzdok Holly L. Hillyer Breanna Thomas	chris@tropospherelegal.com holly@tropospherelegal.com breanna@tropospherelegal.com
City of Ann Arbor Valerie J.M. Brader Valerie Jackson	ecf@rivenoaklaw.com valerie@rivenoaklaw.com vjackson@a2gov.org

Retail Energy Supply Association / Michigan Power Limited Partnership Jennifer U. Heston	 jheston@fraserlawfirm.com
Ecology Center / Environmental Law & Policy Center / Union of Concerned Scientists / Vote Solar Nicholas Wallace Daniel Abrams Carolyn Boyce Alondra Estrada	 MPSCDocket@elpc.org nwallace@elpc.org dabrams@elpc.org cboyce@elpc.org aestrada@elpc.org
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Billerud Americas Corporation Timothy J. Lundgren Justin K. Ooms	 tlundgren@potomaclaw.com jooms@potomaclaw.com
Association of Businesses Advocating Tariff Equity Michael J. Pattwell Stephen A. Campbell Jim Dauphinais	 mpattwell@clarkhill.com scampbell@clarkhill.com jdauphinais@consultbai.com
Dearborn Industrial Generation, L.L.C. Sean P. Gallagher	 sgallagher@fraserlawfirm.com

The statements above are true to the best of my knowledge, information and belief.

Dated May 7, 2024

CITY OF ANN ARBOR

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