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MICHIGAN INTEGRATED RESOURCE PLANNING PARAMETERS - DRAFT

U-21570 & U-21867

Pursuant to Public Act 341 of 2016, as Amended by Public Act 231 of 2023, Section 6t

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I. Executive Summary

This Michigan Integrated Resource Planning Parameters (MIRPP) document was developed as a part of the implementation of the provisions of Public Act 341 of 2016 (PA 341), Section 6t. This document includes one required and one optional integrated resource plan (IRP) modeling scenarios, each with multiple sensitivities per scenario, for the rate-regulated utilities in Michigan's Upper and Lower Peninsulas to use when conducting integrated resource plans. The scenarios and sensitivities are designed to test varying resource portfolios. The scenarios, sensitivities, and modeling parameters are more aptly characterized as stressors utilized to test how different future resource plans perform relative to each other with respect to affordability, reliability, adaptability, and environmental stewardship. In some instances, scenarios and sensitivities intentionally push the boundaries on what may beviewed as probable and could be considered as bookends on the range of possible future outcomes. Utilities may also include separate additional scenarios and sensitivities in IRPs and may use different assumptions or forecasts for the additional scenarios and sensitivities. However, the assumptions and parameters outlined in the required scenario should be used. Including the scenarios will ensure that Michigan's electric utilities consider a wide variety of resources such as renewable energy, demand response (DR), energy waste reduction (EWR), storage, distributed generation technologies, voltage support solutions,and transmission and non-transmission alternatives, in addition to traditional, clean energy system, and fossil-fueled generation alternatives for the future. This IRP parameters document also contains numerous modeling assumptions and requirements, specifies sensitivities for each scenario, identifies significant environmental regulations and laws that effect electric utilities in the state, and identifies required planning reserve margins and local clearing requirements (LCRs) in areas of the state.

The DR, EWR, and Electrification Potential Studies were completed August of 2025. Each of these studies have an influence on integrated resource planning

and are incorporated into the Commission's December XX, 2025, order in Case No. U-21219 for the 4-year update, pursuant to PA 341 Section 6t as amended by Public Act 231.

Section 6t (1) requires that the IRP parameters, required modeling scenarios and sensitivities, applicable reliability requirements, applicable environmental rules and regulations, and the DR and EWR potential studies be re-examined every five years.

II. Background

On November 29, 2023, Public Act 231 was signed into law. The law requires that the Commission shall commence a proceeding by August 31, 2025, that ultimately provides the rate regulated utilities with information needed to conduct IRPs. The Commission issued an order in U-21570, directing Staff to file a redline version of the Michigan Integrated Resource Planning Parameters and to engage with interested persons to seek comment on the amendments in preparation for the August 31, 2025, deadline.

III. Energy Waste Reduction Potential Study

To comply with PA 341 Section 6t (1) (a) and (f) (iii).

IV. Demand Response Potential Study

To comply with PA 341 Section 6t (1) (b).

V. Electrification Potential Study

To comply with PA 341 Section 6t (1) (j) as amended by PA 231.

VI. State and Federal Environmental Regulations, Laws and Rules

Appendix E contains a regulatory timeline of the environmental regulations, laws and rules discussed in this section.

Section 460.6t (1) (c)

To comply with PA 341 Section 6t (1) (c)

Federal rules and laws:

Clean Air Act – The Clean Air Act (CAA) is a United States federal law designed to control air pollution on a national level. The CAA is a comprehensive law that established the National Ambient Air Quality Standards (NAAQS), Maximum Achievable Control Technology Standards (MACT), Hazardous Air Pollutant Standards, and numerous other regulations to address pollution from stationary and mobile sources.

National Ambient Air Quality Standards – Title 1 of the CAA requires the United States Environmental Protection Agency (USEPA) to set NAAQS for six criteria pollutants that have the potential of harming human health or the environment. The NAAQS are rigorously vetted by the scientific community, industry, public interest groups, and the public. The NAAQS establish maximum allowable concentrations for each criteria pollutant in outdoor air. Primary standards are set at a level that is protective of human health with an adequate margin of safety. Secondary standards are protective of public welfare, including protection from damage to crops, forests, buildings, or the impairment of visibility. The adequacy of each standard is to be reviewed every five years. The six criteria pollutants are carbon monoxide, lead, ozone, nitrogen dioxide, particulate matter, and sulfur dioxide (SO_2).[1]

[1] The most recent NAAQS can be accessed here: https://www.epa.gov/criteria-air-pollutants/naaqs-table.

In February 2024, the USEPA strengthened the primary health-based annual PM2.5 NAAQS to 9 micrograms per cubic meter. The previous primary health-based annual PM2.5 standard was 12 micrograms per cubic meter, which was last updated in 2012. The primary and secondary welfare-based PM2.5 standards, secondary annual health-based PM2.5 standard and the primary and secondary PM10 standards were retained and therefore remain unchanged. EGLE reviewed PM2.5 data and provided its attainment status recommendations of the areas not meeting the new standard to USEPA in February 2025. EGLE recommended (based on monitoring and source emissions data, meteorology and geography) that Kalamazoo and Wayne Counties be designated nonattainment for the new PM2.5 standard. USEPA has one year to review data and make its own determinations of attainment/nonattainment.

On March 25, 2025, USEPA announced that it would reconsider the Biden Administration's rule tightening the PM2.5 standard. The action is being taken as one of USEPA's 31 deregulatory actions intended to advance the Trump Administration's day one executive orders. USEPA's attempt to revise the Biden Administration's PM2.5 standard will be subject to a formal rulemaking process with public notice and comment periods. In addition to this reconsideration, USEPA has indicated that it will release guidance to increase the flexibility on implementation of the NAAQS, reforms to new source review and new direction on permitting obligations. USEPA has not yet published a formal proposal to reconsider the PM2.5 NAAQS and the exact timeframe to do so is not currently known.

Nonattainment areas are regions that fail to meet the NAAQS. Locations where air pollution levels are found to contribute significantly to violations or maintenance impairment in another area may also be designated nonattainment. These target areas are expected to make continuous, forward progress in controlling emissions within their boundaries. Those that do not

abide by the CAA requirements to reign in the emissions of the pollutants are subject to USEPA sanctions, either through the loss of federal subsidies or by the imposition of controls through preemption of local or state law. States are tasked with developing strategic plans to achieve attainment, adopting legal authority to accomplish the reductions, submitting the plans to the USEPA for approval into the State Implementation Plan (SIP), and ensuring attainment occurs by the statutory deadline. States may also submit a plan to maintain the NAAQS into the future along with contingency measures that will be implemented to promptly correct any future violation of the NAAQS.

Sulfur Dioxide Nonattainment Areas – In 2010, the USEPA strengthened the primary NAAQS for SO_2, establishing a new 1-hour standard of 75 parts per billion (ppb).

Following the partial disapproval of EGLE's attainment SIP, and due to a lawsuit related to a portion of the SIP, USEPA pursued development of a Federal Implementation Plan (FIP) for the nonattainment area. In January 2022, USEPA made the formal determination that southern Wayne County did not attain the SO_2 NAAQS by the 2018 deadline.

USEPA completed the FIP and a public comment period was held during June and July 2022. USEPA finalized the FIP effective in November 2022. The FIP proposed emissions limits and associated requirements for several area sources, including U.S. Steel (Ecorse and Zug Island), EES Coke, Cleveland-Cliffs Steel Corporation (formerly AK or Severstal Steel), and Dearborn Industrial Generation (DIG). In addition, USEPA proposed to include the Carmeuse Lime emission limits, specified in Permit to Install 193-14A, and the DTE Energy (DTE) Trenton Channel emission limits, specified in Permit to Install 125-11C, which had already been incorporated into Michigan's SIP. The FIP included an attainment demonstration and served to supplement USEPA's prior action, which had concluded that Michigan satisfied the emissions inventory and new source review requirements for the area.

In December 2023, EGLE submitted its SIP revision to supplement the attainment demonstration that USEPA conditionally approved on March 23, 2023. An amendment/supplement to this SIP revision was submitted to USEPA in April 2024 to correct an omission in the original submittal.

Once all of the elements of the SIP had been implemented, EGLE worked to complete a redesignation request for southern Wayne County which was submitted for review and approval to USEPA in May 2025. The USEPA has 18-months to approve or deny EGLE's redesignation request.

On September 26, 2024, USEPA proposed to determine that the St. Clair SO2 nonattainment area attained the 1-hour primary SO2 NAAQS by the September 12, 2021 attainment date.

In early 2025, USEPA requested that EGLE provide additional information to supplement the previously submitted redesignation request for St. Clair County. EGLE is in the process of finalizing the supplemental submittal and will submit to USEPA for approval once complete.

Round three designations were to address all remaining undesignated areas by December 31, 2017. The USEPA sent a letter to Governor Snyder on August 22, 2017, 120 days prior to the intended designation date, indicating that Alpena County and Delta County are to be designated as unclassifiable/attainment areas. Remaining areas of Michigan that were not required to be characterized and for which the USEPA does not have information suggesting that the area may not be meeting the NAAQS or contributing to air quality violations in a nearby area that does not meet the NAAQS, were also designated as unclassifiable/attainment.

Ozone Nonattainment Areas: In 2015, the USEPA strengthened the primary NAAQS for ozone, establishing a new 8-hour standard of 70 ppb.

On August 3, 2018, Michigan was designated marginal nonattainment for the 2015 ozone NAAQS in four areas (ten counties) of the state. In southeast

Michigan, the seven-county area encompassing Livingston, Macomb, Monroe, Oakland, St. Clair, Washtenaw, and Wayne counties and on the west-side, two partial counties including Allegan and Muskegon and one full county, Berrien were found to have design values[2] exceeding the new ozone NAAQS of 70 ppb. This classification established an attainment deadline and attainment plan submittal date of August 3, 2021.

On May 19, 2023, USEPA determined based on "complete, quality-assured, and certified ambient air monitoring data for the 2020-2022 design period" that southeast Michigan achieved attainment of the 2015 ozone NAAQS. This determination was based on the exclusion of certain exceedances that were determined to be due to exceptional events, namely Canadian wildfire smoke. As a result of the CDD, based on the exclusion of the exceptional event-influenced data, USEPA suspended the requirements for the area related to attainment of the 2015 ozone NAAQS for as long as the area continues to attain.

On December 17, 2024, USEPA published a final determination notice indicating that the western Michigan counties failed to attain the 2015 ozone NAAQS by the applicable attainment deadline. On January 16, 2025, the west Michigan counties were officially reclassified from moderate to serious ozone nonattainment by USEPA. EGLE is currently working to complete the required SIP submittals for these areas.

Cross-State Air Pollution Rule – The Cross-State Air Pollution Rule (CSAPR) was promulgated to address air pollution from upwind states that is transported across state lines and impacts the ability of downwind states to attain air quality standards. The rule was developed in response to the Good Neighbor obligations under the CAA for the ozone standards and fine particulate matter standards. CSAPR is a cap-and-trade rule which governs the emission of SO_2

[2] The design value is the three-year average of the 4th highest 8-hour ozone value).

and NO_x from fossil-fueled electric generating units (EGUs) through an allowance- based program. Under this program, NO_x is regulated on both an annual basis and during the ozone season (March through October). Each allowance (annual or ozone season) permits the emission of one ton of NO_x, with the emissions cap and number of allocated allowances decreasing over time. The state currently has Good Neighbor obligations for the 2015 ozone standard.

On March 12, 2025, UESPA announced plans to roll back the Good Neighbor Plan. The Supreme Court, in an opinion released in June 2025 stated that States could contest USEPA's earlier decision to first disapprove state good neighbor plans in regional appellate courts instead of the United States Court of Appeals for the District of Columbia Circuit which is where such challenges are usually heard. USEPA is currently reviewing the Court's opinion.

Mercury and Air Toxics Standards – Section 302 of the CAA requires the USEPA to adopt MACT for hazardous air pollutants (HAPs). The Mercury and Air Toxics Standards (MATS) became effective April 16, 2012. The MATS rule requires new and existing oil- and coal-fueled facilities to achieve emission standards for mercury, acid gases, certain metals, and organic constituents.

On May 7, 2024, USEPA finalized updates to the MATS rule that were first proposed in April 2023. The updated rule strengthens the national emission standards for hazardous air pollutants (NESHAP) based on an evaluation of the residual risk and technology review. The final rule further limits the emissions of non-mercury HAPs by reducing the existing emission standard for filterable particulate matter by two-thirds as well as strengthens monitoring and compliance requirements for coal- and oil-fired EGUs by requiring the use of continuous emission monitoring systems. Start-up requirements were also revised to allow for better emissions performance during startup activities.

On June 11, 2025, USEPA proposed to repeal certain amendments of the MATS rule finalized in 2024. With this action, USEPA is proposing to repeal the

filterable particulate matter (fPM) standard for existing coal-fired EGUs of 0.010 pounds per million British thermal units (lb/MMBtu) of heat input (previous fPM standard of 0.030 lb/MMBtu would remain in place), and the fPM emission standard compliance demonstration requiring all coal- and oil-fired EGUs to use PM continuous emission monitoring systems (CEMS). In addition, USEPA is proposing to repeal the mercury emission standard for existing lignite-fired EGUs of 1.2 pounds per trillion British thermal units of heat input (lb/TBtu) (the previous mercury standard, 4.0 lb/TBtu, would remain in place). Lastly, as an alternative to returning to the previous emissions standards, USEPA is requesting comment on cost-effective and achievable options that could replace the 2024 standards. The MATS proposal must go through a 45-day public comment period which began June 17, 2025.

CAA Section 111(b), Standards of Performance for Greenhouse Gas Emissions from New, Modified and Reconstructed Stationary Sources: Electric Utility Generating Units – New Source Performance Standards (NSPS) are established under Section 111(b) of the CAA for certain industrial sources of emissions determined to endanger public health and welfare. In October 2015, the USEPA finalized a NSPS that established standards for emissions of carbon dioxide (CO_2) for newly constructed, modified, and reconstructed fossil-fuel fired EGUs. There are different standards of performance for fossil fuel-fired steam generating units and fossil fuel-fired combustion turbines.[3]

On May 8, 2024, USEPA finalized the NSPS that had been previously proposed in May 2023 for GHG emission reductions from new and reconstructed fossil fuel-fired stationary combustion turbine EGUs. For new fossil-fuel generation, the final rule includes three subcategories based on the utilization of each EGU.

[3] The 111(b) standards can be found in Table 1 here: https://www.federalregister.gov/documents/2015/10/23/2015-22837/standards-of-performance-for-greenhouse-gas-emissions-from-new-modified-and-reconstructed-stationary.

CAA Section 111(d), Carbon Pollution Emission Guidelines for Existing Stationary Sources - Electric Utility Generating Units (Clean Power Plan) – Section 111(d) of the CAA requires the USEPA to establish standards for certain existing industrial sources. The final Clean Power Plan (CPP), promulgated on October 23, 2015, addressed CO_2 emissions from EGUs. The CPP established interim and final statewide goals and tasked states with developing and implementing plans for meeting the goals.

As described above, on May 8, 2024, USEPA finalized regulations under Section 111(d) of the CAA for GHG reductions for existing coal-fired EGUs as well as existing coal-fired power plants and other coal-fired steam generating units. The final rule establishes subcategories based on how long each unit is expected to operate. In addition, States are able to evaluate units in their fleet and provide a variance for units that will operate under different circumstances than those considered by USEPA based on "remaining useful life and other factors".

On June 11, 2025, the USEPA proposed to repeal the GHG emissions standards for fossil fuel-fired power plants promulgated under Section 111 of the CAA. With this action, the requirements USEPA has proposed to repeal include the NSPS for coal and gas-fired power plants, promulgated on October 23, 2015, the NSPS for coal-fired steam generating units undergoing a large modification, the NSPS for new natural gas-fired power plants finalized in the Carbon Pollution Standards (CPS) on May 9, 2024, and the emission guidelines for existing coal-, oil-, and gas-fired steam generating units, also finalized on May 9, 2024. This proposed rule is currently in the middle of a 45-day public comment period set to wrap up the end of summer. A final rule is currently expected to be released by USEPA before the end of 2025.

Greenhouse Gas Reporting Program – The Greenhouse Gas Reporting Program (codified at 40 CFR Part 98) tracks facility-level emissions of greenhouse gas from large emitting facilities, suppliers of fossil fuels, suppliers of industrial gases that result in greenhouse gas emissions when used, and facilities that inject CO_2 underground. Facilities calculate their emissions using approved

methodologies and report the data to the USEPA. Annual reports covering emissions from the prior calendar year are due by March 31 of each year.

On March 12, 2025, the USEPA Administrator announced plans to reconsider the mandatory GHG reporting program on the basis that the program is costly and burdensome to the over 8,000 facilities required to calculate and submit their emissions reports annually. As of the end of June 2025, the proposed rule to reconsider and potentially repeal the GHG emissions reporting program was being reviewed by USEPA's Office of Management and Budget.

Boiler Maximum Achievable Control Technology – The Boiler MACT establishes national emission standards for HAPs from three major source categories: industrial boilers, commercial and institutional boilers, and process heaters. The final emission standards for control of mercury, hydrogen chloride, particulate matter (as a surrogate for non-mercury metals), and carbon monoxide (as a surrogate for organic hazardous emissions) from coal-fired, biomass-fired, and liquid-fired major source boilers are based on the MACT. In addition, all major source boilers and process heaters are subject to a work practice standard to periodically conduct tune-ups of the boiler or process heater.

Regional Haze – Section 169 of the federal CAA sets forth the provisions to improve visibility, or visual air quality, in 156 national parks and wilderness areas across the country by establishing a national goal to remedy impairment of visibility in Class 1 federal areas from manmade air pollution. There are two Class 1 areas in Michigan: Seney National Wildlife Refuge and Isle Royale National Park. Michigan also has an obligation to eliminate the state's contribution to impairment in Class 1 areas in other states. States must ensure that emission reductions occur over a period of time to achieve natural conditions by 2064. Air pollutants that have the potential to affect visibility include fine particulates, NO_x, SO_2, certain volatile organic compounds, and ammonia. The 1999 Regional Haze rule required states to evaluate the best

available retrofit technology (BART) to address visibility impairment from certain categories of major stationary sources built between 1962 and 1977.

In 2005, the USEPA published the guidelines for BART determinations. Michigan met most of the initial BART determination requirements through its first planning period state SIP; however, USEPA did issue FIPs for three of Michigan's non-EGU BART-subject sources between 2012 and 2016. All BART determinations made for EGU sources in Michigan were approved by USEPA and adopted into the SIP.

In July 2024, USEPA released guidance for the second planning period progress report for regional haze. EGLE submitted its mid-term five-year progress report for the second planning period to USEPA on May 19, 2025. USEPA has yet to act on the submittal.

Resource Conservation and Recovery Act – The Resource Conservation and Recovery Act (RCRA) gives the USEPA the authority to control hazardous waste from the "cradle-to-grave", which includes the generation, transportation, treatment, storage, and disposal of hazardous waste. RCRA also set forth a framework for the management of non-hazardous solid wastes.

On May 8, 2024, USEPA finalized changes to the CCR regulations for inactive surface impoundments at inactive electric utilities called "legacy CCR surface impoundments." The rule was finalized at the same time as a larger suite of regulations for power plants, some of which were mentioned above, and others will be mentioned below. The rules were finalized at the same time to allow utilities more certainty in future planning. Finalized CCR requirements mirror those previously completed in 2015 for inactive impoundments at active facilities. This part of the final rule responds to the August 2018 court decision vacating and remanding a provision of the 2015 CCR rule that exempted inactive impoundments at inactive electric utilities back to USEPA. The final rule also remedies concerns noted by USEPA once implementation of the 2015 CCR rule began.

Clean Water Act – The Clean Water Act is a United States federal law designed to control water pollution on a national level.

Clean Water Act Section 316(b) – The USEPA promulgated rules under Section 316(b) of the Clean Water Act establishing standards for cooling water intake structures at new and existing facilities in order to minimize the impingement and entrainment of fish and other aquatic organisms at these structures. Section 316(b) applies to existing electric generation facilities with a design intake flow greater than two million gallons per day that use at least 25% of the water withdrawn from the surface waters of the United States for cooling purposes.

According to the published rules, any facility subject to the existing facilities rule must identify which one of the seven alternatives identified in the best technology available (BTA) standard will be met for compliance with minimizing impingement mortality. While the rules do not specify a deadline for compliance of the rules, facilities will need to achieve the impingement and entrainment mortality standards as soon as practicable according to the schedule of requirements set by EGLE following NPDES permit reissuance.

Steam Electric Effluent Guidelines – The Steam Electric Effluent Guidelines (SEEG), promulgated under the Clean Water Act, strengthens the technology-based Effluent Limitation Guidelines (ELG) and standards for the steam electric power generating industry. The 2015 amendment to the rule established national limits on the amount of toxic metals and other pollutants that steam electric power plants are allowed to discharge.

Like USEPA's GHG regulations for existing coal-fired power plants and steam electric generating units and CCR, updated ELGs were promulgated in spring 2024. The updated regulations strengthen the wastewater discharge standards that apply to coal-fired power plants by establishing more stringent discharge standards for flue gas desulfurization wastewater, bottom ash transport water, and combustion residual leachate.

For those facilities that will be required to meet the more restrictive effluent limitations in the 2024 rule, the new limitations do not apply until a date determined by the permitting authority that is 'as soon as possible,' on or after July 8, 2024, but no later than December 31, 2029. The final rule also established a new subcategory for the permanent cessation of coal combustion by December 31, 2034.

In June 2025, USEPA announced that it plans to delay and potentially loosen the water standards for coal-fired power plants due to concerns with compliance deadlines and the need to strengthen grid reliability. In addition, the Secretary of Energy under section 202(c) of the Federal Power Act, 16 U.S.C. § 824a(c), and section 301(b) of the Department of Energy Organization Act, 42 U.S.C. § 7151(b), issued an order in May 2025 to the MISO to ensure reliability of its system over the following 90 days. That order specifically requests dispatch of the Campbell Plant to best meet the emergency reliability concerns and serve the public interest for purposes of FPA section 202(c) instead of proceeding with the scheduled decommissioning of the plant on May 31, 2025. Similar orders may be issued for this facility, or other facilities, which conflict with the compliance timelines of the existing ELGs.

One Big Beautiful Bill (OBBB) Act – The OBBB was signed into law on July 4, 2025. The OBBB accelerates the sunset for Wind and Solar under Sections 45Y and 48E, setting more strict timelines for beginning construction or in service dates. However, Hydropower, geothermal, energy storage, and nuclear retain full tax credits through 2033 with a phase out starting in 2034. Fuel Cells now qualify for a flat 30% ITC under Section 48E and the OBBB increases the domestic content bonus credit thresholds. The OBBB also impacts residential clean energy by ending the residential solar tax credit by December 31, 2025 and leased residential systems by December 31, 2027 under section 48E. Leased residential solar hot water heaters and small wind turbines installed

after December 31, 2025 are no longer eligible. OBBB also adds tax credits for carbon capture and sequestration under Section 45Q.

State Rules and Laws:

The majority of Michigan's environmental regulations, and laws were consolidated into the Natural Resources and Environmental Protection Act (NREPA) of 1994, PA 451 as amended (Act 451). Act 451 is organized into sections called "Parts" and serves "to protect the environment and natural resources of the state; to codify, revise, consolidate, and classify laws relating to the environment and natural resources of the state; to regulate the discharge of certain substances into the environment; to regulate the use of certain lands, waters, and other natural resources of the state; to protect the people's right to hunt and fish; to prescribe the powers and duties of certain state and local agencies and officials; to provide for certain charges, fees, assessments, and donations; to provide certain appropriations; to prescribe penalties and provide remedies; and to repeal acts and parts of acts."

Michigan Mercury Rule – The purpose of the Michigan Mercury Rule (MMR) is to regulate the emissions of mercury in the State of Michigan. Existing coal-fired EGUs must choose one of three methods to comply with the emission limits and any new EGU will be required to utilize Best Available Control Technology. The MMR is identical to the MATS in its limitations and all compliance dates for this rule have since past.

Michigan Environmental Protection Act – Part 17 of Michigan's NREPA, 1994 PA 451. Under Michigan Environmental Protection Act (MEPA), the attorney general or any person may maintain an action for an alleged violation or when one is likely to occur for declaratory and equitable relief against any person for the protection of the air, water, and other natural resources and the public trust in these resources from pollution, impairment, or destruction. MEPA also provides for consideration of environmental impairment and whether a

feasible and prudent alternative exists to any impairment consistent with the promotion of the public health, safety, and welfare in light of the state's paramount concern for the protection of its natural resources from pollution, impairment, or destruction.

Solid Waste Management (Part 115) – Part 115 of the Michigan NREPA regulates CCR as a solid waste. It requires any CCR that will remain in place in a surface impoundment or landfill be subject to siting criteria, permitting, and licensing of the disposal area, construction standards for the disposal area, groundwater monitoring, corrective action, and financial assurance and post-closure care for a 30-year period. The disposal facility is required to maintain the financial assurance to conduct groundwater monitoring throughout the post-closure care period.

The disposal facility is required to maintain the financial assurance to conduct groundwater monitoring throughout the post-closure care period. The disposal of CCR is currently dually regulated under the RCRA rule published in April 2015, and under Part 115 of the NREPA. However, in December 2016, the Water Infrastructure Improvements for the Nation (WIIN) Act was passed, which included an amendment to Section 4005 of RCRA providing a mechanism to allow states to develop a state permitting program for regulationof CCR units. Under the amendment, upon approval of a state program, the RCRA regulations would be enforced by states and the CCR units would not be subject to the dual regulatory structure. In 2018, Part 115 was amended to include that majority of the RCRA regulations would be enforced by states and that CCR units would not be subject to the dual regulatory structure. Michigan's request for state program approval has not yet been approved by USEPA. EGLE is currently working to revise the State program and plans to resubmit for USEPA's review and approval once complete.

Water Resource Protection (Part 31) – Part 31 of the Michigan NREPA grants EGLE authority to develop rules to protect waters of the state.

Water Quality Based Effluent Limits for Toxic Substances (Part 8) – Michigan's Part 8 Rules, Water Quality-Based Effluent Limit Development for Toxic Substances are used to establish toxic substance water quality based effluent limits (WQBELs) for point-source discharges that are protective of the designated uses of the surface waters of the state. Part 8 includes provisions for establishing total maximum daily loads, waste load allocations for toxic substances, reasonable potential for chemical-specific WQBELs, and calculating WQBELs that are less than the quantification level.

Water Quality Standards (Part 4) – Michigan's Part 4 Rules, Water Quality Standards, are used to establish water quality requirements applicable to the Great Lakes, the connecting waters, and all other surface waters of the state, to protect the health and welfare, to enhance and maintain the quality of water, and to protect the state's natural resources. Part 4 includes provisions for establishing specific standards for physical characteristics, dissolved solids, hydrogen ion concentrations, toxic substances, nutrients, microorganisms, dissolved oxygen, and temperature. It provides conditions for establishing mixing zones, antidegradation requirements, and variances from water quality standards, and defines the designated uses for which all surface waters of the state shall be protected.

To comply with PA 341 Section 6t (5) (m)

"How the utility will comply with all applicable state and federal environmental regulations, laws and rules, and the projected costs of complying with those regulations, laws and rules."

In developing its IRP, a utility should present an environmental compliance strategy which demonstrates how the utility will comply with all applicable federal and state environmental regulations, laws, and rules. Included with this information, the utility should analyze the cost of compliance on its existing generation fleet going forward, including existing projects being undertaken on the utility's generation fleet, and include the relevant future compliance costs within the IRP model. Review and approval of an electric utility's IRP by

the MPSC does not constitute a finding of actual compliance with applicable state and federal environmental laws.

Executive Directive 2020-10 (ED 2020-10) – On September 23, 2020, Governor Whitmer signed an executive directive (ED 2020-10) establishing Michigan's plans toward carbon neutrality by 2050. ED 2020-10 also established an interim goal of a 28 percent reduction (below 2005 levels) in GHG emissions by 2025 and required EGLE's Office of Climate and Energy to develop, with stakeholder input the MI Healthy Climate Plan and then oversee implementation of the Plan.

The ED also directed EGLE to expand its IRP advisory opinion under MCL section 460.6t to include an evaluation of "the potential impacts of proposed energy generation resources and alternatives to those resources." An evaluation of whether the IRPs filed are consistent with the emission reduction goals established in the ED must also be completed. Lastly, the ED required EGLE's advisory opinions to include considerations of environmental justice and public health impacts.

Upon the signing of ED 2020-10, EGLE began working with the MPSC and utilities subject to the IRP process to develop a list of additional data requirements to better allow EGLE to complete the evaluations of environmental justice and public health impacts. These requirements were finalized in the IRP filing requirement document completed in the fall of 2022.

EGLE finalized the MI Healthy Climate Plan in April 2022 and has completed two annual reports since that time. The Plan detailed the pathway to obtaining 100 percent carbon neutrality by 2050 based on seven key objectives. The Plan's roadmap to 2030 provided key recommendations to reach the goal of reducing GHG emissions (from 2005 levels) by 52 percent by 2030. Some of the recommendations included in the Plan are to move the electric grid to cleaner resources, electrification of vehicles and increasing public transit, and the commitment to environmental justice and a just transition.

Public Act 231 (PA 231) – In November 2023, Governor Whitmer signed into law new energy legislation making changes to several aspects of Michigan's energy future, including IRPs. Public Act 231 (PA 231) includes updates to the IRP statute requiring an update to this IRP planning parameters document, IRP filing requirements, and adding additional considerations the Commission must review in its evaluation of each IRP. Most notably, this planning parameters document is required to be updated in 2025 and every four years thereafter. From the EGLE perspective, PA 231 codifies the additional data requirements necessary to complete a more thorough review of IRP documents from the environmental justice and public health perspectives. PA 231 has additional requirements applicable to the Commission, including opening a proceeding to consider expanding opportunities for public engagement in the Commission's proceedings and decision-making process, as well as proceedings to consider improving review of utility rate cases.

Public Act 235 (PA 235) – PA 235 established a clean energy standard of 80 percent by 2035 and 100 percent carbon neutrality by 2040. This moves up the energy transition ten years from ED 2020-10, where the 100 percent carbon neutrality goal was to be achieved by 2050. Clean energy plan format and guidelines are to be developed by the Commission by 2026, and utilities must submit plans no later than 2028. PA 235 also establishes a statewide energy storage target of 2,500 MW, with utilities required to submit plans to procure a proportional share of the statewide target by December 31, 2029. This act also establishes a renewable energy standard of 50 percent by 2030 and 60 percent by 2035. PA 235 also allows for an increase in the distributed generation program cap from one percent to ten percent and required a one-time upper peninsula energy study which is currently been completed by the Commission.

In addition to PA 231 and PA 235, the Governor also signed into law PA 229 and 233 impacting electric utilities. PA 229 established new energy waste reduction

targets and PA 233 created a voluntary siting process for significant renewable energy and energy storage facilities.

VII. Planning Reserve Margins and Local Clearing Requirements

To comply with PA 341 Section 6t (1) (e)

Compliance with Section 6t (1) (e) requires the identification of any required planning reserve margins and LCRs in areas of the state of Michigan. The majority of Michigan is part of the Midcontinent Independent System Operator (MISO). MISO is divided into local resource zones (LRZs or Zones) with the majority of the Lower Peninsula in Zone 7 and the Upper Peninsula combined with a large portion of Wisconsin in Zone 2, as shown in Appendix B. The unshaded portion of the southwest area of the Lower Peninsula is served by the PJM regional transmission operator. While the PJM has similar reliability criteria to MISO, there are some differences in terminology and details.

MISO publishes planning reserve margins in its annual Loss of Load Expectation (LOLE) Study Report each November.[4] The MISO LOLE Study Report includes the planning reserve margin for the next ten years in a table labeled, "MISO System Planning Reserve Margins 2022 through 2031" for the entire footprint. MISO also calculates the local reliability requirement of each Zone in the LOLE Study Report. The local reliability requirement is a measure of the planning resources required to be physically located inside a LRZ without considering any imports from outside of the zone in order to meet the reliability criterion of one day in ten years LOLE. The MISO LCR is defined as "the minimum amount of unforced capacity that is physically located within

[4] MISO 2024-2025 Loss of Load Expectation Study Report published on November 1, 2024 MISO One Voice Style Guide

the LRZ that is required to meet the LOLE requirement while fully using the Capacity Import Limit for such." The LCR for each LRZ is reported annually with the MISO planning resource auction results in April.[5]

For the southwest corner of the Lower Peninsula, in PJM's territory,[6] similar reliability requirements are outlined in PJM Manual 18 for the PJM Capacity Market.[7] PJM outlines requirements for an Installed Reserve Margin, similar to MISO's planning reserve margin, on an installed capacity basis, and a Forecast Pool Requirement on an unforced capacity basis, similar to MISO's planning reserve margin, on an unforced capacity basis. PJM also specifies 27 Local Deliverability Areas, somewhat similar to MISO's LRZ. PJM publishes a Reserve Requirement Study[8] annually in October containing the requirements for generator owners and load serving entities within its footprint for the next ten years.

Electric utilities required to file IRPs under Section 6t are also required to annually make demonstrations to the MPSC that they have adequate resources to serve anticipated customer needs four years into the future, pursuant to Section 6w of PA 341. On September 15, 2017, in Case No. U-18197, the MPSC adopted an order establishing a capacity demonstration process in an effort to implement the State Reliability Mechanism (SRM) requirements of Section 6w. This order established SRM-specific planning reserve margin

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[5] MISO Planning Resource Auction results, April 2024

https://cdn.misoenergy.org/PY21-22%20Planning%20Resource%20Auction%20Results541166.pdf

[6] See Appendix C for a map of PJM Local Deliverability Areas.

[7] See Appendix C for a map of PJM Local Deliverability Areas.

[8] PJM Reserve Requirement Study, October 2021.

https://www.pjm.com/-/media/committees-groups/subcommittees/raas/2021/20211004/20211004-pjm-reserve-requirement-study.ashx

requirements for each electric provider in Michigan for the period of planning years 2018 through 2021. In an order issued on October 14, 2017, in Case No. U-18444, the MPSC initiated a proceeding to establish a methodology to determine a forward locational requirement, to establish a methodology to determine a forward planning reserve margin requirement, and to establish these requirements for planning year 2022. In addition to planning to meet the reliability requirements of the regional grid operator (MISO or PJM, as applicable), electric utility IRP filings should be consistent with the requirements of the SRM under Section 6w, as established in Case Nos. U-18197, U-18444, and any subsequent cases initiated to implement these provisions.

VIII. Modeling Scenarios, Sensitivities and Assumptions

To comply with MCL 460.6t(1)(f)

For utilities located in the Michigan portion of MISO Zone 2 and MISO Zone 7, Scenario 1 is required, and Scenario 2 can be replaced with a utility created scenario if assumptions in Scenario 2 have changed such that they are no longer applicable. Northern States Power-Wisconsin and Indiana Michigan Power Company are utilities located in Michigan that already file multi-state IRPs in other jurisdictions. Due to the provisions in MCL 460.6t (4) regarding multi-state IRPs, Northern States Power-Wisconsin and Indiana Michigan Power Company are intentionally excluded from the explicit requirement to model the outlined scenarios. However, the multi-state utilities are encouraged to include the provisions included in each scenario. The Commission may request additional information from multi-state utilities prior to approving an IRP, pursuant to MCL 460.6t (4).

Scenario #1 (required)

(Applicability: Utilities located in the Michigan portion of MISO Zone 2 and MISO Zone 7, encouraged for multi-state utilities.)

This scenario directionally aligns with MISO's November 2023 Futures Report, Future 3a[9],[10]. This scenario incorporates 100% of utility IRP and announced state and utility goals within their respective timelines and assumes that 100% of the utility and state goals are met across the MISO region. This scenario incorporates the retirement announcements and retirement assumptions throughout the MISO footprint, as identified in MISO Future 3a. A utility can adjust these retirements if those adjustments are supported by publicly available information or utility supported analysis. As subsequent MISO Futures Reports are released, the utility should adopt the updated retirement assumptions identified in the Future most aggressive carbon reduction future.

This scenario assumes significant advancements toward electrification that drives a total energy growth rate to 1.08 (or the growth rate specified in MISO's most recent Futures 3a) throughout the Eastern Interconnect.[11] Utilities should assume EV adoption reaches 50% of total vehicle sales by 2030, with a trend toward 100% of vehicle sales continues throughout the remainder of the study period.[12] Using this information, utilities may develop their own demand and energy forecasts for their service territory with description and detail of how their forecast has included the impacts of climate change,[13] electrification,

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[9] The most recent MISO futures are published on the MISO website: https://www.misoenergy.org/planning/transmission-planning/futures-development/

[10] As MISO develops new futures, this scenario should align with MISO's most aggressive carbon reduction future. All 3a assumptions should then be updated accordingly.

[11] This high load growth is meant to capture both large scale industrial and manufacturing load growth as well as residential load growth. The utility can specify the drivers of this load growth with support if it sees the need to do so.

[12] Note: This EV adoption rate applies to all vehicle types.

[13] Midcentury datapoints for several climate change variables are available through Great Lakes Integrated Sciences and Assessments (GLISA) and Center for Climatic Research (CCR) at the University of Wisconsin-Madison. This information should be used to aid in establishing forecasts that include the impacts of climate change.

demand side resources, and customer-owned distributed generation and how these factors impact overall load and demand.

Emissions decline driven by state goals and utility plans throughout the MISO footprint, creating an 80% carbon reduction (or the reduction included in MISO's most recent Futures 3 scenario) by 2042 across the MISO region. For utilities operating in PJM, assume 80% carbon reduction by 2040 from the baseline year of 2005 for the PJM region. If PJM provides no set goal, then utilities shall utilize carbon reduction goals set by their respective corporate entity. This trajectory of carbon reduction is expected to continue beyond 2042. Market energy transactions are modeled at a carbon intensity consistent with the relevant RTO system average. MISO expected system averages are identified in Future 3a.[14]

- Natural gas prices utilized are consistent with the Reference Case projections from the United States EIA's most recent AEO.[15]
- Current DR, energy efficiency, and utility distributed generation programs remain in place and additional growth in those programs would happen if they were economically selected by the model or to help comply with the specified carbon reductions in this scenario.
- Consistent with the most recent MISO Future 3a, EV adoption and customer electrification increases causing adjustments in utility load profiles as electrification and EV's are adopted through the planning horizon.

[14] Scenario 1 aligns with MISO Future 3a from the November 2023 MISO Futures Report. If, in the future, MISO Futures significantly change, regulated utilities will work with Staff to determine the most appropriate future to use for Scenario 1.

[15] The natural gas price forecast utilized should be consistent with the EIA's most recent Annual Energy Outlook natural gas spot price at Henry Hub in nominal dollars and include delivery costs from Henry Hub to the point of delivery. Utilities may use a mixed 5-year future if the remainder of the forecast mirrors the EIA's most recent AEO.

- Electrification growth within the utility service territory and subsequent energy and demand impacts shall be informed by either established proprietary forecasts or publicly available data and account for utility customer trends. Assumed impacts of electrification on energy and demand forecasts shall be clearly delineated and identified in the utility filing. Utility electrification programs should be informed by the Statewide Electrification Study.
- A combination of new customer load and electrification are used to achieve the forecasted energy growth in this scenario.
- Specific new units are modeled in the LRZ if under construction or with regulatory approval (i.e., IRP cost pre-approval, CON, signed GIA, Renewable Energy Plan, or Voluntary Green Pricing Plan) for units in the utility's resource zone only (e.g., DTE Electric's LRZ is MISO Zone 7).
- For an electric utility independently administering its own EWR program, load should be modeled based upon maintaining a 2.17% EWR savings.
- The EWR maximum achievable savings opportunity will be established in a potential study by the Michigan state-wide achievable potential with an average life of at least 8 years for EWR measures, at the portfolio level. If the utility is not already at 2.17%, ramp up the utility's EWR savings to at least 2.17% of prior year sales over the course of 3 years, using EWR cost supply curves provided in the Michigan state-wide potential study for more aggressive potential.
- EWR savings remain at a minimum of 2.17% throughout the study period.[16] Additional cost effective EWR should be modeled. There should be no cap on EWR savings levels. There should be no cap on costs

[16] If there is not enough achievable savings potential to reach 2% of total retail electricity sales in megawatt hours in the preceding year, the maximum achievable potential found within the study will be modeled. The minimum energy savings should not be less than 1.5% of total retail electricity sales in megawatt hours in the preceding year. All scenarios will have an average life of at least 8 years for EWR measures, at the portfolio level, pursuant to Public Act 295 of 2008 as amended by Public Act 229 of 2023, Sec. 77.

associated with EWR programs as long as the program portfolio is cost effective based on a UCT score of 1.0 or greater.

- New resource selection for the utility filing their IRP should align with the Company's REP and associated renewable portfolio standard, achieving 50% renewable energy by 2030 and 60% renewable energy by 2035. The plan developed using this scenario should illustrate how the Company plans to achieve the clean energy standard, 80% clean energy portfolio by 2035 and 100% clean energy portfolio by 2040.
- Existing renewable energy production and storage tax credits continue and renewable energy and storage investment tax credits continue, pursuant to current law. If the resource is eligible for Production Tax Credits (PTC) or Investment Tax Credits (ITC), the credit should be included in the modeling. Federal policy timing may impact modeling.
- Energy storage resources are modeled using available best practice methodologies. Allow for multiple market revenue streams where applicable and demonstrate the utility is reasonably capturing the full value of storage. Utilize public, high resolution spatial and temporal data (e.g., related to costs and technologies) to improve the chronology of energy storage models and, if adequate public data is not available, use data that can be shared with parties through nondisclosure agreements. Utilize best practices to accurately model the operations of long-duration and multi-day energy storage technologies and their participation in markets. Technology costs and limits to the total resource amount available for EWR and DR programs will be informed by the most recently Commission approved state-wide potential study and may be augmented by prior EWR and DR potential studies and/or additional research as well as by the actual experience of EWR programs in Michigan.
- Existing Public Utility Regulatory Policies Act (PURPA) qualifying facilities (QFs), up to the utility's "must buy" obligation MW threshold, are assumed to be renewed, unless the QF indicates otherwise, either publicly or directly to the utility.

- Existing PURPA QFs greater than the utility's "must buy" obligation MW threshold are assumed to continue operations within the wholesale market beyond the termination date of the contract, unless the QF indicates otherwise, either publicly or directly to the utility.
- Achieve and maintain energy storage resources necessary to meet the utility's proportional share of the minimum statewide energy storage target using the calculation methodology approved by the Commission in Case No. U-21571. Modeling should support the selection of energy storage technologies and other details of the utility's energy storage resource portfolio in the PCA.
- If the utility is planning on adding a non-clean resource, defined as any electric generating resource that does not qualify as a "clean energy system" or "renewable energy resource" under Act 295, as amended, or the MPSC's Clean Energy Plan Filing Requirements, it must model the scenario without the non-clean resource as well.

Scenario #1 Sensitivities:

1. Fuel cost projections: Increase the natural gas fuel price projections from the base projections to at least the high EIA gas price in the most recent EIA Low Oil and Gas Supply forecast natural gas fuel price projections (or other publicly available source) by the end of the 20-year study period.
2. Model an unexpected 20% reduction from the utility's base assumption of annual renewable build constraints, to represent a limited inability to source renewable resources in the first 6 years of the plan.
3. For electric utilities independently administering its own EWR program, ramp up to 2.5% EWR savings based upon prior year sales within the utility's Michigan jurisdiction.
4. Model incremental large load increases that are equal to 10% of the annual forecasted load in years 2030, 2035, and 2040.
5. Model a policy shift to a high investment in off-shore wind starting in the 5th year of the plan and extending to the last year of the plan. Off-shore

wind would be expected to receive any PTC or ITC equivalent to all other renewable generation. Policy is based upon preservation of farmland and perpetuated by low seasonal capacity accreditation of solar in winter months whereby all new renewable generation after the 5th year of the plan must be 50% off-shore wind. In addition to the production cost of this sensitivity, please provide a discussion of barriers to off-shore wind and an estimation, based upon current solar construction practices, of the acreage of productive cropland that is likely to be preserved under this sensitivity.

Scenario #2

Applicability: Utilities located in the Michigan portion of MISO Zone 2 and MISO Zone 7 (encouraged for multi-state utilities).[17]

This scenario directionally aligns with MISO's December 2023 Futures Report, Future 1a and reflects substantial achievement of state and utility announcements, including generation retirements and environmental goals. This scenario incorporates 100% of utility IRP retirement announcements and retirement assumptions throughout the MISO footprint, as identified in MISO Future 1. For the utility performing the analysis, the generation unit retirement assumptions may vary from the MISO Futures Report only for the thermal generation units that the utility has decision making authority or for any unit retirements that have been publicly announced since publication of the MISO report. The filing utility may incorporate more recently announced retirements if practical. As subsequent MISO Futures Reports are released, updated retirement assumptions identified in the Future most similar to Future 1a of

[17] For example, the most recent EIA AEO Low Oil and Gas Supply natural gas price is $4.27/MMBtu in 2040.

the November 2023 report should be used.[18] This scenario assumes that CO_2 emissions decline, driven by state goals and utility plans throughout the MISO footprint, creating a target of 40% carbon reduction by 2042[24] from the baseline year of 2005 for the MISO region. Carbon emissions continue to decline on this trajectory beyond 2040.

This scenario assumes an annual energy growth of 0.22%, driven by existing economic factors, with moderate electric vehicle (EV) adoption and customer electrification, resulting in moderate MISO footprint-wide demand and energy growth rates. Utilities may use the most recent United States Energy Information Administration (EIA) Annual Energy Outlook (AEO) Reference Case or other reputable source for forecasted EV adoption rates. If the utility does not use EIA AEO, then the EV forecast information must be provided within the utility IRP filing. Using this information, a utility may develop its own demand and energy forecasts with description and detail how its forecast has included the impacts of climate change, [19] electrification, demand side resources, and customer owned distributed generation and how these factors change overall load and demand. The utility can use alternative load growth assumptions to the extent that they are fully supported by publicly available data.

- Natural gas prices utilized are consistent with Reference Case projections from the United States EIA's most recent AEO. [20]

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[18] Scenario 2 aligns with MISO Future 1a from the November 2023 MISO Futures Report. If, in the future, MISO Futures significantly change in future reports, regulated utilities will work with Staff to determine the most appropriate future to use for Scenario 2.

[19] Midcentury datapoints for several climate change variables are available through Great Lakes Integrated Sciences and Assessments (GLISA) and Center for Climatic Research (CCR) at the University of Wisconsin-Madison. This information should be used to aid in establishing forecasts that include the impacts of climate change.

[20] The natural gas price forecast utilized should be consistent with the EIA's most recent Annual Energy Outlook natural gas spot price at Henry Hub in nominal dollars, including delivery costs from Henry Hub to the point of delivery.

- Moderate EV adoption and customer electrification result in moderate MISO footprint-wide demand and energy growth. Within Michigan, EV and electrification forecasts should be blended with historical sales such that after three years, Michigan's load and demand increase reflects the source forecasts for EV and electrification technologies. Utility load profiles of EVs and electrification technologies should be clearly delineated and presented individually such that it is clear how they each impacted the overall energy and demand forecast. EV forecasts maybe based off the Reference Case in the most recent EIA AEO.
- Electrification growth within the utility service territory and subsequent energy and demand impacts shall be informed by either established proprietary forecasts or publicly available data and account for utility customer trends. Assumed impacts of electrification on energy and demand forecasts shall be clearly delineated and identified in the utility filing. Utility electrification programs should be informed by the Statewide Electrification Study.
- Resource assumptions: MISO Future 1a retirements for existing thermal and nuclear generation resources published in the most recent Futures Report should be used when available. The filing utility may incorporate more recently announced retirements if practical. Specific new units will be modeled if under construction or with regulatory approval (i.e., Certificate of Necessity (CON), IRP cost pre-approval, or signed generator interconnection agreement (GIA)). In the absence of a MISO defined retirement assumption, maximum age assumption by resource type, as specified by applicable regional transmission organization (RTO), can also be used. Generic new resources are assumed to be consistent with the scenario description, considering anticipated new resources currently in generation interconnection queue, and should be chosen based upon economics and reliability.
- New resource selection for the utility filing their IRP should align with the Company's REP and associated renewable portfolio standard, achieving

50% renewable energy by 2030 and 60% renewable energy by 2035. The plan developed using this scenario should illustrate how the Company plans to achieve the clean energy standard, 80% clean energy portfolio by 2035 and 100% clean energy portfolio by 2040.

- For an electric utility independently administering its own EWR program, load should be modeled based upon maintaining a 1.5% EWR savings.
- The EWR maximum achievable savings opportunity will be established in a potential study by the Michigan state-wide achievable potential with an average life of at least 8 years for EWR measures, at the portfolio level.
- This scenario assumes that a utility maintains a minimum of 1.5% EWR savings throughout the study period.[21] Additional cost effective EWR should be modeled. There should be no cap on EWR savings levels. There should be no cap on costs associated with EWR programs as long as the program portfolio is cost effective based on a UCT score of 1.0 or greater.
- Energy storage resources are modeled using available best practice methodologies. Allow for multiple market revenue streams where applicable and demonstrate the utility is reasonably capturing the full value of storage. Utilize public, high resolution spatial and temporal data (e.g., related to costs and technologies) to improve the chronology of energy storage models and, if adequate public data is not available, use data that can be shared with parties through nondisclosure agreements. Utilize best practices to accurately model the operations of long-duration and multi-day energy storage technologies and their participation in markets.

[21] If there is not enough achievable savings potential to reach 2% of total retail electricity sales in megawatt hours in the preceding year, the maximum achievable potential found within the study will be modeled. The minimum energy savings should not be less than 1.5% of total retail electricity sales in megawatt hours in the preceding year. All scenarios will have an average life of at least 8 years for EWR measures, at the portfolio level, pursuant to Public Act 295 of 2008 as amended by Public Act 229 of 2023, Sec. 77.

- Technology costs for thermal units and wind track with mid-range industry expectations.
- Technology costs and limits to the total resource amount available for EWR and DR programs will be informed by the most recently Commission approved state-wide potential study and may be augmented by prior EWR and DR potential studies and/or additional research.
- Technology costs for solar, storage, and other emerging technologies decline with commercial experience, consistent with National Renewable Energy Laboratory (NREL) or other publicly available reputable sources.
- Existing PTC and ITC tax credits continue, pursuant to current law, and should be included in the modeling. Federal policy timing may impact modeling.
- Technology costs and limits to the total resource amount available for EWR and DR programs will be informed by the most recently Commission approved state-wide potential study and may be augmented by prior EWR and DR potential studies and/or additional research as well as by the actual experience of EWR programs in Michigan.
- Existing Public Utility Regulatory Policies Act (PURPA) qualifying facilities (QFs), up to the utility's "must buy" obligation MW threshold, are assumed to be renewed, unless the QF indicates otherwise, either publicly or directly to the utility.
- Existing PURPA QFs greater than the utility's "must buy" obligation MW threshold are assumed to continue operations within the wholesale market beyond the termination date of the contract, unless the QF indicates otherwise, either publicly or directly to the utility.
- Achieve and maintain energy storage resources necessary to meet the utility's share of the statewide energy storage target using the calculation

methodology approved by the Commission in Case No. U-21571. Modeling should support the selection of energy storage technologies and other details of the utility's energy storage resource portfolio in the PCA.

Scenario #2 Sensitivities:

1. Fuel cost: Increase the natural gas fuel price projections from the base projections to at least the high EIA gas price in the most recent EIA Low Oil and Gas Supply forecast.[22]

2. Load projections:

    a. High load growth: For the filing utility's load obligation, increase the energy growth rate by at least a factor of two above the base case energy or 0.5% (whichever is larger) on a per customer basis. Adjust demand accordingly. For the region included in the scenario utilize load growth that is consistent with the most recent MISO futures.

    b. Low load growth: EV adoption and electrification are slower than expected. Demand and load growth are consistent with 5-year historical growth rates prior to 2020 and the onset of COVID-19.

3. If the utility is not already achieving 2.17% EWR, ramp up the utility's EWR savings to at least 2.17% of prior year sales over the course of three years within the utility's Michigan jurisdiction.[23] EWR savings remain at 2.17% throughout the remainder of the study period.

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[22] For example, the most recent EIA AEO Low Oil and Gas Supply natural gas price is $4.27/MMBtu in 2040.

[23] 2025 Energy Waste Reduction Potential Study

IX. Michigan IRP Modeling Input Assumptions and Sources

The following IRP modeling input assumptions and sources are recommended to be used in conjunction with the descriptions of the scenarios and sensitivities.

	Value	Sources
1 - Analysis Period	• A minimum analysis period of 20 years, with reporting for years 5,10, and 15 at a minimum as specified in the statute.	
2 - Model Region	• The minimum model region includes the utility's service territory, with transmission interconnections modeled to the remainder of Michigan, adjacent Canadian provinces if applicable. A larger model region is preferable, including the applicable RTO region as deemed appropriate by utility.	
3 - Economic Indicators and Financial Assumptions (e.g., Weighted Average Cost of Capital)	• Utility-specific	• Prevailing value from most recent MPSC proceedings
4 - Load Forecast	• 50/50 forecast • Forecasts other than 50/50 utilized to align with scenario and/or sensitivity descriptions should be documented and justified.	• Utility forecast and applicable RTO forecasts
5 - Unit Retirements	• Retirements driven by maximum age assumption or economics • Public announcements on retirements	• MISO or PJM documented fuel type retirements • All retirement assumptions must be documented • Retirement assumptions throughout the MISO footprint are consistent with MISO futures development Future 1a and Future 3a.
6 - Natural Gas Price nominal dollars $/MMBtu	• Forecasts utilized should align with scenario and/or sensitivity descriptions; Gas prices should include transportation costs.	• NYMEX futures (applicable for near-term forecastsonly) • EIA Annual Energy Outlook • EIA Table 3: Energy Prices • EIA Short-Term Energy Outlook Reports • If utility-specific data is utilized, it should be justified and made available to all intervening parties.
7 - Coal Price nominal dollars $/MMBtu	• Forecasts utilized should align with scenario and/or sensitivity descriptions; Coal prices should include transportation costs.	• EIA Coal Production and Minemouth Prices by Region • EIA Annual Energy Outlook • EIA Table 3: Energy Prices • EIA Short-Term Energy Outlook Reports/AnnualReports • If utility-specific data is utilized, it should be justified and made available to all intervening parties.
8 - Fuel Oil Price nominal dollars $/MMBtu	• Forecasts utilized should align with scenario and/or sensitivity descriptions.	• If utility-specific data is utilized, it should be justified and made available to all intervening parties.

9 - EWR Savings MWhs	Scenario #1: • For electric utilities earning a financial incentive, base case energy reductions of 1.5% per year as a net to load forecast. • For non-incentive earning electric utility, mandated annual incremental savings (1.0%) as a net to load. • Not less than 35% of the state's electric needs should be met through a combination of EWR and renewable energy by 2025, as per PA 342 Section 1 (3). Scenario #1 Sensitivities: • For savings beyond mandate, incorporate EWR as an optimized generation resource. Scenario #2**:** • Ramp up EWR savings at least 2.0% over the course of four years. • Consider load shape of EWR measures so on-peak capacity reduction associated with EWR can be reflected.	• Utility EWR plan and reconciliation filings • 2024/5 Energy Waste Reduction Potential Study • Other pertinent studies and research used by the utility.
10 - EWR Costs nominal dollars per kWh (Program administrator costs only; participant costs are not to be included in this analysis.)	• Current average levelized costs, as defined in 2021 EWR Potential Study, and Supplemental Modeling reflecting aggressive and cost-effective program savings goals.	• Utility EWR plan and reconciliation filings • 2024/5 Energy Waste Reduction Potential Study • Other pertinent studies and research used by the utility.
11 - DR Savings MWs	• MWs by individual program (e.g., residential peak pricing, residential time-of-use pricing, residential peak time rebate pricing, residential programmable thermostats, residential interruptible air, industrial curtailable, industrial interruptible, etc.) or program type and class (e.g., residential behavioral, residential direct control, commercial pricing, volt/ Volt-Amp Reactive (VAR) optimization). • Technical, economic, and achievable levels of DR as applicable to the scenario.	• As defined by 2021 Demand Response Potential Study
12 - DR Costs nominal dollars per MW	• Costs/MW by program, including all payments, credits, or shared savings awarded to the utility through regulatory incentive mechanism.	• As defined by 2021 Demand Response Potential Study
13 - Renewable Capacity Factors		• If utility-specific data is utilized, it should be justified and made available to all intervening parties.
14 - Renewable Capital Costs and Fixed O&M Costs nominal dollars per kWh and Renewable Fixed O&M Costs nominal dollars per kW	• Wind, solar, biomass, landfill gas • Combined heat and power (CHP)	• National Renewable Energy Lab's *Annual Technology Baseline Report* • Department of Energy's *Wind Technologies Market Report* • Lawrence Berkeley National Lab's *Tracking the Sun* and *Utility Scale PV Cost* • Assumptions based on utility experience (Michigan specific and/or RTO - MISO/PJM) • 2015 Michigan Renewable Resource Assessment • Department of Energy's *Wind Vision Study* • Department of Energy's *Sunshot Vision Study* • Lazard's Levelized Cost of Storage Analysis 2.0 • If utility is using specific data not publicly sourced, mustbe justified and made available to all intervening parties.

15 – Fossil and Nuclear Generation nominal dollars per kW nominal dollars per kWh	• Combustion Turbine • Combined Cycle • Reciprocating Internal Combustion Engine • Carbon Capture and Sequestration • Nuclear, including Small Modular Reactor	US Energy Information Administration AEO2023 Cost and Performance Characteristics of New Generating Technologies
16 – Storage	• Achieve and maintain energy storage resources necessary to meet the utility's share of the statewide energy storage target using the calculation methodology approved by the Commission in Case No. U-21571. Modeling should support the selection of energy storage technologies and other details of the utility's energy storage resource portfolio in the PCA.	• **LDES National Consortium** • **Lazard's Levelized Cost of Storage Analysis 9.0** • **PNNL's Energy Storage Cost and Performance Database** • **Commission's Study of Long-Duration and Multi-Day Energy Storage Systems**
17 – Other Resources	• Changes to operation guides • Options which improve reliability (Storage, SVC, HVDC, CVR) • Utilities shall take into account small qualifying facilities (20 MW and under) and other aggregated demand-side options as part of establishing load curves and future demand. Larger renewable energy resources, combined heat and power plants, and self-generation facilities (behind-the-meter (BTM) generation) that consist of resources listed below or fossil fueled generation should be considered in modeling, either as discrete projects, where such have been developed/defined, or as generic blocks of tangible size (e.g., 100 MW wind farm) where not yet defined. • Utility-scale (e.g., integrated gasification combined cycle, CHP, pumped hydro storage, other storage, voltage optimization) • BTM (customer BTM) Generation (e.g., solar photovoltaic (PV), biogas (including anaerobic digesters), CHP (combustion turbine,steam, reciprocating engines), customer-owned backup generators, microturbines (with and without cogeneration),fuel cells (with and without cogeneration), small-scale Reciprocating Internal Combustion Engine (RICE) units (with and without cogeneration)) • Other Distributed Resources (e.g., stationary batteries, electric vehicles, thermal storage, compressed air, flywheel, solid rechargeable batteries, flow batteries).	• Assumptions and parameters other than costs that are associated with the technologies and options (such as future adoption rates) should be afforded flexibility due to those technologies' and options' presently unconventional nature. However, the utility should still show that all assumptions and parameters are reasonable and were developed from credible sources. • Utilities shall use cost and cost projection data from publicly available sources or the utility's internal data sources. The utility must show that their data and projection sources are reasonable and credible. • State of the Art Practices for Modeling Storage in Integrated Resource Planning. • Charging Ahead: Energy Storage Guide for Policymakers • Advanced Energy Storage in Integrated Resource Planning. • Energy Storage in Integrated Resource Plans • Michigan Energy Storage Roadmap
18- Wholesale Electric Prices		• Documentation for wholesale price forecast must be provided to all intervening parties.
19 – Electric Vehicle Forecasts	Scenario 1 EIA AEO Reference Case Scenario 2 half of vehicle sales are electric by 2030	• EIA AEO Transportation
20- Electrification Forecasts	TBD	• 2024/5 Electrification Potential Study

X. Additional IRP Requirements and Assumptions

1. Prices and costs should be expressed in nominal dollars.
2. Models should account for operating costs and locational, capital and performance variations. For example, setting pricing for different tranches if justified.

3. Capacity factors should be projected based on demonstrated performance, consideration of technology improvements and geographic/locational considerations. Additional requirements for renewable capacity factors are described in the Michigan IRP Modeling Input Assumptions and Sources in the previous section of this draft.
4. For purposes of IRP modeling, forecasted energy efficiency savings should be aggregated into hourly units, coincident with hourly load forecasts, with indicative estimates of efficiency cost and savings on an hourly basis. It is this aggregation and forecast of energy efficiency, to be acquired on an hourly basis that allows EWR to be modeled as a resource in an IRP for planning purposes.
5. Prior to modeling Scenario 1 and Scenario 2, the utilities shall consider and prescreen all the technologies, resources, and generating options listed in the Michigan IRP Modeling Input Assumptions and Sources in the previous section of this draft. These findings will then be presented and discussed via at least one stakeholder meeting with written comments from stakeholders taken into consideration. The options having potential viability are then considered in modeling.
6. Consider all supply and demand-side resource options on equal merit, allowing for special consideration for instances where a project or a resource need requires rapid deployment.
7. In modeling each scenario and sensitivity evaluated as part of the IRP process, the utility shall clearly identify all unit retirement assumptions and unless otherwise specified in the required scenarios, the utility has flexibility to allow the model to select retirement of the utility's existing generation resources, rather than limiting retirements to input assumptions.
8. The IRP should consider any and all revenues expected to be earned by the utility's asset(s), as offsets to the NPVRRs. The utility should explicitly identify

revenues that are expected to be earn that are offsets to the NPVRRs and the assumptions that those revenues are based upon.

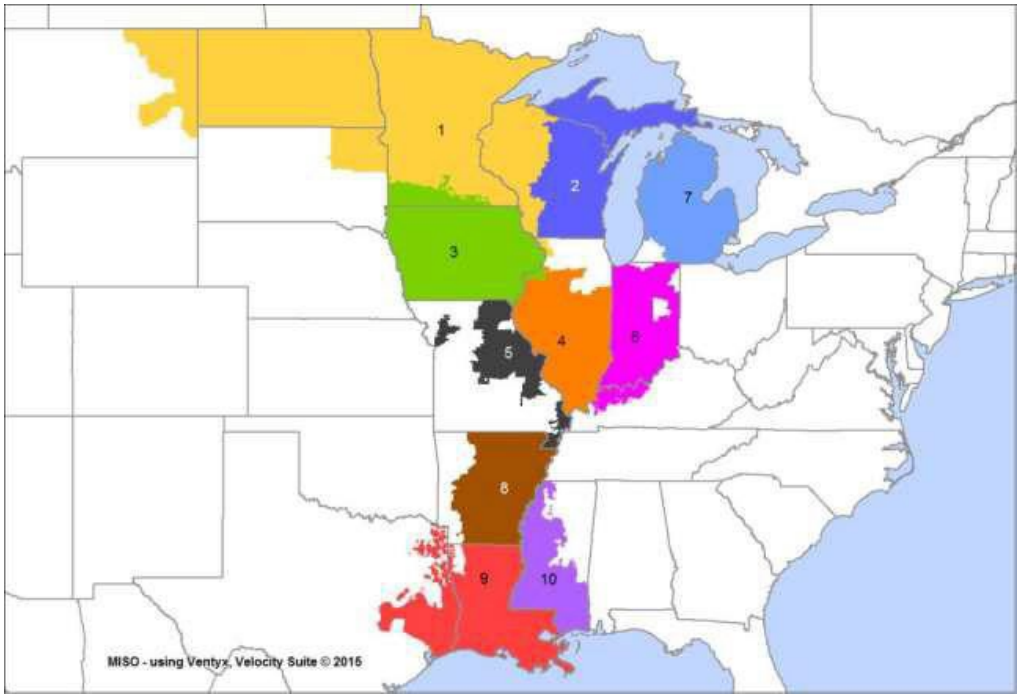
Appendix A: Organization Participation List

- Adams BioProcess Services
- Advanced Energy Economy
- American Council for an Energy-Efficient Economy
- American Electric Power
- American Municipal Power
- American Transmission Company
- Apollo Energy
- Armada Power
- Association of Businesses Advocating Tariff Equity
- Association of Energy Engineers
- Atlantic Council
- Attorney General
- Bay City Light & Power
- Bedrock Group
- Brattle Group
- Burns & McDonnell
- Cadmus Group
- Center Point Energy
- Charge Point
- Charthouse Energy
- Citizen Utility Board of Michigan
- City of Ann Arbor
- City of Grand Rapids
- City of Marquette
- Clark Hill
- Clean Grid Alliance
- CMS Energy
- Coalitions for Energy Efficient Logistics
- Consumers Energy
- CPower Energy Manager
- Dimension Renewable Energy
- DNV GL
- Dominion Energy
- Driftless Energy
- DTE Electric
- Duke Energy
- Dykema
- Earth Justice
- Ecology Center
- Dept. of Environment, Great Lakes & Energy
- Energy Exemplar
- Environmental Law & Policy Center
- EPRI
- Fein Solutions
- Five Lakes Energy
- Ford Motor Company
- Fraser Trebilcock Davis & Dunlap
- Futures Energy Group
- Great Plains Institute
- Grand Rapids Chamber of Commerce
- Grand Rapids Resident
- Grid Lap
- Guidehouse
- Hawk Utility Consulting
- Hecate Energy

- ICF New York University
- IFC
- Indiana Michigan Power
- ITC Holdings
- Key Capture Energy
- Lawrence Berkley National Laboratory
- Mi Air Mi Health
- Michigan Biomass
- Michigan Chemistry Council
- Michigan Climate Action Network
- Michigan Clinicians for Climate Action
- Michigan Conservative Energy forum
- Michigan Electric and Gas Association
- Michigan Electric Cooperative Association
- Michigan Energy Innovation Business Council
- Michigan Environmental Council
- Michigan Environmental Justice Coalition
- Michigan Farm Energy Program
- Michigan League of Conservation Voters
- Michigan Power Purchasers Association
- Michigan State University
- Michigan Townships Association
- Midcontinent Independent System Operator
- Milligan Grid Solutions
- Minnesota Public Utility Commission
- National Renewable Energy Laboratory
- Natural Resource Defense Council, Inc.
- Natural Resources Research Institute
- New Energy Advisors, LLC.
- Next Energy
- Northern States Power
- NRG Business Solutions, LLC.
- Oakridge National Laboratory
- Opower
- PACE Financing
- Pacific Northwest National Laboratory
- PJM
- Plugged in Strategies
- Policy Advisor Michigan House of Representatives
- Potomac Law Group
- PSC Healthy Energy
- Public Sector Consultants
- Public Utilities Commission of Ohio
- Purdue University Forecasting Group
- Ranger Power
- Regulatory Assistance Project
- Renewable Energy Buyers Alliance

- Renewable Energy Systems
- Rivenoak Consulting
- Ruben Strategy Group
- Siemens
- Sierra Club
- Spark Building Energy Solutions
- Sun 5 Repowering
- Sunrun
- The Healthy Homes Coalition of West Michigan
- Traverse City Light and Power
- Union of Concerned Scientists
- United States Energy Association
- University of Michigan
- Soulardarity
- Upper Peninsula Power Co.
- Urban Core Collective
- US Climate Alliance
- Varnum Law
- Vote Solar
- Walker Miller Energy
- Wartsila
- WEC Energy Group
- Wisconsin Public Service Commission
- Wolverine Electric Cooperative
- Wolverine Power
- Xcel Energy

Appendix B: Map of MISO Local Resource Zones



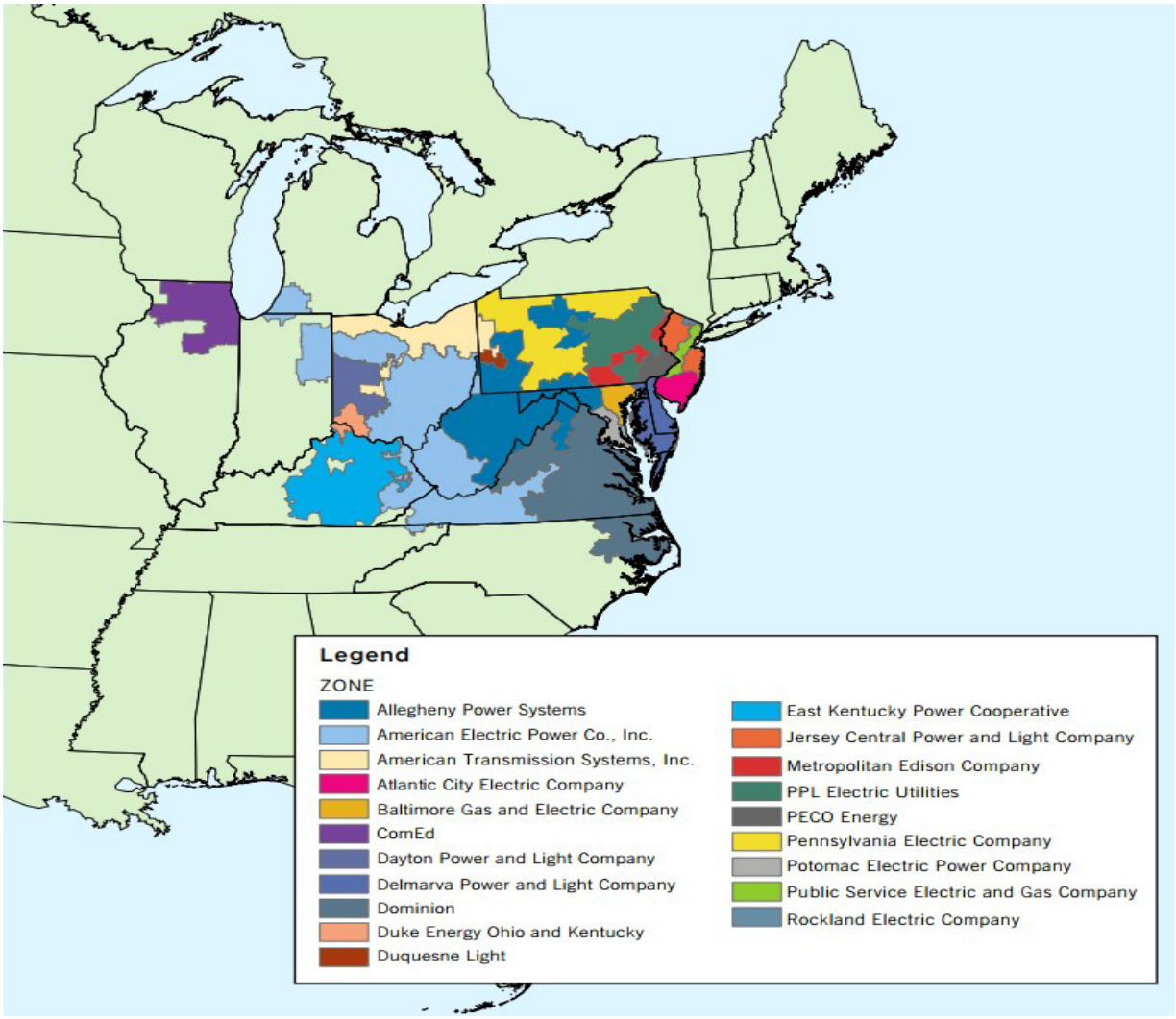
MISO Zone 1 - Rate regulated electric utility - Northern States Power-Wisconsin

MISO Zone 2 - Rate regulated electric utilities - Upper Michigan Energy Resources Corporation and Upper Peninsula Power Company

MISO Zone 7 - Rate regulated electric utilities - Alpena Power Company, Consumers Energy Company, and DTE Electric Company

PJM (Southwest Michigan) - Rate regulated electric utility - Indiana Michigan Power Company

Appendix C: Map of PJM Local Deliverability Areas



PJM (Southwest Michigan) - Rate regulated electric utility - Indiana Michigan Power Company is part of the American Electric Power Co., Inc.

Appendix D: Public Act 341 of 2016, Section 6t (1)

Section 6t (1) The commission shall, by August 31, 2025, and every 4 years thereafter, commence a proceeding and, in consultation with the department of environment, Great Lakes, and energy, and other interested parties, do all of the following as part of the proceeding:

(a) Conduct an assessment of the potential for energy waste reduction in this state.

(b) Conduct an assessment for the use of demand response programs in this state, based on what is economically and technologically feasible, as well as what is reasonably achievable. The assessment must expressly account for advanced metering infrastructure that has already been installed in this state and seek to fully maximize potential benefits to ratepayers in lowering utility bills.

(c) Identify significant state or federal environmental regulations, laws, or rules and how each regulation, law, or rule would affect electric utilities in this state.

(d) Identify any formally proposed state or federal environmental regulation, law, or rule that has been published in the Michigan Register or the Federal Register and how the proposed regulation, law, or rule would affect electric utilities in this state.

(e) Identify any required planning reserve margins and local clearing requirements in areas of this state.

(f) Establish the modeling scenarios and assumptions each electric utility should include in addition to its own scenarios and assumptions in developing its integrated resource plan filed under subsection (3), including, but not limited to, all of the following:

(i) Any required planning reserve margins and local clearing requirements.

(ii) All applicable state and federal environmental regulations, laws, and rules identified in this subsection.

(iii) Any supply-side and demand-side resources that reasonably could address any need for additional generation capacity, including, but not limited to, the type of generation technology for any proposed generation facility, projected energy waste reduction savings, projected load impact due to electrification, and projected load management and demand response savings.

(iv) Any regional infrastructure limitations in this state.

(v) The projected costs of different types of technologies and fuel used for electric generation.

(g) Allow other state agencies to provide input regarding any other regulatory requirements that should be included in modeling scenarios or assumptions.

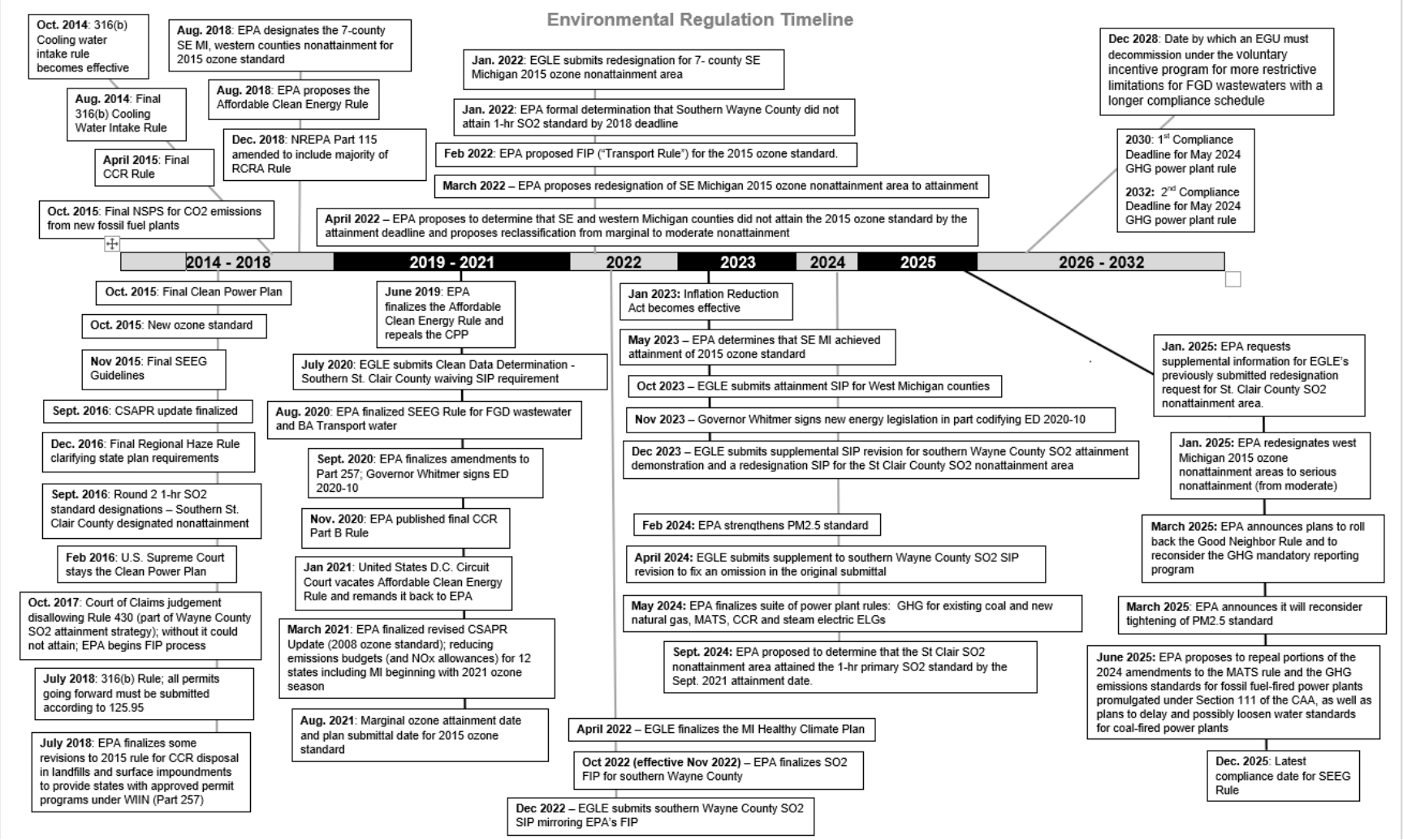
(h) Publish a copy of the proposed modeling scenarios and assumptions to be used in integrated resource plans on the commission's website.

(i) Before issuing the final modeling scenarios and assumptions each electric utility should include in developing its integrated resource plan, receive written comments and hold hearings to solicit public input regarding the proposed modeling scenarios and assumptions.

(j) Conduct an assessment of the potential for electrification of transportation, buildings, and industries consistent with economy-wide elimination of greenhouse gas emissions in this state, based on what is economically and technically feasible, as well as what is reasonably achievable.

(k) Identify environmental justice communities.

Appendix E: Environmental Regulatory Timeline



Appendix F: Acronyms

ACE: Affordable Clean Energy

AEO: Annual Energy Outlook

BA: Bottom Ash

BART: Best Available Retrofit Technology

BTA: Best Technology Available

BTM: Behind the Meter

CAA: Clean Air Act

CCR: Coal Combustion Residual

CDD: Clean Data Determination

CHP: Combined Heat and Power

CON: Certificate of Necessity

CO_2: Carbon Dioxide

CPP: Clean Power Plan

CSAPR: Cross-State Air Pollution Rule

DR: Demand Response

DSMSim™: Demand Side Management Simulator

EGLE: Department of Environment, Great Lakes, and Energy

EGU: Electric Generating Units

EIA: Energy Information Administration

ELG: Effluent Limitation Guidelines

EWR: Energy Waste Reduction

EV: Electric Vehicle

FGD: Flue Gas Desulfurization

FIP: Federal Implementation Plan

GIA: Generator Interconnection Agreement

HAP: Hazardous Air Pollutants

HVDC: High Voltage Direct Current

IRP: Integrated Resource Plan

LCR: Local Clearing Requirement

LOLE: Loss of Load Expectation

LRZ: Local Resource Zones or Zones

MACT: Maximum Achievable Control Technology Standards

MAE: Michigan Agency for Energy

MATS: Mercury and Air Toxic Standards

MDEQ: Michigan Department of Environmental Quality

MEPA: Michigan Environmental Protection Act

MIRPP: Michigan Integrated Resource Planning Parameters

MISO: Midcontinent Independent System Operator

MMR: Michigan Mercury Rule

MPSC: Michigan Public Service Commission or Commission

MW: Megawatts

MWh: Megawatt Hour

NAAQS: National Ambient Air Quality Standards

NO_x: Nitrogen Oxide

NPDES: National Pollutant Discharge Elimination System

NPVRR: Net Present Value Revenue Requirement

NREL: National Renewable Energy Laboratory

NREPA: Natura Resources and Environmental Protection Act

NSPS: New Source Performance Standards

PA: Public Act

Ppb: Parts per Billion

PURPA: Public Utility Regulatory Policies Act

PV: Photovoltaic

QF: Qualifying Facility

RCRA: Resource Conservation and Recovery Act

RICE: Reciprocating Internal Combustion Engine

RTO: Regional Transmission Organization

SEEG: Steam Electric Effluent Guidelines

SIP: State Implementation Plan

SO_2: Sulfur Dioxide

SRM: State Reliability Mechanism

UCT: Utility Cost Test

USEPA: United States Environmental Protection Agency

USWAG: Utility Solid Waste Activities Group

VAR: Volt- Amp Reactive

WIIN: Water Infrastructure Improvements for the Nation

Appendix G: Minimum Scenario and Sensitivities Required for Retirement Analysis

	Build Plans					
	PCA	Utility Alternative	Previous Approved IRP PCA Retirement Dates	Retirement Decision A	Retirement Decision B	Retirement Decision C
Scenario #1 (required)						
Base Scenario	X	X	X	X	X	X
1. High Gas Price	X	X		X	X	X
2. Renewable Constraints	X	X		X	X	X
3. 2.5% EWR	X	X				
4. Hydrogen Policy	X	X				
5. Offshore Wind Policy	X	X				
6. Nuclear Policy	X	X				
Scenario #2 (or utility replacement)						
Base Scenario	X	X	X	X	X	X
1. High Gas Price	X	X		X	X	X
2. a. High Load Growth	X	X		X	X	X
2. b. Low Load Growth	X	X				
3. 2.17% EWR	X	X				

The intent of this matrix is to allow for a robust comparison of the final PCA, any utility proposed alternative, and retirement decisions across many futures. The matrix will provide an understanding of how the proposed build plans will respond in when forced into the two scenarios and sensitivities. Additionally, this matrix is intended to illustrate the utility's retirement decision is the most reasonable and allow for each retirement decision to be evaluated independently and collectively to the extent that the utility chooses to include the retirement in its PCA.

This matrix is designed to show the minimum scenarios and sensitivities that a final PCA, utility proposed alternative, and retirement decision should be evaluated. The scenario number and sensitivity number correspond to the

MIRPP scenarios and sensitivities detailed in this document. The retirement decisions identified as Retirement Evaluation A, B, C above is meant to represent the different retirement decisions a utility may be evaluating within the IRP. For example, if a utility proposes a retirement be included in the PCA, the evaluation of that decision would be the opposite, i.e. the build plan without the retirement.

Notes:

1. Utility Alternative is only necessary to the extent that the utility is proposing an alternative to its PCA in its filing.
2. For the previously approved IRP Retirement Date runs The previously approved PCA retirement dates should be fixed in the model and the model allowed to reoptimize for the optimal resources. This is done to isolate the effect that changes in retirement date have on the overall build plan when compared with previously approved retirement dates.

STRIKE AND BOLD

MICHIGAN INTEGRATED RESOURCE PLANNING PARAMETERS - DRAFT

U-21570 & U-21867

Pursuant to Public Act 341 of 2016, as Amended by Public Act 231 of 2023, Section 6t

August 15, 2025

U-21570 & U-21867

Table of Contents

I. Executive Summary

This Michigan Integrated Resource Planning Parameters (MIRPP) document was developed as a part of the implementation of the provisions of Public Act 341 of 2016 (PA 341), Section 6t. This document includes **one** ~~two~~ **required and one optional** integrated resource plan (IRP) modeling scenarios, **each** with multiple sensitivities per scenario, for the rate-regulated utilities in Michigan's Upper and Lower Peninsulas **to use when conducting integrated resource plans**. ~~None of the scenarios, sensitivities or other modeling parameters included within this document should be construed as policy goals or even as likely predictions of the future. Instead~~, **The scenarios and sensitivities are designed to test varying resource portfolios.** The scenarios, sensitivities, and modeling parameters are more aptly characterized as stressors utilized to test how different future resource plans perform relative to each other with respect to affordability, reliability, adaptability, and environmental stewardship. In some instances, scenarios and sensitivities intentionally push the boundaries on what may beviewed as probable and could be considered as bookends on the range of possible future outcomes. Utilities may also include separate additional scenarios and sensitivities in IRPs and may use different assumptions or forecasts for the additional scenarios and sensitivities. However, the assumptions and parameters outlined **in the required scenario** ~~in this document~~ should be used ~~for the required scenarios and sensitivities~~. Including the scenarios will ensure that Michigan's electric utilities consider a wide variety of resources such as renewable energy, demand response (DR), energy waste reduction (EWR), storage, distributed generation technologies, voltage support solutions,and transmission and non-transmission alternatives, in addition to traditional, **clean energy system, and** fossil-fueled generation alternatives for the future. This IRP parameters document also contains numerous modeling assumptions and requirements, ~~requires~~ **specifies** sensitivities for each scenario, identifies significant environmental regulations and laws that effect electric utilities in the state, and identifies required

planning reserve margins and local clearing requirements (LCRs) in areas of the state.

The DR**,** ~~and~~ EWR**, and Electrification** Potential Studies were completed August of 202~~1~~**5**. ~~Both~~**Each of these** studies have an influence on integrated resource planning and are incorporated into the Commission's ~~October~~**December XX**~~27~~, 202~~2~~**5**, order in Case No. U-21219 for the ~~5~~**4**-year update, pursuant to PA 341 Section 6t **as amended by Public Act 231**.

Section 6t (1) requires that the IRP parameters, required modeling scenarios and sensitivities, applicable reliability requirements, applicable environmental rules and regulations, and the DR and EWR potential studies be re-examined every five years. ~~This is the first 5-year update. The next 120-day proceeding to conduct these assessments and gather input should commence in July 2027.~~

II. Background

~~On December 21, 2016, PA 341 was signed into law, which amended PA 3 of 1939 and became effective on April 20, 2017. The law requires the Michigan Public Service Commission (MPSC or Commission), with input from the Michigan Agency for Energy (MAE), Michigan Department of Environmental Quality (MDEQ), and other interested parties to set modeling parameters and assumptions for utilities to use in filing IRPs. PA 341 then requires rate-regulated electric utilities to submit IRPs to the MPSC for review and approval.~~

~~At the conclusion of a stakeholder process and issuance of draft MIRPP, the Commission adopted the MIRPP on November 21, 2017, in Case No. U-18418.~~

~~Pursuant to PA 341, the MPSC and the Department of Environment, Great Lakes, and Energy (EGLE) began a second collaborative process as part of MI Power Grid Phase II – Integration of Resource/Distribution/Transmission Planning on September 24, 2020, with state-wide participation from a wide-range of stakeholders (listed in Appendix A). On October 29, 2020, the Commission issued an order in Case No. U-20633 directing Staff to also work~~

~~with stakeholder groups to determine how to update IRP planning parameters and filing requirement to take into account the goals set by Michigan's utilities and how these goals align with the greenhouse gas emissions targets set by Governor Whitmer. Stakeholder sessions discussed many aspects of PA 341 Section 6t including:~~

~~i. Environmental Policy~~

~~ii. Forecasting~~

~~iii. Transmission~~

~~iv. The Regional Energy Market~~

~~v. Distributed Energy Resources~~

~~vi. Economic valuation~~

~~vii. Generation Diversity~~

~~viii. Risk Assessment~~

~~Stakeholders were invited to participate by providing comments and feedback during and after every stakeholder session met regularly from December 2021 to late April 2022 to discuss how to update various subsections of PA 341 Section 6t. Further details on the stakeholder sessions are included on the MPSC's web page for Phase III of the MI Power Grid initiative.[1]~~

~~Future outreach efforts will be summarized here upon document finalization.~~

On November 29, 2023, Public Act 231 was signed into law. The law requires that the Commission shall commence a proceeding by August 31, 2025 that ultimately provides the rate regulated utilities with information needed to conduct IRPs. The Commission issued an order in U-21570, directing Staff to file a redline version of the Michigan Integrated Resource Planning

[1] https://www.michigan.gov/mpsc/0,9535,7-395-93307_93312_93320-508709--,00.html.

Parameters and to engage with interested persons to seek comment on the amendments in preparation for the August 31, 2025 deadline.

III. Energy Waste Reduction Potential Study

To comply with PA 341 Section 6t (1) (a) and (f) (iii)

~~The statewide assessment of EWR potential was conducted by Guidehouse Inc. (Guidehouse) for electricity and natural gas for the entire State of Michigan. This study's objective was to assess the potential in the residential, commercial, and industrial sectors, with the addition of small commercial, multi-family, and low-income segments, by analyzing EWR measures and improvements to end-user behaviors to reduce energy consumption. Measure and market characterization data was input into Guidehouse's Demand Side Management Simulator (DSMSim™) model, which calculates technical, economic, and achievable potential across utility service areas in Michigan for more than 600 measure permutations. Results were developed and are presented separately for the Lower and Upper Peninsulas. These results will be used to inform EWR goal setting and associated program design for the MPSC.~~[2]

~~Scenario #1: Reference– Estimates of achievable potential calibrated to 2021 total program expectations and refined using relative savings percentages at the end use and high impact measure level with 2019 actual achievements. Key assumptions include non-low-income measure incentives of 40% of incremental cost (low-income segments incentivized at 100% of incremental cost) and administrative costs representing 33% of total utility program spending.~~

~~Scenario #2: Aggressive– Increased measure incentives and marketing factors and decreased program administrative costs. Analyzed measure incentive~~

[2] MI EWR Potential Study MI EWR Statewide Potential Study (2021-2040) Combined (michigan.gov), Retrieved December 8, 2021.

levels to determine the 1.0 Utility Cost Test (UCT) ratio tipping point. Developed measure-level incentive estimates based on these results and adjusted where necessary to ensure program-level cost-effectiveness. Increased marketing factors above calibrated values for specific end use and sector combinations.

Scenario #3: Carbon Price - Acknowledging the regulatory uncertainty around carbon price legislation, provides a high-level fuel cost adder, ramping up through time as the probability of regulatory action increases. This scenario provides insight into the sensitivity of EWR savings potential to avoided costs. Due to the uncertain nature of carbon pricing legislation, the scenario is not related to specific program or policy recommendations. Increased electricity ($/MWh) and natural gas ($/therm) avoided costs by 50% in 2021, escalating with a 2.5% multiplier growth until a 100% increase was met.

IV. Demand Response Potential Study

To comply with PA 341 Section 6t (1) (b)

The MPSC issued a request for proposal for the DR potential study[3] in May of 2020. Bids were received and evaluated and a contract for the study was awarded to Guidehouse in August of 2020. The DR potential study assessed DR potential in Michigan from 2021 to 2040 and was conducted in conjunction with the EWR potential study. The DR potential study was completed in September of 2021.

The objective of the DR potential assessment was to estimate the potential for cost-effective DR as a capacity resource to reduce customer loads during peak summer periods. Additionally, the study assessed electric winter peak reduction potential and natural gas DR potential. DR potential estimates were developed for both the Lower Peninsula and the Upper Peninsula.

[3] https://www.michigan.gov/mpsc/0,9535,7-395-93308_94792-552726--,00.html

~~The DR potential and cost estimates were developed using a bottom-up analysis. The analysis used customer and load data from Michigan utilities for market characterization, customer survey data to assess technology saturation and customer willingness to enroll in DR programs, DR program information from Michigan utilities, the latest available information from the industry on DR resource performance and costs. These sources provided input data to the model used to calculate total DR potential across Michigan.~~

~~The DR potential study was a collaborative process wherein the MPSC, Guidehouse, and stakeholders worked together to ensure the study reflected current Michigan market trends. Three virtual stakeholder meetings were held during the study which provided stakeholders with an update on study progress and an opportunity to provide feedback to Guidehouse and MPSC Staff.~~

V. Electrification Potential Study

To comply with PA 341 Section 6t (1) (j) as amended by PA 231.

VI. State and Federal Environmental Regulations, Laws and Rules

Appendix E contains a regulatory timeline of the environmental regulations, laws and rules discussed in this section.

Section 460.6t (1) (c)

To comply with PA 341 Section 6t (1) (c)
Federal rules and laws:

Federal rules and laws:

Clean Air Act – The Clean Air Act (CAA) is a United States federal law designed to control air pollution on a national level. The CAA is a comprehensive law that established the National Ambient Air Quality Standards (NAAQS), Maximum

Achievable Control Technology Standards (MACT), Hazardous Air Pollutant Standards, and numerous other regulations to address pollution from stationary and mobile sources.

National Ambient Air Quality Standards – Title 1 of the CAA requires the United States Environmental Protection Agency (USEPA) to set NAAQS for six criteria pollutants that have the potential of harming human health or the environment. The NAAQS are rigorously vetted by the scientific community, industry, public interest groups, and the public. The NAAQS establish maximum allowable concentrations for each criteria pollutant in outdoor air. Primary standards are set at a level that is protective of human health with an adequate margin of safety. Secondary standards are protective of public welfare, including protection from damage to crops, forests, buildings, or the impairment of visibility. The adequacy of each standard is to be reviewed every five years. The six criteria pollutants are carbon monoxide, lead, ozone, nitrogen dioxide, particulate matter, and sulfur dioxide (SO_2).[4]

In February 2024, the USEPA strengthened the primary health-based annual PM2.5 NAAQS to 9 micrograms per cubic meter. The previous primary health-based annual PM2.5 standard was 12 micrograms per cubic meter, which was last updated in 2012. The primary and secondary welfare-based PM2.5 standards, secondary annual health-based PM2.5 standard and the primary and secondary PM10 standards were retained and therefore remain unchanged. EGLE reviewed PM2.5 data and provided its attainment status recommendations of the areas not meeting the new standard to USEPA in February 2025. EGLE recommended (based on monitoring and source emissions data, meteorology and geography) that Kalamazoo and Wayne Counties be designated nonattainment for the new

[4] The most recent NAAQS can be accessed here: https://www.epa.gov/criteria-air-pollutants/naaqs-table.

PM2.5 standard. USEPA has one year to review data and make its own determinations of attainment/nonattainment.

On March 25, 2025, USEPA announced that it would reconsider the Biden Administration's rule tightening the PM2.5 standard. The action is being taken as one of USEPA's 31 deregulatory actions intended to advance the Trump Administration's day one executive orders. USEPA's attempt to revise the Biden Administration's PM2.5 standard will be subject to a formal rulemaking process with public notice and comment periods. In addition to this reconsideration, USEPA has indicated that it will release guidance to increase the flexibility on implementation of the NAAQS, reforms to new source review and new direction on permitting obligations. USEPA has not yet published a formal proposal to reconsider the PM2.5 NAAQS and the exact timeframe to do so is not currently known.

Nonattainment areas are regions that fail to meet the NAAQS. Locations where air pollution levels are found to contribute significantly to violations or maintenance impairment in another area may also be designated nonattainment. These target areas are expected to make continuous, forward progress in controlling emissions within their boundaries. Those that do not abide by the CAA requirements to reign in the emissions of the pollutants are subject to USEPA sanctions, either through the loss of federal subsidies or by the imposition of controls through preemption of local or state law. States are tasked with developing strategic plans to achieve attainment, adopting legal authority to accomplish the reductions, submitting the plans to the USEPA for approval into the State Implementation Plan (SIP), and ensuring attainment occurs by the statutory deadline. States may also submit a plan to maintain the NAAQS into the future along with contingency measures that will be implemented to promptly correct any future violation of the NAAQS.

Sulfur Dioxide Nonattainment Areas – In 2010, the USEPA strengthened the primary NAAQS for SO_2, establishing a new 1-hour standard of 75 parts per billion (ppb).

Following the partial disapproval of EGLE's attainment SIP, and due to a lawsuit related to a portion of the SIP, USEPA ~~is pursuing~~ **pursued development of** a Federal Implementation Plan (FIP) for the nonattainment area. ~~the action of which is still underway.~~ In January 2022, USEPA made the formal determination that southern Wayne County did not attain the SO_2 NAAQS by the 2018 deadline.

USEPA completed the FIP and a public comment period was held during June and July 2022. ~~EGLE anticipates the finalization of the FIP during fall 2022 and is working to incorporate its provisions into an SO_2 SIP.~~ **USEPA finalized the FIP effective in November 2022. The FIP proposed emissions limits and associated requirements for several area sources, including U.S. Steel (Ecorse and Zug Island), EES Coke, Cleveland-Cliffs Steel Corporation (formerly AK or Severstal Steel), and Dearborn Industrial Generation (DIG). In addition, USEPA proposed to include the Carmeuse Lime emission limits, specified in Permit to Install 193-14A, and the DTE Energy (DTE) Trenton Channel emission limits, specified in Permit to Install 125-11C, which had already been incorporated into Michigan's SIP. The FIP included an attainment demonstration and served to supplement USEPA's prior action, which had concluded that Michigan satisfied the emissions inventory and new source review requirements for the area.**

In December 2023, EGLE submitted its SIP revision to supplement the attainment demonstration that USEPA conditionally approved on March 23, 2023. An amendment/supplement to this SIP revision was submitted to USEPA in April 2024 to correct an omission in the original submittal.

Once all of the elements of the SIP ha**d** been implemented, EGLE **worked to complete a** ~~plans to pursue a~~ redesignation request for southern Wayne

County **which was submitted for review and approval to USEPA in May 2025**. **The USEPA has 18-months to approve or deny EGLE's redesignation request.**

~~Round two designations were based on modeling of emissions from sources emitting over 2000 tons of SO_2 per year. A portion of St. Clair County was designated nonattainment in September 2016.~~

~~To better understand the quality of the air in the nonattainment area, two monitors were installed in the vicinity in November 2016. The monitoring data has consistently shown SO_2 levels in the area to be below the SO_2 NAAQS. The CAA allows a state to submit a Clean Data Determination (CDD) to the USEPA if air monitors show three consecutive years of attaining data in a nonattainment area. This action waives the requirement for the state to produce a SIP for the nonattainment area.~~

~~EGLE determined that the CDD criteria had been met for the St. Clair nonattainment area and submitted a CDD to USEPA in July 2020, waiving the SIP requirement for the area. EGLE's CDD was approved by USEPA in December 2021. EGLE has begun working on a SIP submittal to pursue redesignation of the St. Clair County non-attainment area following the shutdown of the St. Clair Power Plant in May 2022.~~

On September 26, 2024, USEPA proposed to determine that the St. Clair SO2 nonattainment area attained the 1-hour primary SO2 NAAQS by the September 12, 2021 attainment date.

In early 2025, USEPA requested that EGLE provide additional information to supplement the previously submitted redesignation request for St. Clair County. EGLE is in the process of finalizing the supplemental submittal and will submit to USEPA for approval once complete.

Round three designations were to address all remaining undesignated areas by December 31, 2017. The USEPA sent a letter to Governor Snyder on August

22, 2017, 120 days prior to the intended designation date, indicating that Alpena County and Delta County are to be designated as unclassifiable/attainment areas. Remaining areas of Michigan that were not required to be characterized and for which the USEPA does not have information suggesting that the area may not be meeting the NAAQS or contributing to air quality violations in a nearby area that does not meet the NAAQS, were also designated as unclassifiable/attainment.

Ozone Nonattainment Areas: In 2015, the USEPA strengthened the primary NAAQS for ozone, establishing a new 8-hour standard of 70 ppb.

On August 3, 2018, Michigan was designated marginal nonattainment for the 2015 ozone NAAQS in four areas (ten counties) of the state. In southeast Michigan, the seven-county area encompassing Livingston, Macomb, Monroe, Oakland, St. Clair, Washtenaw, and Wayne counties and on the west-side, two partial counties including Allegan and Muskegon and one full county, Berrien were found to have design values[5] exceeding the new ozone NAAQS of 70 ppb. This classification established an attainment deadline and attainment plan submittal date of August 3, 2021. ~~In addition to the requirement to attain by this deadline, there are also more stringent requirements for major source air permits, including lowest achievable emission rate conditions and offsets for new emissions of the ozone precursors of nitrogen oxide (NO_x) and volatile organic compounds. To attain the standard, monitoring values over the three-year period between 2018 and 2020 must have design values at or below the standard of 70 ppb.~~

~~In the fall of 2021, EGLE completed a redesignation request for the seven-county southeast Michigan nonattainment area.~~ ~~Although design values for the three-year period between 2018 and 2020 did not show attainment with~~

[5] The design value is the three-year average of the 4th highest 8-hour ozone value).

~~the 2015 ozone NAAQS, the design values for the three-year period between 2019 and 2021 did attain. The redesignation request was submitted to USEPA in January 2022, and it is currently under review. In March 2022, USEPA proposed to reclassify the southeast Michigan nonattainment area to attainment/maintenance for the 2015 ozone standard. The proposal was out for public comment until the end of April 2022 and one comment of significance was received. USEPA was working to address all comments to proceed with redesignation when elevated ozone values were detected by monitors in the nonattainment area. Efforts to redesignate the area are currently on hold and EGLE is working to evaluate data. The three western nonattainment counties (partial Muskegon and Allegan and full county Berrien) did not attain the standard.~~

~~In April 2022, USEPA proposed to determine that southeast and western Michigan counties did not attain the 2015 ozone standard by the attainment deadline and proposes reclassification from marginal to moderate nonattainment. A reclassification from marginal to moderate extends the attainment deadline to August 2024; however, a classification of moderate requires additional actions to reduce emissions to attain the standard. Required moderate nonattainment planning elements include, but are not limited to, major source reasonably available control technology, 15% reasonable further progress, and an attainment demonstration.~~

~~On October 7, 2022, USEPA issued its final determinations of attainment by the attainment date and reclassifications of areas classified as marginal for the 2015 ozone NAAQS. USEPA's final determination reclassified the three western nonattainment counties from marginal to moderate nonattainment. EGLE is currently working on an attainment SIP for those areas and expects to submit sometime in early 2023.~~

On May 19, 2023, USEPA determined based on "complete, quality-assured, and certified ambient air monitoring data for the 2020-2022 design period" that southeast Michigan achieved attainment of the 2015 ozone NAAQS.

This determination was based on the exclusion of certain exceedances that were determined to be due to exceptional events, namely Canadian wildfire smoke. As a result of the CDD, based on the exclusion of the exceptional event-influenced data, USEPA suspended the requirements for the area related to attainment of the 2015 ozone NAAQS for as long as the area continues to attain.

On December 17, 2024, USEPA published a final determination notice indicating that the western Michigan counties failed to attain the 2015 ozone NAAQS by the applicable attainment deadline. On January 16, 2025, the west Michigan counties were officially reclassified from moderate to serious ozone nonattainment by USEPA. EGLE is currently working to complete the required SIP submittals for these areas.

Cross-State Air Pollution Rule – The Cross-State Air Pollution Rule (CSAPR) was promulgated to address air pollution from upwind states that is transported across state lines and impacts the ability of downwind states to attain air quality standards. The rule was developed in response to the Good Neighbor obligations under the CAA for the ozone standards and fine particulate matter standards. CSAPR is a cap-and-trade rule which governs the emission of SO_2 and NO_x from fossil-fueled electric generating units (EGUs) through an allowance- based program. Under this program, NO_x is regulated on both an annual basis and during the ozone season (~~April~~ **March** through October). Each allowance (annual or ozone season) permits the emission of one ton of NO_x, with the emissions cap and number of allocated allowances decreasing over time. ~~The USEPA promulgated the CSAPR Update, which addresses interstate transport for the 2008 ozone standard and went into effect in May 2017.~~ The state currently has Good Neighbor obligations for the 2015 ozone standard.

~~On March 15, 2021, USEPA finalized the revised CSAPR rule update for the 2008 ozone NAAQS. Starting with the 2021 ozone season, the revised rule reduced the emission budgets and therefore allocation of NO_x allowances from power~~

~~plants in 12 states, including Michigan. The revision includes adjusting these 12 states emissions budgets for each ozone season from 2021 through 2024.~~

~~EPA establishes that the revised CSAPR update will reduce NO_x emissions from power plants in 12 states in the eastern United States by 17,000 tons in 2021 compared to projections without the rule, yielding public health and climate benefits that are valued, on average, at up to $2.8 billion each year from 2021 to 2040.~~

On March 12, 2025, UESPA announced plans to roll back the Good Neighbor Plan. The Supreme Court, in an opinion released in June 2025 stated that States could contest USEPA's earlier decision to first disapprove state good neighbor plans in regional appellate courts instead of the United States Court of Appeals for the District of Columbia Circuit which is where such challenges are usually heard. USEPA is currently reviewing the Court's opinion.

Mercury and Air Toxics Standards – Section 302 of the CAA requires the USEPA to adopt MACT for hazardous air pollutants (HAPs). The Mercury and Air Toxics Standards (MATS) became effective April 16, 2012. The MATS rule requires new and existing oil and coal-fueled facilities to achieve emission standards for mercury, acid gases, certain metals, and organic constituents. ~~Existing sources were required to comply with these standards by April 16, 2015. Some individual sources were granted an additional year, at the discretion of the Air Quality Division of EGLE. In June 2015, the United States Supreme Court found that the USEPA did not properly consider costs in making its determination to regulate hazardous pollutants from power plants. In December 2015, the District of Columbia Circuit Court of Appeals ruled that MATS may be enforced as the USEPA modifies the rule to comply with the United States Supreme Court decision.~~ The deadline for MATS compliance for all EGUs was April 16, 2016.

In December 2015, in response to the United States Supreme Court's direction, the USEPA published a proposed supplemental finding that a consideration of cost does not alter their previous determination that it is appropriate and necessary to regulate air toxic emissions from coal- and oil-fired EGUs. The proposed supplemental finding was based on an evaluation of several cost metrics relevant to the power sector and considered public comments. USEPA found that the cost of compliance with MATS was reasonable and that the electric power industry could comply with MATS and maintain its ability to provide reliable electric power to consumers at a reasonable cost. USEPA's supplemental cost finding was finalized in April 2016.

In May 2020, USEPA completed a reconsideration of the April 2016 appropriate and necessary finding for the MATS, correcting flaws in the approach considering costs and benefits while ensuring that HAP emissions from power plants continue to be appropriately controlled. The agency also completed the CAA required residual risk and technology review for MATS. Following that reconsideration, USEPA concluded that the consideration of cost in the 2016 Supplemental Finding was flawed. Specifically, they found that what was described in the 2016 Supplemental Finding as the preferred approach, or "cost reasonableness test," did not meet the statute's requirements to fully consider costs and was an unreasonable interpretation of the CAA mandate. Power plants were already complying with the standards limiting emissions of mercury and other HAPs, and that final action leaves those emission limits in place and unchanged.

In January 2022 USEPA issued a proposal to reaffirm that it remains appropriate and necessary to regulate HAPs, including mercury, from power plants after considering cost. This action revokes the May 2020 finding that it was not appropriate and necessary to regulate coal- and oil-fired power plants under CAA Section 112 which covers toxic air pollutants. USEPA reviewed the 2020 finding and considered updated information on both the public health burden associated with HAP emissions from coal- and oil-fired power plants as

~~well as the costs associated with reducing those emissions under the MATS. After weighing the public risks posed by these emissions to particularly exposed and sensitive populations, against the costs of reducing HAP emissions, USEPA is proposing to conclude that it remains appropriate and necessary to regulate these emissions.~~

On May 7, 2024, USEPA finalized updates to the MATS rule that were first proposed in April 2023. The updated rule strengthens the national emission standards for hazardous air pollutants (NESHAP) based on an evaluation of the residual risk and technology review. The final rule further limits the emissions of non-mercury HAPs by reducing the existing emission standard for filterable particulate matter by two-thirds as well as strengthens monitoring and compliance requirements for coal- and oil-fired EGUs by requiring the use of continuous emission monitoring systems. Start-up requirements were also revised to allow for better emissions performance during startup activities.

On June 11, 2025, USEPA proposed to repeal certain amendments of the MATS rule finalized in 2024. With this action, USEPA is proposing to repeal the filterable particulate matter (fPM) standard for existing coal-fired EGUs of 0.010 pounds per million British thermal units (lb/MMBtu) of heat input (previous fPM standard of 0.030 lb/MMBtu would remain in place), and the fPM emission standard compliance demonstration requiring all coal- and oil-fired EGUs to use PM continuous emission monitoring systems (CEMS). In addition, USEPA is proposing to repeal the mercury emission standard for existing lignite-fired EGUs of 1.2 pounds per trillion British thermal units of heat input (lb/TBtu) (the previous mercury standard, 4.0 lb/TBtu, would remain in place). Lastly, as an alternative to returning to the previous emissions standards, USEPA is requesting comment on cost-effective and achievable options that could replace the 2024 standards. The MATS proposal must go through a 45-day public comment period which began June 17, 2025.

CAA Section 111(b), Standards of Performance for Greenhouse Gas Emissions from New, Modified and Reconstructed Stationary Sources: Electric Utility Generating Units – New Source Performance Standards (NSPS) are established under Section 111(b) of the CAA for certain industrial sources of emissions determined to endanger public health and welfare. In October 2015, the USEPA finalized a NSPS that established standards for emissions of carbon dioxide (CO_2) for newly constructed, modified, and reconstructed fossil-fuel fired EGUs. There are different standards of performance for fossil fuel-fired steam generating units and fossil fuel-fired combustion turbines.[6]

On May 8, 2024, USEPA finalized the NSPS that had been previously proposed in May 2023 for GHG emission reductions from new and reconstructed fossil fuel-fired stationary combustion turbine EGUs. For new fossil-fuel generation, the final rule includes three subcategories based on the utilization of each EGU.

CAA Section 111(d), Carbon Pollution Emission Guidelines for Existing Stationary Sources - Electric Utility Generating Units (Clean Power Plan) – Section 111(d) of the CAA requires the USEPA to establish standards for certain existing industrial sources. The final Clean Power Plan (CPP), promulgated on October 23, 2015, addressed CO_2 emissions from EGUs. The CPP established interim and final statewide goals and tasked states with developing and implementing plans for meeting the goals.

~~On February 9, 2016, the United States Supreme Court issued five orders granting a stay of the CPP pending judicial review. On March 28, 2017, President Trump signed an Executive Order directing the USEPA to review the~~

[6] The 111(b) standards can be found in Table 1 here: https://www.federalregister.gov/documents/2015/10/23/2015-22837/standards-of-performance-for-greenhouse-gas-emissions-from-new-modified-and-reconstructed-stationary.

~~CPP and the standards of performance for new, modified, and reconstructed EGUs (Section 111(b) rule).~~

~~On June 19, 2016, the USEPA promulgated the Affordable Clean Energy (ACE) Rule which replaced and repealed the CPP. The ACE rule established emission guidelines for states to use in developing plans to limit carbon emissions at their coal-fired EGUs; but did not establish specific carbon emission reduction goals. The ACE rule focused on an "inside the fence line" best system of emission reduction (BSER) approach to emission reductions in the form of heat rate improvements at each EGU. On January 19, 2021, the United States Court of Appeals for the District of Columbia Circuit vacated the ACE rule and remanded it back to the USEPA for further proceedings consistent with the Court's ruling. On October 29, 2021, the United States Supreme Court agreed to grant a writ of certiorari for petitions for review of the January 2021 decision of the United States Court of Appeals for the District of Columbia Circuit to strike down USEPA's 2019 ACE Rule. Four pending petitions before the United States Supreme Court were filed earlier in 2021 by a coalition of 19 states led by West Virginia, the State of North Dakota, the North American Coal Corporation, and Westmoreland Mining Holdings, LLC. The Supreme Court heard the four combined cases on February 28, 2022 and the case was decided on June 30,2022. While the Court did indicate that including generation shifting (away from coal to cleaner forms of energy generation) as the BSER would inappropriately transform USEPA's authority from reducing pollution to setting the national generation mix, it also clarified that USEPA can regulate the power sector. The Court relied on the "major questions" doctrine which holds that courts should not defer to agencies on matters of "vast economic or political significance" unless Congress has explicitly given the agencies the authority to act in those situations thus limiting the power of the USEPA (and other agencies) in the absence of a clear congressional mandate to do so.~~

~~Although there are not currently any rules regulating carbon emissions from existing EGUs; due to the USEPA's 2009 endangerment finding on greenhouse gases, and in light of the current carbon reduction goals at both state and federal levels, utilities should address their anticipated greenhouse gas emissions with those carbon reduction goals in mind. In addition, USEPA has announced plans to propose new carbon reduction regulations for existing power plants in spring 2023 and is holding meetings with stakeholders to help inform that proposal.~~

As described above, on May 8, 2024, USEPA finalized regulations under Section 111(d) of the CAA for GHG reductions for existing coal-fired EGUs as well as existing coal-fired power plants and other coal-fired steam generating units. The final rule establishes subcategories based on how long each unit is expected to operate. In addition, States are able to evaluate units in their fleet and provide a variance for units that will operate under different circumstances than those considered by USEPA based on "remaining useful life and other factors".

On June 11, 2025, the USEPA proposed to repeal the GHG emissions standards for fossil fuel-fired power plants promulgated under Section 111 of the CAA. With this action, the requirements USEPA has proposed to repeal include the NSPS for coal and gas-fired power plants, promulgated on October 23, 2015, the NSPS for coal-fired steam generating units undergoing a large modification, the NSPS for new natural gas-fired power plants finalized in the Carbon Pollution Standards (CPS) on May 9, 2024, and the emission guidelines for existing coal-, oil-, and gas-fired steam generating units, also finalized on May 9, 2024. This proposed rule is currently in the middle of a 45-day public comment period set to wrap up the end of summer. A final rule is currently expected to be released by USEPA before the end of 2025.

Greenhouse Gas Reporting Program – The Greenhouse Gas Reporting Program (codified at 40 CFR Part 98) tracks facility-level emissions of greenhouse gas from large emitting facilities, suppliers of fossil fuels, suppliers of industrial gases that result in greenhouse gas emissions when used, and facilities that inject CO_2 underground. Facilities calculate their emissions using approved methodologies and report the data to the USEPA. Annual reports covering emissions from the prior calendar year are due by March 31 of each year.

On March 12, 2025, the USEPA Administrator announced plans to reconsider the mandatory GHG reporting program on the basis that the program is costly and burdensome to the over 8,000 facilities required to calculate and submit their emissions reports annually. As of the end of

June 2025, the proposed rule to reconsider and potentially repeal the GHG emissions reporting program was being reviewed by USEPA's Office of Management and Budget.

Boiler Maximum Achievable Control Technology – The Boiler MACT establishes national emission standards for HAPs from three major source categories: industrial boilers, commercial and institutional boilers, and process heaters. The final emission standards for control of mercury, hydrogen chloride, particulate matter (as a surrogate for non-mercury metals), and carbon monoxide (as a surrogate for organic hazardous emissions) from coal-fired, biomass-fired, and liquid-fired major source boilers are based on the MACT. In addition, all major source boilers and process heaters are subject to a work practice standard to periodicallyconduct tune-ups of the boiler or process heater.

Regional Haze – Section 169 of the federal CAA sets forth the provisions to improvevisibility, or visual air quality, in 156 national parks and wilderness areas across the country by establishing a national goal to remedy impairment of visibility in Class 1 federal areas from manmade air pollution. **There are two Class 1 areas in Michigan: Seney National Wildlife Refuge and Isle Royale National Park. Michigan also has an obligation to eliminate the state's contribution to impairment in Class 1 areas in other states.** States must ensure that emission reductions occur over a period of time to achieve natural conditions by 2064. Air pollutants that have the potential to affect visibility include fine particulates, NO_x, SO_2, certain volatile organic compounds, and ammonia. The 1999 Regional Haze rule required states to evaluate the best available retrofit technology (BART) to address visibility impairment from certain categories of major stationary sources built between 1962 and 1977. ~~A BART analysis considered five factors as part of eachsource-specific analysis: 1) the costs of compliance, 2) the energy and non-air quality environmental impacts of compliance, 3) any existing pollution control technology in use at the source, 4) the remaining useful life of the source, and 5) the degree of~~

~~visibility improvement that may reasonably be anticipated to result from use of such technology. For fossil-fueled electric generating plants with a total generating capacity in excess of 750 megawatts (MW), states must use guidelines promulgated by the USEPA.~~

In 2005, the USEPA published the guidelines for BART determinations. Michigan ~~has~~ met **most of** the initial BART determination requirements **through its first planning period state SIP**; **however, USEPA did issue FIPs for three of Michigan's non-EGU BART-subject sources between 2012 and 2016. All BART determinations made for EGU sources in Michigan were approved by USEPA and adopted into the SIP.** ~~In December 2016, the USEPA issued a final rule setting revised and clarifying requirements for periodic updates in state plans. The next periodic update was due July 31, 2021. EGLE has submitted the periodic update and it is currently being reviewed by USEPA. There are two Class 1 areas in Michigan: Seney National Wildlife Refuge and Isle Royale National Park. Michigan also has an obligation to eliminate the state's contribution to impairment in Class 1 areas in other states.~~

In July 2024, USEPA released guidance for the second planning period progress report for regional haze. EGLE submitted its mid-term five-year progress report for the second planning period to USEPA on May 19, 2025. USEPA has yet to act on the submittal.

Resource Conservation and Recovery Act – The Resource Conservation and Recovery Act (RCRA) gives the USEPA the authority to control hazardous waste from the "cradle-to-grave", which includes the generation, transportation, treatment, storage, and disposal of hazardous waste. RCRA also set forth a framework for the management of non-hazardous solid wastes.

~~In April 2015, the USEPA established requirements for the safe disposal of coal combustion residuals (CCR) produced at electric utilities and independent power producers. These requirements were established under Subtitle D of~~

~~RCRA and apply to CCR landfills andsurface impoundments. Michigan electric utilities must comply with these regulations.~~

~~In July 2016, the USEPA Administrator signed a direct final rule and a companion proposal to extend for certain inactive CCR surface impoundments the compliance deadlines established by the regulations for the disposal of CCR under Subtitle D (Non-hazardous solid waste). These revisions were completed in response to a partial vacatur ordered by the United States Court of Appeals for the District of Columbia Circuit on June 14, 2016. This direct final rule became effective on October 4, 2016.~~

~~In July 2018, the USEPA finalized certain revisions to the 2015 regulations for the disposal of CCR in landfills and surface impoundments to provide states with approved CCR permit programs under the Water Infrastructure Improvements for the Nation (WIIN) Act or USEPA (where USEPA is the permitting authority) the ability to use alternate performance standards and to revise the groundwater protection standards for four constituents in Appendix IV to part 257 for which maximum contaminant levels under the Safe Drinking Water Act had not been established. The revision also provided facilities which are triggered into closure by the regulations additional time to cease receiving waste and initiate closure. This additional time was meant to better align the CCR rule compliance dates with the Effluent Limitations Guidelines (ELGs) and Standards Rule for the Steam Electric Power Generating Point Source Category.~~

~~In September 2020, the USEPA finalized amendments to the part 257 regulations. First, the USEPA finalized a change to the classification of compacted-soil lined or "clay-lined" surface impoundments from "lined" to "unlined" under §257.71(a)(1)(i), which reflected the vacatur ordered in the Utility Solid Waste Activities Group (USWAG) decision. Secondly, USEPA finalized revisions to the initiation of closure deadlines for unlined CCR surface impoundments, and for units that failed the aquifer location restriction, found in §257.101(a) and (b)(1). These revisions addressed the USWAG decisions with~~

~~respect to all unlined and "clay-lined" impoundments, as well as revisions to the provisions that were remanded to the Agency for further reconsideration. Specifically, USEPA finalized a new deadline of April 11, 2021, for CCR units to cease receipt of waste and initiate closure because the unit was either an unlined or formerly "clay-lined" CCR surface impoundment (§257.101(a)) or failed the aquifer location standard (§257.101(b)(1)). With this action, USEPA also finalized revisions to the alternative closure provisions, §257.103. The revisions granted facilities additional time to develop alternative capacity to manage their waste streams (both CCR and/or non-CCR), to achieve cessation of receipt of waste and initiate closure of their CCR surface impoundments.~~

~~In November 2020, the USEPA published the CCR Part B final rule which allowed a limited number of facilities to demonstrate to USEPA, or a participating state director, that based on groundwater data and the design of a particular surface impoundment, the unit had ensured and will continue to ensure there is no reasonable probability of adverse effects to human health and the environment. The regulations stated that facilities had until November 30, 2020, to submit applications to USEPA for approval, but given the effective date for the final rule was December 14, 2020, USEPA accepted revisions or applications until December 14, 2020.~~

~~In October 2020, USEPA issued an advanced notice of proposed rulemaking seeking input on inactive surface impoundments at inactive electric utilities, referred to as "legacy CCR surface impoundments". The information and data received will assist in the development of future regulations for these CCR units.~~

On May 8, 2024, USEPA finalized changes to the CCR regulations for inactive surface impoundments at inactive electric utilities called "legacy CCR surface impoundments." The rule was finalized at the same time as a larger suite of regulations for power plants, some of which were mentioned above, and others will be mentioned below. The rules were finalized at the same time to allow utilities more certainty in future planning. Finalized

CCR requirements mirror those previously completed in 2015 for inactive impoundments at active facilities. This part of the final rule responds to the August 2018 court decision vacating and remanding a provision of the 2015 CCR rule that exempted inactive impoundments at inactive electric utilities back to USEPA. The final rule also remedies concerns noted by USEPA once implementation of the 2015 CCR rule began.

Clean Water Act – The Clean Water Act is a United States federal law designed to control water pollution on a national level.

Clean Water Act Section 316(b) – The USEPA promulgated rules under Section 316(b) of the Clean Water Act establishing standards for cooling water intake structures at new and existing facilities in order to minimize the impingement and entrainment of fish and other aquatic organisms at these structures. Section 316(b) applies to existing electric generation facilities with a design intake flow greater than two million gallons per day that use at least 25% of the water withdrawn from the surface waters of the United States for cooling purposes.

~~In 2001, the USEPA promulgated rules specific to cooling water intake structures at new facilities. Generally, new greenfield, stand-alone facilities are required to construct the facility to limit the intake capacity and velocity requirements commensurate with that achievable with a closed-cycle, recirculating cooling system.~~

~~Following a previously promulgated version of the rules and judicial remand, the regulations for existing facilities were promulgated in August 2014. These rules were also challenged and undergoing judicial review.~~ According to the published rules, any facility subject to the existing facilities rule must identify which one of the seven alternatives identified in the best technology available (BTA) standard will be met for compliance with minimizing impingement mortality. ~~The rules do not specify national BTA standards for minimizing entrainment mortality but instead require that EGLE establish the BTA~~

~~entrainment requirements for a facility on a site-specific basis. These BTA requirements are established after consideration of the specific factors spelled out in the rule. Facilities with actual flows in excess of 125 million gallons per day must provide an entrainment study with its National Pollutant Discharge Elimination System (NPDES) permit application.~~ While the rules do not specify a deadline for compliance of the rules, facilities will need to achieve the impingement and entrainment mortality standards as soon as practicable according to the schedule of requirements set by EGLE following NPDES permit reissuance.

Steam Electric Effluent Guidelines – The Steam Electric Effluent Guidelines (SEEG), promulgated under the Clean Water Act, strengthens the technology-based Effluent Limitation Guidelines (ELG) and standards for the steam electric power generating industry. The 2015 amendment to the rule established national limits on the amount of toxic metals and other pollutants that steam electric power plants are allowed to discharge~~. Multiple petitions for review challenging the regulations were consolidated in the United States Court of Appeals for the Fifth Circuit on December 8, 2015. On April 25, 2017, the USEPA issued an administrative stay of the compliance dates in the ELGs and standards rule that had not yet passed pending judicial review. In addition, the USEPA requested, and was granted, a 120-day stay of the litigation (until September 12, 2017) to allow the USEPA to consider the merits of the petitions for reconsideration of the Rule. On August 11, 2017, the USEPA provided notice that it would conduct a rulemaking to revise the new, more stringent BTA effluent limitations and Pretreatment Standards for Existing Sources in the 2015 rule that apply to bottom ash (BA) transport water and flue gas desulfurization (FGD) wastewater. The EPA published the regulations on October 13, 2020, finalizing the revisions for these two wastewaters allowing for less costly technologies, a two-year extension of the compliance time frame and for meeting the requirements, and adding subcategories for both wastewaters. The subcategories included a voluntary incentive program for more restrictive limitations for FGD wastewaters with a longer compliance~~

~~schedule, and an allowance that EGUs that decommission by December 31, 2028, need not comply with the more costly and restrictive requirements of the 2015 ELGs based upon a cost evaluation which takes into consideration the remaining useful lifespan of these facilities. The earliest date for compliance with BA and FGD wastewaters was set for October 13, 2021, but no later than December 31, 2025, unless the facility announces compliance with an optional program. In addition, the EPA published an announcement on August 3, 2021, on its decision to undertake additional rulemaking to again revise the SEEG. As part of the rulemaking process, the EPA will determine whether more stringent effluent limitations and standards are appropriate and consistent with the technology-forcing statutory scheme and the goals of the Clean Water Act. EPA intends to publish the proposed rulemaking for public comment in the fall of 2022. On September 18, 2017, the 120-day administrative stay was lifted, postponing certain compliance deadlines. The earliest date for compliance with SEEG was November 1, 2020.~~

~~On August 31, 2020, USEPA finalized a rule revising the regulations for the Steam Electric Power Generating category (40 CFR Part 423). The rule revises requirements for two specific waste streams produced by steam electric power plants: FGD wastewater and BA transport water. In the revised rule, USEPA delays the compliance deadlines for BA transport water and FGD wastewater two years to December 31, 2025. In addition, the revised rule includes a voluntary incentive program that provides additional time, until December 31, 2028, for facilities that implement additional processes that achieve more stringent limitations and has an allowance that EGUs that decommission by December 31, 2028, need not comply with the more costly and restrictive requirements of the 2015 ELGs based upon a cost evaluation which takes into consideration the remaining useful lifespan of these facilities.~~

Like USEPA's GHG regulations for existing coal-fired power plants and steam electric generating units and CCR, updated ELGs were promulgated in spring 2024. The updated regulations strengthen the wastewater

discharge standards that apply to coal-fired power plants by establishing more stringent discharge standards for flue gas desulfurization wastewater, bottom ash transport water, and combustion residual leachate.

For those facilities that will be required to meet the more restrictive effluent limitations in the 2024 rule, the new limitations do not apply until a date determined by the permitting authority that is 'as soon as possible,' on or after July 8, 2024, but no later than December 31, 2029. The final rule also established a new subcategory for the permanent cessation of coal combustion by December 31, 2034.

In June 2025, USEPA announced that it plans to delay and potentially loosen the water standards for coal-fired power plants due to concerns with compliance deadlines and the need to strengthen grid reliability. In addition, the Secretary of Energy under section 202(c) of the Federal Power Act, 16 U.S.C. § 824a(c), and section 301(b) of the Department of Energy Organization Act, 42 U.S.C. § 7151(b), issued an order in May 2025 to the MISO to ensure reliability of its system over the following 90 days. That order specifically requests dispatch of the Campbell Plant to best meet the emergency reliability concerns and serve the public interest for purposes of FPA section 202(c) instead of proceeding with the scheduled decommissioning of the plant on May 31, 2025. Similar orders may be issued for this facility, or other facilities, which conflict with the compliance timelines of the existing ELGs.

One Big Beautiful Bill (OBBB) Act – The OBBB was signed into law on July 4, 2025. The OBBB accelerates the sunset for Wind and Solar under Sections 45Y and 48E, setting more strict timelines for beginning construction or in service dates. However, Hydropower, geothermal, energy storage, and nuclear retain full tax credits through 2033 with a

phase out starting in 2034. Fuel Cells now qualify for a flat 30% ITC under Section 48E and the OBBB increases the domestic content bonus credit thresholds. The OBBB also impacts residential clean energy by ending the residential solar tax credit by December 31, 2025 and leased residential systems by December 31, 2027 under section 48E. Leased residential solar hot water heaters and small wind turbines installed after December 31, 2025 are no longer eligible. OBBB also adds tax credits for carbon capture and sequestration under Section 45Q.

State Rules and Laws:

The majority of Michigan's environmental regulations, and laws were consolidated into the Natural Resources and Environmental Protection Act (NREPA) of 1994, PA 451 as amended (Act 451). Act 451 is organized into sections called "Parts" and serves "to protect the environment and natural resources of the state; to codify, revise, consolidate, and classify laws relating to the environment and natural resources of the state; to regulate the discharge of certain substances into the environment; to regulate the use of certain lands, waters, and other natural resources of the state; to protect the people's right to hunt and fish; to prescribe the powers and duties of certain state and local agencies and officials; to provide for certain charges, fees, assessments, and donations; to provide certain appropriations; to prescribe penalties and provide remedies; and to repeal acts and parts of acts."

State Rules and Laws:

Michigan Mercury Rule – The purpose of the Michigan Mercury Rule (MMR) is to regulatethe emissions of mercury in the State of Michigan. Existing coal-fired EGUs must choose one of three methods to comply with the emission limits and any new EGU will be required to utilize Best Available Control Technology. The MMR is identical to the MATS in its limitations and all compliance dates for this rule have since past.

Michigan Environmental Protection Act – Part 17 of Michigan's NREPA, 1994 PA 451. Under Michigan Environmental Protection Act (MEPA), the attorney general or any person may maintain an action for an alleged violation or when one is likely to occur for declaratory and equitable relief against any person for the protection of the air, water, and other natural resources and the public trust in these resources from pollution, impairment, or destruction. MEPA also provides for consideration of environmental impairment and whether a feasible and prudent alternative exists to any impairment consistent with the promotion of the public health, safety, and welfare in light of the state's paramount concern for the protection of its natural resources from pollution, impairment, or destruction.

Solid Waste Management (Part 115) – Part 115 of the Michigan NREPA regulates CCR as a solid waste. It requires any CCR that will remain in place in a surface impoundment or landfill be subject to siting criteria, permitting, and licensing of the disposal area, construction standards for the disposal area, groundwater monitoring, correctiveaction, and financial assurance and post-closure care for a 30-year period. The disposal facility is required to maintain the financial assurance to conduct groundwater monitoring throughout the post-closure care period.

The disposal facility is required to maintain the financial assurance to conduct groundwater monitoring throughout the post-closure care period. The disposal of CCR is currently dually regulated under the RCRA rule published in April 2015, and under Part 115 of the NREPA. However, in December 2016, the Water Infrastructure Improvements for the Nation (WIIN) Act was passed, which included an amendment to Section 4005 of RCRA providing a mechanism to allow states to develop a state permitting program for regulationof CCR units. Under the amendment, upon approval of a state program, the RCRA regulations would be enforced by states and the CCR units would not be subject to the dual regulatory structure. In 2018, Part 115 was amended to include that majority of the RCRA regulations would be enforced by states and

that CCR units would not be subject to the dual regulatory structure. Michigan's request for state program approval ~~is currently under review by the USEPA.~~ **has not yet been approved by USEPA. EGLE is currently working to revise the State program and plans to resubmit for USEPA's review and approval once complete.**

~~Water Quality Based Effluent Limits for Toxic Substances (Part 8) - Michigan's Part 8 Rules, Water Quality-Based Effluent Limit Development for Toxic Substances are used to establish toxic substance water quality based effluent limits (WQBELs) for point source discharges that are protective of the designated uses of the surface waters of the state. Part 8 includes provisions for establishing total maximum daily loads, wasteload allocations for toxic substances, reasonable potential for chemical specific WQBELs, and calculating WQBELs that are less than the quantification level.~~

~~To achieve compliance with the low WQBELs (those that are less than the quantification level) and associated regulatory requirements, the department encourages, the use of pollution prevention, source control, and other waste minimization programs. End-of-pipe treatment for the low WQBELs which is extraordinary or beyond that which would be necessary if not for the low WQBELs is not required by the department unless it is determined to be the most cost-effective means or the only means to achieve the applicable water quality-based effluent limit.~~

Water Resource Protection (Part 31) – Part 31 of the Michigan NREPA grants EGLE authority to develop rules to protect waters of the state.

Water Quality Based Effluent Limits for Toxic Substances (Part 8) - Michigan's Part 8 Rules, Water Quality-Based Effluent Limit Development for Toxic Substances are used to establish toxic substance water quality based effluent limits (WQBELs) for point-source discharges that are protective of the designated uses of the surface waters of the state. Part 8 includes provisions for establishing total maximum daily loads, waste load

allocations for toxic substances, reasonable potential for chemical-specific WQBELs, and calculating WQBELs that are less than the quantification level.

Water Quality Standards (Part 4) – Michigan's Part 4 Rules, Water Quality Standards, are used to establish water quality requirements applicable to the Great Lakes, the connecting waters, and all other surface waters of the state, to protect the health and welfare, to enhance and maintain the quality of water, and to protect the state's natural resources. Part 4 includes provisions for establishing specific standards for physical characteristics, dissolved solids, hydrogen ion concentrations, toxic substances, nutrients, microorganisms, dissolved oxygen, and temperature. It provides conditions for establishing mixing zones, antidegradation requirements, and variances from water quality standards, and defines the designated uses for which all surface waters of the state shall be protected.

To comply with PA 341 Section 6t (5) (m)
"How the utility will comply with all applicable state and federal environmental regulations, lawsand rules, and the projected costs of complying with those regulations, laws and rules."

In developing its IRP, a utility should present an environmental compliance strategy which demonstrates how the utility will comply with all applicable federal and state environmental regulations, laws, and rules. Included with this information, the utility should analyze the cost of compliance on its existing generation fleet going forward, including existing projects being undertaken on the utility's generation fleet, and include the relevant future compliance costs within the IRP model. Review and approval of an electric utility's IRP by the MPSC does not constitute a finding of actual compliance with applicable state and federal environmental laws. ~~Electric utilities that construct and~~

~~operate a facility included in an approved IRP remain responsible for complying with all applicable state and federal environmental laws.~~

On September 23, 2020, Governor Whitmer signed an executive directive (ED 2020-10) establishing Michigan's plans toward carbon neutrality by 2050. ED 2020-10 also established an interim goal of a 28 percent reduction (below 2005 levels) in GHG emissions by 2025 and required EGLE's Office of Climate and Energy to develop, with stakeholder input the MI Healthy Climate Plan and then oversee implementation of the Plan.

The ED also directed EGLE to expand its IRP advisory opinion under MCL section 460.6t to include an evaluation of "the potential impacts of proposed energy generation resources and alternatives to those resources." An evaluation of whether the IRPs filed are consistent with the emission reduction goals established in the ED must also be completed. Lastly, the ED required EGLE's advisory opinions to include considerations of environmental justice and public health impacts.

Upon the signing of ED 2020-10, EGLE began working with the MPSC and utilities subject to the IRP process to develop a list of additional data requirements to better allow EGLE to complete the evaluations of environmental justice and public health impacts. These requirements were finalized in the IRP filing requirement document completed in the fall of 2022.

EGLE finalized the MI Healthy Climate Plan in April 2022 and has completed two annual reports since that time. The Plan detailed the pathway to obtaining 100 percent carbon neutrality by 2050 based on seven key objectives. The Plan's roadmap to 2030 provided key recommendations to reach the goal of reducing GHG emissions (from 2005 levels) by 52 percent by 2030. Some of the recommendations included in the Plan are to move the electric grid to cleaner resources, electrification of vehicles and

increasing public transit, and the commitment to environmental justice and a just transition.

Public Act 231 (PA 231) - In November 2023, Governor Whitmer signed into law new energy legislation making changes to several aspects of Michigan's energy future, including IRPs. Public Act 231 (PA 231) includes updates to the IRP statute requiring an update to this IRP planning parameters document, IRP filing requirements, and adding additional considerations the Commission must review in its evaluation of each IRP. Most notably, this planning parameters document is required to be updated in 2025 and every four years thereafter. From the EGLE perspective, PA 231 codifies the additional data requirements necessary to complete a more thorough review of IRP documents from the environmental justice and public health perspectives. PA 231 has additional requirements applicable to the Commission, including opening a proceeding to consider expanding opportunities for public engagement in the Commission's proceedings and decision-making process, as well as proceedings to consider improving review of utility rate cases.

Public Act 235 (PA 235) - PA 235 established a clean energy standard of 80 percent by 2035 and 100 percent carbon neutrality by 2040. This moves up the energy transition ten years from ED 2020-10, where the 100 percent carbon neutrality goal was to be achieved by 2050. Clean energy plan format and guidelines are to be developed by the Commission by 2026, and utilities must submit plans no later than 2028. PA 235 also establishes a statewide energy storage target of 2,500 MW, with utilities required to submit plans to procure a proportional share of the statewide target by December 31, 2029. This act also establishes a renewable energy standard of 50 percent by 2030 and 60 percent by 2035. PA 235 also allows for an increase in the distributed generation program cap from one percent to ten percent and required a one-time upper peninsula energy study which has been completed by the Commission.

In addition to PA 231 and PA 235, the Governor also signed into law PA 229 and 233 impacting electric utilities. PA 229 established new energy waste reduction targets and PA 233 created a voluntary siting process for significant renewable energy and energy storage facilities.

VII. Planning Reserve Margins and Local Clearing Requirements

To comply with PA 341 Section 6t (1) (e)

Compliance with Section 6t (1) (e) requires the identification of any required planning reserve margins and LCRs in areas of the state of Michigan. The majority of Michigan is part of the Midcontinent Independent System Operator (MISO). MISO is divided into local resource zones (LRZs or Zones) with the majority of the Lower Peninsula in Zone 7 and the Upper Peninsula combined with a large portion of Wisconsin in Zone 2, as shown in Appendix B. The unshaded portion of the southwest area of the Lower Peninsula is served by the PJM regional transmission operator. While the PJM has similar reliability criteria to MISO, there are some differences in terminology and details.

MISO publishes planning reserve margins in its annual Loss of Load Expectation (LOLE) Study Report each November.[7] The MISO LOLE Study Report includes the planning reserve margin for the next ten years in a table labeled, "MISO System Planning Reserve Margins 2022 through 2031" for the entire footprint. MISO also calculates the local reliability requirement of each Zone in the LOLE Study Report. The local reliability requirement is a measure of the planning resources required to be physically located inside a LRZ without considering any imports from outside of the zone in order to meet the reliability criterion of one day in ten years LOLE. The MISO LCR is defined as

[7] MISO 2022~~4~~-2023~~5~~ Loss of Load Expectation Study Report published on November 1, 2021~~4~~ ~~https://cdn.misoenergy.org/PY%202022-23%20LOLE%20Study%20Report601325.pdf.~~ **MISO One Voice Style Guide** **MISO One Voice Style Guide**

"the minimum amount of unforced capacity that is physically located within the LRZ that is required to meet the LOLE requirement while fully using the Capacity Import Limit for such." The LCR for each LRZ is reported annually with the MISO planning resource auction results in April.[8]

For the southwest corner of the Lower Peninsula, in PJM's territory,[9] similar reliability requirements are outlined in PJM Manual 18 for the PJM Capacity Market.[10] PJM outlines requirements for an Installed Reserve Margin, similar to MISO's planning reserve margin, on a installed capacity basis, and a Forecast Pool Requirement on an unforced capacity basis, similar to MISO's planning reserve margin, on an unforced capacity basis. PJM also specifies 27 Local Deliverability Areas, somewhat similar to MISO's LRZ. PJM publishes a Reserve Requirement Study[11] annually in October containing the requirements for generator owners and load serving entities within its footprint for the next ten years.

Electric utilities required to file IRPs under Section 6t are also required to annually make demonstrations to the MPSC that they have adequate resources to serve anticipated customer needs four years into the future, pursuant to Section 6w of PA 341. On September 15, 2017, in Case No. U-18197, the MPSC adopted an order establishing a capacity demonstration process in an effort to implement the State Reliability Mechanism (SRM) requirements of

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[8] **MISO Planning Resource Auction results, April 2024**

https://cdn.misoenergy.org/PY21-22%20Planning%20Resource%20Auction%20Results541166.pdf

[9] See Appendix C for a map of PJM Local Deliverability Areas.

[10] See Appendix C for a map of PJM Local Deliverability Areas.

[11] PJM Reserve Requirement Study, October 2021.

https://www.pjm.com/-/media/committees-groups/subcommittees/raas/2021/20211004/20211004-pjm-reserve-requirement-study.ashx

Section 6w. This order established SRM-specific planning reserve margin requirements for each electric provider in Michigan for the period of planning years 2018 through 2021. In an order issued on October 14, 2017, in Case No. U-18444, the MPSC initiated a proceeding to establish a methodology to determine a forward locational requirement, to establish a methodology to determine a forward planning reserve margin requirement, and to establish these requirements for planning year 2022. In addition to planning to meet the reliability requirements of the regional grid operator (MISO or PJM, as applicable), electric utility IRP filings should be consistent with the requirements of the SRM under Section 6w, as established in Case Nos. U-18197, U-18444, and any subsequent cases initiated to implement these provisions.

VIII. Modeling Scenarios, Sensitivities and Assumptions

To comply with ~~PA 341 Section 6t~~ ***MCL 460.6t****(1)(f)*

For utilities located in the Michigan portion of MISO Zone 2 and MISO Zone 7, ~~two~~ **Scenario 1 is required, and Scenario 2 can be replaced with a utility created scenario if assumptions in Scenario 2 have changed such that they are no longer applicable.** ~~modeling scenarios are required.~~ Northern States Power-Wisconsin and Indiana Michigan Power Company are utilities located in Michigan that already file multi-state IRPs in other jurisdictions. Due to the provisions in ~~PA 341 Section~~ **MCL 460.**6t (4) regarding multi-state IRPs, Northern States Power-Wisconsin and Indiana Michigan Power Company are intentionally excluded from the explicit requirement to model the outlined scenarios. However, the multi-state utilities are encouraged to include the provisions included in each scenario. The Commission may request additional information from multi-state utilities prior to approving an IRP, pursuant to ~~Section~~ **MCL 460.**6t (4) ~~of PA 341~~.

Scenario #1 (required)

(Applicability: Utilities located in the Michigan portion of MISO Zone 2 and MISO Zone 7, encouraged for multi-state utilities.)

This scenario directionally aligns with MISO's ~~December 2021~~ **November 2023** Futures Report, Future **3a**[12],[13]~~.1 and reflects substantial achievement of state and utility announcements including generation retirements and environmental goals.~~ This scenario incorporates 100% of utility IRP **and announced state and utility goals within their respective timelines and assumes that 100% of the utility and state goals are met across the MISO region. This scenario incorporates the** retirement announcements and retirement assumptions throughout the MISO footprint, as identified in MISO Future **3a**~~1~~. **A utility can adjust these retirements if those adjustments are supported by publicly available information or utility supported analysis.** ~~For the utility performing the analysis, the generation unit retirement assumptions may vary for only the generation units for which the utility has decision making authority or for any unit retirements that have been publicly announced since publication of the MISO report. The filing utility may incorporate more recently announced retirements if practical.~~ As subsequent MISO Futures Reports are released, **the utility should adopt the** updated retirement assumptions identified in the Future most **aggressive carbon reduction future** ~~similar to Future 1 of the December 2021 report~~ should be used.[14] ~~This scenario assumes that CO_2 emissions decline, driven by state goals and utility plans throughout the MISO footprint creating at least a 63% carbon~~

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[12] The most recent MISO futures are published on the MISO website: https://www.misoenergy.org/planning/transmission-planning/futures-development/

[13] **As MISO develops new futures, this scenario should align with MISO's most aggressive carbon reduction future. All 3a assumptions should then be updated accordingly.**

[14] ~~Scenario 1 aligns with MISO Future 1 from the December 2021 MISO Futures Report. If, in the future, MISO Futures significantly change in future reports, regulated utilities will work with Staff to determine the most appropriate future to use for Scenario 1.~~

~~reduction by 2040[15] from the baseline year of 2005 for the MISO region. Carbon emissions continue to decline on this trajectory beyond 2040.~~

This scenario assumes significant advancements toward electrification that drives a total energy growth rate to 1.08 (or the growth rate specified in MISO's most recent Futures 3a) throughout the Eastern Interconnect.[16] Utilities should assume EV adoption reaches 50% of total vehicle sales by 2030, with a trend toward 100% of vehicle sales continues throughout the remainder of the study period.[17] Using this information, utilities may develop their own demand and energy forecasts for their service territory with description and detail of how their forecast has included the impacts of climate change,[18] electrification, demand side resources, and customer-owned distributed generation and how these factors impact overall load and demand.

Emissions decline driven by state goals and utility plans throughout the MISO footprint, creating an 80% carbon reduction (or the reduction included in MISO's most recent Futures 3 scenario) by 2042 across the MISO region. For utilities operating in PJM, assume 80% carbon reduction by 2040 from the baseline year of 2005 for the PJM region. If PJM provides no set goal, then utilities shall utilize carbon reduction goals set by their respective corporate entity. This trajectory of carbon reduction is expected to continue beyond ~~2040~~ 2042. Market energy transactions are modeled at a carbon intensity consistent with the relevant RTO system average. MISO expected system averages are identified in Future 3a.[19]

~~[15] This carbon reduction is an output of the MISO expansion plan for 2021 MISO Future 1. Subsequent expansion plan modeling may update the regions overall carbon reduction percentage.~~

[16] **This high load growth is meant to capture both large scale industrial and manufacturing load growth as well as residential load growth. The utility can specify the drivers of this load growth with support if it sees the need to do so.**

[17] **Note: This EV adoption rate applies to all vehicle types.**

[18] **Midcentury datapoints for several climate change variables are available through Great Lakes Integrated Sciences and Assessments (GLISA) and Center for Climatic Research (CCR) at the University of Wisconsin-Madison. This information should be used to aid in establishing forecasts that include the impacts of climate change.**

[19] Scenario 1 aligns with MISO Future 3a from the ~~December 2021~~ **November 2023** MISO Futures Report. If, in the future, MISO Futures significantly change, regulated utilities will work with Staff to determine the most appropriate future to use for Scenario 1.

~~This scenario assumes that demand and energy growth are driven by existing economic factors, with moderate electric vehicle (EV) adoption and customer electrification, resulting in moderate MISO footprint wide demand and energy growth rates. Utilities may use the most recent United States Energy Information Administration (EIA) Annual Energy Outlook (AEO) Reference Case[20] or other reputable source for forecasted EV adoption rates. If the utility does not use EIA AEO, then the EV forecast information must be provided within the utility IRP filing. Using this information, a utility may develop its own demand and energy forecasts with description and detail how its forecast has included the impacts of climate change, [21] electrification, demand side resources, and customer owned distributed generation and how these factors change overall load and demand.~~

- Natural gas prices utilized are consistent with the Reference Case projections from the United States EIA's most recent AEO.[22]
- **Current DR, energy efficiency, and utility distributed generation programs remain in place and additional growth in those programs would happen if they were economically selected by the model or to help comply with the specified carbon reductions in this scenario.**

~~[20] Electric Vehicle adoption as forecasted in the most recent EIA AEO East North Central Census Region Reference Case, http://www.eia.gov/outlooks/aeo/tables_ref.php The utility may use an alternate electric vehicle forecast provided the forecast is publicly available and the inputs and methodology is available and auditable.~~

~~[21] Midcentury datapoints for several climate change variables are available through Great Lakes Integrated Sciences and Assessments (GLISA) and Center for Climatic Research (CCR) at the University of Wisconsin-Madison. This information should be used to aid in establishing forecasts that include the impacts of climate change.~~

[22] The natural gas price forecast utilized should be consistent with the EIA's most recent Annual Energy Outlook natural gas spot price at Henry Hub in nominal dollars, including delivery costs from Henry Hub to the point of delivery. **Utilities may use a mixed 5-year future if the remainder of the forecast mirrors the EIA's most recent AEO.**

- **Consistent with the most recent MISO Future 3a, EV adoption and customer electrification increases causing adjustments in utility load profiles as electrification and EV's are adopted through the planning horizon.**
- **Electrification growth within the utility service territory and subsequent energy and demand impacts shall be informed by either established proprietary forecasts or publicly available data and account for utility customer trends. Assumed impacts of electrification on energy and demand forecasts shall be clearly delineated and identified in the utility filing. Utility electrification programs should be informed by the Statewide Electrification Study.**
- **A combination of new customer load and electrification are used to achieve the forecasted energy growth in this scenario.**
- **Specific new units are modeled in the LRZ if under construction or with regulatory approval (i.e., IRP cost pre-approval, CON, signed GIA, Renewable Energy Plan, or Voluntary Green Pricing Plan) for units in the utility's resource zone only (e.g., DTE Electric's LRZ is MISO Zone 7).**
- **For an electric utility independently administering its own EWR program, load should be modeled based upon maintaining a 2% EWR savings.**
- **The EWR maximum achievable savings opportunity will be established in a potential study by the Michigan state-wide achievable potential with an average life of at least 8 years for EWR measures, at the portfolio level. If the utility is not already at 2.17%, ramp up the utility's EWR savings to at least 2.17% of prior year sales over the course of 3 years, using EWR cost supply curves provided in the Michigan state-wide potential study for more aggressive potential.**

- **EWR savings remain at a minimum of 2.17% throughout the study period.[23] Additional cost effective EWR should be modeled. There should be no cap on EWR savings levels. There should be no cap on costs associated with EWR programs as long as the program portfolio is cost effective based on a UCT score of 1.0 or greater.**
- **New resource selection for the utility filing their IRP should align with the Company's REP and associated renewable portfolio standard, achieving 50% renewable energy by 2030 and 60% renewable energy by 2035. The plan developed using this scenario should illustrate how the Company plans to achieve the clean energy standard, 80% clean energy portfolio by 2035 and 100% clean energy portfolio by 2040**.
- ~~Moderate EV adoption and customer electrification result in moderate MISO footprint-wide demand and energy growth. Within Michigan, EV and electrification forecasts should be blended with historical sales such that after three years, Michigan's load and demand increase reflects the source forecasts for EV and electrification technologies. Utility load profiles of EVs and electrification technologies should be clearly delineated and presented individually such that it is clear how they each impacted the overall energy and demand forecast. EV forecasts maybe based off the Reference Case in the most recent EIA AEO. Electrification technology forecasts should be based off either established proprietary forecasts or publicly available data.~~
- ~~Resource assumptions: MISO Future 1 retirements for existing thermal and nuclear generation resources published in the most recent Futures Report should be used when available along with recent public announcements. Specific new units will be modeled if under~~

[23] **If there is not enough achievable savings potential to reach 2% of total retail electricity sales in megawatt hours in the preceding year, the maximum achievable potential found within the study will be modeled. The minimum energy savings should not be less than 1.5% of total retail electricity sales in megawatt hours in the preceding year. All scenarios will have an average life of at least 8 years for EWR measures, at the portfolio level, pursuant to Public Act 295 of 2008 as amended by Public Act 229 of 2023, Sec. 77.**

~~construction or with regulatory approval (i.e., Certificate of Necessity (CON), IRP cost pre-approval, or signed generator interconnection agreement (GIA). In the absence of a MISO defined retirement assumption, maximum age assumption by resource type as specified by applicable regional transmission organization (RTO) can also be used. Generic new resources are assumed consistent with the scenario description, considering anticipated new resources currently in generation interconnection queue, and should be chosen based upon economics and reliability.~~

- ~~Not less than 35% of the state's electric needs should be met through a combination of EWR and renewable energy by 2025, as per MCL 460.1001 (3).~~
- ~~For all in-state electric utilities participating in the State EWR Program, EWR should be based upon the minimum allowed under the incentive of 1.5% and should be based upon an average cost of megawatt hour (MWh) saved. The model should include an EWR supply cost curve to project future program expenditures beyond baseline assumptions that includes a projection of lifetime savings (MWh) and lifetime benefits ($). There should be no cap on EWR savings levels beyond 1.5% or a cap on costs associated with EWR programs as long as the program portfolio is cost effective based on a UCT score of 1.0 or greater.~~
- Existing **renewable energy production and storage** tax credits continue **and renewable energy and storage investment tax credits continue,** pursuant to current law. **If the resource is eligible for Production Tax Credits (PTC) or Investment Tax Credits (ITC), the credit should be included in the modeling.** Federal policy timing may impact modeling.
- Energy storage resources are modeled using available best practice methodologies ~~to the extent that such guidelines exist~~.[24] Allow for

[24] ~~Staff Report in Case No. U-20633 issued, May 27, 2021, and adopted by the Commission in its September 24, 2021 order.~~

multiple market revenue streams where applicable and demonstrate the utility is reasonably capturing the full value of storage. **Utilize public, high resolution spatial and temporal data (e.g., related to costs and technologies) to improve the chronology of energy storage models and, if adequate public data is not available, use data that can be shared with parties through nondisclosure agreements. Utilize best practices to accurately model the operations of long-duration and multi-day energy storage technologies and their participation in markets.**

- **Technology costs and limits to the total resource amount available for EWR and DR programs will be informed by the most recently Commission approved state-wide potential study and may be augmented by prior EWR and DR potential studies and/or additional research as well as by the actual experience of EWR programs in Michigan.**
- ~~Technology costs for thermal units and wind track with mid-range industry expectations.~~
- ~~Technology costs and limits to the total resource amount available for EWR and DR programs will be informed by the most recently Commission approved state-wide potential study and may be augmented by prior EWR and DR potential studies and/or additional research.~~
- ~~Technology costs for solar, storage, and other emerging technologies decline with commercial experience consistent with National Renewable Energy Laboratory (NREL) or other publicly available reputable sources.~~
- Existing Public Utility Regulatory Policies Act (PURPA) qualifying facilities (QFs), up to the utility's "must buy" obligation MW threshold, are assumed to be renewed, unless the QF indicates otherwise, either publicly or directly to the utility.
- Existing PURPA QFs greater than the utility's "must buy" obligation MW threshold are assumed to continue operations within the wholesale

market beyond the termination date of the contract, unless the QF indicates otherwise, either publicly or directly to the utility.

- **Achieve and maintain energy storage resources necessary to meet the utility's proportional share of the minimum statewide energy storage target using the calculation methodology approved by the Commission in Case No. U-21571. Modeling should support the selection of energy storage technologies and other details of the utility's energy storage resource portfolio in the PCA**.
- **If the utility is planning on adding a non-clean resource, defined as any electric generating resource that does not qualify as a "clean energy system" or "renewable energy resource" under Act 295, as amended, or the MPSC's Clean Energy Plan Filing Requirements, it must model the scenario without the non-clean resource as well.**

Scenario #1 Sensitivities:

1. ~~Fuel cost: Increase the natural gas fuel price projections from the base projections to at least the high EIA gas price in the most recent EIA Low Oil and Gas Supply forecast.~~[25] **Fuel cost projections: Increase the natural gas fuel price projections from the base projections to at least the high EIA gas price in the most recent EIA Low Oil and Gas Supply forecast natural gas fuel price projections (or other publicly available source) by the end of the 20-year study period.[23]**
2. **Model an unexpected 20% reduction from the utility's base assumption of annual renewable build constraints, to represent a limited inability to source renewable resources in the first 6 years of the plan**~~. Load projections:~~

   ~~(a) High load growth: For the filing utility's load obligation, increase the energy growth rate by at least a factor of two above the base case energy~~

[25] For example, the most recent EIA AEO Low Oil and Gas Supply natural gas price is **$4.27**/MMBtu in 2040.

~~or 0.5% (whichever is larger) on a per customer basis. Adjust demand accordingly. For the region included in the scenario utilize load growth that is consistent with the most recent MISO futures.~~

~~(b) Low load growth: EV adoption and electrification are slower than expected. Demand and load growth are consistent with 5-year historical growth rates prior to 2020 and the onset of COVID-19.~~

~~(c) If the utility has retail choice load in its service territory, model the return of 50% of its retail choice load to the utility's capacity service by the demonstration year of the utility's next capacity demonstration filing. Assume that load is returned in two phases with the first half returning halfway through the four year forward demonstration period and the remainder returning in the demonstration year of the utility's next capacity demonstration filing. This sensitivity does not apply to utilities within an RTO that requires the incumbent utility to show capacity for choice load.~~

3. **For electric utilities independently administering its own EWR program, ramp up to 2.5% EWR savings based upon prior year sales within the utility's Michigan jurisdiction.** ~~If the utility is not already achieving 2% EWR, ramp up the utility's EWR savings to at least 2.0% of prior year sales over the course of three years within the utility's Michigan jurisdiction.~~ [26] ~~EWR savings remain at 2% throughout the remainder of the study period.~~
4. **Model incremental large load increases that are equal to 10% of the annual forecasted load in years 2030, 2035, and 2040.**
5. **Model a policy shift to a high investment in off-shore wind starting in the 5th year of the plan and extending to the last year of the plan. Off-shore wind would be expected to receive any PTC or ITC equivalent to all other renewable generation. Policy is based upon preservation of farmland and perpetuated by low seasonal capacity accreditation of solar in winter months whereby all new renewable generation after the**

[26] ~~2021 Energy Waste Reduction Potential Study, Appendix D.~~

5th year of the plan must be 50% off-shore wind. In addition to the production cost of this sensitivity, please provide a discussion of barriers to off-shore wind and an estimation, based upon current solar construction practices, of the acreage of productive cropland that is likely to be preserved under this sensitivity.

Scenario #2

Applicability: Utilities located in the Michigan portion of MISO Zone 2 and MISO Zone 7 (encouraged for multi-state utilities).

This scenario directionally aligns with MISO's December 2023 Futures Report, Future 1a and reflects substantial achievement of state and utility announcements, including generation retirements and environmental goals. This scenario incorporates 100% of utility IRP retirement announcements and retirement assumptions throughout the MISO footprint, as identified in MISO Future 1. For the utility performing the analysis, the generation unit retirement assumptions may vary from the MISO Futures Report only for the thermal generation units that the utility has decision making authority or for any unit retirements that have been publicly announced since publication of the MISO report. The filing utility may incorporate more recently announced retirements if practical. As subsequent MISO Futures Reports are released, updated retirement assumptions identified in the Future most similar to Future 1a of the November 2023 report should be used.[27] This scenario assumes that CO_2 emissions decline, driven by state goals and utility plans throughout the MISO footprint, creating a target of 40% carbon reduction by 2042[24] from the baseline year of 2005 for the MISO region. Carbon emissions continue to decline on this trajectory beyond 2040.

This scenario assumes an annual energy growth of 0.22%, ~~are~~ driven by existing economic factors, with moderate electric vehicle (EV) adoption and customer electrification, resulting in moderate MISO footprint-wide demand and energy growth rates. Utilities may use the most recent United States Energy Information Administration (EIA) Annual Energy Outlook

[27] Scenario 2 aligns with MISO Future 1a from the November 2023 MISO Futures Report. If, in the future, MISO Futures significantly change in future reports, regulated utilities will work with Staff to determine the most appropriate future to use for Scenario 2.

(AEO) Reference Case[25] or other reputable source for forecasted EV adoption rates. If the utility does not use EIA AEO, then the EV forecast information must be provided within the utility IRP filing. Using this information, a utility may develop its own demand and energy forecasts with description and detail how its forecast has included the impacts of climate change,[28] electrification, demand side resources, and customer owned distributed generation and how these factors change overall load and demand. The utility can use alternative load growth assumptions to the extent that they are fully supported by publicly available data.

~~This scenario aligns with the MISO's December 2021 Futures Report, Future 3.[29] It incorporates 100% of utility IRPs and announced state and utility goals within their respective timelines and assumes that 100% of the utility and state goals are met. This scenario incorporates the retirement announcements and assumptions throughout the MISO footprint, as identified in Future 3. As subsequent Futures Reports are released, updated retirement assumptions identified in the Future most similar to Future 3 of December 2021 Futures Report should be used.~~

~~This scenario assumes significant advancements toward electrification that drives a total energy and demand annual growth rates to 1.71% and 1.41% respectively throughout the Eastern Interconnect.[30] Utilities should assume EV adoption reaches 50% of total vehicle sales by 2030 with a trend toward 100% of vehicle sales continues throughout the remainder of the study period~~**,** ~~consistent with the MI Healthy Climate Plan goals. Using this information,~~

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[28] **Midcentury datapoints for several climate change variables are available through Great Lakes Integrated Sciences and Assessments (GLISA) and Center for Climatic Research (CCR) at the University of Wisconsin-Madison. This information should be used to aid in establishing forecasts that include the impacts of climate change.**

~~[29] The most recent MISO futures are published on the MISO website: https://www.misoenergy.org/planning/transmission-planning/futures-development/~~

[30] Scenario 2 aligns with MISO Future 3 from the December 2021 MISO Futures Report. If, in the future, MISO Futures significantly change, regulated utilities will work with Staff to determine the most appropriate future to use for Scenario 2.

~~utilities may develop their own demand and energy forecasts for their service territory with description and detail how their forecast has included the impacts of climate change,~~ [31] ~~electrification, demand side resources, and customer owned distributed generation and how these factors impact overall load and demand.~~

~~Emissions decline driven by state goals and utility plans throughout the MISO footprint, creating at least an 80% carbon reduction by 2040 by the baseline year of 2005 for the MISO region. For utilities operating in PJM, assume 80% carbon reduction by 2040 from the baseline year of 2005 for the PJM region. If PJM provides no set goal, then utilities shall utilize carbon reduction goals set by their respective corporate entity. This trajectory of carbon reduction is expected to continue beyond 2040. Market energy transactions are modeled at a carbon intensity consistent with the relevant RTO system average. MISO expected system averages are identified in Future 3.~~[32]

- Natural gas prices utilized are consistent with Reference Case projections from the United States EIA's most recent AEO. [33]
- ~~Current DR, energy efficiency, and utility distributed generation programs remain in place and additional growth in those programs would happen if they were economically selected by the model or to help comply with the specified carbon reductions in this scenario.~~

[31] Midcentury datapoints for several climate change variables are available through Great Lakes Integrated Sciences and Assessments (GLISA) and Center for Climatic Research (CCR) at the University of Wisconsin-Madison. This information should be used to aid in establishing forecasts that include the impacts of climate change.

[32] Scenario 2 aligns with MISO Future 3 from the December 2021 MISO Futures Report. If, in the future, MISO Futures significantly change, regulated utilities will work with Staff to determine the most appropriate future to use for Scenario 2.

[33] The natural gas price forecast utilized should be consistent with the EIA's most recent Annual Energy Outlook natural gas spot price at Henry Hub in nominal dollars and also including delivery costs from Henry Hub to the point of delivery.

- **Moderate EV adoption and customer electrification result in moderate MISO footprint-wide demand and energy growth. Within Michigan, EV and electrification forecasts should be blended with historical sales such that after three years, Michigan's load and demand increase reflects the source forecasts for EV and electrification technologies. Utility load profiles of EVs and electrification technologies should be clearly delineated and presented individually such that it is clear how they each impacted the overall energy and demand forecast. EV forecasts maybe based off the Reference Case in the most recent EIA AEO.**
- **Electrification growth within the utility service territory and subsequent energy and demand impacts shall be informed by either established proprietary forecasts or publicly available data and account for utility customer trends. Assumed impacts of electrification on energy and demand forecasts shall be clearly delineated and identified in the utility filing. Utility electrification programs should be informed by the Statewide Electrification Study.**
- **Resource assumptions: MISO Future 1a retirements for existing thermal and nuclear generation resources published in the most recent Futures Report should be used when available. The filing utility may incorporate more recently announced retirements if practical. Specific new units will be modeled if under construction or with regulatory approval (i.e., Certificate of Necessity (CON), IRP cost pre-approval, or signed generator interconnection agreement (GIA)). In the absence of a MISO defined retirement assumption, maximum age assumption by resource type, as specified by applicable regional transmission organization (RTO), can also be used. Generic new resources are assumed to be consistent with the scenario description, considering anticipated new resources currently in generation interconnection queue, and should be chosen based upon economics and reliability.**

- **New resource selection for the utility filing their IRP should align with the Company's REP and associated renewable portfolio standard, achieving 50% renewable energy by 2030 and 60% renewable energy by 2035. The plan developed using this scenario should illustrate how the Company plans to achieve the clean energy standard, 80% clean energy portfolio by 2035 and 100% clean energy portfolio by 2040.**
- **For an electric utility independently administering its own EWR program, load should be modeled based upon maintaining a 1.5% EWR savings.**
- **The EWR maximum achievable savings opportunity will be established in a potential study by the Michigan state-wide achievable potential with an average life of at least 8 years for EWR measures, at the portfolio level.**
- **This scenario assumes that a utility maintains a minimum of 1.5% EWR savings throughout the study period.[34] Additional cost effective EWR should be modeled. There should be no cap on EWR savings levels. There should be no cap on costs associated with EWR programs as long as the program portfolio is cost effective based on a UCT score of 1.0 or greater.**
- ~~Consistent with the most recent MISO Future 3, EV adoption and customer electrification increases causing adjustments in utility load profiles as electrification and EV's are adopted through the planning horizon.~~
- ~~Specific new units are modeled in the LRZ if under construction or with regulatory approval (i.e., IRP cost pre-approval, CON, signed GIA,~~

[34] **If there is not enough achievable savings potential to reach 2% of total retail electricity sales in megawatt hours in the preceding year, the maximum achievable potential found within the study will be modeled. The minimum energy savings should not be less than 1.5% of total retail electricity sales in megawatt hours in the preceding year. All scenarios will have an average life of at least 8 years for EWR measures, at the portfolio level, pursuant to Public Act 295 of 2008 as amended by Public Act 229 of 2023, Sec. 77.**

~~Renewable Energy Plan, or Voluntary Green Pricing Plan) for units in the utility's resource zone only (i.e, DTE Electric's LRZ is MISO Zone 7).~~

- ~~For an electric utility independently administering its own EWR program, maintain a 2% EWR savings. If the utility is not already at 2%, ramp up the utility's EWR savings to at least 2.0% of prior year sales over the course of 3 years, using EWR cost supply curves provided in the 2021 supplemental potential study for more aggressive potential. EWR savings remain at 2% throughout the study period.~~
- ~~Achieve and maintain a 50% renewable energy portfolio by 2030 and another 10% from other renewable resources such as voluntary green pricing and distributed generation.[35]~~
- ~~Existing renewable energy production and storage tax credits and renewable energy and storage investment tax credits continue pursuant to current law. Federal policy timing may impact modeling.~~
- Energy storage resources are modeled using available best practice methodologies ~~to the extent that such guidelines exist~~. Allow for multiple market revenue streams where applicable and demonstrate the utility is reasonably capturing the full value of storage. **Utilize public, high resolution spatial and temporal data (e.g., related to costs and technologies) to improve the chronology of energy storage models and, if adequate public data is not available, use data that can be shared with parties through nondisclosure agreements. Utilize best practices to accurately model the operations of long-duration and multi-day energy storage technologies and their participation in markets.**
- **Technology costs for thermal units and wind track with mid-range industry expectations.**
- **Technology costs and limits to the total resource amount available for EWR and DR programs will be informed by the most recently**

[35] ~~Exemption if this requirement would result in curtailment of other carbon free resources.~~

Commission approved state-wide potential study and may be augmented by prior EWR and DR potential studies and/or additional research.

- **Technology costs for solar, storage, and other emerging technologies decline with commercial experience, consistent with National Renewable Energy Laboratory (NREL) or other publicly available reputable sources.**
- ~~Technology costs for wind, solar, storage and other renewables decline linearly with commercial experience and forecasted at levels resulting in a 30% reduction from Scenario 1 by the end of the 20-year study period.~~
- Existing **PTC and ITC** tax credits continue, pursuant to current law, **and should be included in the modeling**. Federal policy timing may impact modeling.
- Technology costs and limits to the total resource amount available for EWR and DR programs will be informed by the most recently Commission approved state-wide potential study and may be augmented by prior EWR and DR potential studies and/or additional research as well as by the actual experience of EWR programs in Michigan.
- **Existing Public Utility Regulatory Policies Act (PURPA) qualifying facilities (QFs), up to the utility's "must buy" obligation MW threshold, are assumed to be renewed, unless the QF indicates otherwise, either publicly or directly to the utility.**
- ~~Existing PURPA contracts are assumed to be renewed. Existing PURPA QFs up to the utility's "must buy" obligation MW threshold are assumed to be renewed unless the QF indicates otherwise either publicly or directly to the utility.~~
- Existing PURPA QFs greater than the utility's "must buy" obligation MW threshold are assumed to continue operations within the wholesale

market beyond the termination date of the contract, unless the QF indicates otherwise, either publicly or directly to the utility.

- Storage should be modeled assuming MI Healthy Climate Plan statewide goals are achieved on a utility load share basis.
- **Achieve and maintain energy storage resources necessary to meet the utility's share of the statewide energy storage target using the calculation methodology approved by the Commission in Case No. U-21571. Modeling should support the selection of energy storage technologies and other details of the utility's energy storage resource portfolio in the PCA.**

Scenario #2 Sensitivities:

1. **Fuel cost: Increase the natural gas fuel price projections from the base projections to at least the high EIA gas price in the most recent EIA Low Oil and Gas Supply forecast.[36]**

2. **Load projections:**

   a. **High load growth: For the filing utility's load obligation, increase the energy growth rate by at least a factor of two above the base case energy or 0.5% (whichever is larger) on a per customer basis. Adjust demand accordingly. For the region included in the scenario utilize load growth that is consistent with the most recent MISO futures.**

   b. **Low load growth: EV adoption and electrification are slower than expected. Demand and load growth are consistent with 5-year historical growth rates prior to 2020 and the onset of COVID-19.**

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[36] For example, the most recent EIA AEO Low Oil and Gas Supply natural gas price is **$4.27/MMBtu** in 2040.

3. **If the utility is not already achieving 2.17% EWR, ramp up the utility's EWR savings to at least 2.17% of prior year sales over the course of three years within the utility's Michigan jurisdiction.[37] EWR savings remain at 2.17% throughout the remainder of the study period.**

~~1. Fuel cost projections: Increase the natural gas fuel price projections from the base projections to at least the high EIA gas price in the most recent EIA Low Oil and Gas Supply forecast natural gas fuel price projections by the end of the 20-year study period.[38]~~

~~2. Assume all coal facilities in Michigan are retired by 2030 and Michigan electric sector meets an 80% carbon reduction from the 2005 baseline, modeled as a hard cap on the amount of carbon emissions.[39]~~

~~3. Remove the assumed 50% RPS and assume that not less than 35% of the state's electric needs should be met through a combination of EWR and renewable energy by 2025, as per MCL 460.1001 (3). Assume 10% from other renewable resources such as voluntary green pricing and distributed generation remains.~~

~~4. For electric utilities independently administering its own EWR program, ramp up to 2.5% EWR savings based upon prior year sales within the utility's Michigan jurisdiction.~~

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[37] **2025 Energy Waste Reduction Potential Study**

~~[39] Based upon ramping to a net zero carbon power sector by 2035 https://www.whitehouse.gov/briefing-room/statements-releases/2021/04/22/fact-sheet-president-biden-sets-2030-greenhouse-gas-pollution-reduction-target-aimed-at-creating-good-paying-union-jobs-and-securing-u-s-leadership-on-clean-energy-technologies/~~

6. Michigan IRP Modeling Input Assumptions and Sources

The following IRP modeling input assumptions and sources are recommended to be used in conjunction with the descriptions of the scenarios and sensitivities.

	Value	Sources
1 - Analysis Period	• A minimum analysis period of 20 years, with reporting foryears 5,10, and 15 at a minimum as specified in the statute.	
2 - Model Region	• The minimum model region includes the utility's service territory, with transmission interconnections modeled to the remainder of Michigan, adjacent Canadian provinces if applicable. A larger model region is preferable, including the applicable RTO region as deemed appropriate by utility.	
3 - Economic Indicators and Financial Assumptions(e.g., Weighted Average Cost of Capital)	• Utility-specific	• Prevailing value from most recent MPSC proceedings
4 - Load Forecast	• 50/50 forecast • Forecasts other than 50/50 utilized to align with scenario and/or sensitivity descriptions should be documented and justified.	• Utility forecast and applicable RTO forecasts
5 - Unit Retirements	• Retirements driven by maximum age assumption or economics • Public announcements on retirements	• MISO or PJM documented fuel type retirements • All retirement assumptions must be documented • Retirement assumptions throughout the MISO footprint are consistent with MISO futures development Future 1**a** and Future 3**a**.
6 - Natural Gas Price nominal dollars $/MMBtu	• Forecasts utilized should align with scenario and/or sensitivity descriptions; Gas prices should include transportation costs.	• NYMEX futures (applicable for near-term forecastsonly) • EIA Annual Energy Outlook • EIA Table 3: Energy Prices • EIA Short-Term Energy Outlook Reports • If utility-specific data is utilized, it should be justified and made available to all intervening parties.
7 - Coal Price nominal dollars $/MMBtu	• Forecasts utilized should align with scenario and/or sensitivity descriptions; Coal prices should include transportation costs.	• EIA Coal Production and Minemouth Prices by Region • EIA Annual Energy Outlook • EIA Table 3: Energy Prices • EIA Short-Term Energy Outlook Reports/AnnualReports • If utility-specific data is utilized, it should be justified and made available to all intervening parties.
8 - Fuel Oil Price nominal dollars $/MMBtu	• Forecasts utilized should align with scenario and/or sensitivity descriptions.	• If utility-specific data is utilized, it should be justified and made available to all intervening parties.

9 - EWR Savings MWhs	Scenario #1: • For electric utilities earning a financial incentive, base case energy reductions of 1.5% per year as a net to loadforecast. • For non-incentive earning electric utility, mandated annual incremental savings (1.0%) as a net to load. • Not less than 35% of the state's electric needs should be met through a combination of EWR and renewable energy by 2025, as per PA 342 Section 1 (3). Scenario #1 Sensitivities: • For savings beyond mandate, incorporate EWR as an optimized generation resource. Scenario #2**:** • Ramp up EWR savings at least 2.0% over the course of four years. • Consider load shape of EWR measures so on-peak capacity reduction associated with EWR can be reflected.	• Utility EWR plan and reconciliation filings • 202**4/5** Energy Waste Reduction Potential Study • Other pertinent studies and research used by the utility.
10 - EWR Costs nominal dollars per kWh (Program administrator costs only; participant costs are not to be included in this analysis.)	• Current average levelized costs, as defined in 2021 EWR Potential Study, and Supplemental Modeling reflecting aggressive and cost-effective program savings goals.	• Utility EWR plan and reconciliation filings • 202**4/5** Energy Waste Reduction Potential Study • Other pertinent studies and research used by the utility.
11 - DR Savings MWs	• MWs by individual program (e.g., residential peak pricing, residential time-of-use pricing, residential peak time rebate pricing, residential programmable thermostats, residential interruptible air, industrial curtailable, industrial interruptible, etc.) or program type and class (e.g., residential behavioral, residential direct control, commercial pricing, volt/ Volt-Amp Reactive (VAR) optimization). • Technical, economic, and achievable levels of DR as applicable to the scenario.	• As defined by 2021 Demand Response Potential Study
12 - DR Costs nominal dollars per MW	• Costs/MW by program, including all payments, credits, or shared savings awarded to the utility through regulatory incentive mechanism.	• As defined by 2021 Demand Response Potential Study
13 - Renewable Capacity Factors		• If utility-specific data is utilized, it should be justifiedand made available to all intervening parties.
14 - Renewable Capital Costs and Fixed O&M Costs nominal dollars per kWh and Renewable Fixed O&M Costs nominal dollars per kW	• Wind, solar, biomass, landfill gas • Combined heat and power (CHP)	• National Renewable Energy Lab's *Annual Technology Baseline Report* • Department of Energy's *Wind Technologies Market Report* • Lawrence Berkeley National Lab's *Tracking the Sun* and *Utility Scale PV Cost* • Assumptions based on utility experience (Michiganspecific and/or RTO - MISO/PJM) • 2015 Michigan Renewable Resource Assessment • Department of Energy's *Wind Vision Study* • Department of Energy's *Sunshot Vision Study* • Lazard's Levelized Cost of Storage Analysis 2.0 • If utility is using specific data not publicly sourced, mustbe justified and made available to all intervening parties.

15 – Fossil and Nuclear Generation **nominal dollars per kW** **nominal dollars per kWh**	• **Combustion Turbine** • **Combined Cycle** • **Reciprocating Internal Combustion Engine** • **Carbon Capture and Sequestration** • **Nuclear including Small Modular Reactor**	**US Energy Information Administration** **AEO2023 Cost and Performance Characteristics of New Generating Technologies**
16 – Storage	• **Achieve and maintain energy storage resources necessary to meet the utility's share of the statewide energy storage target using the calculation methodology approved by the Commission in Case No. U-21571. Modeling should support the selection of energy storage technologies and other details of the utility's energy storage resource portfolio in the PCA.**	• **LDES National Consortium** • **Lazard's Levelized Cost of Storage Analysis 9.0** • **PNNL's Energy Storage Cost and Performance Database** • **Commission's Study of Long-Duration and Multi-Day Energy Storage Systems**
17 – Other Resources	• Changes to operation guides • Options which improve reliability (Storage, SVC, HVDC, CVR) • Utilities shall take into account small qualifying facilities(20 MW and under) and other aggregated demand-side options as part of establishing load curves and future demand. Larger renewable energy resources, combined heat and power plants, and self-generation facilities (behind-the-meter (BTM) generation) that consist of resources listed below or fossil fueled generation should be considered in modeling, either as discrete projects, where such have been developed/defined, or as generic blocks of tangible size (e.g., 100 MW wind farm) where not yet defined. • Utility-scale (e.g., integrated gasification combined cycle, CHP, pumped hydro storage, other storage, voltage optimization) • BTM (customer BTM) Generation (e.g., solar photovoltaic (PV), biogas (including anaerobic digesters), CHP (combustion turbine,steam, reciprocating engines), customer-owned backup generators, microturbines (with and without cogeneration),fuel cells (with and without cogeneration), small-scale Reciprocating Internal Combustion Engine (RICE) units (with and without cogeneration)) • Other Distributed Resources (e.g., stationary batteries,electric vehicles, thermal storage, compressed air, flywheel, solid rechargeable batteries, flow batteries).	• Assumptions and parameters other than costs that are associated with the technologies and options (such as future adoption rates) should be afforded flexibility due tothose technologies' and options' presently unconventionalnature. However, the utility should still show that all assumptions and parameters are reasonable and were developed from credible sources. • Utilities shall use cost and cost projection data frompublicly available sources or the utility's internal data sources. The utility must show that their data and projection sources are reasonable and credible. • State of the Art Practices for Modeling Storage in Integrated Resource Planning. • Charging Ahead: Energy Storage Guide for Policymakers • Advanced Energy Storage in Integrated Resource Planning. • Energy Storage in Integrated Resource Plans • Michigan Energy Storage Roadmap
18- Wholesale Electric Prices		• Documentation for wholesale price forecast must be provided to all intervening parties.
19 – Electric Vehicle Forecasts **20- Electrification Forecasts**	Scenario 1 EIA AEO Reference Case Scenario 2 half of vehicle sales are electric by 2030 **TBD**	• EIA AEO Transportation • 202**4/5** Electrification Potential Study

7. Additional IRP Requirements and Assumptions

1. Prices and costs should be expressed in nominal dollars.
2. Models should account for operating costs and locational, capital and performance variations. For example, setting pricing for different tranches if justified.
3. Capacity factors should be projected based on demonstrated performance, consideration of technology improvements and geographic/locational considerations. Additional requirements for renewable capacity factors are described in the Michigan IRP Modeling Input Assumptions and Sources in the previous section of this draft.
4. For purposes of IRP modeling, forecasted energy efficiency savings should be aggregated into hourly units, coincident with hourly load forecasts, with indicative estimates of efficiency cost and savings on an hourly basis. It is this aggregation and forecast of energy efficiency, to be acquired on an hourly basis that allows EWR to be modeled as a resource in an IRP for planning purposes.
5. Prior to modeling Scenario 1 and Scenario 2, the utilities shall consider and prescreen all the technologies, resources, and generating options listed in the Michigan IRP Modeling Input Assumptions and Sources in the previous section of this draft. These findings will then be presented and discussed via at least one stakeholder meeting with written comments from stakeholders taken into consideration. The options having potential viability are then considered in modeling.
6. Consider all supply and demand-side resource options on equal merit, allowing for special consideration for instances where a project or a resource need requires rapid deployment.

7. In modeling each scenario and sensitivity evaluated as part of the IRP process, the utility shall clearly identify all unit retirement assumptions and unless otherwise specified in the required scenarios, the utility has flexibility to allow the model to select retirement of the utility's existing generation resources, rather than limiting retirements to input assumptions.
8. The IRP should consider any and all revenues expected to be earned by the utility's asset(s), as offsets to the NPVRRs. The utility should explicitly identify revenues that are expected to be earn that are offsets to the NPVRRs and the assumptions that those revenues are based upon.

Appendix A: Organization Participation List

- Adams BioProcess Services
- Advanced Energy Economy
- American Council for an Energy-Efficient Economy
- American Electric Power
- American Municipal Power
- American Transmission Company
- Apollo Energy
- Armada Power
- Association of Businesses Advocating Tariff Equity
- Association of Energy Engineers
- Atlantic Council
- Attorney General
- Bay City Light & Power
- Bedrock Group
- Brattle Group
- Burns & McDonnell
- Cadmus Group
- Center Point Energy
- Charge Point
- Charthouse Energy
- Citizen Utility Board of Michigan
- City of Ann Arbor
- City of Grand Rapids
- City of Marquette
- Clark Hill
- Clean Grid Alliance
- CMS Energy
- Coalitions for Energy Efficient Logistics
- Consumers Energy
- CPower Energy Manager
- Dimension Renewable Energy
- DNV GL
- Dominion Energy
- Driftless Energy
- DTE Electric
- Duke Energy
- Dykema
- Earth Justice
- Ecology Center
- Dept. of Environment, Great Lakes & Energy
- Energy Exemplar
- Environmental Law & Policy Center
- EPRI
- Fein Solutions
- Five Lakes Energy
- Ford Motor Company
- Fraser Trebilcock Davis & Dunlap
- Futures Energy Group
- Great Plains Institute
- Grand Rapids Chamber of Commerce
- Grand Rapids Resident
- Grid Lap
- Guidehouse
- Hawk Utility Consulting
- Hecate Energy
- ICF New York University

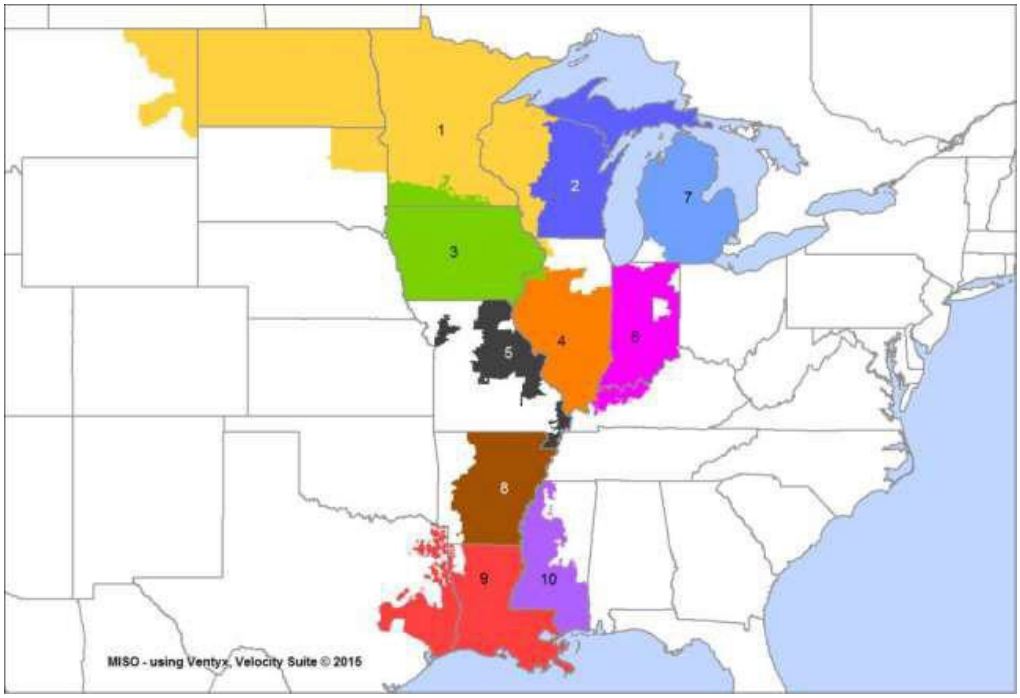
Appendix A: Organization Participation List

- IFC
- Indiana Michigan Power
- ITC Holdings
- Key Capture Energy
- Lawrence Berkley National Laboratory
- Mi Air Mi Health
- Michigan Biomass
- Michigan Chemistry Council
- Michigan Climate Action Network
- Michigan Clinicians for Climate Action
- Michigan Conservative Energy forum
- Michigan Electric and Gas Association
- Michigan Electric Cooperative Association
- Michigan Energy Innovation Business Council
- Michigan Environmental Council
- Michigan Environmental Justice Coalition
- Michigan Farm Energy Program
- Michigan League of Conservation Voters
- Michigan Power Purchasers Association
- Michigan State University
- Michigan Townships Association
- Midcontinent Independent System Operator
- Milligan Grid Solutions
- Minnesota Public Utility Commission
- National Renewable Energy Laboratory
- Natural Resource Defense Council, Inc.
- Natural Resources Research Institute
- New Energy Advisors, LLC.
- Next Energy
- Northern States Power
- NRG Business Solutions, LLC.
- Oakridge National Laboratory
- Opower
- PACE Financing
- Pacific Northwest National Laboratory
- PJM
- Plugged in Strategies
- Policy Advisor Michigan House of Representatives
- Potomac Law Group
- PSC Healthy Energy
- Public Sector Consultants
- Public Utilities Commission of Ohio
- Purdue University Forecasting Group
- Ranger Power
- Regulatory Assistance Project

Appendix A: Organization Participation List

- Renewable Energy Buyers Alliance
- Renewable Energy Systems
- Rivenoak Consulting
- Ruben Strategy Group
- Siemens
- Sierra Club
- Spark Building Energy Solutions
- Sun 5 Repowering
- Sunrun
- The Healthy Homes Coalition of West Michigan
- Traverse City Light and Power
- Union of Concerned Scientists
- United States Energy Association
- University of Michigan
- Soulardarity
- Upper Peninsula Power Co.
- Urban Core Collective
- US Climate Alliance
- Varnum Law
- Vote Solar
- Walker Miller Energy
- Wartsila
- WEC Energy Group
- Wisconsin Public Service Commission
- Wolverine Electric Cooperative
- Wolverine Power
- Xcel Energy

Appendix B: Map of MISO Local Resource Zones



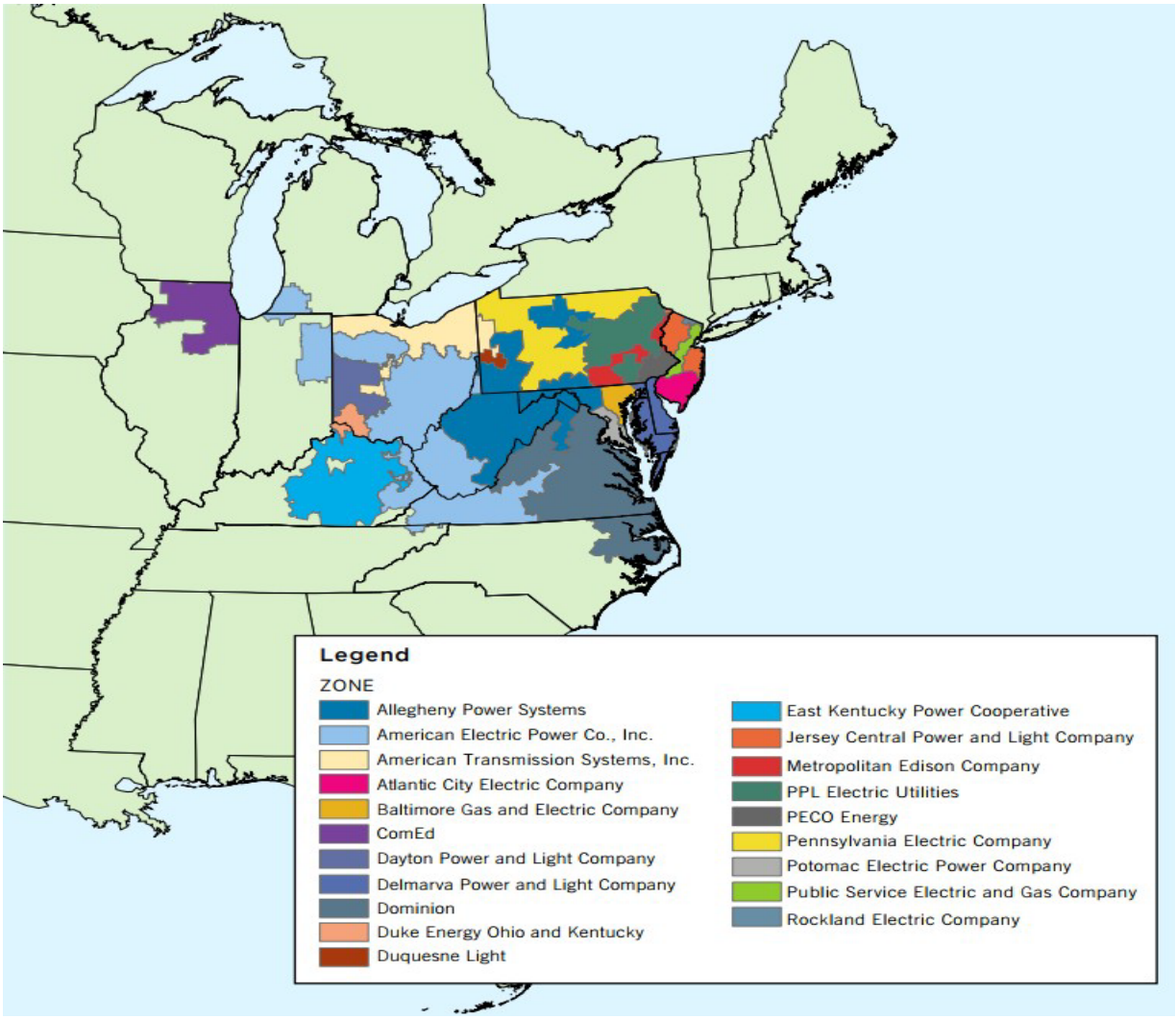
MISO Zone 1 - Rate regulated electric utility - Northern States Power-Wisconsin

MISO Zone 2 - Rate regulated electric utilities - Upper Michigan Energy Resources Corporation and Upper Peninsula Power Company

MISO Zone 7 - Rate regulated electric utilities - Alpena Power Company, Consumers Energy Company, and DTE Electric Company

PJM (Southwest Michigan) - Rate regulated electric utility - Indiana Michigan Power Company

Appendix C: Map of PJM Local Deliverability Areas



PJM (Southwest Michigan) - Rate regulated electric utility - Indiana Michigan Power Company is part of the American Electric Power Co., Inc.

Appendix D: Public Act 341 of 2016, Section 6t (1)

Section 6t (1) **The commission shall, by August 31, 2025, and every 4 years thereafter, commence a proceeding and, in consultation with the department of environment, Great Lakes, and energy, and other interested parties, do all of the following as part of the proceeding:**

(a) Conduct an assessment of the potential for energy waste reduction in this state.

(b) Conduct an assessment for the use of demand response programs in this state, based on what is economically and technologically feasible, as well as what is reasonably achievable. The assessment must expressly account for advanced metering infrastructure that has already been installed in this state and seek to fully maximize potential benefits to ratepayers in lowering utility bills.

(c) Identify significant state or federal environmental regulations, laws, or rules and how each regulation, law, or rule would affect electric utilities in this state.

(d) Identify any formally proposed state or federal environmental regulation, law, or rule that has been published in the Michigan Register or the Federal Register and how the proposed regulation, law, or rule would affect electric utilities in this state.

(e) Identify any required planning reserve margins and local clearing requirements in areas of this state.

(f) Establish the modeling scenarios and assumptions each electric utility should include in addition to its own scenarios and assumptions in developing its integrated resource plan filed under subsection (3), including, but not limited to, all of the following:

(i) Any required planning reserve margins and local clearing requirements.

Appendix D: Public Act 341 of 2016, Section 6t (1)

(ii) All applicable state and federal environmental regulations, laws, and rules identified in this subsection.

(iii) Any supply-side and demand-side resources that reasonably could address any need for additional generation capacity, including, but not limited to, the type of generation technology for any proposed generation facility, projected energy waste reduction savings, projected load impact due to electrification, and projected load management and demand response savings.

(iv) Any regional infrastructure limitations in this state.

(v) The projected costs of different types of technologies and fuel used for electric generation.

(g) Allow other state agencies to provide input regarding any other regulatory requirements that should be included in modeling scenarios or assumptions.

(h) Publish a copy of the proposed modeling scenarios and assumptions to be used in integrated resource plans on the commission's website.

(i) Before issuing the final modeling scenarios and assumptions each electric utility should include in developing its integrated resource plan, receive written comments and hold hearings to solicit public input regarding the proposed modeling scenarios and assumptions.

(j) Conduct an assessment of the potential for electrification of transportation, buildings, and industries consistent with economy-wide elimination of greenhouse gas emissions in this state, based on what is economically and technically feasible, as well as what is reasonably achievable.

(k) Identify environmental justice communities.

Appendix D: Public Act 341 of 2016, Section 6t (1)

~~The commission shall, within 120 days of the effective date of the amendatory act that added this section and every 5 years thereafter, commence a proceeding and, in consultation with MAE, MDEQ, and other interested parties, do all the following as part of the proceeding:~~

~~(a) Conduct an assessment of the potential for EWR in this state, based on what is economically and technologically feasible, as well as what is reasonably achievable.~~

~~(b) Conduct an assessment for the use of demand response programs in this state, based on what is economically and technologically feasible, as well as what is reasonably achievable. The assessment shall expressly account for advanced metering infrastructure that has already been installed in this state and seek to fully maximize potential benefits to ratepayers in lowering utility bills.~~

~~(c) Identify significant state or federal environmental regulations, laws, or rules and how each regulation, law, or rule would affect electric utilities in this state.~~

~~(d) Identify any formally proposed state or federal environmental regulation, law, or rule that has been published in the Michigan Register or the Federal Register and how the proposed regulation, law, or rule would affect electric utilities in this state.~~

~~(e) Identify any required planning reserve margins and LCRs in areas of this state.~~

~~(f) Establish the modeling scenarios and assumptions each electric utility should include in addition to its own scenarios and assumptions in~~

developing its IRP filed under subsection (3), including, but not limited to, all of the following:

(i) Any required planning reserve margins and LCRs.

(ii) All applicable state and federal environmental regulations, laws, and rules identified in this subsection.

(iii) Any supply-side and demand-side resources that reasonably could address any need for additional generation capacity, including, but not limited to, the type of generation technology for any proposed generation facility, projected EWR savings, and projected load management and DR savings.

(iv) Any regional infrastructure limitations in this state.

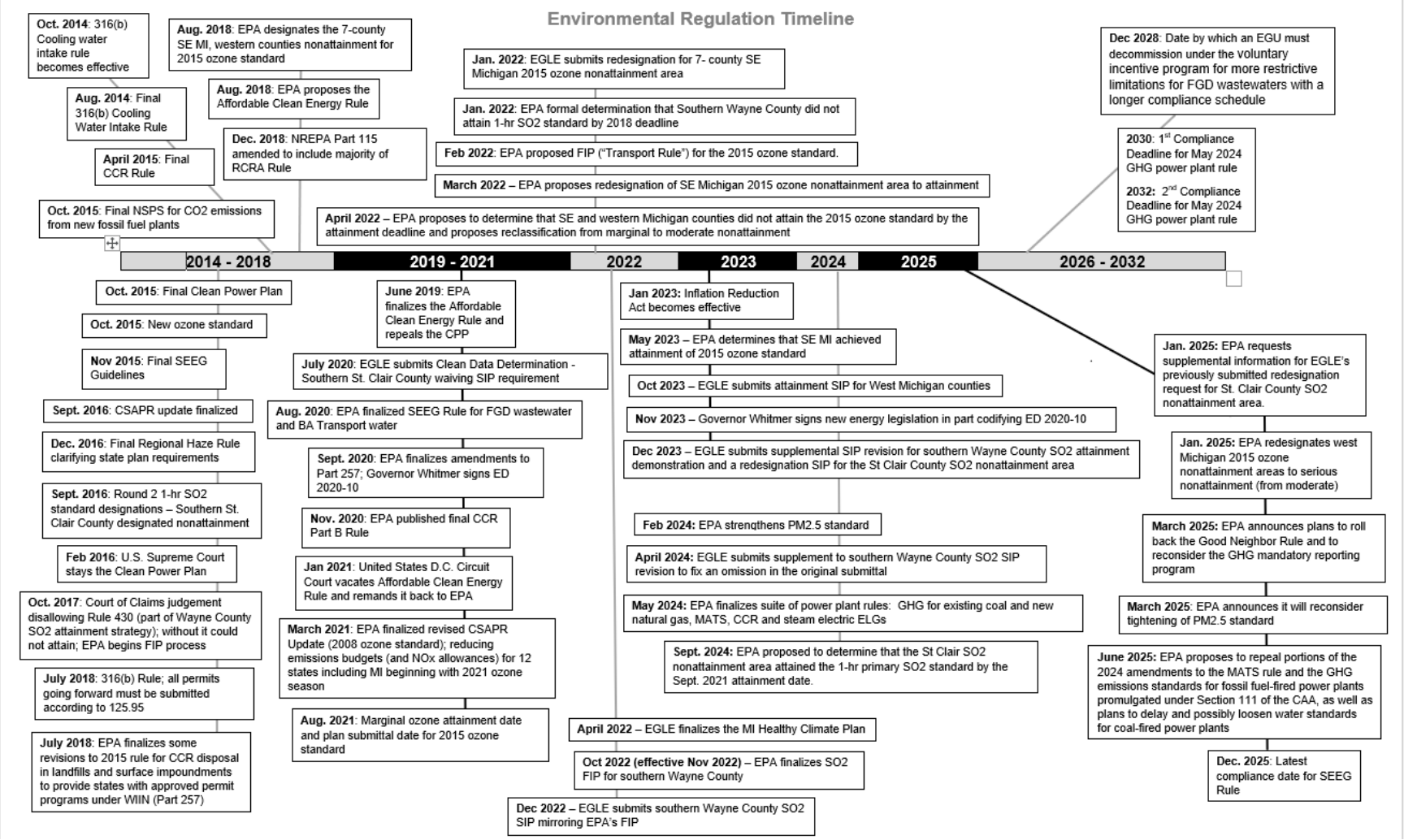
(v) The projected costs of different types of fuel used for electric generation.

(g) Allow other state agencies to provide input regarding any other regulatory requirements that should be included in modeling scenarios or assumptions.

(h) Publish a copy of the proposed modeling scenarios and assumptions to be used in IRPs on the Commission's website.

(i) Before issuing the final modeling scenarios and assumptions each electric utility should includein developing its IRP, receive written comments and hold hearings to solicit public input regarding the proposed modeling scenarios and assumptions.

Appendix E: Environmental Regulatory Timeline



Appendix F: Acronyms

ACE: Affordable Clean Energy

AEO: Annual Energy Outlook

BA: Bottom Ash

BART: Best Available Retrofit Technology

BTA: Best Technology Available

BTM: Behind the Meter

CAA: Clean Air Act

CCR: Coal Combustion Residual

CDD: Clean Data Determination

CHP: Combined Heat and Power

CON: Certificate of Necessity

CO_2: Carbon Dioxide

CPP: Clean Power Plan

CSAPR: Cross-State Air Pollution Rule

DR: Demand Response

DSMSim™: Demand Side Management Simulator

EGLE: Department of Environment, Great Lakes, and Energy

EGU: Electric Generating Units

EIA: Energy Information Administration

ELG: Effluent Limitation Guidelines

EWR: Energy Waste Reduction

EV: Electric Vehicle

FGD: Flue Gas Desulfurization

FIP: Federal Implementation Plan

Appendix F: Acronyms

GIA: Generator Interconnection Agreement

HAP: Hazardous Air Pollutants

HVDC: High Voltage Direct Current

IRP: Integrated Resource Plan

LCR: Local Clearing Requirement

LOLE: Loss of Load Expectation

LRZ: Local Resource Zones or Zones

MACT: Maximum Achievable Control Technology Standards

MAE: Michigan Agency for Energy

MATS: Mercury and Air Toxic Standards

MDEQ: Michigan Department of Environmental Quality

MEPA: Michigan Environmental Protection Act

MIRPP: Michigan Integrated Resource Planning Parameters

MISO: Midcontinent Independent System Operator

MMR: Michigan Mercury Rule

MPSC: Michigan Public Service Commission or Commission

MW: Megawatts

MWh: Megawatt Hour

NAAQS: National Ambient Air Quality Standards

NO_x: Nitrogen Oxide

NPDES: National Pollutant Discharge Elimination System

NPVRR: Net Present Value Revenue Requirement

NREL: National Renewable Energy Laboratory

NREPA: Natura Resources and Environmental Protection Act

Appendix F: Acronyms

NSPS: New Source Performance Standards

PA: Public Act

Ppb: Parts per Billion

PURPA: Public Utility Regulatory Policies Act

PV: Photovoltaic

QF: Qualifying Facility

RCRA: Resource Conservation and Recovery Act

RICE: Reciprocating Internal Combustion Engine

RTO: Regional Transmission Organization

SEEG: Steam Electric Effluent Guidelines

SIP: State Implementation Plan

SO_2: Sulfur Dioxide

SRM: State Reliability Mechanism

UCT: Utility Cost Test

USEPA: United States Environmental Protection Agency

USWAG: Utility Solid Waste Activities Group

VAR: Volt- Amp Reactive

WIIN: Water Infrastructure Improvements for the Nation

Appendix G: Minimum Scenario and Sensitivities Required for Retirement Analysis

	Build Plans					
	PCA	Utility Alternative	Previous **Approved** IRP PCA **Retirement Dates**	Retirement Decision A	Retirement Decision B	Retirement Decision C
Scenario #1 (required)						
Base Scenario	X	X	X	X	X	X
1. High Gas Price	X	X		X	X	X
2. Renewable Constraints	X	X		X	X	X
3. 2.5% EWR	X	X		~~X~~	~~X~~	~~X~~
4. Hydrogen Policy	X	X				
5. Offshore Wind Policy	X	X				
6. Nuclear Policy	X	X				
Scenario #2 (or utility replacement)						
Base Scenario	X	X	X	X	X	X
1. High Gas Price	X	X		X	X	X
2. a. High Load Growth	X	X		X	X	X
2. b. Low Load Growth	X	X				
3. 2.~~0~~**17**% EWR	X	X		~~X~~	~~X~~	~~X~~

The intent of this matrix is to allow for a robust comparison of the final PCA, any utility proposed alternative, and retirement decisions across many futures. The matrix will provide an understanding of how the proposed build plans will respond in when forced into the two scenarios and sensitivities. Additionally, this matrix is intended to illustrate the utility's retirement decision is the most reasonable and allow for each retirement decision to be evaluated independently and collectively to the extent that the utility chooses to include the retirement in its PCA.

This matrix is designed to show the minimum scenarios and sensitivities that a final PCA, utility proposed alternative, and retirement decision should be evaluated. The scenario number and sensitivity number correspond to the MIRPP scenarios and sensitivities detailed in this document. The retirement decisions identified as Retirement Evaluation A, B, C above is meant to represent the different retirement decisions a utility may be evaluating within the IRP. For example, if a utility proposes a retirement be included in the PCA, the evaluation of that decision would be the opposite, i.e. the build plan without the retirement.

Notes:

1. **Utility Alternative is only necessary to the extent that the utility is proposing an alternative to its PCA in its filing.**
2. **For the previously approved IRP Retirement Date runs The previously approved PCA retirement dates should be fixed in the model and the model allowed to reoptimize for the optimal resources. This is done to isolate the effect that changes in retirement date have on the overall build plan when compared with previously approved retirement dates.**