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March 31, 2020

Electronic Mail

Ms. Lisa Felice
Executive Secretary
Michigan Public Service Commission
7109 West Saginaw Highway
P.O. Box 30221
Lansing, MI 48909

RE: MPSC Case No. U-20220 – In the matter of the application of CONSUMERS ENERGY COMPANY for the reconciliation of its power supply cost recovery plan (Case No. U-20219) for the 12-months ended December 31, 2019.

Dear Ms. Felice:

Included in this electronic file are **Consumers Energy Company's Application and the Direct Testimony and Exhibits of Consumers Energy Company's witnesses Joshua W. Hahn, Norman J. Kapala, Stephen J. Nadeau, Hannah L. Patton, Jenny L. Rickard, Angela K. Rissman, Raymond T. Scaife, Keith G. Troyer, and Emily J. Warners**. This is a paperless filing and is therefore being filed only in a PDF format. Also included is a Proof of Service reflecting service on the parties to Case No. U-20219.

Sincerely,

Digitally signed by
Gary A. Gensch, Jr.
Date: 2020.03.31
13:59:49 -04'00'

Gary A. Gensch, Jr.

cc: Parties per Attachment 1 to Proof of Service.

STATE OF MICHIGAN

BEFORE THE MICHIGAN PUBLIC SERVICE COMMISSION

In the matter of the application of **CONSUMERS ENERGY COMPANY** for reconciliation of its power supply cost recovery plan (Case No. U-20219) for the 12 months ended December 31, 2019.	))))))	Case No. U-20220

APPLICATION

Consumers Energy Company ("Consumers Energy" or the "Company"), pursuant to 1982 PA 304 ("Act 304"), MCL 460.6j, as amended, and other applicable laws, orders, and regulations, applies for approval of its Power Supply Cost Recovery ("PSCR") reconciliation for the period January 2019 through December 2019 and for other relief as stated herein. In support of this Application, Consumers Energy states as follows:

1. Consumers Energy is a public utility engaged in, among other things, the generation, purchase, distribution, and sale of electric energy to approximately 1.8 million retail electric customers in the lower peninsula of the state of Michigan.

2. Consumers Energy's retail electric business is subject to the jurisdiction of the Michigan Public Service Commission ("MPSC" or the "Commission") pursuant to the provisions of 1939 PA 3, as amended by various acts, including Act 304 and other applicable law.

3. Pursuant to Section 6j of Act 304, MCL 460.6j, on September 28, 2018, Consumers Energy filed an Application with the Commission in Case No. U-20219 for approval of a PSCR Plan and PSCR factors for the 12-month period ending December 31, 2019. The Commission has not yet issued a final order in that matter.

4. Consumers Energy requests that the Commission commence a PSCR reconciliation proceeding pursuant to Section 6j(12) of Act 304, MCL 460.6j(12), for the 12-month period ending December 31, 2019.

5. Concurrently with the filing of this Application, Consumers Energy is filing testimony and exhibits in support of its requested reconciliation of PSCR costs and revenues for the 12-month period ending December 31, 2019. The Company's 2019 power supply costs are presented in the testimony and exhibits of Company witnesses Angela K. Rissman, Hannah L. Patton, Norman J. Kapala, Raymond T. Scaife, Keith G. Troyer, Jenny L. Rickard, Joshua W. Hahn, Stephen J. Nadeau, and Emily J. Warners. The relief described in the testimony and exhibits should be considered as if specifically requested in this Application. The Company's filing includes a record of any monthly overrecovery and underrecovery amounts, as well as details concerning PSCR costs, revenues, and amounts subject to refund. Attachment 1 to this Application contains a list of prefiled exhibits.

6. During the 12-month period ending December 31, 2019, Consumers Energy incurred PSCR costs of approximately $1.9 billion. Consumers Energy has calculated a year-end overrecovery of approximately $20.91 million. That, combined with the $1.5 million overrecovery from the 2018 PSCR year, yields a cumulative overrecovery of $22.41 million. Accrued interest owed by Consumers Energy to customers for the 2019 PSCR period, pursuant to Act 304, is $1.92 million.

WHEREFORE, Consumers Energy Company respectfully requests that the Michigan Public Service Commission:

A. Issue a Notice of Hearing of the commencement of this PSCR Reconciliation proceeding;

B. Approve the January 2019 through December 2019 PSCR Reconciliation as presented in Consumers Energy's testimony and exhibits in this filing;

C. Approve Consumers Energy's proposed methodology for rolling-in the total net overrecovery; and

D. Grant Consumers Energy such other and further relief as is lawful and appropriate.

Respectfully submitted,

CONSUMERS ENERGY COMPANY

Digitally signed by Timothy J. Sparks
Date: 2020.03.31 14:02:32 -04'00'

Dated: March 31, 2020 By:_____

Timothy J. Sparks
Vice President of Electric Grid Integration
Consumers Energy Company

Digitally signed by Gary A. Gensch, Jr.
Date: 2020.03.31 14:05:08 -04'00'

_____

Robert W. Beach (P73112)
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STATE OF MICHIGAN

BEFORE THE MICHIGAN PUBLIC SERVICE COMMISSION

In the matter of the application of **CONSUMERS ENERGY COMPANY** for reconciliation of its power supply cost recovery plan (Case No. U-20219) for the 12 months ended December 31, 2019.	))))))	Case No. U-20220

VERIFICATION

Timothy J. Sparks, being first duly sworn, deposes and says that he is the Vice President of Electric Grid Integration of Consumers Energy Company; that he has executed the foregoing Application for, and on behalf of, Consumers Energy Company; that he has read the foregoing Application and is familiar with the contents thereof; that the facts contained therein are true, to the best of his knowledge and belief; and that he is duly authorized to execute such Application on behalf of Consumers Energy Company.

Digitally signed by
Timothy J. Sparks
Date: 2020.03.31
14:07:23 -04'00'

Dated: March 31, 2020

Timothy J. Sparks
Vice President of Electric Grid Integration
Consumers Energy Company

PREFILED EXHIBITS

Exhibit of Joshua W. Hahn

Exhibit A-1 (JWH-1)	Forecasted and Actual Generation Requirements and Purchased and Interchange Expense – 2019;
Exhibit A-2 (JWH-2)	2019 Expense and Revenue Resulting from Congestion, FTR, and ARR Transactions; and
Exhibit A-3 (JWH-3)	Ludington Lost MWh

Exhibits of Norman J. Kapala

Exhibit A-4 (NJK-1)	Event Summary Report, January 2019 to December 2019;
Exhibit A-5 (NJK-2)	Event Identification – Outages;
Exhibit A-6 (NJK-3)	Periodic Outage Reports;
Exhibit A-7 (NJK-4)	2019 Fossil and Pumped Storage Outages Occurring for Twenty-Eight Days or More;
Exhibit A-8 (NJK-5)	Generation Performance Statistics (January 1, 2019 to December 31, 2019);
Exhibit A-9 (NJK-6)	Comparison of Consumers Energy and GADS Averages for Similar Units Equivalent Availability;
Exhibit A-10 (NJK-7)	2019 Base Load Generation Power Plant Cost Efficiency; and
Exhibit A-11 (NKJ-8)	2019 Chemical Reagent Expense.

Exhibit of Stephen J. Nadeau

Exhibit A-12 (SJN-1)	Comparison of 2019 As-Burned Costs of Oil & Gas.

Exhibits of Hannah L. Patton

Exhibit A-13 (HLP-1)	2019 Power Supply Cost Recovery Reconciliation; and
Exhibit A-14 (HLP-2)	PSCR Interest Calculation – 2019.

Exhibits of Angela K. Rissman

Exhibit A-15 (AKR-1)	2019 Coal Receipts – Plan and Actual; and
Exhibit A-16 (AKR-2)	Comparison of 2019 As-Burned Cost of Fuel.

Exhibit of Raymond T. Scaife

Exhibit A-17 (RTS-1)	2019 – Summary of MISO Market and Tariff Administration Charges/(Credits) Settlement; and
Exhibit A-18 (RTS-2)	2019 – Energy Sales Revenue Net of Fuel Cost.

Exhibits of Keith G. Troyer

Exhibit A-19 (KGT-1)	Purchased, Interchanged, and Renewable Power Transactions;
Exhibit A-20 (KGT-2)	2019 Interchange Delivered by Counterparties to MISO;
Exhibit A-21 (KGT-3)	Purchased Power and Cogeneration – Energy and Expense - Total 2019; and
Exhibit A-22 (KGT-4)	Purchased Power Contract Rates and MPSC Approval Orders – Total 2019.

Exhibit of Emily J. Warners

Exhibit A-23 (EJW-1)	PA 295 Purchased Power and New Build Renewables – 2019.

STATE OF MICHIGAN

BEFORE THE MICHIGAN PUBLIC SERVICE COMMISSION

In the matter of the application of **CONSUMERS ENERGY COMPANY** for reconciliation of its power supply cost recovery plan (Case No. U-20219) for the 12 months ended December 31, 2019.	))))))	Case No. U-20220

DIRECT TESTIMONY

OF

JOSHUA W. HAHN

ON BEHALF OF

CONSUMERS ENERGY COMPANY

March 2020

Q. Please state your name and business address.

A. My name is Joshua W. Hahn, and my business address is 1945 West Parnall Road, Jackson, Michigan 49201.

Q. By whom are you employed?

A. I am employed by Consumers Energy Company ("Consumers Energy" or the "Company").

Q. In what capacity are you employed?

A. I am a Senior Engineer in the Electric Sourcing and Resource Planning Section of the Electric Supply Department.

Qualifications

Q. Please describe your educational background.

A. I received a Bachelor of Science Degree in Mechanical Engineering in 2008 from Michigan Technological University.

Q. Please describe your business and professional experience.

A. I joined the Company's Transactions and Resource Planning Department in January 2010. I was responsible for analysis of Financial Transmission Rights ("FTR") and acquisition of FTRs through monthly and annual allocations and auctions as well as maintaining the Company's short-term load and market price models using Metrix IDR. In June 2012, I assumed primary responsibilities for the maintenance of the PROMOD IV Full Transmission production cost model. In January 2013, I began working closely with the Company's subject matter expert witness on fuel, purchased and net interchange power, and expense forecasting. By June 2013, I assumed primary responsibilities for the maintenance of the PROMOD IV production cost model and all analysis developed using

the tool. I served in this role on a temporary basis for a total of nine months. Later, in June 2015, I was again assigned responsibility to maintain the model and perform all analysis developed using PROMOD IV. Effective June 2015, my primary responsibilities have been directly tied to PROMOD IV modeling. I have supported all model development, as well as providing support for development of testimony and exhibits filed with the Michigan Public Service Commission ("MPSC" or the "Commission").

Q. What are your present responsibilities and duties as a Senior Engineer?

A. I am responsible for modeling and analysis of fuel and purchased and net interchange power costs that are used in developing the Power Supply Cost Recovery ("PSCR") Plan and updating the PSCR factor. Additionally, I am responsible for generation unit outage analysis and related matters.

Q. Have you provided testimony before the Commission?

A. Yes. I provided testimony in the following MPSC cases:

- U-17918-R, the Company's 2016 PSCR Reconciliation case;
- U-18402, the Company's 2018 PSCR Plan case;
- U-20068, the Company's 2017 PSCR Reconciliation case;
- U-20219, the Company's 2019 PSCR Plan case;
- U-20202, the Company's 2018 PSCR Reconciliation case; and
- U-20525, the Company's 2020 PSCR Plan case.

Q. What is the purpose of your direct testimony?

A. My direct testimony will address the projected costs in the Company's 2019 PSCR Plan Case, Case No. U-20219, and the actual generation requirements and purchased and

interchange expenses incurred by the Company in 2019. My direct testimony also describes the costs and revenues associated with the Company's participation in the Midcontinent Independent System Operator, Inc.'s ("MISO's") FTR and Auction Revenue Rights ("ARR") markets. In addition, I will support the calculations of lost MWh for the Ludington Pumped Store Plant ("Ludington") Units.

Q. Are you sponsoring any exhibits?

A. Yes. I am sponsoring the following exhibits:

Exhibit A-1 (JWH-1)	Forecasted and Actual Generation Requirements and Purchased and Interchange Expense - 2019.
Exhibit A-2 (JWH-2)	2019 Expense and Revenue Resulting from Congestion, FTR and ARR Transactions; and
Exhibit A-3 (JWH-3)	Ludington Lost MWh.

Q. Were these exhibits created by you?

A. Yes.

Forecasted and Actual Generation Requirements and Purchased and Interchange Expense

Q. Please describe Exhibit A-1 (JWH-1).

A. Exhibit A-1 (JWH-1) shows the forecasted amount of electric energy (measured in MWh) generated and purchased, as presented in the Company's 2019 PSCR Plan in Case No. U-20219, the actual amounts of electric energy generated and purchased in 2019 and the variance of actual from the plan. This exhibit also shows the Purchased and Net Interchange Power costs as forecasted in the 2019 PSCR Plan case, the actual 2019 Purchased and Net Interchange Power costs, and the variance of actual from the plan.

Q. How did the total amount of electric energy required to serve PSCR customers in 2019 vary from the Company's 2019 PSCR Plan?

A. The total amount of electric energy required to service customers in 2019 was 3.1% lower than forecasted, as is shown on Exhibit A-1 (JWH-1), line 14, column (d).

Q. Please explain the reasons for the major increases or decreases in generation, by category, shown on Exhibit A-1 (JWH-1), lines 1 through 13.

A. The actual Steam Coal generation shown on Exhibit A-1 (JWH-1), line 1, is 2.36% lower than planned. The actual Gas and Oil generation shown on Exhibit A-1 (JWH-1), line 2, is 1.38% higher than planned. The actual Combustion Turbine ("Peaker") generation shown on Exhibit A-1 (JWH-1), line 5, is 60.3% lower than planned primarily due to decreased utilization of the Zeeland Peaker units. Actual utilization of the Ludington Pumped Storage facility, shown on Exhibit A-1 (JWH-1), lines 6 and 8, was lower than planned primarily due to a smaller than projected spread between on-peak and off-peak energy market prices. The actual Interchange Received energy from the Energy Market operated by MISO, shown on Exhibit A-1 (JWH-1), line 12, is 0.94% higher than planned. The actual Interchange Delivered energy, shown on Exhibit A-1 (JWH-1), line 13, is 53.53% higher than planned due to lower than forecasted demand coupled with higher than forecasted purchased power from Non-Utility Generators ("NUGs").

Q. Please explain the reasons for the major increases or decreases in purchased and interchange power expenses or revenues, by category, shown on Exhibit A-1 (JWH-1), lines 15 through 22.

A. The actual MISO Interchange Received expense shown on Exhibit A-1 (JWH-1), line 17, is 9.11% lower than planned primarily due to lower than forecasted energy market prices

as well as lower cost power purchases from NUGs due mainly to lower than forecasted natural gas prices. The actual expense for the Purchase of Zonal Resource Credits ("ZRCs") is 32.76% lower than planned. The purchase of ZRCs in year 2019 is explained in detail in the direct testimony of Company witness Keith G. Troyer. The actual Transmission Service expense shown on Exhibit A-1 (JWH-1), line 19, is 12.17% lower than planned primarily due to lower peak demand than expected. The actual MISO Interchange Delivered revenue shown on Exhibit A-1 (JWH-1), line 21, is 24.4% higher than planned due to the higher than forecasted Interchange Delivered MWh. The actual revenue for Schedule 2-Reactive Supply shown on Exhibit A-1 (JWH-1), line 22, is 38.18% higher than planned.

FTR and ARR Markets

Q. Did the Company participate in the MISO FTR and ARR Market in 2018?

A. Yes.

Q. Are you familiar with the Commission's August 22, 2006 Order in Case No. U-14701 regarding FTRs?

A. Yes. In that Order, the Commission concurred with the Company's position that the costs and revenues associated with FTRs are to be included in the Company's PSCR plan and reconciliation proceedings at their ultimate settled value. The Commission declined to authorize interim adjustments to the fair value of FTRs as regulatory assets and liabilities for purposes of regulatory reporting to the Commission.

Q. Has the Company included its FTR and ARR costs and revenues in this case consistent with the Commission's August 22, 2006 Order in MPSC Case No. U-14701?

A. Yes. FTR and ARR costs and revenues included in this reconciliation case are based on the settled value of the FTRs. My direct testimony reports on the expenses and revenues for all FTRs and ARRs that were settled for each month of 2019; however, the amount requested for recovery includes only those FTRs for which the settlement was booked in 2019.

Q. Please explain the projected expense associated with the Company's participation in the FTR and ARR market in the Company's 2019 PSCR Plan case, Case No. U-20219.

A. The FTR and ARR expense projected for that case was $253,844 as sponsored by Company witness Daniel S. Alfred. See MPSC Case No. U-20219, Exhibit A-1 (DSA-1), page 1, line 22, Schedule 16 expense.

Q. What was the actual expense the Company incurred as a result of the Company's participation in the FTR and ARR Market in 2019?

A. The Company incurred an actual FTR and ARR expense net of congestion charges of ($67,281), or net revenue of $67,281, as shown in Exhibit A-2 (JWH-2), line 7, column (m).

Q. Was any of the expense shown on Exhibit A-2 (JWH-2), line 7, column (m), incurred in a prior year?

A. Yes, for instance, the Company purchased FTRs for January 2019 in the MISO monthly FTR auction that occurred in December 2018. The costs of those purchases were not

recovered with the Company's 2018 power supply costs but were instead deferred for recovery in the year for which the FTRs applied; which in this case was 2019.

Q. Was any of the expense shown on Exhibit A-2 (JWH-2), line 7, column (m), incurred for FTRs that were applicable in a future year?

A. No.

Q. Do you believe the Company was prudent in its participation in the FTR and ARR Market in 2018?

A. Yes.

<u>Ludington Lost MWh Calculation</u>

Q. Can you describe Exhibit A-3 (JWH-3)?

A. Yes. Exhibit A-3 (JWH-3) presents the Company's calculations of the economic MWh loss for each of the outage events for the Ludington Units during 2019 and supplements Exhibit A-4 (NJK-1). These calculations are being provided pursuant to the Settlement Agreement which was approved in the Commission's June 28, 2018 Order in Case No. U-17918-R. This exhibit provides the outage event number in column (a), the start and end dates of the outage in columns (b) and (c), the duration of the outage in hours in column (d), the potential MWh loss (simple product of the unit's net demonstrated capacity and the duration of the outage) in column (e), and the economic MWh loss in column (f).

Q. What does the economic MWh loss represent?

A. The economical MWh loss reflects the theoretical economic dispatch of the unit given day-ahead energy market prices in each hour.

Q. Does this complete your direct testimony?

A. Yes.

S T A T E O F M I C H I G A N

BEFORE THE MICHIGAN PUBLIC SERVICE COMMISSION

In the matter of the application of **CONSUMERS ENERGY COMPANY** for reconciliation of its power supply cost recovery plan (Case No. U-20219) for the 12 months ended December 31, 2019.	))))))	Case No. U-20220

EXHIBITS OF

OF

JOSHUA W. HAHN

ON BEHALF OF

CONSUMERS ENERGY COMPANY

March 2020

MICHIGAN PUBLIC SERVICE COMMISSION
Consumers Energy Company

Case No.: U-20220
Exhibit No.: A-1 (JWH-1)
Page: 1 of 1
Witness: JWHahn
Date: March 2020

FORECASTED AND ACTUAL GENERATION REQUIREMENTS AND PURCHASED AND INTERCHANGE EXPENSE - 2019

2019 Energy

Line No.	(a) Description	(b) Plan [1] MWh	(c) Actual [2] MWh	(d) Actual vs Plan %
1	Steam Coal	10,012,403	9,775,684	-2.36%
2	Gas & Oil	5,877,853	5,958,984	1.38%
3	Station Power While Off Line	106,718	-	-
4	Owned Renewables [6]	1,114,984	1,137,206	1.99%
5	Combustion Turbine (Peaker)	844,324	335,191	-60.30%
6	Pumped Storage Generation	1,205,757	801,927	-33.49%
7	Total Generated	19,162,039	18,008,992	-6.02%
8	Pumped Storage Pumping	(1,581,969)	(1,109,936)	-29.84%
9	Total Generated Less Pumping	17,580,070	16,899,056	-3.87%
10	Purchased Power (NUG) [4] [6]	9,182,401	9,781,822	6.53%
11	Nuclear PPA	6,872,943	6,946,420	1.07%
12	Interchange Received [5]	4,588,829	4,632,129	0.94%
13	Interchange Delivered	(2,156,028)	(3,310,163)	53.53%
14	Total MWh Requirement	36,068,215	34,949,264	-3.10%

2019 Purchased and Interchange Power Expense/(Revenue)

Line No.	Description	Plan [1] $*1000	Actual [3] $*1000	Actual vs Plan %
15	Purchased Power (Capacity and Energy)	$ 666,646	$ 651,877	-2.22%
16	Nuclear PPA	$ 390,896	$ 394,731	0.98%
17	Interchange Received	$ 136,976	$ 124,496	-9.11%
18	Purchase of Zonal Resource Credits	$ 1,129	$ 759	-32.76%
19	Transmisson Service	$ 443,191	$ 389,268	-12.17%
20	Total Received	$ 1,638,838	$ 1,561,132	-4.74%
21	Interchange Delivered	$ (81,339)	$ (101,182)	24.40%
22	Schedule 2-Reactive Supply Revenue	$ (4,500)	$ (6,218)	38.18%
23	Total Delivered	$ (85,839)	$ (107,400)	25.12%

[1] MPSC Case No. U-20219, Exhibit A-12 (JWH-1), except lines 19 and 22.

Line 19 is from MPSC Case No. U-20219, Exhibit A-1 (DSA-1).

Line 22 is from MPSC Case No. U-20219, Direct Testimony of Company witness Daniel S. Alfred.

[2] General Accounting Department, Production Summary Report, Period Ending 12/31/19, Except lines 10, 11, 12, & 13, which are from Exhibit A-19 (KGT-1).

For comparison to plan purposes:

Line 12 was reduced by the amount shown on Exhibit A-19 (KGT-1), line 10, column (b).

Line 13 was increased by the amount shown on Exhibit A-19 (KGT-1), line 10, column (b).

[3] Exhibit A-19 (KGT-1).

[4] Palisades PPA generation removed from actual purchased power and added to line 11 for comparison to plan purposes.

[5] Cross Winds generation of 472,625 MWh was removed from actual Interchange Received and subscribed portion (116,703 MWh) removed from line 4 for comparison to plan purposes.

[6] Line 4 includes the unsubscribed portion of Solar Gardens.

Line 10 includes the subscribed portion of Solar Gardens.

MICHIGAN PUBLIC SERVICE COMMISSION
Consumers Energy Company

Case No.: U-20220
Exhibit No.: A-2 (JWH-2)
Page: 1 of 1
Witness: JWHahn
Date: March 2020

2019 Expense and Revenue Resulting from Congestion, FTR and ARR Transactions

Line No.		(a) January	(b) February	(c) March	(d) April	(e) May	(f) June	(g) July	(h) August	(i) September	(j) October	(k) November	(l) December	(m) Total
	TOTAL FTR COST													
1	Congestion (revenue)/expense	271,177	753,655	348,490	276,207	585,935	1,142,893	3,058,412	1,253	944,381	477,555	680,186	669,384	9,209,530
2	FTR (revenue)/expense	(134,260)	(451,951)	(34,794)	(124,182)	(164,906)	(795,729)	(1,985,364)	(14,089)	(770,523)	(476,389)	(633,889)	(537,991)	(6,124,066)
3	Auction (revenue)/expense	(17,165)	(13,605)	78,605	86,831	77,315	77,315	52,940	44,713	67,842	24,570	23,043	5,573	507,978
4	Stage 2 (revenue)/expense	(502,100)	(502,101)	(202,571)	(202,571)	(202,571)	(373,191)	(375,093)	(375,093)	(315,693)	(315,674)	(315,674)	(315,674)	(3,998,008)
5	ARR Infeasibility Uplift expense	10,510	10,510	9,947	9,947	9,947	13,533	13,533	13,533	28,925	28,925	28,925	28,925	207,162
6	Schedule 16 expense	9,515	2,510	9,494	15,983	8,682	21,251	12,389	4,641	14,903	10,673	9,208	10,644	129,895
7	Total	(362,322)	(200,755)	209,171	62,216	314,403	86,073	776,818	(325,041)	(30,165)	(250,340)	(208,200)	(139,139)	(67,281)

Ludington Lost MWh

(a)	(b)	(c)	(d)	(e)	(f)
LUDINGTON - LUDINGTON 1					
Event	**Start**	**End**	**Eq Hrs**	**Potential MWh Loss[1]**	**Economic MWh Loss[1]**
1	1/1/2019 0:00	5/21/2019 4:57	3,363.95	1,040,884	25,618
2	5/21/2019 4:57	6/16/2019 8:12	627.25	198,838	12,307
3	6/16/2019 21:22	6/19/2019 8:12	58.83	18,650	0
4	6/19/2019 8:19	6/19/2019 8:45	0.43	137	0
5	6/19/2019 9:15	6/19/2019 9:44	0.48	153	0
6	6/19/2019 10:16	6/19/2019 10:46	0.50	159	0
7	6/19/2019 11:50	6/21/2019 12:24	48.57	15,396	0
16	6/21/2019 21:01	6/22/2019 7:07	10.10	3,202	0
17	6/22/2019 13:38	6/22/2019 14:53	1.25	396	0
18	6/22/2019 15:17	6/24/2019 20:10	52.88	16,764	0
19	6/24/2019 21:36	6/25/2019 20:32	22.93	7,270	0
20	6/25/2019 21:50	6/26/2019 20:11	22.35	7,085	0
21	6/26/2019 21:29	6/26/2019 22:30	1.02	322	0
9	6/28/2019 6:23	6/28/2019 9:40	3.28	1,041	0
22	7/2/2019 8:01	7/2/2019 9:02	1.02	322	0
23	7/10/2019 7:00	7/10/2019 14:08	7.13	2,261	0
71	8/9/2019 7:00	8/9/2019 13:06	6.10	1,934	195
110	9/11/2019 0:55	9/11/2019 8:51	7.93	2,515	0
113	9/12/2019 0:58	9/12/2019 9:41	8.72	2,763	0
114	9/13/2019 1:00	9/13/2019 7:00	6.00	1,902	0
115	9/13/2019 7:00	9/13/2019 13:45	6.75	2,140	152
116	9/16/2019 1:01	9/16/2019 10:04	9.05	2,869	0
125	9/17/2019 1:00	9/17/2019 9:08	8.13	2,578	0
134	9/27/2019 11:44	9/28/2019 13:37	25.88	8,205	152
141	10/6/2019 4:19	10/15/2019 16:19	228.00	72,276	0
148	10/15/2019 16:20	10/19/2019 18:00	97.67	30,960	610
150	10/19/2019 18:00	10/24/2019 14:00	116.00	36,772	4,422
151	10/24/2019 14:46	10/24/2019 15:11	0.42	132	0
178	11/8/2019 11:38	11/8/2019 14:24	2.77	877	0
215	12/6/2019 5:45	12/6/2019 13:45	8.00	2,384	0
240	12/6/2019 13:45	12/6/2019 16:05	2.33	695	0

[1]Potential MWh Loss is the product of Net Demonstrated Capacity of the unit and the duration of the outage. Economic MWh Loss is the theoretical economic dispatch of the unit for the duration of the outage given the energy market prices experienced

Ludington Lost MWh

(a)	(b)	(c)	(d)	(e)	(f)
LUDINGTON - LUDINGTON 2					
Event	**Start**	**End**	**Eq Hrs**	**Potential MWh Loss$_1$**	**Economic MWh Loss$_1$**
1	1/7/2019 7:00	1/7/2019 14:13	7.22	2,504	0
59	2/11/2019 6:15	2/11/2019 14:15	8.00	2,776	0
90	2/11/2019 14:15	2/11/2019 18:05	3.83	1,330	0
119	3/12/2019 18:10	3/12/2019 21:47	3.62	1,382	0
120	3/13/2019 6:00	3/13/2019 14:00	8.00	3,056	0
139	3/13/2019 14:00	3/13/2019 16:40	2.67	1,019	0
140	3/13/2019 16:46	3/13/2019 18:03	1.28	490	0
141	3/25/2019 7:01	3/25/2019 7:31	0.50	191	0
148	3/28/2019 7:03	3/28/2019 11:51	4.80	1,834	0
155	4/7/2019 7:18	4/7/2019 11:59	4.68	1,789	0
193	4/22/2019 7:00	4/22/2019 15:00	8.00	3,056	0
194	4/22/2019 15:00	4/22/2019 15:48	0.80	306	0
208	4/29/2019 12:20	4/29/2019 19:58	7.63	2,916	0
210	4/29/2019 22:37	5/12/2019 11:52	301.25	115,078	3,965
214	5/12/2019 19:16	5/12/2019 21:20	2.07	789	0
216	5/14/2019 10:58	5/14/2019 18:30	7.53	2,878	0
225	5/18/2019 15:10	5/18/2019 16:10	1.00	382	0
226	5/20/2019 6:15	5/21/2019 20:48	38.55	14,726	762
230	5/23/2019 9:00	5/23/2019 12:13	3.22	1,229	0
231	5/24/2019 8:57	5/24/2019 12:40	3.72	1,420	0
242	5/29/2019 1:51	5/29/2019 7:16	5.42	2,069	0
250	5/31/2019 3:20	5/31/2019 11:27	8.12	3,101	0
258	6/10/2019 7:00	6/10/2019 14:09	7.15	2,731	0
261	6/12/2019 8:43	6/12/2019 19:02	10.32	3,941	0
264	6/14/2019 7:35	6/14/2019 19:50	12.25	4,680	0
265	6/15/2019 7:14	6/15/2019 16:05	8.85	3,381	0
266	6/16/2019 17:35	6/16/2019 21:25	3.83	1,464	0
272	6/17/2019 9:00	6/17/2019 12:40	3.67	1,401	0
275	6/19/2019 7:03	6/19/2019 11:52	4.82	1,840	0
278	6/21/2019 12:15	6/21/2019 21:41	9.43	3,604	391
279	6/22/2019 7:00	6/22/2019 14:47	7.78	2,973	0
300	6/22/2019 15:16	6/22/2019 15:55	0.65	248	0
280	6/23/2019 7:12	6/23/2019 12:08	4.93	1,885	0
281	6/23/2019 21:55	6/23/2019 22:40	0.75	287	0
282	6/24/2019 20:00	6/25/2019 0:30	4.50	1,719	0
282	6/25/2019 20:00	6/25/2019 22:51	2.85	1,089	0
285	6/26/2019 20:00	6/26/2019 22:40	2.67	1,019	0
286	6/28/2019 6:23	6/28/2019 9:40	3.28	1,254	0
301	7/2/2019 8:01	7/2/2019 9:02	1.02	388	0
302	7/7/2019 15:37	7/7/2019 17:15	1.63	624	195
333	7/8/2019 21:24	7/8/2019 22:15	0.85	325	0

Ludington Lost MWh

(a)	(b)	(c)	(d)	(e)	(f)
LUDINGTON - LUDINGTON 2 CONTINUED					
Event	**Start**	**End**	**Eq Hrs**	**Potential MWh Loss$_1$**	**Economic MWh Loss$_1$**
325	7/12/2019 7:00	7/12/2019 14:09	7.15	2,731	195
358	8/12/2019 7:07	8/12/2019 14:25	7.30	2,789	586
389	9/9/2019 7:20	9/9/2019 14:37	7.28	2,782	305
392	9/11/2019 0:55	9/11/2019 8:51	7.93	3,031	0
395	9/12/2019 0:59	9/12/2019 9:41	8.70	3,323	0
396	9/13/2019 1:00	9/13/2019 9:30	8.50	3,247	0
397	9/16/2019 1:01	9/16/2019 10:04	9.05	3,457	0
406	9/17/2019 1:00	9/17/2019 9:08	8.13	3,107	0
421	10/6/2019 4:19	10/15/2019 16:19	228.00	87,096	0
428	10/15/2019 16:19	12/6/2019 19:30	1,252.18	473,731	28,363

LUDINGTON - LUDINGTON 3					
Event	**Start**	**End**	**Eq Hrs**	**Potential MWh Loss$_1$**	**Economic MWh Loss$_1$**
2	1/14/2019 6:14	1/14/2019 14:22	8.13	2,562	305
46	2/3/2019 7:00	2/3/2019 15:25	8.42	2,651	0
48	2/12/2019 7:19	2/12/2019 14:33	7.23	2,279	0
99	3/12/2019 18:10	3/12/2019 21:47	3.62	1,197	0
118	3/13/2019 16:46	3/13/2019 18:03	1.28	425	0
116	3/25/2019 7:00	3/25/2019 15:00	8.00	2,648	0
119	3/25/2019 15:00	3/25/2019 16:23	1.38	458	0
127	4/7/2019 7:18	4/7/2019 8:48	1.50	497	0
128	4/7/2019 9:21	4/7/2019 11:59	2.63	872	0
176	4/29/2019 6:20	4/29/2019 16:40	10.33	3,420	0
181	5/13/2019 6:01	1/1/2020 0:00	5,586.98	1,833,667	139,570

Ludington Lost MWh

(a)	(b)	(c)	(d)	(e)	(f)
LUDINGTON - LUDINGTON 4					
Event	**Start**	**End**	**Eq Hrs**	**Potential MWh Loss[1]**	**Economic MWh Loss[1]**
3	1/14/2019 6:13	2/4/2019 19:19	517.10	179,434	5,947
39	2/4/2019 19:49	2/4/2019 19:56	0.12	40	0
72	3/12/2019 18:10	3/12/2019 21:47	3.62	1,382	0
94	3/13/2019 16:46	3/13/2019 18:03	1.28	490	0
92	3/25/2019 7:00	3/25/2019 15:00	8.00	3,056	0
95	3/25/2019 15:00	3/25/2019 16:23	1.38	528	0
106	4/7/2019 7:18	4/7/2019 11:59	4.68	1,789	0
157	4/29/2019 5:37	5/2/2019 11:52	78.25	29,892	2,287
159	5/2/2019 22:05	5/3/2019 7:13	9.13	3,489	0
160	5/7/2019 14:10	5/7/2019 14:40	0.50	191	0
161	5/13/2019 5:33	5/13/2019 13:33	8.00	3,056	762
162	5/13/2019 13:33	5/13/2019 17:30	3.95	1,509	610
210	6/12/2019 7:00	6/12/2019 14:00	7.00	2,674	0
222	6/28/2019 6:23	6/28/2019 18:15	11.87	4,533	781
233	7/2/2019 8:01	7/2/2019 9:02	1.02	388	0
265	7/25/2019 7:00	7/25/2019 14:08	7.13	2,725	0
286	8/14/2019 7:15	8/14/2019 13:59	6.73	2,572	195
308	9/3/2019 7:25	11/4/2019 18:25	1,500.00	573,000	39,190
311	11/4/2019 18:25	12/9/2019 15:30	837.08	314,163	16,469
325	12/9/2019 15:30	12/19/2019 11:30	236.00	83,780	5,032
314	12/19/2019 12:30	12/19/2019 13:02	0.53	189	0
323	12/21/2019 17:57	12/21/2019 18:01	0.07	24	0

Ludington Lost MWh

(a)	(b)	(c)	(d)	(e)	(f)
LUDINGTON - LUDINGTON 5					
Event	**Start**	**End**	**Eq Hrs**	**Potential MWh Loss$_1$**	**Economic MWh Loss$_1$**
3	1/10/2019 7:01	1/10/2019 14:01	7.00	2,443	0
56	2/14/2019 7:00	2/14/2019 14:20	7.33	2,559	0
104	3/12/2019 18:10	3/12/2019 21:47	3.62	1,382	0
124	3/13/2019 16:46	3/13/2019 18:03	1.28	490	0
121	3/25/2019 7:00	3/25/2019 7:40	0.67	255	0
122	3/26/2019 7:19	3/26/2019 14:04	6.75	2,579	0
140	4/7/2019 7:18	4/7/2019 11:59	4.68	1,789	0
142	4/15/2019 7:02	4/18/2019 16:09	81.12	30,987	1,220
180	5/2/2019 23:35	5/3/2019 0:35	1.00	382	0
205	5/16/2019 7:00	5/16/2019 14:13	7.22	2,757	0
207	5/20/2019 23:02	5/21/2019 7:00	7.97	3,043	0
213	5/21/2019 16:15	5/21/2019 19:10	2.92	1,114	0
214	5/22/2019 8:34	5/22/2019 12:46	4.20	1,604	0
241	6/13/2019 7:00	6/13/2019 14:05	7.08	2,706	0
250	6/25/2019 9:52	6/25/2019 11:48	1.93	739	0
251	6/28/2019 6:23	6/28/2019 10:22	3.98	1,522	0
262	7/2/2019 8:01	7/2/2019 9:02	1.02	388	0
263	7/9/2019 11:51	7/9/2019 14:40	2.82	1,076	391
265	7/11/2019 7:00	7/11/2019 14:22	7.37	2,814	0
313	8/9/2019 15:12	8/17/2019 15:10	191.97	73,331	10,157
346	9/12/2019 7:06	9/12/2019 13:36	6.50	2,483	152
366	10/6/2019 4:19	10/15/2019 16:19	228.00	87,096	0
372	10/15/2019 16:19	12/17/2019 9:43	1,506.40	561,665	31,870

Ludington Lost MWh

(a)	(b)	(c)	(d)	(e)	(f)
LUDINGTON - LUDINGTON 6					
Event	**Start**	**End**	**Eq Hrs**	**Potential MWh Loss[1]**	**Economic MWh Loss[1]**
3	1/11/2019 7:00	1/11/2019 13:39	6.65	2,294	762
12	2/15/2019 7:00	2/15/2019 14:08	7.13	2,461	0
16	3/13/2019 22:00	3/19/2019 19:40	141.67	53,975	1,220
17	3/21/2019 11:22	3/21/2019 11:34	0.20	76	0
22	3/25/2019 7:00	3/25/2019 7:40	0.67	254	0
23	3/26/2019 7:19	3/26/2019 16:00	8.68	3,308	0
39	4/2/2019 13:21	4/2/2019 14:23	1.03	394	0
42	4/7/2019 7:18	4/7/2019 11:59	4.68	1,784	0
47	4/17/2019 6:30	4/17/2019 15:37	9.12	3,473	0
91	4/17/2019 15:38	4/17/2019 17:55	2.28	870	0
118	5/22/2019 7:06	5/22/2019 15:00	7.90	3,010	0
119	5/22/2019 15:01	5/24/2019 19:05	52.07	19,837	1,677
140	6/14/2019 7:00	6/14/2019 14:15	7.25	2,762	0
146	6/25/2019 9:52	6/25/2019 11:48	1.93	737	0
147	6/28/2019 6:23	6/28/2019 10:22	3.98	1,518	0
160	7/2/2019 8:01	7/2/2019 9:02	1.02	387	0
161	7/9/2019 23:25	7/10/2019 0:24	0.98	375	0
194	7/24/2019 7:08	7/24/2019 14:12	7.07	2,692	0
218	8/14/2019 15:00	8/14/2019 15:50	0.83	318	0
223	8/16/2019 7:01	8/16/2019 14:08	7.12	2,711	391
225	8/17/2019 14:00	8/17/2019 14:15	0.25	95	195
259	9/16/2019 7:00	9/16/2019 14:04	7.07	2,692	0
274	9/25/2019 23:23	9/26/2019 0:54	1.52	578	0
282	10/6/2019 4:19	10/15/2019 23:59	235.67	89,789	0
288	10/16/2019 0:50	10/16/2019 3:15	2.42	921	0
299	10/23/2019 11:59	10/23/2019 14:45	2.77	1,054	0
327	11/8/2019 5:54	11/8/2019 6:07	0.22	83	0
339	11/15/2019 11:17	11/15/2019 13:11	1.90	724	0
368	12/7/2019 5:41	12/7/2019 9:41	4.00	1,380	0
388	12/13/2019 6:59	12/13/2019 14:59	8.00	2,760	0
391	12/13/2019 14:59	12/13/2019 15:50	0.85	293	0

S T A T E O F M I C H I G A N

BEFORE THE MICHIGAN PUBLIC SERVICE COMMISSION

In the matter of the application of **CONSUMERS ENERGY COMPANY** for reconciliation of its power supply cost recovery plan (Case No. U-20219) for the 12 months ended December 31, 2019.	))))))	Case No. U-20220

DIRECT TESTIMONY

OF

NORMAN J. KAPALA

ON BEHALF OF

CONSUMERS ENERGY COMPANY

March 2020

Q. Please state your name and business address.

A. My name is Norman J. Kapala, and my business address is One Energy Plaza, Jackson, Michigan 49201.

Q. By whom are you employed and in what capacity?

A. I am employed by Consumers Energy Company ("Consumers Energy" or the "Company") as the Executive Director of Coal Generation.

Qualifications

Q. Please describe your educational background.

A. In 1996, I received a Bachelor of Science in Mechanical Engineering from Michigan Technological University. In 2008, I received a Master of Science in Manufacturing Management from Kettering University.

Q. Please describe your business experience.

A. From 1990 to 1994, I served our country as a Rifleman in the United States Marine Corps. In May 1996, I joined Chrysler Corporation and held various positions with progressing levels of responsibility at the Trenton Engine Plant, progressing from a Technical Advisor to Area Manager. In September 2002, I joined Delphi Corporation as a Production supervisor and, in September 2004, progressed to a Senior Manufacturing Engineer. In July 2008, I joined Consumers Energy at the D.E. Karn ("Karn")/J.C. Weadock ("Weadock") Generating Complex and progressed through positions from Senior Engineer to the Site Business Manager. In June 2015, I transferred to the B.C. Cobb ("Cobb") Generating Complex and J.H. Campbell ("Campbell") Generating Complex as the Site Business Manager for both facilities. Following the closure of seven of the Company's

coal-fired units at its Cobb, Weadock, and J.R. Whiting sites in 2016, I was promoted to Executive Director of Coal Generation.

Q. Have you previously sponsored testimony before the Michigan Public Service Commission ("MPSC" or the "Commission")?

A. Yes. I sponsored testimony in the following MPSC cases:

Case No. U-20165	2018 Integrated Resource Plan under MCL 460.6t;
Case No. U-20202	2018 Power Supply Cost Recovery ("PSCR") Reconciliation;
Case No. U-20219	2019 PSCR Plan; and
Case No. U-20525	2020 PSCR Plan.

Purpose of Direct Testimony

Q. What is the purpose of your direct testimony in this proceeding?

A. The purpose of my direct testimony is to:

- Describe the reasonableness and prudence of certain outages experienced in 2019 at the Company's fossil-fueled electric generating units and the Ludington Pumped Storage Plant ("Ludington");
- Explain the expense associated with emission allowances for oxides of nitrogen ("NO_x") and Sulfur Dioxide ("SO_2"); and
- Explain the expense associated with the consumption of urea, aqueous ammonia, lime, and activated carbon.

Q. Are you sponsoring exhibits with your direct testimony?

A. Yes, I am sponsoring the following exhibits:

Exhibit A-4 (NJK-1)	Event Summary Report, January 2019 to December 2019;
Exhibit A-5 (NJK-2)	Event Identification – Outages;
Exhibit A-6 (NJK-3)	Periodic Outage Reports;
Exhibit A-7 (NJK-4)	2019 Fossil and Pumped Storage Outages Occurring for Twenty-Eight Days or More;

Exhibit A-8 (NJK-5)	Generation Performance Statistics (January 1, 2019 to December 31, 2019);
Exhibit A-9 (NJK-6)	Comparison of Consumers Energy and GADS Averages for Similar Units Equivalent Availability;
Exhibit A-10 (NJK-7)	2019 Base Load Generation Power Plant Cost Efficiency; and
Exhibit A-11 (NJK-8)	Chemical Reagent Expense (January 1, 2019 to December 31, 2019).

Q. Were these exhibits prepared by you or under your direction and supervision?

A. Yes.

2019 Outages

Q. Have you provided a listing of all 2019 outages?

A. Yes. The Event Summary Report, Exhibit A-4 (NJK-1), lists all unit outages and trips. The report shows 48 events on the coal units, 169 on the Ludington Units, 41 on the Zeeland Combined Cycle (Units 3, 4, and 5) Plant ("Zeeland") and Jackson Gas Plant ("Jackson"), 62 on Karn Units 3 and 4, 19 on the Zeeland Simple Cycle Units 1 and 2, and 159 on the hydro units. The total number of outage events for the fleet was 498 in 2019.

Exhibit A-4 (NJK-1) provides a description of each event, including the event start time, event end time, cause code[1], duration in equivalent hours, and equivalent MWh. The equivalent MWh calculation assumes that the units would have operated at 100% capacity factor.

[1] Cause codes used are taken from the Data Reporting Instructions of the North American Electric Reliability Corporation Generating Availability Data System. Explanations for the cause codes can be found at: http://www.nerc.com/pa/RAPA/gads/DataReportingInstructions/Appendix_B1_Fossil_Steam_Unit_Cause_Codes.pdf

Q. Has the Company also calculated the lost generation for the Ludington Units in accordance with the Settlement Agreement approved in the Commission's June 28, 2018 Order in Case No. U-17918-R?

A. Yes. Company witness Joshua W. Hahn provides the economic MWh loss calculations for the Ludington Units assuming they were operating and dispatchable and not only based on an assumption of 100% capacity factor. These calculations are presented in Exhibit A-3 (JWH-3).

Q. Would you please define the words "outage," "trip," and "event"?

A. A unit "outage" on a base-load unit is defined as the period from when the circuit breaker opens, separating the unit from the electric system, to when it closes, tying the unit to the electric system and making it available for dispatch, and the unit is not in economic reserve status. A unit "outage" on a cycling or peaking unit is defined as the period from when the Company's Electric Sourcing department releases a unit, making it unavailable, to when the plant reports to Electric Sourcing that the unit is available for service. For the purposes of these definitions, the coal and hydro units are considered base-load units, and the Zeeland, Jackson, and Karn Units 3 and 4 are all considered cycling units. Zeeland Units 1 and 2 are considered peakers.

A "trip" is a unit outage that begins when protective devices automatically separate a unit from the electric system or the operator initiates a manual and immediate separation. This is in contrast to the normal controlled shutdown process where operators may spend several hours slowly reducing pressure and load before separating the unit from the system.

An "event" is a one-line entry on the Event Summary Report. Each line on the Report contains an outage "event." The outage event classification is divided into eight

distinct event types: (i) Planned Outage; (ii) Maintenance Outage; (iii) Planned Outage Extension; (iv) Maintenance Outage Extension; (v) Startup Failure; (vi) Unplanned (Forced) Outage-Immediate; (vii) Unplanned (Forced) Outage – Delayed; and (viii) Unplanned (Forced) Outage-Postponed. Exhibit A-5 (NJK-2) explains the different types of outages shown on Exhibit A-4 (NJK-1).

Q. Have you documented outage occurrences in more detail?

A. Yes. In addition to documenting all of the outages reported on page 3 of this testimony and reflected in Exhibit A-4 (NJK-1), outage information sheets were also prepared for generating units that had lower availability averages than those shown in Generating Availability Data System ("GADS") data discussed later in my direct testimony. The information sheets are provided as Exhibit A-6 (NJK-3). Each sheet contains the same statistical data found on Exhibit A-4 (NJK-1), as well as: (i) an expanded description of the event; (ii) a cause of the event; (iii) the work that was done to correct the root cause for forced outages or the work that was performed during maintenance and periodic outages; (iv) other work, if any, that was performed; (v) a description of work that extended the outage, if any extension occurred; and (vi) why that work was performed.

Additionally, the Company prepared a Periodic Outage, Maintenance Outage, or Forced Outage Information sheet for each of the events lasting 28 days or more on the fossil, pumped storage, peaking, and hydro units shown on Exhibit A-4 (NJK-1).

<u>Fossil, Cycling, and Pumped Storage Outages Planned for 28 Days or More</u>

Q. In Case No. U-20219, how many outages were planned for 28 days or more?

A. My direct testimony and Exhibit A-4 (NJK-1) identified 11 such outages.

Q. Were all 11 outages completed during the plan year?

A. No. Only seven of the planned outages were completed during the plan year.

Q. Please identify which outages were not completed during the plan year and why.

A. The 60-day Campbell Unit 1 outage (scheduled to begin March 06, 2019 and end May 05, 2019) was initially deferred to fall 2019 and ultimately cancelled. Throughout 2019 several maintenance outages were taken during which some of the outage work (i.e., back pass cleaning) was accomplished, other project work was cancelled based upon condition assessments and the balance of the work scope will be accomplished during the 84-day Campell Unit 1 turbine outage scheduled to begin on February 27, 2020;

The 60-day Campbell Unit 2 outage (scheduled to begin September 19, 2019 and end November 18, 2019) was cancelled and the work scope was deferred to future outages; the Distributed Control System ("DCS") and simulator upgrade project was deferred to 2020 and the Selective Catalytic Reduction ("SCR") catalyst management and Pulse Jet Fabric Filter ("PJFF") bag replacement projects were deferred to 2021 based upon condition assessments;

The 60-day Karn Unit 2 outage (scheduled to begin September 28, 2019 and end November 27, 2019) was cancelled because some of the intended scope (i.e., DCS and simulator upgrade project) was accomplished during unplanned outages in 2019 and other work scope (i.e., NO_x analyzer replacement) was deferred to 2020; and

The 72-day Karn Unit 3 outage (scheduled to begin October 1, 2019 and end December 12, 2019) was cancelled because much of the intended scope was accomplished during the 2019 DCS outage which began on January 1, 2019.

Q. Did the Company conduct additional outages of 28 days or more in 2019?

A. Yes. The Company conducted a total of 14 outages that lasted 28 days or more; seven that were planned and discussed in Case No. U-20219 and seven additional outages. All 14 outages are identified in Exhibit A-7 (NJK-4).

Q. Has your review of the outages listed in Exhibit A-7 (NJK-4) led you to a conclusion concerning these outages?

A. Yes. I have concluded that all of the outages listed in Exhibit A-7 (NJK-4) were carefully planned, prudently managed, and free of negligence as to either causation or extension of outage time. Below is a brief summary of each of the outages listed in Exhibit A-7 (NJK-4).

Ludington Unit 1

The Ludington Unit 1 outage began May 21, 2018 and was taken for the overhaul and upgrade of the unit. This was the fifth unit outage of Ludington's multiyear $800 million overhaul and upgrade. The outage was necessary to refurbish and/or upgrade most major components including the water turbine (a.k.a. – runner), wicket gates, generator/pump, pony motor, and stator. The overhaul and upgrade of the unit was originally planned to be completed on May 27, 2019, however, 146 days into 2019 the outage was extended and the unit returned to service on June 26, 2019, 177 days into 2019. The outage was extended due to emergent outage work, including the repair of multiple piping connection leaks in the headcover, the repair of an oil leak on the thrust tub door, and remediation of metal debris discovered in lift oil system for the thrust bearing. The Company provided technical oversight and increased contractor resources to mitigate the outage extension impact. The upgrade resulted in improved efficiency and increased unit capacity by 35 MW.

Karn Unit 4

The Karn Unit 4 outage was scheduled to begin on January 1, 2019 and projected to last 147 days. The outage began on January 1, 2019 and was necessary for the continued replacement of cooling tower structural timbers, remaining stacks, and fan blades. The outage was extended due to the need to perform generator seal oil cleaning, address issues with the ID fan cooling system, and purge and clean the hydrogen purity analyzer system due to oil contamination. The outage lasted 196 days and the unit was returned to service on July 16, 2019.

Karn Unit 3

The Karn Unit 3 outage was scheduled to begin on January 1, 2019 and was projected to last 115 days. The outage began on January 1, 2019 and was necessary for upgrade of the obsolete and unsupported DCS. The outage was extended to address the hydraulic testable dump manifold test failure and make burner deck deluge system repairs. Several weeks of testing and tuning was performed prior to returning the unit to service. The Company engaged the support of the DCS system product representative to expedite the completion of testing and tuning of the new DCS. The outage lasted 141 days and the unit was returned to service on May 22, 2019.

Karn Unit 1

The Karn Unit 1 outage was scheduled to begin on March 14, 2019 and was projected to last 60 days. The outage began on March 22, 2019 and was necessary for boiler inspections, ash pit repairs, and condenser circulating water pump rebuild. The outage lasted only 38 days due to the completion of some work during a February 2019 maintenance outage and the unit was returned to service on April 29, 2019.

Ludington Unit 3

The Ludington Unit 3 outage was scheduled to begin on April 28, 2019 and was projected to last 248 days. The outage began on May 13, 2019 and was the sixth and final unit outage of Ludington's multiyear $800 million overhaul and upgrade. The outage was necessary to refurbish and/or upgrade most all major components including the water turbine (a.k.a. – runner), wicket gates, generator/pump, and stator. The unit remained out of service for the remainder of the year, a total of 233 days.

Karn Unit 4

The Karn Unit 4 outage was scheduled to begin on October 1, 2019 and was projected to take 72 days. The outage began on October 13, 2019 and was necessary for the continued replacement of cooling tower structural timbers, remaining stacks, and fan blades as well as initial project work for the retrofit of the electro-hydraulic controls ("EHCs"). Because the cooling tower and EHC replacement work was planned to continue on January 1, 2020, the outage continued for the remainder of the year, a total duration of 80 days.

Campbell Unit 3

The Campbell Unit 3 outage was scheduled to begin on October 5, 2019 and was projected to take 55 days. The outage began on October 5, 2019 and was necessary for the replacement of the 7A high pressure feedwater heater, replacement of burner primary air tubes, replacement of closed loop cooling heat exchangers, and SCR catalyst management. The outage lasted only 50 days and the unit was returned to service on November 24, 2019.

Karn Unit 1

After filing its 2019 PSCR Plan case, Consumers Energy pulled forward a 45-day Karn Unit 1 periodic outage which was originally scheduled to begin on April 17, 2020. The

outage began on October 29, 2019 and was necessary for the removal of three layers of plugged/deactivated catalyst in the SCR reactor and installation of two new layers of catalyst. Based upon a condition assessment (compliance with NO_x emission rates), an immediate need to perform this environmental compliance work was identified in order to avoid limiting unit operation. The outage lasted 49 days and the unit was returned to service on December 16, 2019.

Karn Unit 2

Karn Unit 2 experienced an unplanned outage due to reheater tube leaks on January 1, 2019. The unit remained off-line while Consumers Energy completed the necessary tube leak repairs. The unit returned to service 34 days later on February 4, 2019.

Karn Unit 2

Karn Unit 2 scheduled a short maintenance outage to begin on April 22, 2019 and conclude on May 14, 2019. The outage was necessary for performance of boiler leak repairs. A maintenance outage extension was taken for deslag of the economizer backpass, ash pit cleaning, and hydrogen cooler repair while the unit was in economic reserve shutdown. The maintenance outage, including the extension, lasted 67 days and the unit was returned to service on June 29, 2019.

Karn Unit 2

Karn Unit 2 experienced an unplanned outage due to superheater leaks on August 1, 2019, requiring removal and replacement of a tube section as well as additional tubing repairs in six areas. On August 16, 2019, prior to returning the unit to service, Karn Unit 2 experienced high carbon monoxide ("CO") in the coal bunkers as a result of smoldering

coal. The unit remained off-line while Consumers Energy remediated the impacts of the event. The unit returned to service on August 30, 2019, a total duration of 29 days.

Ludington Unit 2

The Ludington Unit 2 pond outage was scheduled to begin on October 4, 2019 and was projected to last eight days. The outage began on October 6, 2019 and was necessary for the regulatory inspection of the tailrace and the reservoir. Concurrent unit (Unit 5) inspections identified defects in the discharge ring assembly requiring warranty repair. A planned outage extension was taken to perform welding repairs of the discharge ring and the outage lasted 62 days with the unit returning to service on December 6, 2019.

Ludington Unit 4

After filing its 2019 PSCR Plan case, Consumers Energy deferred a 63-day Ludington Unit 4 periodic outage from 2018 to 2019 to accommodate the change in the sequence of the major unit overhauls. The outage began September 3, 2019 and was necessary for installation of the new #2 generator step-up ("GSU") transformer. A planned outage extension was taken for implementation of the isophase bus upgrade from the GSU to the main transformer bank. With the exception of post maintenance testing, the planned outage extension was completed on December 9, 2019, at which time the unit entered an unplanned outage to make stay vane warranty repairs. Post maintenance testing for the isophase bus upgrade was performed subsequent to the unplanned outage and the unit returned to service on December 20, 2019, 107 days after onset of the planned outage.

Ludington Unit 5

The Ludington Unit 5 pond outage was scheduled to begin on October 4, 2019 and was projected to last 8 days. The outage began on October 6, 2019 and was necessary for the

regulatory inspection of the tailrace and the reservoir. Concurrent unit (Unit 2) inspections identified defects in the discharge ring assembly requiring warranty repairs. A planned outage extension was taken to perform welding repairs of the discharge ring and the outage lasted 72 days with the unit returning to service on December 17, 2019.

Q. Have you reviewed the peaker and hydro unit outages?

A. Yes. I reviewed the events for each peaker and hydro unit shown on the Event Summary Report, Exhibit A-4 (NJK-1). There were no peaker outages greater than 28 days.

River hydro outages greater than 28 days are summarized in the table below:

Line No.	Hydro Unit	Actual Days in 2019	Event Number(s)
1	Allegan 3	195	1-2
2	Cooke 2	177	3-4
3	Croton 2	107	1
4	Croton 3	51	3
5	Croton 3	62	5
6	Croton 4	365	1
7	Five Channels 1	36	8-9
8	Hardy 1	123	4, 7-8
9	Hardy 2	32	1-2
10	MIO 1	*14	1
11	Rogers 1	60	1
12	Rogers 1	106	3-4, 8-10
13	Rogers 2	105	4-5
14	Rogers 3	352	1-6
15	Rogers 4	215	2-4
16	Webber 1	29	6
17	Webber 2	183	1

* Outage was extended from 2018 with a total duration of 51 days

My review of these events and the additional information provided on Exhibit A-6 (NJK-3) leads me to conclude that those outages were conducted in a prudent manner.

Outages with a Duration of Less Than 28 Days

Q. How many periodic outages less than 28 days but greater than one day in length occurred on the fossil and Ludington Units in 2019?

A. As shown on Exhibit A-4 (NJK-1), 8 short periodic (planned) outages occurred on the fossil and Ludington Units in 2019.

Q. What was the purpose of these periodic outages?

A. In general, the purpose of these outages was to perform preventative maintenance activities on equipment that has been assessed as being non-functional or more than one to two years without preventative or corrective maintenance.

Availability

Q. Please discuss the Company's 2019 generation unit availability.

A. The Company's 2019 generation unit availability data is shown on Exhibit A-8 (NJK-5). The Company's Total Fossil MWh availability increased from 64.19% in 2018 (see Case No. U-20202, Exhibit A-6 (NJK-5), line 10, column (c)) to 79.71% in 2019 (see Exhibit A-8 (NJK-5), line 11, column (c)), due to increases in MWh availability at Campbell Unit 1, Zeeland, and Jackson. The increase in MWh availability for these generating units, coupled with continued strong MWh availability from Campbell Unit 3, provided a significant amount of customer benefit in 2019. The Company quantifies this customer benefit through Net Energy Value ("NEV"). At a high level, the NEV of a generating unit is the difference between the market value of energy and the cost of producing and supplying that energy. Despite the softer Midcontinent Independent System Operator, Inc. ("MISO") energy market in 2019, in which the average day ahead Location Marginal Price

was almost $6/MWh lower than 2018, the Company's estimated 2019 NEV was $99.6 million[2], an amount which is directly attributable to MWh availability.

The Company's 2019 base load fossil MWh availability decreased slightly from 69.85% in 2018 (see Case No. U-20202, Exhibit A-6 (NJK-5), line 11, column (c)) to 68.71% in 2019 (see Exhibit A-8 (NJK-5), line 12, column (c)), due to decreases in MWh availability at Campbell Unit 3 and Karn Unit 1. The cause of the slight decrease in MWh availability at Campbell Unit 3 was the completion of a periodic outage in the fall of 2019, as I have already discussed in this testimony. The cause of the decrease in MWh availability at Karn Unit 1 was the completion of an outage in the fall of 2019 (pulled forward from 2020), as I have already discussed in this testimony.

Comparison to GADS Data

Q. Did you compare the availability of the Company's base load fossil units to GADS data?

A. Yes. I compared the availability of the Company's base load fossil units to both the 2018 and 2014 through 2018 GADS data for comparable sized and fueled units. The results are shown on my Exhibit A-9 (NJK-6). The availability of Campbell Units 1 and 3 were higher than both the one-year and the five-year GADS average. The availability of Campbell Unit 2 and Karn Units 1 and 2 were below both the one-year and five-year comparisons.

Q. Please explain the outages that contributed to lower than average availability on a MWh basis.

A. Campbell Unit 2 experienced a total of seven outages during 2019: six maintenance and one unplanned. The maintenance outages were taken to clean ash out of the secondary

[2] The NEV calculation is based upon S-55 MISO settlement statements through operating day December 31, 2019.

superheater, clean the backpass, repair boiler tube leaks, make air preheater 2A repairs, make turbine trip block diaphragm repairs, and perform turbine over-speed testing. The unplanned outage was the result of a hydraulic coupling lube oil cooler oil leak caused by a failed cooler tube bundle due to cyclic fatigue.

Karn Unit 1 experienced fifteen outages during 2019: two planned, four maintenance, and nine unplanned. The planned outages were taken for ash pit repairs and catalyst replacement, as discussed previously in this testimony. The four maintenance outages were taken to repair boiler tube leaks, complete pendant clip welding, repair a steam leak on the boiler circulating water pump piping, and replace the fuel handling C&D coal chutes. The nine unplanned outages were taken for unit trips due to high turbine back pressure, boiler inspection for certification, boiler tube leaks, deionization water line failure, turbine bearing vibration, and turbine trip.

Karn Unit 2 experienced 18 outages during 2019: two maintenance and 16 unplanned. The two maintenance outages were taken to repair boiler leaks and perform ash pit cleaning and deslag of the economizer backpass, as previously discussed in this testimony. The 16 unplanned outages were taken for various reasons including reheater and superheater tube leaks, bushing potential device main transformer failure, high CO in the coal bunkers, air preheater coupling failures, superheat drain line leaks, hydrogen seal oil pump coupling failure, hydrogen vent valve misalignment, boiler feed pump cooling oil contamination, throttle valve leakage, turbine lube oil contamination, breaker mis-operation, and high turbine differential expansion.

Q. Did you review all of the outages shown on Exhibit A-4 (NJK-1)?

A. Yes. I reviewed all the base load fossil and pumped storage outages that lasted longer than 24 hours.

Q. In your opinion, did Consumers Energy act in a reasonable and prudent manner in connection with the outages you reviewed on Exhibit A-4 (NJK-1)?

A. Yes.

NO_x Allowance Expenses

Q. Did Consumers Energy forecast NO_x expenses in the 2019 PSCR Plan case?

A. No. Consumers Energy did not forecast NO_x expenses in the 2019 PSCR Plan case because SCRs were installed and have significantly reduced NO_x emissions and the need to purchase allowances. The SCRs were installed to comply with the Clean Air Interstate Rule ("CAIR"), which was replaced by the Cross-State Air Pollution Rule ("CSAPR"). CSAPR is a cap and trade rule much like CAIR. CSAPR governs the emission of SO_2 and NO_x from fossil-fueled electric generating units through the use of an allowance based "cap and trade" program. Under CSAPR, NO_x is regulated on both an annual basis and during the ozone season (May through September). Each allowance (annual or seasonal) permits the emission of one ton of NO_x, with the emissions cap and number of allocated allowances decreasing over time. SO_2 is regulated on an annual basis only, with the emissions cap decreasing over time. Phase I of CSAPR took effect on January 1, 2015 and Phase II became effective on January 1, 2017. No allowance purchases were required for either the annual or seasonal requirements and there were no expenses associated with the allowances allocated by the Michigan Department of Environment, Great Lakes and Energy.

Q. Did Consumers Energy receive revenue credits in 2019 related to the sale of NO_x allowances?

A. No. The Company did not sell NO_x emission allowances in 2019. However, the Company did incur expenses during 2019 associated with the 2018 sale of both annual and ozone NO_x emission allowances associated with Campbell Unit 3. The expense resulted from the Company's sharing of the 2018 proceeds with Michigan Public Power Agency and Wolverine Power Supply Cooperative, partial owners of Campbell Unit 3.

Q. Are the actual expenses (for the sale of 2018 allowances) and credits for NO_x contained in Consumers Energy's 2019 PSCR Reconciliation?

A. Yes. Company witness Hannah L. Patton includes the actual NO_x expenses in Exhibit A-13 (HLP-1).

SO_2 Allowance Expenses

Q. Did Consumers Energy incur expenses or receive revenue credits in 2019 related to the SO_2 Allowance Program?

A. Yes. Although the Company did not sell SO_2 emission allowances out of its inventory in 2019, it did receive revenue for a portion of the Company-allocated SO_2 emission allowances during the annual US Environmental Protection Agency auction.

Q. Are the actual expenses and credits for SO_2 contained in Consumers Energy's 2019 Reconciliation?

A. Yes. Company witness Patton includes the actual SO_2 expenses and credits in Exhibit A-13 (HLP-1).

Urea Expenses

Q. What was Consumers Energy's estimate of urea expenses for the 2019 PSCR Plan case?

A. Consumers Energy projected the cost of urea for 2019 to be $2.284 million as reflected on Exhibit A-11 (NJK-8), line 7, column (b), based on projected generation and SCR operations at the Campbell Complex for Campbell Units 2 and 3.

Q. What were the actual urea expenses?

A. As reflected on Exhibit A-11 (NJK-8), line 7, column (c), actual urea expense for 2019 was $2.087 million, $0.196 million lower than projected.

Q. Why were actual urea expenses lower than projected?

A. Urea expenses were slightly lower than forecast as a result of Campbell Unit 3 operation at a higher capacity factor than projected, resulting in increased SCR efficiency. The Company achieved reduced Urea consumption while delivering higher than projected generation at both Campbell Units 2 and 3.

Aqueous Ammonia

Q. What was Consumers Energy's estimate of aqueous ammonia for the 2019 PSCR Plan case?

A. Consumers Energy projected the cost of aqueous ammonia for 2019 to be $1.131 million as reflected on Exhibit A-11 (NJK-8), line 7, column (d), based on projected generation and SCR operations at Karn Units 1 and 2 and Zeeland Combined Cycle.

Q. What was the actual aqueous ammonia expense?

A. As reflected on Exhibit A-11 (NJK-8), line 7, column (e), actual aqueous ammonia expense for 2019 was $0.684 million, $0.447 million lower than projected.

Q. Why were actual aqueous ammonia expenses lower than projected?

A. Aqueous ammonia expenses for Karn Units 1 and 2 were lower than forecast because actual generation at Karn Units 1 and 2 was lower than projected, the uncontrolled NO_x emission rates were lower than projected and the Company began to implement a project aimed at optimizing the chemical reagent consumption rates on all applicable generation units. Further, while actual generation at Zeeland was consistent with the generation projected in the PSCR Plan, aqueous ammonia consumption was lower than projected due to the fact that the duct burners were operated less than projected, resulting in lower NO_x concentration in the flue gas at the SCR inlet and a reduced need for aqueous ammonia.

Lime

Q. What was Consumers Energy's estimate of lime expense in the 2019 PSCR Plan case?

A. Consumers Energy projected the cost of lime for 2019 to be $9.723 million as reflected on Exhibit A-11 (NJK-8), line 7, column (f), based on projected generation and Spray Dry Absorber ("SDA") and Dry Sorbent Injection operations at the Karn and Campbell plants.

Q. What were the actual lime expenses?

A. As reflected on Exhibit A-11 (NJK-8), line 7, column (g), actual lime expense for 2019 was $8.022 million, $1.701 million lower than projected.

Q. Why were actual lime expenses lower than projected?

A. Lime expenses were lower than projected for the Campbell site primarily due to efficient Campbell Unit 3 SDA operation and lower than projected sulfur content in the coal burned. The actual 2019 lime expense for the Campbell site was $1.010 million below the projected amount in spite of the higher than projected actual generation for all three Campbell units. 2019 lime expense was $0.691 million lower at the Karn site because actual generation at

Karn Units 1 and 2 was less than projected, the actual sulfur content of the coal burned was lower than projected and the Company began to implement a project aimed at optimizing the chemical reagent consumption rates on all applicable generation units.

Activated Carbon

Q. What was Consumers Energy's estimate of activated carbon for the 2019 PSCR Plan case?

A. Consumers Energy projected the cost of activated carbon for 2019 to be $1.671 million as reflected on Exhibit A-11 (NJK-8), line 7, column (h), based on projected generation and Activated Carbon Injection operations at Karn and Campbell.

Q. What were the actual activated carbon expenses?

A. As reflected on Exhibit A-11 (NJK-8), line 7, column (i), actual activated carbon expenses for 2019 were $1.047 million, $0.624 million lower than projected.

Q. Why were activated carbon expenses lower than projected?

A. Activated carbon expenses were lower than projected at the Campbell site primarily due to efficient Campbell Unit 3 SDA operation combined with ash recycling. The mercury co-benefits provided by the SDA and SCR operations directly impacted the required activated carbon consumption. Despite higher than projected actual generation for all three Campbell units, the actual 2019 activated carbon expense for the Campbell site was $0.478 million below the projected amount. 2019 activated carbon expense was $0.146 million lower than projected at the Karn site because actual generation at Karn Units 1 and 2 was lower than projected, the SDA and SCR operations provided mercury co-benefits, and because of coal variability.

Q. Did the Company undertake any other efforts aimed at reducing chemical reagent expense?

A. Yes. During 2019 the Company initiated a Commodity Chemicals Request for Proposal ("RFP") aimed at reducing chemical reagent expense. The RFP included Aqueous Ammonia, Granular Urea, Hydrated Lime, Pebble Lime, and Powdered Activated Carbon.

Q. What is the status of the Commodity Chemicals RFP?

A. During 2019, the Company tested a total of seven products at the Campbell and Karn generation sites, including four non-incumbent products, to determine their viability. The testing included three hydrated lime products, one of which was not an incumbent, three powdered activated carbon products, two of which were not incumbent, and one granulated urea product which was not an incumbent. Based upon the qualification testing and other RFP considerations, new hydrated lime and granulated urea products were selected for use at the Campbell site and an existing powdered activated carbon product was chosen for use at the Campbell and Karn sites.

Q. When will the cost savings achieved in the RFP begin to be realized?

A. The contracts for hydrated lime, activated carbon, and granulated urea become effective January 2020 and, therefore, the cost reductions will be reflected in both the reconciliation of chemical costs in the Company's 2020 PSCR Reconciliation case and also the Company's management of the monthly PSCR factor in 2020.

Q. What are the RFP results for pebble lime and aqueous ammonia?

A. Specification restraints for pebble lime limited the supplier base, thereby limiting consideration to the incumbent product for continuing supply to Campbell Unit 3 and Karn Units 1 and 2. Nonetheless, the new contract did result in a modest cost reduction. The

RFP results for aqueous ammonia products, which are a commodity similar to pebble lime and granulated urea, confirmed that the Company already had in place the most competitive arrangements that are available. As such, no savings were available for continuing use of this chemical reagent at the Campbell and Karn generation sites.

2019 Base Load Power Plant Generating Cost Efficiency

Q. Why was Exhibit A-10 (NJK-7) included in this filing?

A. This information was provided in response to the MPSC's Report on Status of Power Quality in Michigan in Case No. U-15945.

Q. Does this conclude your direct testimony?

A. Yes.

STATE OF MICHIGAN

BEFORE THE MICHIGAN PUBLIC SERVICE COMMISSION

In the matter of the application of **CONSUMERS ENERGY COMPANY** for reconciliation of its power supply cost recovery plan (Case No. U-20219) for the 12 months ended December 31, 2019.	))))))	Case No. U-20220

EXHIBITS OF

OF

NORMAN J. KAPALA

ON BEHALF OF

CONSUMERS ENERGY COMPANY

March 2020

MicroGADS Gold

Event Summary Report

Report Period: January 2019 to December 2019

CAMPBELL 1-2 - CAMPBELL 1							
Event	Type	Start	End	Cause	Description	Eq Hrs	Eq MWH
12	U1	1/22/2019 22:14	1/23/2019 16:21	0250	1A feeder S. probe failed causing DCS to ramp other feeders. Manual trip, high temps.	18.12	4710.33
87	U1	4/23/2019 10:15	5/1/2019 9:08	4289	1B Hydraulic coupling oil leak, unable to isolate. Unit brought offline.	190.88	49629.67
115	MO	5/1/2019 9:08	5/10/2019 6:28	4289	MO following completion of the critical path 1B hydraulic coupling oil leak (event 87)	213.33	55466.66
89	MO	5/10/2019 13:16	5/10/2019 18:44	4460	Turbine overspeed tests.	5.47	1421.33
248	MO	11/30/2019 10:23	12/13/2019 11:00	1170	MO for back pass cleaning and 1A APH repairs.	312.62	81280.33

CAMPBELL 1-2 - CAMPBELL 2							
Event	Type	Start	End	Cause	Description	Eq Hrs	Eq MWH
36	MO	1/31/2019 19:05	2/2/2019 22:21	9630	2A APH OOS, opacity exceedance resulted in removing unit from service.	51.27	18456.00
132	MO	4/15/2019 19:42	4/24/2019 20:44	1150	Maintenance outage to clean ash out of the SH.	217.03	78132.00
130	U1	4/25/2019 19:02	5/17/2019 15:27	4289	Hydraulic coupling lube oil cooler oil leak, unable to isolate/bypass.	524.42	188790.00
225	MO	8/19/2019 22:45	8/23/2019 17:20	4302	U2 offline, loss of turbine vacuum due to trip block diaphragm leak.	90.58	31613.58
295	MO	10/26/2019 1:10	11/3/2019 23:59	1140	Maintenance outage to clean the backpass.	215.82	77694.00
296	ME	11/3/2019 23:59	11/16/2019 20:18	1140	Maintenance extension following backpass cleaning for boiler tube leaks.	308.32	110994.01
297	MO	11/17/2019 2:36	11/17/2019 3:57	4460	Annual turbine overspeed trip testing.	1.35	486.00

CAMPBELL 3 - CAMPBELL 3							
Event	Type	Start	End	Cause	Description	Eq Hrs	Eq MWH
1	U1	1/1/2019 0:00	1/19/2019 3:56	0570	FO; reheater leak.	435.93	367491.78
380	PO	10/5/2019 6:47	11/24/2019 16:45	3441	Unit Periodic Outage for FWH and CLCW HX Replacements	1210.97	1013579.13
402	PO	11/25/2019 8:37	11/25/2019 13:41	4460	Perform Turbine Overspeed Trip Test	5.07	4240.80

HYDROS - ALCONA 1							
Event	Type	Start	End	Cause	Description	Eq Hrs	Eq MWH
1	MO	1/19/2019 4:00	1/19/2019 5:00	3644	Substation outage	1.00	1.45
2	U1	1/19/2019 8:50	1/23/2019 14:00	7053	Gate operator pressure failure.	101.17	146.69
3	MO	6/24/2019 7:21	6/24/2019 15:20	3644	4.8 kV Bus Outage	7.98	11.18
4	U1	7/5/2019 11:10	7/18/2019 14:00	7141	Gate Operator Issue	314.83	440.77
5	U1	8/26/2019 9:12	8/26/2019 13:00	7110	Divers clearing the trash rack.	3.80	5.32
6	MO	9/11/2019 6:46	9/11/2019 16:20	3653	Bus Outage - 4.8 kV repair	9.57	13.87
7	U1	11/12/2019 14:20	11/15/2019 10:14	3644	Field Failure Alarm/Auxiliary T-Relay #4	67.90	98.46
8	U1	11/16/2019 7:06	11/21/2019 12:53	7009	Bearing Oil Pressure Issue	125.78	182.39
9	U1	12/13/2019 8:35	12/13/2019 13:30	7110	Trash Rack Modifications	4.92	7.13

HYDROS - ALCONA 2							
Event	Type	Start	End	Cause	Description	Eq Hrs	Eq MWH
1	MO	1/19/2019 4:00	1/19/2019 8:50	3644	Substation outage	4.83	7.01
2	PO	2/17/2019 12:28	2/20/2019 11:00	7201	Periodic Outage/Outage was postposed after headgate frozen	70.53	102.27
3	MO	3/18/2019 6:32	3/18/2019 14:41	7140	Wicket Gate measurements per Bryce	8.15	11.82
4	U1	3/18/2019 14:41	3/23/2019 11:43	3644	Extension of scheduled outage due to burnt up field breaker	117.03	169.70
5	MO	6/24/2019 7:21	6/24/2019 15:20	3644	4.8 kV Bus Outage	7.98	11.18
6	MO	7/24/2019 8:55	7/24/2019 12:22	7201	Tailrace Dive Inspection	3.45	4.83
7	MO	7/25/2019 9:06	7/25/2019 13:52	7201	Tailrace Dive Inspection	4.77	6.67
8	MO	9/11/2019 6:46	9/11/2019 16:20	3653	Bus Outage - 4.8 kV repair	9.57	13.87
9	PO	11/25/2019 7:00	12/6/2019 10:46	7201	Periodic Outage	267.77	388.26
10	U1	12/13/2019 13:35	12/13/2019 15:00	7110	Trash Rack Modifications	1.42	2.05

HYDROS - ALLEGAN 1							
Event	Type	Start	End	Cause	Description	Eq Hrs	Eq MWH
1	U1	8/18/2019 10:21	8/18/2019 13:32	3644	Loss of station power due to storm.	3.18	0.73
2	MO	8/22/2019 9:00	8/22/2019 11:10	7201	Tailrace Dive Inspection	2.17	0.50
3	U1	9/11/2019 23:52	9/12/2019 1:40	3644	Millgrove Sub Circuit Trip	1.80	0.50
4	U1	9/27/2019 18:20	9/27/2019 20:20	3644	27/59 & 81 Relays - Severe Weather	2.00	0.56
6	U1	11/23/2019 10:30	11/23/2019 12:05	7110	Clear racks and tuffboom of leaves.	1.58	0.44
5	U1	11/27/2019 16:33	11/27/2019 18:15	3644	27/59 Due to High Winds/Distribution Issue	1.70	0.48

HYDROS - ALLEGAN 2							
Event	Type	Start	End	Cause	Description	Eq Hrs	Eq MWH
1	U1	8/18/2019 10:21	8/18/2019 11:11	3644	Loss of station power due to storm.	0.83	0.39
2	MO	8/22/2019 9:00	8/22/2019 11:10	7201	Tailrace Dive Inspection	2.17	1.02
3	U1	9/11/2019 23:52	9/12/2019 1:40	3644	Millgrove Sub Circuit Trip	1.80	1.10
4	U1	9/27/2019 18:20	9/27/2019 20:20	3644	27/59 & 81 Relays - Severe Weather	2.00	1.22
6	U1	10/17/2019 16:59	10/18/2019 7:35	3644	Millgrove Sub fault on 1-6 circuit XY Phases	14.60	8.91
8	U1	11/13/2019 13:58	11/14/2019 6:15	7110	Leaves were plugging the trash rack.	16.28	9.93
9	U1	11/23/2019 10:30	11/23/2019 12:05	7110	Clear racks and tuffboom of leaves.	1.58	0.97
7	U1	11/27/2019 16:33	11/27/2019 18:15	3644	27/59 Due to High Winds/Distribution Issue	1.70	1.04

HYDROS - ALLEGAN 3							
Event	Type	Start	End	Cause	Description	Eq Hrs	Eq MWH
1	PO	6/20/2019 8:36	8/16/2019 8:36	7140	Wicket Gate Replacement	1368.00	820.80
2	PE	8/16/2019 8:36	1/1/2020 0:00	7140	Wicket Gate Replacement Outage Extended	3304.40	2597.73

HYDROS - COOKE 1							
Event	Type	Start	End	Cause	Description	Eq Hrs	Eq MWH
1	PO	3/3/2019 13:22	3/14/2019 10:00	7201	Periodic Outage	259.63	389.45
2	MO	5/28/2019 10:06	6/5/2019 14:18	7201	Headgate Inspection Outage	196.20	288.79
3	U1	6/19/2019 9:20	6/19/2019 10:20	9920	3 Phase Station Power Breaker Tripped/Crane Operators	1.00	1.45
4	MO	7/1/2019 9:12	7/1/2019 17:28	7140	Took unit offline for divers/Wicket Gate Outage & Head Gate Inspection on Unit 2	8.27	11.99

HYDROS - COOKE 2							
Event	Type	Start	End	Cause	Description	Eq Hrs	Eq MWH
1	MO	5/28/2019 10:08	5/28/2019 16:15	7201	Dive Inspection	6.12	16.52
2	U1	6/19/2019 9:20	6/19/2019 10:20	9920	3 Phase Station Power Breaker Tripped/Crane Operator	1.00	2.58
3	PO	7/1/2019 9:12	10/1/2019 9:12	7140	Wicket Gate Outage/Head Gate Inspection Unit 2	2208.00	5696.64
4	PE	10/1/2019 9:12	12/25/2019 9:20	7140	Wicket Gate Outage/Head Gate Inspection U2	2041.13	5266.12

177.0056

HYDROS - COOKE 3							
Event	Type	Start	End	Cause	Description	Eq Hrs	Eq MWH
1	U1	5/7/2019 11:35	5/8/2019 10:48	4609	Exciter cleaned and retorqued	23.22	69.65
2	MO	5/28/2019 10:09	5/28/2019 16:15	7201	Dive Inspection	6.10	18.30
3	U1	6/19/2019 9:20	6/19/2019 10:20	9920	3 Phase Station Power Breaker Tripped/Crane Operators	1.00	2.84
4	MO	7/1/2019 9:12	7/1/2019 17:28	7140	Took unit offline for divers/Wicket Gate Outage & Head Gate Inspection on Unit 2	8.27	23.48

HYDROS - CROTON 1							
Event	Type	Start	End	Cause	Description	Eq Hrs	Eq MWH
2	U1	7/2/2019 9:40	7/2/2019 11:20	7009	Repaired Oil Leak	1.67	1.92
1	U1	7/12/2019 12:32	7/16/2019 11:00	7009	Bearing temp relay issue	94.47	108.64
3	U1	9/15/2019 13:18	9/17/2019 8:30	3644	Blown Lightning Arrestor/245 Trip	43.20	73.44
4	U2	10/22/2019 8:00	10/24/2019 15:00	4520	Support for the testing of unit 2	55.00	93.50

HYDROS - CROTON 2							
Event	Type	Start	End	Cause	Description	Eq Hrs	Eq MWH
1	U1	9/15/2019 13:18	1/1/2020 0:00	3644	Blown Lightning Arrestor/245 Trip	2579.70	4385.49

HYDROS - CROTON 3							
Event	Type	Start	End	Cause	Description	Eq Hrs	Eq MWH
1	U1	1/5/2019 15:52	1/8/2019 12:15	3644	Unit Tripped - Protective Relaying	68.38	51.29
2	U2	4/16/2019 6:13	4/18/2019 11:38	7140	Croton 4 Wicket Gate Measurement	53.42	40.06
3	U1	7/23/2019 12:30	9/12/2019 16:14	7009	Support Unit 4 Outage Work	1227.73	778.68
4	U1	9/15/2019 13:18	9/20/2019 14:04	3644	Blown Lightning Arrestor/245 Trip	120.77	90.58
5	U2	10/31/2019 10:00	1/1/2020 0:00	7009	Support rebuild of unit 4	1479.00	1109.25

HYDROS - CROTON 4							
Event	Type	Start	End	Cause	Description	Eq Hrs	Eq MWH
1	U1	1/1/2019 0:00	1/1/2020 0:00	3644	Outage was extended into 2019 - Losing Bearing Oil	8760.00	6238.80

HYDROS - FIVE CHANNELS 1							
Event	Type	Start	End	Cause	Description	Eq Hrs	Eq MWH
1	U1	2/21/2019 21:30	2/22/2019 0:00	3644	Disparity	2.50	7.75
2	U1	5/8/2019 16:40	5/8/2019 17:33	3644	1277 National City Line Trip	0.88	2.74
3	MO	5/20/2019 8:50	5/22/2019 17:45	3730	Substation Tie-In	56.92	176.44
4	U1	6/10/2019 9:56	6/10/2019 10:22	3730	Lincoln Line Tripped Off	0.43	1.37
5	U1	6/15/2019 22:25	6/16/2019 0:05	3653	Multiple Trips/Possible Governor issue caused spike in DC Exciter Voltage.	1.67	5.28
6	U1	8/29/2019 6:10	8/29/2019 15:30	7201	Electrical Inspection Outage	9.33	29.59
7	U1	9/22/2019 12:18	9/22/2019 12:29	3644	116 Breaker Alarm/Trip	0.18	0.58
8	PO	10/14/2019 8:45	11/2/2019 8:45	7201	Periodic Outage	456.00	1445.52
9	PE	11/2/2019 8:45	11/19/2019 10:59	7201	PE of Periodic Inspection Outage	411.23	1303.61
10	U1	12/27/2019 6:08	12/27/2019 10:33	3644	AVR Cooling Fan Issues	4.42	14.00
11	U1	12/27/2019 13:29	1/1/2020 0:00	4609	Unable to excite unit/DRX Trip	106.52	337.66

HYDROS - FIVE CHANNELS 2							
Event	Type	Start	End	Cause	Description	Eq Hrs	Eq MWH
1	U1	2/21/2019 21:20	2/22/2019 0:00	3644	Disparity	2.67	8.00
2	MO	5/20/2019 8:50	5/22/2019 17:45	3730	Substation Tie-In	56.92	170.75

HYDROS - FOOTE 1							
Event	Type	Start	End	Cause	Description	Eq Hrs	Eq MWH
1	MO	1/14/2019 7:50	1/14/2019 16:00	3644	Emergency Generator Black Light Testing	8.17	8.66
2	U1	4/14/2019 18:48	4/14/2019 22:18	3730	Lincoln line tripped	3.50	3.71
3	U1	10/3/2019 13:47	10/3/2019 15:21	3710	Emergency Repair of Lincoln Line per System Control	1.57	1.66

HYDROS - FOOTE 2							
Event	Type	Start	End	Cause	Description	Eq Hrs	Eq MWH
1	PO	1/13/2019 13:20	1/25/2019 13:23	7201	Periodic Inspection Outage	288.05	308.21
2	U1	4/14/2019 18:48	4/14/2019 22:18	3730	Lincoln line tripped	3.50	3.75
3	U1	10/3/2019 13:47	10/3/2019 15:27	3710	Emergency Repair of Lincoln Line per System Control	1.67	1.78

HYDROS - FOOTE 3							
Event	Type	Start	End	Cause	Description	Eq Hrs	Eq MWH
1	MO	1/14/2019 8:24	1/14/2019 16:05	3644	Emergency Generator Black Light Testing	7.68	8.22
2	U1	4/14/2019 18:48	4/14/2019 22:18	3730	Lincoln line tripped	3.50	3.75

HYDROS - HARDY 1							
Event	Type	Start	End	Cause	Description	Eq Hrs	Eq MWH
4	PO	6/13/2019 12:32	10/1/2019 12:32	7199	Spill Tube Re-Lining	2640.00	28512.00
7	PE	10/1/2019 12:32	10/9/2019 7:55	7199	Extension of Spill Tube Relining Project	187.38	2023.74
8	U1	10/9/2019 7:55	10/14/2019 10:30	4609	Excitation problems	122.58	1323.90
5	MO	10/16/2019 8:00	10/16/2019 16:30	9720	Provide clearance for repairs to rain gutters.	8.50	91.80
6	MO	10/17/2019 8:00	10/17/2019 18:30	9720	Provide clearance for repairs to rain gutters.	10.50	113.40

HYDROS - HARDY 2							
Event	Type	Start	End	Cause	Description	Eq Hrs	Eq MWH
1	PO	2/11/2019 15:39	2/23/2019 15:39	7201	Periodic Outage	288.00	3024.00
2	PE	2/23/2019 15:39	3/15/2019 17:30	7201	Periodic Outage Extension/Aspiration piping repair.	480.85	5048.93
6	MO	10/16/2019 8:00	10/16/2019 16:30	9720	Provide clearance for repairs to rain gutters.	8.50	91.80
7	MO	10/17/2019 8:00	10/17/2019 18:30	9720	Provide clearance for repairs to rain gutters.	10.50	113.40

HYDROS - HARDY 3							
Event	Type	Start	End	Cause	Description	Eq Hrs	Eq MWH
4	MO	10/16/2019 8:00	10/16/2019 16:30	9720	Provide clearance for repairs to rain gutters.	8.50	97.75
5	MO	10/17/2019 8:00	10/17/2019 18:30	9720	Provide clearance for repairs to rain gutters.	10.50	120.75

HYDROS - HODENPYL 1							
Event	Type	Start	End	Cause	Description	Eq Hrs	Eq MWH
1	U1	3/12/2019 12:28	3/15/2019 18:00	7120	Broken Headgate Chain	77.53	178.33
2	MO	7/22/2019 18:38	7/25/2019 15:02	9720	Brake Ring Repair	68.40	136.80

HYDROS - LOUD 1							
Event	Type	Start	End	Cause	Description	Eq Hrs	Eq MWH
1	MO	1/7/2019 8:58	1/7/2019 14:22	9720	Trash Rack Dive Inspection	5.40	11.88
2	U1	2/21/2019 17:30	2/21/2019 18:00	3730	High Bus Voltage due to switching	0.50	1.10
3	U1	2/21/2019 21:20	2/21/2019 23:50	3730	High Bus Voltage due to switching	2.50	5.50
4	U1	5/8/2019 16:40	5/8/2019 17:45	3644	Tripped due to disparity caused by 5CH Unit 1 trip	1.08	2.38
5	MO	5/20/2019 8:50	5/22/2019 17:45	3730	Substation Tie-In	56.92	125.22
6	U1	6/10/2019 9:56	6/10/2019 10:20	3730	Disparity caused by 5Channels Unit 1 trip/Lincoln Line	0.40	0.88
7	U1	6/15/2019 22:57	6/15/2019 23:13	3653	Disparity caused by 5 Channels Unit 1 Trip	0.27	0.59
8	PO	7/29/2019 10:29	8/7/2019 12:45	7201	Periodic Outage	218.27	480.19
9	PO	11/4/2019 10:03	11/12/2019 11:56	9720	Trash Rack Replacement Outage	193.88	426.54

HYDROS - LOUD 2							
Event	Type	Start	End	Cause	Description	Eq Hrs	Eq MWH
1	MO	1/7/2019 8:58	1/7/2019 14:22	9720	Trash Rack Dive Inspection	5.40	11.88
2	U1	2/21/2019 17:30	2/21/2019 17:50	3730	High Bus Voltage due to switching	0.33	0.73
3	U1	2/21/2019 21:20	2/21/2019 23:50	3730	High Bus Voltage due to switching	2.50	5.50
4	MO	5/20/2019 8:50	5/22/2019 17:45	3730	Substation Tie- In	56.92	125.22
5	U1	6/19/2019 8:22	6/19/2019 8:38	9920	Contractor pulling wire and shorted out load center	0.27	0.59
6	PO	11/12/2019 11:57	11/15/2019 14:25	9720	Trash Rack Replacement Project	74.47	163.83

HYDROS - MIO 1							
Event	Type	Start	End	Cause	Description	Eq Hrs	Eq MWH
1	PO	1/1/2019 0:00	1/15/2019 10:30	7050	Extended into 2019 - Governor Replacement Project	346.50	277.20
2	U1	2/4/2019 23:56	2/5/2019 13:35	7003	Unit Trip - Low Oil Pressure	13.65	10.92
3	MO	2/10/2019 12:20	2/11/2019 14:00	7009	RTD Punchlist Items	25.67	20.53
4	U1	3/14/2019 14:40	3/14/2019 15:12	3644	Reason unknown/most likely oil flow switch	0.53	0.43
5	U1	3/14/2019 17:03	3/15/2019 6:44	7009	Bearing oil pressure	13.68	10.95
6	U1	3/15/2019 14:00	3/19/2019 12:15	7009	Bearing oil pressure switch	94.25	75.40
7	U1	3/19/2019 18:49	3/22/2019 13:04	7009	Unit Tripped/Bearing Oil Flow Switch???	66.25	53.00
8	MO	3/26/2019 8:47	3/28/2019 13:30	3644	Maintenance Outage/Auto Sync	52.72	42.17
9	MO	7/10/2019 7:40	7/11/2019 10:55	7009	Change oil pump	27.25	20.44

HYDROS - MIO 2							
Event	Type	Start	End	Cause	Description	Eq Hrs	Eq MWH
1	U1	3/14/2019 15:31	3/15/2019 10:44	3644	Breakers failed to close upon restart	19.22	15.37
2	U1	6/6/2019 12:00	6/11/2019 14:00	7009	Bearing Oil Pump Issue.	122.00	91.50
3	U1	11/12/2019 9:10	11/14/2019 11:50	7009	Maintenance cleaning and replacing brushes due to being covered with oil.	50.67	40.53
4	U1	12/2/2019 9:45	12/2/2019 12:55	3644	U2 Governor 256 ESD Trip	3.17	2.53

HYDROS - ROGERS 1							
Event	Type	Start	End	Cause	Description	Eq Hrs	Eq MWH
1	U1	1/1/2019 0:00	3/1/2019 14:00	3644	Extended into 2019 - unit tripped due to inadvertent operation of the 166	1430.00	1144.00
2	PO	5/13/2019 8:30	5/19/2019 11:49	7050	Governor Project/Electrical Upgrade support	147.32	117.85
3	PO	9/6/2019 8:15	11/3/2019 4:56	7050	Electrical Upgrade/Governor Replacement Project.	1389.68	1111.75
4	PE	11/3/2019 4:56	12/16/2019 8:39	7050	PE of Electrical upgrade/governor replacement project	1035.72	828.57
8	PO	12/17/2019 9:20	12/20/2019 13:57	7050	PE of Electrical Upgrade/Governor Replacement Project	76.62	61.29
9	PO	12/20/2019 15:50	12/21/2019 7:52	7050	PE of Electrical Upgrade/Governor Replacement Project	16.03	12.83
10	PO	12/21/2019 10:59	12/21/2019 11:17	7050	PE of Electrical Upgrade/Governor Replacement Project	0.30	0.24

HYDROS - ROGERS 2							
Event	Type	Start	End	Cause	Description	Eq Hrs	Eq MWH
1	PO	1/7/2019 13:01	1/25/2019 13:15	7201	Periodic Outage	432.23	345.79
2	U2	2/25/2019 9:30	3/1/2019 14:00	7124	Support Unit #1 EGC	100.50	80.40
3	PO	5/13/2019 8:30	5/19/2019 11:49	7050	Governor Project/Electrical Upgrade support	147.32	117.85
4	PO	9/6/2019 8:20	11/3/2019 5:01	7050	Electrical Upgrade/Governor Replacement Project	1389.68	1111.75
5	PE	11/3/2019 5:01	12/20/2019 11:26	7050	PE of electrical upgrade/governor replacement project	1134.42	907.53
6	U1	12/22/2019 4:33	12/22/2019 8:55	3644	Hi-Hi Headwater Alarm Trip	4.37	3.49

HYDROS - ROGERS 3							
Event	Type	Start	End	Cause	Description	Eq Hrs	Eq MWH
1	U1	1/1/2019 0:00	9/20/2019 15:30	7007	Extended from 2018 - Thrust Bearing Wiped	6302.50	4710.80
2	PO	9/20/2019 15:30	11/23/2019 15:30	7050	Electrical upgrade project	1537.00	1229.60
3	PE	11/23/2019 15:30	12/17/2019 16:11	7050	Electrical Upgrade Project/Governor Replacement	576.68	461.35
4	PO	12/17/2019 18:30	12/18/2019 8:56	7050	PE of Electrical Upgrade/Governor Replacement Project	14.43	11.55
5	PO	12/18/2019 18:03	12/19/2019 11:16	7050	PE of Electrical Upgrade/Governor Replacement Project	17.22	13.77
6	PO	12/19/2019 11:18	12/19/2019 11:21	7050	PE of Electrical Upgrade/Governor Replacement Project	0.05	0.04

HYDROS - ROGERS 4							
Event	Type	Start	End	Cause	Description	Eq Hrs	Eq MWH
1	U1	5/2/2019 13:18	5/6/2019 15:30	3653	Failure of the electric gate opener DC motor	98.20	78.56
2	U2	5/19/2019 13:43	9/20/2019 15:30	7007	Thrust Bearing Replacement Outage	2977.78	2051.03
3	PO	9/20/2019 15:30	11/23/2019 15:30	7050	Electrical upgrade project	1537.00	1229.60
4	PE	11/23/2019 15:30	12/20/2019 12:00	7050	Electrical Upgrade Project/Governor Replacement	644.50	515.60
5	U1	12/22/2019 4:33	1/1/2020 0:00	3644	Hi-Hi Headwater Alarm Trip	235.45	188.36

HYDROS - TIPPY 1							
Event	Type	Start	End	Cause	Description	Eq Hrs	Eq MWH
1	PO	11/18/2019 8:44	11/27/2019 15:16	7201	Periodic Outage	222.53	489.57
2	U2	11/27/2019 15:39	12/2/2019 15:07	7009	Bearing Oil Pump Issue	119.47	262.83

HYDROS - TIPPY 2							
Event	Type	Start	End	Cause	Description	Eq Hrs	Eq MWH
1	PO	12/3/2019 11:54	12/11/2019 13:18	7201	Periodic Outage	193.40	425.48

HYDROS - TIPPY 3							
Event	Type	Start	End	Cause	Description	Eq Hrs	Eq MWH
1	PO	12/13/2019 10:41	12/20/2019 14:07	7201	Periodic Outage	171.43	377.15
2	U1	12/20/2019 17:06	1/1/2020 0:00	7009	Low Bearing Oil Pressure/Unit Tripped Offline	270.90	595.98

HYDROS - WEBBER 1							
Event	Type	Start	End	Cause	Description	Eq Hrs	Eq MWH
1	U1	1/2/2019 9:11	1/2/2019 12:20	9920	Redundant relay string trip/contractor	3.15	4.41
2	U1	1/21/2019 11:59	1/24/2019 10:15	3644	Governor Trip Solenoid Inactive	70.27	98.37
3	U1	4/25/2019 7:50	4/25/2019 9:30	3644	Over Excitation	1.67	2.33
4	U1	5/2/2019 2:56	5/2/2019 7:25	3644	188 David Line Tripped	4.48	6.28
5	PO	5/20/2019 8:00	6/3/2019 8:00	9590	Annual Smolt Passage	336.00	439.04
6	PO	7/29/2019 8:17	8/27/2019 13:48	7050	Governor Replacement Project	701.52	589.27
7	U1	12/25/2019 0:48	12/26/2019 12:36	7008	Bearing Temp Trip	35.80	50.12

HYDROS - WEBBER 2							
Event	Type	Start	End	Cause	Description	Eq Hrs	Eq MWH
1	U1	1/1/2019 0:00	7/2/2019 18:51	4500	Extended from 2018 - scheduled overhaul of unit #2/Generator Rewind	4385.85	1647.54
2	U1	7/30/2019 8:13	7/30/2019 11:30	9920	Contractor shorted out gate limit switch	3.28	0.85
3	U1	7/30/2019 15:07	8/1/2019 8:00	3644	Blown fuse for the U2 gate limit switch (GTS Trip)	40.88	10.63

JACKSON GENERATING STATION - JACKSON GENERATING STATION							
Event	Type	Start	End	Cause	Description	Eq Hrs	Eq MWH
27	U1	1/30/2019 23:01	1/31/2019 10:20	9130	Fuel Gas Supply Limits Due to Extreme Cold Weather	11.32	6133.63
60	U1	3/8/2019 3:42	3/8/2019 5:29	4810	Breaker 177 Opened	1.78	966.57
116	PO	4/28/2019 1:12	5/3/2019 9:27	3999	Periodic planned spring facility outage	128.25	69511.50
158	PO	5/3/2019 9:30	5/4/2019 0:45	3999	periodic spring facility outage	15.25	8265.50
159	PO	5/4/2019 0:48	5/4/2019 1:01	3999	periodic spring facility outage	0.22	117.43
140	U1	5/20/2019 7:13	5/20/2019 7:36	3982	Failed PLC output card	0.38	207.77
142	U1	5/21/2019 7:38	5/21/2019 11:03	3970	Communication server code failures	3.42	1851.83

KARN 1-2 - KARN 1							
Event	Type	Start	End	Cause	Description	Eq Hrs	Eq MWH
2	U1	1/2/2019 19:54	1/3/2019 6:12	1190	Tripped due to High Back-Pressure	10.30	2626.50
30	MO	2/6/2019 22:04	2/18/2019 4:24	1090	Boiler Tube Leak	270.33	68935.00
110	U1	3/22/2019 23:59	3/27/2019 23:59	9590	Removed to facilitate completion of boiler inspection for certification	120.00	30600.00
106	PO	3/27/2019 23:59	4/19/2019 11:58	1190	RH Ash Pit Repair	539.98	137695.75
129	SF	4/22/2019 13:14	4/23/2019 4:10	3399	Startup stopped due to lack of condensate. K2 tube leak step change shut down.	14.93	3808.00
115	U1	4/23/2019 4:10	4/28/2019 8:00	3499	DI water line rupture	123.83	31577.50
121	SF	4/28/2019 8:00	4/29/2019 14:39	4499	Failed to reach 550 rpm in 10 min. Turbine tripped. Boiler out. Restart needed.	30.65	7815.75
130	U1	5/14/2019 0:39	6/1/2019 3:27	1000	Boiler tube leak.	434.80	110870.55
134	MO	6/1/2019 3:27	6/5/2019 23:59	1999	Completed welding of pendant clips.	116.53	29599.47
181	U1	8/21/2019 18:32	8/28/2019 20:17	1000	SH Boiler Leak	169.75	43116.50
186	MO	8/28/2019 20:17	9/12/2019 9:00	3420	K1 STM LK on elbow on BWCW to Drips Tk	348.72	88847.03
195	U1	10/4/2019 13:45	10/6/2019 4:48	4899	Tripped on high condenser back pressure from seal oil deluge trip equipment failure.	39.05	9957.75
200	SF	10/6/2019 4:48	10/6/2019 12:19	4140	Unit tripped during startup during 1b 1 bearing vibration	7.52	1916.75
203	PO	10/29/2019 3:10	12/16/2019 15:00	8812	Periodic Outage to replace Catalyst	1164.83	297032.50
205	MO	12/16/2019 15:01	12/19/2019 19:52	0030	FH C/D Coal Chute Replacement	76.85	19596.75

KARN 1-2 - KARN 2							
Event	Type	Start	End	Cause	Description	Eq Hrs	Eq MWH
2	U1	1/1/2019 0:46	2/1/2019 0:00	1090	Re-heater tube leak	743.23	193240.67
4	U1	2/1/2019 0:00	2/4/2019 11:29	1090	Re-Heater tube leak	83.48	21705.67
127	MO	4/22/2019 21:22	5/14/2019 23:59	1000	Boiler leak repair	530.62	137960.33
131	ME	5/14/2019 23:59	6/29/2019 0:00	1000	Economic reserve shutdown. Deslag of econ backpass, ash pit cleaning, H2 cooler repair	1080.02	273412.34
135	U1	6/29/2019 0:00	7/3/2019 9:27	9900	H2 analyzer vent valve open (N/C) preventing gen from PMT	105.45	26257.05
137	SF	7/9/2019 2:30	7/9/2019 20:02	4720	Failed Bushing Potential Device (BPD) main transformer	17.53	4365.80
153	U1	8/1/2019 1:38	8/16/2019 22:57	1040	SH Boiler Leak NW Corner 6th floor	381.32	94947.85
170	U1	8/16/2019 22:57	8/30/2019 0:01	0090	Karn 2 Bunkers were smoldering causing a HI CO in the bunkers	313.07	77953.60
162	U1	9/2/2019 9:04	9/3/2019 19:28	4619	2A h2 seal oil pump coupling separated	34.40	8875.20
169	SF	9/9/2019 15:06	9/11/2019 17:18	0530	Leak in Superheat drain lines to flash tank	50.20	12951.60
172	SF	9/13/2019 5:42	9/13/2019 6:49	3410	Water in the oil of 2B BFP	1.12	288.10
173	U1	9/13/2019 20:01	9/14/2019 8:30	4302	Karn 2 Turbine tripped due to Thrust / Differential Expansion	12.48	3220.70
174	SF	9/14/2019 8:30	9/16/2019 1:56	4289	Water in Karn 2 Oil Base	41.43	10689.80
234	U1	10/4/2019 15:45	10/5/2019 3:58	9900	Operator went to wrong unit breaker	12.22	3151.90
239	U1	10/25/2019 13:13	10/26/2019 20:27	1488	2B Air Preheater coupling failing	31.23	8058.20
240	SF	10/26/2019 20:27	10/26/2019 21:09	1700	Lost Drum Level	0.70	180.60
243	U1	10/26/2019 21:09	10/27/2019 3:05	1488	2B Air Preheater Coupling Failure	5.93	1530.80
241	SF	10/27/2019 3:05	10/28/2019 3:09	4099	Gasket on throttle valve leakoff was found blowing. Unit had to stop the startup	24.07	6209.20

KARN 3-4 - KARN 3							
Event	Type	Start	End	Cause	Description	Eq Hrs	Eq MWH
1	PO	1/1/2019 0:00	4/26/2019 23:59	3975	DCS Upgrade	2782.98	1692053.88
2	PE	4/26/2019 23:59	5/7/2019 11:27	3975	DCS upgrade	251.47	152891.74
3	PO	5/7/2019 12:54	5/7/2019 13:48	3975	DCS Upgrade	0.90	547.20
4	PO	5/7/2019 15:06	5/7/2019 19:08	3975	DCS Upgrade	4.03	2452.27
5	PO	5/7/2019 19:45	5/9/2019 8:54	3975	DCS Upgrade	37.15	22587.20
6	PO	5/9/2019 9:35	5/9/2019 10:33	3975	DCS Upgrade	0.97	587.73
7	PO	5/9/2019 13:16	5/9/2019 17:10	3975	DCS Upgrade	3.90	2371.20
8	PO	5/9/2019 19:54	5/10/2019 7:00	3975	DCS Upgrade	11.10	6748.80
9	PO	5/10/2019 19:26	5/14/2019 10:58	3975	DCS Upgrade	87.53	53220.27
10	PO	5/14/2019 18:50	5/15/2019 7:26	3975	DCS Upgrade	12.60	7660.80
11	PO	5/15/2019 8:40	5/15/2019 9:57	3975	DCS Upgrade	1.28	780.27

KARN 3-4 - KARN 3 CONTINUED							
Event	Type	Start	End	Cause	Description	Eq Hrs	Eq MWH
12	PO	5/15/2019 11:14	5/16/2019 10:49	3975	DCS Upgrade	23.58	14338.67
13	PO	5/17/2019 0:18	5/22/2019 1:35	3975	DCS Upgrade	121.28	73740.27
14	U1	6/2/2019 7:55	6/4/2019 17:57	9900	oil contamination of Mbfp oil base.	58.03	35342.30
16	PO	6/4/2019 19:09	6/5/2019 4:35	3975	DCS Upgrade	9.43	5744.90
17	PO	6/5/2019 7:08	6/5/2019 10:19	3975	DCS Upgrade	3.18	1938.65
18	PO	6/5/2019 22:47	6/6/2019 5:08	3975	DCS Upgrade	6.35	3867.15
19	PO	6/6/2019 21:44	6/25/2019 4:45	3975	DCS Upgrade	439.02	267361.16
20	SF	6/25/2019 4:45	6/25/2019 7:33	9900	Supply to Main steam seals regulator closed for MBFP seal	2.80	1705.20
21	PO	6/25/2019 7:33	6/25/2019 14:06	3975	DCS Upgrade	6.55	3988.95
22	PO	6/25/2019 18:06	6/26/2019 2:46	3975	DCS Upgrade	8.67	5278.00
23	PO	6/26/2019 6:48	6/26/2019 12:23	3975	DCS Upgrade	5.58	3400.25
24	PO	6/28/2019 10:00	6/28/2019 12:24	3975	DCS Upgrade	2.40	1461.60
25	PO	6/28/2019 14:20	6/28/2019 18:49	3975	DCS Upgrade	4.48	2730.35
26	PO	6/28/2019 22:15	7/3/2019 1:34	3975	DCS Upgrade	99.32	60483.85
27	SF	7/3/2019 1:34	7/3/2019 4:30	4300	Reheat stop valve #1 didn't close and I&C had to force the point.	2.93	1786.40
41	PO	7/3/2019 4:30	7/3/2019 7:50	3975	DCS Upgrade	3.33	2030.00
32	U1	7/5/2019 23:00	7/7/2019 23:00	9960	Short of operators to run the unit	48.00	29232.00
42	SF	7/12/2019 1:50	7/12/2019 7:22	3344	DA steam regulator failed close	5.53	3369.80
34	SF	7/12/2019 8:38	7/12/2019 9:28	1710	The boiler pressure was too high for the VOS startup Pulled fire to reduce pressure	0.83	507.50
45	SF	7/12/2019 11:00	7/12/2019 14:01	4720	399 switch was not making up properly	3.02	1837.15
46	U1	7/12/2019 15:25	7/13/2019 6:00	3410	Boiler Feed Pump Issues	14.58	8881.25
38	SF	7/15/2019 6:45	7/18/2019 13:54	3833	Aux steam pressure to the boiler DA tank failed in closed position	79.15	48202.35
40	MO	7/22/2019 5:40	7/28/2019 23:59	1590	Common Stack	162.32	98850.85
50	MO	8/13/2019 6:46	8/16/2019 9:52	4299	Replace the Turbine Dump Manifold Block	75.10	45735.90
55	SF	8/19/2019 5:31	8/19/2019 14:56	3415	Water was found in the oil of the MBFP oil base during startup.	9.42	5734.75
57	U1	8/30/2019 12:48	8/30/2019 13:40	9900	Unit tripped due to loss of auxiliary steam header when switching from Main/Aux	0.87	527.80
59	U1	9/4/2019 6:55	9/4/2019 14:30	3410	Repairing MBFP steam seal bypass and changing out Fram Filters	7.58	4686.50
66	U1	10/1/2019 17:15	10/1/2019 17:55	1455	Attempted restart but before on line Unit was ordered off and cold by ES&T	0.67	412.00
81	MO	10/7/2019 0:36	10/7/2019 8:50	3830	A Aux boiler was removed from service	8.23	5088.20
73	U1	10/10/2019 8:35	10/14/2019 11:25	4280	#3 Emergency Oil Pump is not available	98.83	61079.00
78	MO	10/29/2019 6:00	10/30/2019 22:53	1710	B Aux Boiler is getting an EVERGREEN update	40.88	25265.90
83	MO	11/18/2019 0:00	11/22/2019 22:28	1999	Boiler Certificate and Boiler Inspection	118.47	73212.40

KARN 3-4 - KARN 4							
Event	Type	Start	End	Cause	Description	Eq Hrs	Eq MWH
1	PO	1/1/2019 0:00	5/29/2019 0:00	3245	Cooling Tower Upgrade	3551.00	2169661.00
2	PE	5/29/2019 0:00	6/19/2019 2:32	3245	Cooling Tower Upgrade	506.53	272556.53
3	SF	6/19/2019 2:32	6/19/2019 8:54	4310	Issue with FGA control system	6.37	3348.87
4	PO	6/19/2019 8:54	7/10/2019 1:35	3245	Cooling Tower Upgrade	496.68	261255.44
5	SF	7/10/2019 1:35	7/10/2019 20:25	4612	H2 was delivered at 19:00 and was off loaded and placed into the H2 bulk tanks	18.83	9906.33
27	PO	7/10/2019 20:25	7/11/2019 5:50	3245	Cooling Tower Upgrade	9.42	4953.17
7	U1	7/11/2019 7:23	7/11/2019 8:48	3410	Loss unit to feed pump controls	1.42	745.17
9	PO	7/11/2019 20:58	7/12/2019 10:18	3245	Cooling Tower Upgrade	13.33	7013.33
18	U1	7/12/2019 10:18	7/15/2019 16:45	3410	Boiler Feed pump issue	78.45	41264.70
19	PO	7/15/2019 16:45	7/16/2019 11:30	3245	Cooling towers upgrade	18.75	9862.50
10	U1	7/17/2019 12:21	7/17/2019 20:16	9900	Operator tripped unit when switching the Gas /Oil ratio	7.92	4164.17
11	U1	7/18/2019 14:51	7/18/2019 18:45	3410	Loss Boiler Feed water pump and unit went low on water after 4B ID Fan tripped	3.90	2051.40
13	SF	7/18/2019 18:45	7/18/2019 21:28	3410	Low water Trip	2.72	1428.97
16	MO	7/22/2019 5:40	7/28/2019 23:59	1455	4B ID Fan	162.32	85378.56
21	SF	7/31/2019 5:14	7/31/2019 9:34	1750	Flame scanner tripped a gun out and the gas pressure spiked	4.33	2279.33
23	U1	7/31/2019 10:40	7/31/2019 11:29	3401	Restart boiler after feedwater trip	0.82	429.57
28	U1	8/13/2019 17:26	8/13/2019 19:26	1710	Both ID fans started and immediately tripped when a card failed in 52/72	2.00	1052.00
30	U1	8/18/2019 12:00	8/26/2019 0:00	9960	Karn 4 was unavailable from 12:00 on 8/18 through 8/26, 00:00	180.00	94680.00
42	PO	10/13/2019 0:00	1/1/2020 0:00	3241	Repairs to be made to EHC system and the Cooling Towers	1921.00	1020051.00

LUDINGTON - LUDINGTON 1							
Event	Type	Start	End	Cause	Description	Eq Hrs	Eq MWH
1	PO	1/1/2019 0:00	5/21/2019 4:57	7200	MOH of Unit #1	3363.95	1040884.16
2	PE	5/21/2019 4:57	6/16/2019 8:12	7200	Continuation of MOH of #1	627.25	198838.25
3	PO	6/16/2019 21:22	6/19/2019 8:12	7200	Commissioning of unit	58.83	18650.17
4	PO	6/19/2019 8:19	6/19/2019 8:45	7200	Commissioning of unit	0.43	137.37
5	PO	6/19/2019 9:15	6/19/2019 9:44	7200	Commissioning of unit	0.48	153.22
6	PO	6/19/2019 10:16	6/19/2019 10:46	7200	Commissioning of unit	0.50	158.50
7	PO	6/19/2019 11:50	6/21/2019 12:24	7200	Commissioning of unit	48.57	15395.63
16	PO	6/21/2019 21:01	6/22/2019 7:07	7200	commissioning of the unit	10.10	3201.70
17	PO	6/22/2019 13:38	6/22/2019 14:53	7200	commissioning of the unit	1.25	396.25
18	PO	6/22/2019 15:17	6/24/2019 20:10	7200	commissioning of the unit	52.88	16764.02
19	PO	6/24/2019 21:36	6/25/2019 20:32	7200	commissioning of the unit	22.93	7269.87
20	PO	6/25/2019 21:50	6/26/2019 20:11	7200	commissioning of the unit	22.35	7084.95
21	PO	6/26/2019 21:29	6/26/2019 22:30	7200	commissioning of the unit	1.02	322.28
9	U1	6/28/2019 6:23	6/28/2019 9:40	7121	replace #4 penstock drain valve	3.28	1040.82
22	U1	7/2/2019 8:01	7/2/2019 9:02	7053	to repair governor air leak	1.02	322.28
23	PO	7/10/2019 7:00	7/10/2019 14:08	4602	brush inspection	7.13	2261.27
71	PO	8/9/2019 7:00	8/9/2019 13:06	4602	brush inspection	6.10	1933.70
110	MO	9/11/2019 0:55	9/11/2019 8:51	3620	MTB #2 outage - transformer move	7.93	2514.87
113	MO	9/12/2019 0:58	9/12/2019 9:41	3620	MTB #2 outage - transformer move	8.72	2763.18
114	MO	9/13/2019 1:00	9/13/2019 7:00	3620	MTB #2 outage - transformer move	6.00	1902.00
115	PO	9/13/2019 7:00	9/13/2019 13:45	4602	brush inspection	6.75	2139.75
116	MO	9/16/2019 1:01	9/16/2019 10:04	3620	MTB #2 outage - transformer move	9.05	2868.85
125	MO	9/17/2019 1:00	9/17/2019 9:08	3620	MTB outage	8.13	2578.27
134	U1	9/27/2019 11:44	9/28/2019 13:37	7053	governor failed to close after pumping - investigation started	25.88	8205.02
141	PO	10/6/2019 4:19	10/15/2019 16:19	7201	2019 Pond Outage	228.00	72276.00
148	MO	10/15/2019 16:20	10/19/2019 18:00	7007	investigating lower guide bearing placement	97.67	30960.33
150	ME	10/19/2019 18:00	10/24/2019 14:00	7007	investigating lower guide bearing placement	116.00	36772.00
151	MO	10/24/2019 14:46	10/24/2019 15:11	7007	testing of unit	0.42	132.08
178	U1	11/8/2019 11:38	11/8/2019 14:24	4650	clean strainers	2.77	877.03
215	PO	12/6/2019 5:45	12/6/2019 13:45	4602	brush inspection	8.00	2384.00
240	U1	12/6/2019 13:45	12/6/2019 16:05	3999	pull y strainers to replace with spool pieces for completions of #1 overhaul	2.33	695.33

LUDINGTON - LUDINGTON 2							
Event	Type	Start	End	Cause	Description	Eq Hrs	Eq MWH
1	PO	1/7/2019 7:00	1/7/2019 14:13	4602	Brush inspection	7.22	2504.18
59	PO	2/11/2019 6:15	2/11/2019 14:15	4602	Brush inspection	8.00	2776.00
90	U1	2/11/2019 14:15	2/11/2019 18:05	3620	MTB #1 work - gauge change out	3.83	1330.17
119	U1	3/12/2019 18:10	3/12/2019 21:47	3641	functionality testing of the 115	3.62	1381.57
120	PO	3/13/2019 6:00	3/13/2019 14:00	4602	Brush inspection	8.00	3056.00
139	U1	3/13/2019 14:00	3/13/2019 16:40	3999	installing 203 links	2.67	1018.67
140	U1	3/13/2019 16:46	3/13/2019 18:03	3999	testing Unit 2 for Lead	1.28	490.23
141	MO	3/25/2019 7:01	3/25/2019 7:31	3999	Barrier net installation - cancelled due to ice on the lake	0.50	191.00
148	U1	3/28/2019 7:03	3/28/2019 11:51	4899	hi temp alarm on turbine guide bearings- found out RTD had a loose wire	4.80	1833.60
155	PO	4/7/2019 7:18	4/7/2019 11:59	9998	Black start testing	4.68	1789.03
193	PO	4/22/2019 7:00	4/22/2019 15:00	4602	brush inspection	8.00	3056.00
194	PE	4/22/2019 15:00	4/22/2019 15:48	4602	brush inspection	0.80	305.60
208	U1	4/29/2019 12:20	4/29/2019 19:58	7009	Change oil in the Turbine Guide Bearing	7.63	2915.93
210	U1	4/29/2019 22:37	5/12/2019 11:52	7001	found water in oil	301.25	115077.50
214	U1	5/12/2019 19:16	5/12/2019 21:20	4551	Lower Guide Bearing temp high alarm	2.07	789.47
216	U1	5/14/2019 10:58	5/14/2019 18:30	7009	found water in turbine guide bearing oil	7.53	2877.73
225	U1	5/18/2019 15:10	5/18/2019 16:10	3899	water due to #1 rheostat draining overflowed	1.00	382.00
226	PO	5/20/2019 6:15	5/21/2019 20:48	3620	work on MTB #1	38.55	14726.10
230	U1	5/23/2019 9:00	5/23/2019 12:13	3999	cross compensating with Unit #1	3.22	1228.77
231	U1	5/24/2019 8:57	5/24/2019 12:40	3999	Cross compensating relays	3.72	1419.77
242	MO	5/29/2019 1:51	5/29/2019 7:16	3999	remove 203 links	5.42	2069.17
250	U1	5/31/2019 3:20	5/31/2019 11:27	3999	Support Unit 1 and 2 MOH. cross compensating relay verification.	8.12	3100.57
258	PO	6/10/2019 7:00	6/10/2019 14:09	4602	brush inspection	7.15	2731.30
261	MO	6/12/2019 8:43	6/12/2019 19:02	3999	due to Unit #1 commissioning	10.32	3940.97
264	MO	6/14/2019 7:35	6/14/2019 19:50	3999	due to commissioning of Unit #1	12.25	4679.50
265	MO	6/15/2019 7:14	6/15/2019 16:05	3999	due to Unit #1 commissioning	8.85	3380.70
266	MO	6/16/2019 17:35	6/16/2019 21:25	3999	due to Unit #1 commissioning	3.83	1464.33
272	MO	6/17/2019 9:00	6/17/2019 12:40	3999	due to Unit #1 commissioning	3.67	1400.67
275	MO	6/19/2019 7:03	6/19/2019 11:52	3999	due to commissioning of Unit #1	4.82	1839.97
278	MO	6/21/2019 12:15	6/21/2019 21:41	3999	due to Unit #1 commissioning	9.43	3603.53
279	MO	6/22/2019 7:00	6/22/2019 14:47	3999	due to Unit #1 commissioning	7.78	2973.23
300	MO	6/22/2019 15:16	6/22/2019 15:55	3999	commissioning of unit #1	0.65	248.30
280	MO	6/23/2019 7:12	6/23/2019 12:08	3999	due to unit #1 commissioning	4.93	1884.53

LUDINGTON - LUDINGTON 2 CONTINUED							
Event	Type	Start	End	Cause	Description	Eq Hrs	Eq MWH
281	MO	6/23/2019 21:55	6/23/2019 22:40	3999	due to Unit #1 commissioning	0.75	286.50
282	MO	6/24/2019 20:00	6/25/2019 0:30	3999	due to Unit #1 commissioning	4.50	1719.00
283	MO	6/25/2019 20:00	6/25/2019 22:51	3999	due to Unit #1 commissioning	2.85	1088.70
285	MO	6/26/2019 20:00	6/26/2019 22:40	3999	testing for unit #1 commissioning	2.67	1018.67
286	U1	6/28/2019 6:23	6/28/2019 9:40	7121	replace #4 penstock drain valve	3.28	1254.23
301	U1	7/2/2019 8:01	7/2/2019 9:02	7053	to repair governor air leak	1.02	388.37
302	U1	7/7/2019 15:37	7/7/2019 17:15	4551	Upper guide bearing oil level alarm	1.63	623.93
333	U1	7/8/2019 21:24	7/8/2019 22:15	3999	upper guide bearing oil level hi-lo alarm	0.85	324.70
325	PO	7/12/2019 7:00	7/12/2019 14:09	4602	brush inspection	7.15	2731.30
358	PO	8/12/2019 7:07	8/12/2019 14:25	4602	brush inspection	7.30	2788.60
389	PO	9/9/2019 7:20	9/9/2019 14:37	4602	Brush inspection	7.28	2782.23
392	MO	9/11/2019 0:55	9/11/2019 8:51	3620	MTB #2 outage - transformer move	7.93	3030.53
395	MO	9/12/2019 0:59	9/12/2019 9:41	3620	MTB #2 outage - transformer move	8.70	3323.40
396	MO	9/13/2019 1:00	9/13/2019 9:30	3620	MTB #2 outage - transformer move	8.50	3247.00
397	MO	9/16/2019 1:01	9/16/2019 10:04	3620	MTB #2 outage - transformer move	9.05	3457.10
406	MO	9/17/2019 1:00	9/17/2019 9:08	3620	MTB #2 outage - transformer move	8.13	3106.93
421	PO	10/6/2019 4:19	10/15/2019 16:19	7201	2019 Pond Outage	228.00	87096.00
428	PE	10/15/2019 16:19	12/6/2019 19:30	7201	2019 Pond Outage Extension	1252.18	473730.53

LUDINGTON - LUDINGTON 3							
Event	Type	Start	End	Cause	Description	Eq Hrs	Eq MWH
2	PO	1/14/2019 6:14	1/14/2019 14:22	4602	Brush Inspection	8.13	2562.00
46	MO	2/3/2019 7:00	2/3/2019 15:25	3682	to replace the 412 link	8.42	2651.25
48	PO	2/12/2019 7:19	2/12/2019 14:33	4602	brush inspection	7.23	2278.50
99	U1	3/12/2019 18:10	3/12/2019 21:47	3641	functionality testing of the 115	3.62	1197.12
118	U1	3/13/2019 16:46	3/13/2019 18:03	3999	testing Unit 2 for Lead	1.28	424.78
116	PO	3/25/2019 7:00	3/25/2019 15:00	4602	brush inspection	8.00	2648.00
119	PE	3/25/2019 15:00	3/25/2019 16:23	4602	brush inspection	1.38	457.88
127	PO	4/7/2019 7:18	4/7/2019 8:48	9998	Black start testing	1.50	496.50
128	PO	4/7/2019 9:21	4/7/2019 11:59	9998	black start testing	2.63	871.63
176	PO	4/29/2019 6:20	4/29/2019 16:40	4602	brush inspection and deluge test	10.33	3420.33
181	PO	5/13/2019 6:01	1/1/2020 0:00	7200	MOH of Unit #3	5586.98	1833667.48

LUDINGTON - LUDINGTON 4							
Event	Type	Start	End	Cause	Description	Eq Hrs	Eq MWH
3	PO	1/14/2019 6:13	2/4/2019 19:19	7201	Plant periodic maintenance outage	517.10	179433.70
39	PO	2/4/2019 19:49	2/4/2019 19:56	7201	Plant periodic maintenance outage	0.12	40.48
72	U1	3/12/2019 18:10	3/12/2019 21:47	3641	functionality testing of the 115	3.62	1381.57
94	U1	3/13/2019 16:46	3/13/2019 18:03	3999	testing Unit 2 for Lead	1.28	490.23
92	PO	3/25/2019 7:00	3/25/2019 15:00	4602	brush inspection	8.00	3056.00
95	PE	3/25/2019 15:00	3/25/2019 16:23	4602	brush inspection	1.38	528.43
106	PO	4/7/2019 7:18	4/7/2019 11:59	9998	Black Start testing	4.68	1789.03
157	PO	4/29/2019 5:37	5/2/2019 11:52	4630	Oil cooler cleaning	78.25	29891.50
159	U1	5/2/2019 22:05	5/3/2019 7:13	7009	suspected water content in turbine guide bearing	9.13	3488.93
160	U1	5/7/2019 14:10	5/7/2019 14:40	3999	monitoring equipment for governor tripped the unit	0.50	191.00
161	PO	5/13/2019 5:33	5/13/2019 13:33	4602	brush inspections	8.00	3056.00
162	PE	5/13/2019 13:33	5/13/2019 17:30	4602	brush inspection extension	3.95	1508.90
210	PO	6/12/2019 7:00	6/12/2019 14:00	4602	brush inspection	7.00	2674.00
222	U1	6/28/2019 6:23	6/28/2019 18:15	7121	replace #4 penstock drain valve	11.87	4533.07
233	U1	7/2/2019 8:01	7/2/2019 9:02	7053	to repair governor air leak	1.02	388.37
265	PO	7/25/2019 7:00	7/25/2019 14:08	4602	brush inspection	7.13	2724.93
286	PO	8/14/2019 7:15	8/14/2019 13:59	4602	brush inspection	6.73	2572.13
308	PO	9/3/2019 7:25	11/4/2019 18:25	3620	#2 MTB outage	1500.00	572999.99
311	PE	11/4/2019 18:25	12/9/2019 15:30	3620	#2 MTB Outage	837.08	314163.33
325	U1	12/9/2019 15:30	12/19/2019 11:30	7130	Unit 4 spiral case stay vane cavitation repairs	236.00	83780.00
314	PO	12/19/2019 12:30	12/19/2019 13:02	3620	Post Outage PMT pump spin test	0.53	189.33
323	SF	12/21/2019 17:57	12/21/2019 18:01	7099	Unit's brakes locked	0.07	23.67

LUDINGTON - LUDINGTON 5							
Event	Type	Start	End	Cause	Description	Eq Hrs	Eq MWH
3	PO	1/10/2019 7:01	1/10/2019 14:01	4602	Brush Inspection	7.00	2443.00
56	PO	2/14/2019 7:00	2/14/2019 14:20	4602	Brush inspection	7.33	2559.33
104	U1	3/12/2019 18:10	3/12/2019 21:47	3641	functionality testing of the 115	3.62	1381.57
124	U1	3/13/2019 16:46	3/13/2019 18:03	3999	testing Unit 2 for Lead	1.28	490.23
121	PO	3/25/2019 7:00	3/25/2019 7:40	3620	#3 MTB deluge test - cancelled due to no support from ITC	0.67	254.67
122	PO	3/26/2019 7:19	3/26/2019 14:04	4602	brush inspection	6.75	2578.50
140	PO	4/7/2019 7:18	4/7/2019 11:59	9998	Black start testing	4.68	1789.03
142	PO	4/15/2019 7:02	4/18/2019 16:09	4640	oil cooler cleaning	81.12	30986.57
180	U1	5/2/2019 23:35	5/3/2019 0:35	7299	brake issues- position sensor plate slightly ajar	1.00	382.00
205	PO	5/16/2019 7:00	5/16/2019 14:13	4602	brush inspection	7.22	2756.77
207	U1	5/20/2019 23:02	5/21/2019 7:00	3999	tripped due to vibrations	7.97	3043.27
213	U1	5/21/2019 16:15	5/21/2019 19:10	3999	lab doing testing	2.92	1114.17
214	U1	5/22/2019 8:34	5/22/2019 12:46	7140	wicket gate testing	4.20	1604.40
241	PO	6/13/2019 7:00	6/13/2019 14:05	4602	brush inspection	7.08	2705.83
250	U1	6/25/2019 9:52	6/25/2019 11:48	3999	for CCC upgrades	1.93	738.53
251	U1	6/28/2019 6:23	6/28/2019 10:22	7121	replace #4 penstock drain valve	3.98	1521.63
262	U1	7/2/2019 8:01	7/2/2019 9:02	7053	to repair governor air leak	1.02	388.37
263	U1	7/9/2019 11:51	7/9/2019 14:40	7007	due to high water level in TGB	2.82	1075.97
265	PO	7/11/2019 7:00	7/11/2019 14:22	4602	brush inspection	7.37	2814.07
313	MO	8/9/2019 15:12	8/17/2019 15:10	7000	shaft seal outage	191.97	73331.27
346	PO	9/12/2019 7:06	9/12/2019 13:36	4602	brush inspection	6.50	2483.00
366	PO	10/6/2019 4:19	10/15/2019 16:19	7201	2019 Pond Outage	228.00	87096.00
372	PE	10/15/2019 16:19	12/17/2019 9:43	7201	2019 Pond Outage Extension	1506.40	561664.72

LUDINGTON - LUDINGTON 6							
Event	Type	Start	End	Cause	Description	Eq Hrs	Eq MWH
3	PO	1/11/2019 7:00	1/11/2019 13:39	4602	Brush Inspection	6.65	2294.25
12	PO	2/15/2019 7:00	2/15/2019 14:08	4602	brush inspection	7.13	2461.00
16	MO	3/13/2019 22:00	3/19/2019 19:40	3999	Unavailable as a lead unit	141.67	53975.00
17	U1	3/21/2019 11:22	3/21/2019 11:34	7053	To fix governor unloader- work cancelled	0.20	76.20
22	PO	3/25/2019 7:00	3/25/2019 7:40	3620	#3 MTB deluge test - cancelled due to no support from ITC	0.67	254.00
23	MO	3/26/2019 7:19	3/26/2019 16:00	7230	Pony motor door repairs & governor unloader work	8.68	3308.35
39	U1	4/2/2019 13:21	4/2/2019 14:23	7053	investigate sound coming from pump	1.03	393.70
42	PO	4/7/2019 7:18	4/7/2019 11:59	9998	Black start testing	4.68	1784.35
47	PO	4/17/2019 6:30	4/17/2019 15:37	3620	#3 MTB deluge testing	9.12	3473.45
91	MO	4/17/2019 15:38	4/17/2019 17:55	3620	MTB # 3 deluge test	2.28	869.95
118	PO	5/22/2019 7:06	5/22/2019 15:00	4602	brush inspections	7.90	3009.90
119	MO	5/22/2019 15:01	5/24/2019 19:05	3899	#6 governor upgrade	52.07	19837.40
140	PO	6/14/2019 7:00	6/14/2019 14:15	4602	brush inspection	7.25	2762.25
146	U1	6/25/2019 9:52	6/25/2019 11:48	3999	due to CCC upgrades	1.93	736.60
147	U1	6/28/2019 6:23	6/28/2019 10:22	7121	replace #4 penstock drain valve	3.98	1517.65
160	U1	7/2/2019 8:01	7/2/2019 9:02	7053	to repair governor air leak	1.02	387.35
161	U1	7/9/2019 23:25	7/10/2019 0:24	4650	Upper wear ring cooling water no flow alarm- 59 min lockout timer	0.98	374.65
194	PO	7/24/2019 7:08	7/24/2019 14:12	4602	brush inspection	7.07	2692.40
218	U1	8/14/2019 15:00	8/14/2019 15:50	3899	breaker issues on #6 governor pump	0.83	317.50
223	PO	8/16/2019 7:01	8/16/2019 14:08	4602	Brush inspection	7.12	2711.45
225	U1	8/17/2019 14:00	8/17/2019 14:15	4630	found CWV 6-16 stuck open	0.25	95.25
259	PO	9/16/2019 7:00	9/16/2019 14:04	4602	brush inspection	7.07	2692.40
274	U1	9/25/2019 23:23	9/26/2019 0:54	4609	Excitation trip w/ governor and excitation alarms on channel 1 - investigation	1.52	577.85
282	PO	10/6/2019 4:19	10/15/2019 23:59	7201	2019 Pond Outage	235.67	89789.00
288	U1	10/16/2019 0:50	10/16/2019 3:15	7230	Start issue traced back to pony motor lockout relay fuses in cabinet	2.42	920.75
299	U1	10/23/2019 11:59	10/23/2019 14:45	4650	clean the wye strainers in the cooling water system	2.77	1054.10
327	U1	11/8/2019 5:54	11/8/2019 6:07	4650	CWV 6-16 leaking air	0.22	82.55
339	U1	11/15/2019 11:17	11/15/2019 13:11	4650	clean strainers	1.90	723.90
368	U1	12/7/2019 5:41	12/7/2019 9:41	3999	draining penstock for #3 stator move	4.00	1380.00
388	PO	12/13/2019 6:59	12/13/2019 14:59	4602	Brush inspection	8.00	2760.00
391	U1	12/13/2019 14:59	12/13/2019 15:50	9997	Relay testing on bank #3 for NERC	0.85	293.25

ZEELAND CC - ZEELAND3							
Event	Type	Start	End	Cause	Description	Eq Hrs	Eq MWH
12	MO	2/7/2019 0:12	2/8/2019 19:40	4261	MSV Control Valve Servo Replacement and Inspection	43.47	7824.00
18	MO	2/12/2019 9:04	2/16/2019 23:59	5109	Maintenance Outage to Remove Stack Dampers on Zeeland 3 and 4	110.92	19965.00
20	ME	2/16/2019 23:59	2/17/2019 19:37	5109	Extension of Maintenance Outage to Complete Stack Damper Removal	19.63	3534.00
28	U1	3/27/2019 11:49	3/28/2019 17:09	5240	Faulty Heat Detector Tripped Unit. Unit off until repairs completed. ETR 3/28/19.	29.33	5280.00
29	U1	3/30/2019 13:07	4/1/2019 14:32	4551	Zeeland 5 Trip on High Vibration Bearing #5	49.42	8895.00
34	PO	5/11/2019 0:11	5/31/2019 0:11	5272	Zeeland Phase 2 Spring Periodic Outage.	480.00	74880.00
35	PE	5/31/2019 0:11	5/31/2019 9:46	5272	Rainy weather lost time on 52G HVB Breaker Overhaul, 24 Hour Extension.	9.58	1495.00
36	PO	5/31/2019 9:53	5/31/2019 10:34	5272	Post Maintenance Testing	0.68	106.60
37	PO	5/31/2019 11:21	5/31/2019 12:56	5272	Post Maintenance Testing	1.58	247.00
41	U1	7/4/2019 21:16	7/8/2019 16:24	3660	GT2A Auxiliary Transformer Failure. Loss of power to Phase 2	91.13	14216.80
48	PO	9/22/2019 0:18	9/26/2019 0:18	5035	Fall Periodic Outage.	96.00	14976.00
50	PE	9/26/2019 0:18	9/26/2019 4:00	5035	Completing Water Washes.	3.70	577.20

ZEELAND CC - ZEELAND4							
Event	Type	Start	End	Cause	Description	Eq Hrs	Eq MWH
11	U1	2/6/2019 3:59	2/8/2019 19:40	5079	Unit Tripped due to unknown Combustion issue-Still Investigating.	63.68	11463.00
16	MO	2/14/2019 0:01	2/16/2019 23:59	5109	Maintenance Outage to Remove Stack Dampers on Zeeland 3 and 4	71.97	12954.00
18	ME	2/16/2019 23:59	2/17/2019 19:37	5109	Extension of Maintenance Outage to Complete Stack Damper Removal	19.63	3534.00
25	U1	3/30/2019 13:07	4/1/2019 19:27	4551	Zeeland 5 Trip on High Bearing Vibration. Bearing #5.	54.33	9780.00
27	U1	4/14/2019 19:51	4/15/2019 20:12	5108	Zeeland 4 Trip on High Exhaust Spread @ 1951.	24.35	4383.00
30	PO	4/27/2019 0:05	4/28/2019 20:36	5035	Water Wash Outage Zeeland 4	44.52	8013.00
32	PO	5/11/2019 0:11	5/31/2019 0:11	5272	Zeeland Phase 2 Spring Periodic Outage.	480.00	76320.00
33	PE	5/31/2019 0:11	5/31/2019 17:07	5272	Rainy weather lost time on 52G HVB Breaker Overhaul, 24 Hour Extension.	16.93	2692.40
38	U1	7/4/2019 21:16	7/8/2019 16:24	3660	GT2A Auxiliary Transformer Failure. Loss of power to Phase 2	91.13	14490.20
46	PO	9/22/2019 0:18	9/26/2019 0:18	5035	Fall Periodic Outage.	96.00	15264.00
48	PE	9/26/2019 0:18	9/26/2019 4:00	5035	Completing Water Washes ran long.	3.70	588.30
67	U1	12/19/2019 6:12	12/19/2019 10:29	5079	Unit was shut down on High Combustion Dynamics.	4.28	771.00

ZEELAND CC - ZEELAND5							
Event	Type	Start	End	Cause	Description	Eq Hrs	Eq MWH
6	U1	1/20/2019 18:10	1/20/2019 19:00	4551	Steam Turbine Trip-INVESTIGATED and FOUND A LOOSE PROXIMITOR for Bearing Probe.	0.83	179.17
12	MO	2/7/2019 0:11	2/8/2019 19:40	4261	MSV Control Valve Servo Replacement and Inspection	43.48	9348.92
17	MO	2/14/2019 0:01	2/16/2019 23:59	5109	Maintenance Outage to Remove Stack Dampers on Zeeland 3 and 4	71.97	15472.83
20	ME	2/16/2019 23:59	2/17/2019 19:37	5109	Extension of Maintenance Outage to Complete Stack Damper Removal	19.63	4221.17
28	U1	3/30/2019 12:42	4/1/2019 16:00	4551	Zeeland 5 Trip on High Bearing Vibration. Bearing #5.	51.30	11029.50
35	PO	5/11/2019 0:08	5/31/2019 0:08	4260	Zeeland Phase 2 Spring Periodic Outage	480.00	104640.00
36	PE	5/31/2019 0:08	5/31/2019 13:46	4260	Rainy weather lost time on 52G HVB Breaker Overhaul, 24 Hour Extension.	13.63	2972.07
42	U1	7/4/2019 21:16	7/8/2019 16:24	3660	GT2A Auxiliary Transformer Failure. Loss of power to Phase 2	91.13	19867.07
50	PO	9/22/2019 0:26	9/26/2019 0:26	5035	Fall Periodic Outage.	96.00	20928.00
52	PE	9/26/2019 0:26	9/26/2019 4:00	5035	Completing Water Washes.	3.57	777.53

ZEELAND ST - ZEELAND1							
Event	Type	Start	End	Cause	Description	Eq Hrs	Eq MWH
15	SF	1/23/2019 8:07	1/23/2019 23:02	5299	GT1A IS UNAVAILABLE FOR DISPATCH DUE TO GROUND FAULT IN THE LCI. NO ETR	14.92	2685.00
46	U1	2/25/2019 12:28	2/25/2019 19:47	9130	ANR-No gas available for unit to run.	7.32	1317.00
65	PO	4/13/2019 0:06	4/13/2019 15:04	5035	Water Wash Maintenance Outage.	14.97	2694.00
78	PO	5/1/2019 0:01	5/10/2019 7:45	5272	Spring 2019 Periodic Outage	223.73	35573.60
90	SF	5/29/2019 4:52	5/29/2019 4:55	5016	CBV Failed	0.05	7.95
145	PO	10/5/2019 0:01	10/25/2019 0:01	3682	Fall Periodic Outage-	480.00	86400.00
146	PE	10/25/2019 0:01	10/25/2019 16:03	3682	Fall Periodic Outage Extension	16.03	2886.00
148	U1	10/28/2019 8:53	10/28/2019 11:24	4620	A.P.U Compress Discharge Line found a Broken Fitting.	2.52	453.00

ZEELAND ST - ZEELAND2							
Event	Type	Start	End	Cause	Description	Eq Hrs	Eq MWH
10	U1	1/21/2019 7:19	1/22/2019 17:05	9130	No Gas Available	33.77	6078.00
12	SF	1/22/2019 17:05	1/22/2019 23:03	5299	89ND Switch Failure	5.97	1074.00
26	U1	2/5/2019 14:30	2/5/2019 17:06	5048	Replacing Fuel Gas Transmitter on Zeeland 2	2.60	468.00
48	U1	2/25/2019 12:29	2/25/2019 19:47	9130	ANR-No gas available for unit to run	7.30	1314.00
65	PO	4/16/2019 0:13	4/16/2019 17:18	5035	Water Wash Outage. ETR 4/16/19 @ 2359	17.08	3075.00
74	PO	5/1/2019 0:01	5/9/2019 7:19	5272	Spring 2019 Outage	199.30	31489.40
87	U1	7/1/2019 17:50	7/2/2019 14:28	5109	EXHAUST BLOWER BEARING BAD. FAN GOT HOT AND MELTED CAUSED GROUND FAULT	20.63	3260.07
98	SF	7/14/2019 12:33	7/15/2019 11:15	3681	299 Sync Breaker did not close at 3600 RPM-Investigation Ongoing.	22.70	3586.60
103	MO	7/17/2019 0:01	7/17/2019 13:55	5109	MO-Replacing Exhaust Frame Blower Motor #2.	13.90	2196.20
133	PO	10/5/2019 0:01	10/24/2019 18:04	3682	Fall Periodic Outage-	474.05	85329.00
150	U1	11/12/2019 5:58	11/23/2019 14:03	4740	Generator Protection Relay Tripped Unit-	272.08	48975.00

MICHIGAN PUBLIC SERVICE COMMISSION
Consumers Energy Company

EVENT IDENTIFICATION – OUTAGES[1]

PO – Planned Outage

An outage that is scheduled well in advance and is of a predetermined duration, can last for several weeks, and occurs only once or twice a year. Typically, these events are specifically listed in the plant budget. Turbine and boiler overhauls or inspections, testing, and nuclear refueling are typical planned outages. For a planned outage, all of the specific individual maintenance and operational tasks to be performed are determined in advance and are referred to as the "original scope of work." The general task of repairing turbines, boilers, pumps, etc. is not considered a work scope because it does not define the individual tasks to be performed. For example, if a general task such as repair boiler is considered the work scope, it is impossible to conclude that any boiler work falls outside of the original scope of work. Discovery work and re-work which render the unit out of service beyond the estimated PO end date are not considered part of the original scope of work. A planned extension may be used only in instances where the original scope of work requires more time to complete than the estimated time. For example, if an inspection that is in the original scope of work for the planned outage takes longer than scheduled, the extra time should be coded as an extension (PE). However, if damage found during the inspection results in an extension of the outage, the extra time required to make repairs should be coded as a forced outage.

MO – Maintenance Outage

An outage that can be deferred beyond the end of the next weekend (defined as Sunday at 2400 hours or as Sunday turns into Monday), but requires that the unit be removed from service, another outage state, or Reserve Shutdown state before the next Planned Outage (PO). Characteristically, a MO can occur any time during the year, has a flexible start date, may or may not have a predetermined duration, and is usually much shorter than a PO. Discovery work and re-work which render the unit out of service beyond the estimated MO end date are not considered part of the original scope of work. A maintenance extension may be used only in instances where the original scope of work requires more time to complete than the estimated time. For example, if an inspection that is in the original scope of work for the outage takes longer than scheduled, the extra time should be coded as an extension (ME). If the damage found during the inspection is of a nature that the unit could be put back on-line and be operational past the end of the upcoming weekend, the work could be considered MO. If the inspection reveals damage that prevents the unit from operating past the upcoming weekend, the extended work time should be Forced Outage (U1).

Note: If an outage occurs before Friday at 2400 hours (or before Friday turns into Saturday), the above definition applies. But if the outage occurs after Friday at 2400 hours and before Sunday at 2400 hours (the 48 hours of Saturday and Sunday), the MO will only apply if the outage can be delayed past the next, not current, weekend. If the outage cannot be deferred, the outage shall be a forced event.

PE – Planned Outage Extension

GADS defines a planned outage extension as an extension of a Planned Outage (PO) beyond its estimated completion date. This means that at the start of the PO, the outage had an estimated duration (time period) for the work and a date set for the unit to return to service. All work during the PO is scheduled (part of the original scope of work) and all repair times are determined before the outage started.

ME – Maintenance Outage Extension

GADS defines a maintenance outage extension as an extension of a Maintenance Outage (MO) beyond its estimated completion date. This means that at the start of the MO, the outage had an estimated duration (time period) for the work and a date set for the unit to return to service. All work during the MO is scheduled (part of the original scope of work) and all repair times are determined before the outage started.

SF – Startup Failure

This is an outage that results when a unit is unable to synchronize within a specified startup time following an outage or reserve shutdown. The startup period for each unit is determined by the operating company. It is unique for each unit, and depends on the condition of the unit at the time of startup (cold, warm, and hot). A typical unit startup occurs in three phases: warm up, synchronization, and ramp up. NERC defines a startup period to begin with the command to start and end when the unit is synchronized. An SF begins when a problem preventing the unit from synchronizing occurs. The SF ends when the unit is synchronized, another SF occurs, or the unit enters another permissible state. Problems encountered during ramp up that force the unit offline are considered outages not SF events.

U1 - Unplanned (Forced) Outage – Immediate

This is an outage that requires immediate removal of a unit from service, another outage state, or a reserve shutdown state. This type of outage usually results from automatic control system trips or operator-initiated manual trips of the unit in response to unit alarms but can also occur while the unit offline.

U2 - Unplanned (Forced) Outage – Delayed

This is an outage that does not require immediate removal of a unit from the in service state, instead requiring removal within six hours. This type of outage can only occur while the unit is in service.

U3 – Unplanned (Forced) Outage – Postponed

This is an outage that can be postponed beyond six hours but requires that a unit be removed from the in-service state before the end of the next weekend (Sunday at 2400 or before Sunday turns into Monday). This type of outage can only occur while the unit is in service.

[1]From January 2019 GADS data reporting instructions.

MICHIGAN PUBLIC SERVICE COMMISSION
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INFORMATION FOR UNIT - Campbell Unit 2
PERIODIC OUTAGE

Sequence Number:	Campbell Unit 2-2019-1
Plant/Unit:	Campbell Unit 2
MW Derate:	
Event Year:	2019
Event Number:	36
Start Date:	1/31/2019 19:05
End Date:	2/2/2019 22:21
Outage Type:	MO
Duration (Hours):	51.27
MWh Loss:	18456.00
NERC Cause Code:	9630
NERC Cause Code Description:	Opacity - Fossil Steam Units...
Root Cause Description:	Air preheater drive failure
Event Description:	2A APH OOS, opacity exceedance resulted in removing unit from service.
Additional Description:	Opacity exceedance resulting from loss of 2A Air Heater
Mode of Failure:	Air Quality Control System (AQCS) protective logic relay activated due to excessive exhaust temperatures which resulted in the bypassing of Pulse Jet Fabric Filters. End result was that particle laden flue gas was sent directly to the stack.
Final Corrective Action:	Unit removed from service due to environmental regulations.
Mechanism Causing:	Opacity exceedance resulting from high flue gas temperatures.
Final Root Cause	Failure of 2A Air Preheater motor drive gearbox coupling
Scope to Correct Root Cause:	Repair 2A gearbox coupling and restored unit to service
Additional Scope:	N/A
If outage Extended for Additional Work & Why:	N/A

MICHIGAN PUBLIC SERVICE COMMISSION
CONSUMERS ENERGY COMPANY

INFORMATION FOR UNIT - Campbell Unit 2
PERIODIC OUTAGE

Sequence Number:	Campbell Unit 2-2019-1
Plant/Unit:	Campbell Unit 2
MW Derate:	
Event Year:	2019
Event Number:	132
Start Date:	4/15/2019 19:42
End Date:	4/24/2019 20:44
Outage Type:	MO
Duration (Hours):	217.03
MWh Loss:	78132.00
NERC Cause Code:	1150
NERC Cause Code Description:	Second Superheater Slagging or Fouling...
Root Cause Description:	Poor fuel quality
Event Description:	Maintenance outage to clean ash out of the SH.
Additional Description:	Poor fuel quality resulting from excessive coal moisture content and lower BTU coal from the long-term storage pile
Mode of Failure:	Excessive slagging in both the screen tubes and the superheat pendant.
Final Corrective Action:	Removal of excessive ash deposition from plugged boiler sections.
Mechanism Causing:	Increased slagging due to poor fuel quality.
Final Root Cause	Low BTU coal resulting from long-term storage and excessive additional coal moisture caused by recent heavy rains.
Scope to Correct Root Cause:	Increase monitoring of coal inventory for both moisture control and cumulative days of storage.
Additional Scope:	N/A
If outage Extended for Additional Work & Why:	N/A

MICHIGAN PUBLIC SERVICE COMMISSION
CONSUMERS ENERGY COMPANY

INFORMATION FOR UNIT - Campbell Unit 2
PERIODIC OUTAGE

Sequence Number:	Campbell Unit 2-2019-2
Plant/Unit:	Campbell Unit 2
MW Derate:	
Event Year:	2019
Event Number:	130
Start Date:	4/25/2019 19:02
End Date:	5/17/2019 15:27
Outage Type:	U1
Duration (Hours):	524.42
MWh Loss:	188790.00
NERC Cause Code:	4289
NERC Cause Code Description:	Turbine - Other Lube Oil System Problems...
Root Cause Description:	Inability to maintain adequate system oil level during unit load shifts.
Event Description:	Hydraulic coupling lube oil cooler oil leak, unable to isolate/bypass
Additional Description:	Oil leakage to the heat exchanger water side causing oil contamination and required cleanup activities.
Mode of Failure:	Cyclic fatigue on the oil cooler tubes due to the oil frothing, which occurs during load shift, resulting in erratic pressure spikes on the oil supply pumps.
Final Corrective Action:	Replaced failed cooler bundle and increased system oil level to minimize frothing.
Mechanism Causing:	Mechanical vibration of system.
Final Root Cause	Inadequate oil level.
Scope to Correct Root Cause:	The addition of an automated system consisting of an overflow tank and pumps to capture excess sump oil and return it to the sump. This modification will better suit hydraulic coupling operational needs and will reduce oil frothing.
Additional Scope:	Visual inspection of the Deaerator Heater
If outage Extended for Additional Work & Why:	N/A

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INFORMATION FOR UNIT - Campbell Unit 2
PERIODIC OUTAGE

Sequence Number:	Campbell Unit 2-2019-4
Plant/Unit:	Campbell Unit 2
MW Derate:	
Event Year:	2019
Event Number:	225
Start Date:	8/19/2019 22:45
End Date:	8/23/2019 17:20
Outage Type:	MO
Duration (Hours):	90.58
MWh Loss:	31613.58
NERC Cause Code:	4302
NERC Cause Code Description:	Turbine Trip Devices (including Instruments)...
Root Cause Description:	Turbine trip due to trip device diaphragm failure.
Event Description:	U2 offline, loss of turbine vacuum due to trip block diaphragm leak.
Additional Description:	Reinforced rubber diaphragm failed on the vacuum trip device.
Mode of Failure:	Cracking and splitting in the diaphragm material.
Final Corrective Action:	Replaced diaphragms on all trip devices.
Mechanism Causing:	Normal wear and tear combined with hot, oily environment.
Final Root Cause	Diaphragm at end of life.
Scope to Correct Root Cause:	Replaced diaphragms on all trip devices.
Additional Scope:	N/A
If outage Extended for Additional Work & Why:	N/A

MICHIGAN PUBLIC SERVICE COMMISSION
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INFORMATION FOR UNIT - Campbell Unit 2
PERIODIC OUTAGE

Sequence Number:	Campbell Unit 2-2019-3
Plant/Unit:	Campbell Unit 2
MW Derate:	
Event Year:	2019
Event Number:	295
Start Date:	10/26/2019 1:10
End Date:	11/3/2019 23:59
Outage Type:	MO
Duration (Hours):	215.82
MWh Loss:	77694.00
NERC Cause Code:	1140
NERC Cause Code Description:	First Superheater Slagging or Fouling...
Root Cause Description:	Fouling of the primary superheater
Event Description:	Maintenance outage to clean the backpass.
Additional Description:	Slagging in the primary superheater causing excessive back pressure and high tube metal temperatures
Mode of Failure:	Slagging in the primary superheater
Final Corrective Action:	Removal of slagging by explosive and mechanical methods
Mechanism Causing:	Ash at temperatures above softening/melting point exiting the furnace and entering the backpass.
Final Root Cause	Ash at temperatures above softening/melting point exiting the furnace and entering the backpass.
Scope to Correct Root Cause:	Follow maintenance and operational procedures to ensure adequate heat absorption in the furnace. Source fuels with high softening temperature.
Additional Scope:	N/A
If outage Extended for Additional Work & Why:	N/A

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INFORMATION FOR UNIT - Campbell Unit 2
PERIODIC OUTAGE

Sequence Number:	Campbell Unit 2-2019-4
Plant/Unit:	Campbell Unit 2
MW Derate:	
Event Year:	2019
Event Number:	296
Start Date:	11/3/2019 23:59
End Date:	11/16/2019 20:18
Outage Type:	ME
Duration (Hours):	308.32
MWh Loss:	110994.01
NERC Cause Code:	1140
NERC Cause Code Description:	First Superheater Slagging or Fouling...
Root Cause Description:	Tube leaks identified during maintenance outage
Event Description:	Maintenance extension following backpass cleaning for boiler tube leaks.
Additional Description:	Leaks identified on the backpass rear wall, backpass side wall, furnace lower slope, and reheat outlet header drain pipe.
Mode of Failure:	Backpass rear and side walls: thermal-mechanical stress. Furnace lower slope: Ash fall. Reheat outlet header drain pipe: mechanical stress
Final Corrective Action:	Welded repair on all affected areas.
Mechanism Causing:	Backpass rear and side walls: thermal-mechanical stress. Furnace lower slope: Ash fall. Reheat outlet header drain pipe: mechanical stress
Final Root Cause	Backpass rear and side walls: thermal-mechanical stress. Furnace lower slope: Ash fall. Reheat outlet header drain pipe: mechanical stress
Scope to Correct Root Cause:	Perform welded repairs on affected areas. Expected to last through end of plant life.
Additional Scope:	N/A
If outage Extended for Additional Work & Why:	N/A

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INFORMATION FOR UNIT - Campbell Unit 2
PERIODIC OUTAGE

Sequence Number:	Campbell Unit 2-2019-7
Plant/Unit:	Campbell Unit 2
MW Derate:	
Event Year:	2019
Event Number:	297
Start Date:	11/17/2019 2:36
End Date:	11/17/2019 3:57
Outage Type:	MO
Duration (Hours):	1.35
MWh Loss:	486.00
NERC Cause Code:	4460
NERC Cause Code Description:	Turbine Overspeed Trip Test
Root Cause Description:	Required annual overspeed trip test.
Event Description:	Annual turbine overspeed trip testing.
Additional Description:	Required annual overspeed trip test.
Mode of Failure:	Planned post-outage testing
Final Corrective Action:	Performed planned testing activity
Mechanism Causing:	Planned post-outage testing
Final Root Cause	Performed planned testing activity
Scope to Correct Root Cause:	Performed planned testing activity
Additional Scope:	N/A
If outage Extended for Additional Work & Why:	N/A

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INFORMATION FOR UNIT - Campbell Unit 3
PERIODIC OUTAGE

Sequence Number:	Campbell Unit 3-2019-2
Plant/Unit:	Campbell Unit 3
MW Derate:	
Event Year:	2019
Event Number:	380
Start Date:	10/5/2019 6:47
End Date:	11/24/2019 16:45
Outage Type:	PO
Duration (Hours):	1210.97
MWh Loss:	1013579.13
NERC Cause Code:	3441
NERC Cause Code Description:	Other High Pressure Heater Problems...
Root Cause Description:	Planned replacement of failing heat exchangers
Event Description:	Unit Periodic Outage for FWH and CLCW HX Replacements
Additional Description:	Replacement of 7A Feedwater heater and closed-loop heat exchanger.
Mode of Failure:	Equipment at end of functional life
Final Corrective Action:	Replace failing equipment with functional equivalent replacements
Mechanism Causing:	End of Life
Final Root Cause	End of Life
Scope to Correct Root Cause:	Replace failing equipment with functional equivalent replacements
Additional Scope:	Boiler deslag & maintenance, SCR catalyst replacement, Large Particle Ash screen cleaning, Burner tube replacement.
If outage Extended for Additional Work & Why:	N/A

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INFORMATION FOR UNIT - Karn Unit 1
PERIODIC OUTAGE

Sequence Number:	Karn Unit 1-2019-1
Plant/Unit:	Karn Unit 1
MW Derate:	
Event Year:	2019
Event Number:	2
Start Date:	1/2/2019 19:54
End Date:	1/3/2019 6:12
Outage Type:	U1
Duration (Hours):	10.30
MWh Loss:	2626.50
NERC Cause Code:	1190
NERC Cause Code Description:	Other Tube Slagging or Fouling...
Root Cause Description:	Fish run overcame the capacity of the debris filter
Event Description:	Tripped due to High Back-Pressure
Additional Description:	Fish run exceeded capacity of debris filter and required manual intervention to reestablish cooling water flow.
Mode of Failure:	High turbine backpressure
Final Corrective Action:	Reset the debris filter and restored the unit.
Mechanism Causing:	Environmental thermal profiles initiating fish run towards unit cooling water inlet.
Final Root Cause	Environmental thermal differentials causing increased attraction of fish toward cooling water inlet.
Scope to Correct Root Cause:	Increased monitoring and training during environmental variants in local source of cooling supply.
Additional Scope:	Not Applicable
If outage Extended for Additional Work & Why:	Not Applicable

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INFORMATION FOR UNIT - Karn Unit 1
PERIODIC OUTAGE

Sequence Number:	Karn Unit 1-2019-2
Plant/Unit:	Karn Unit 1
MW Derate:	
Event Year:	2019
Event Number:	30
Start Date:	2/6/2019 22:04
End Date:	2/18/2019 4:24
Outage Type:	MO
Duration (Hours):	270.33
MWh Loss:	68935.00
NERC Cause Code:	1090
NERC Cause Code Description:	Other Boiler Tube Leaks...
Root Cause Description:	Boiler Tube Leak
Event Description:	Boiler Tube Leak
Additional Description:	Economizer inlet header leak
Mode of Failure:	Defect in tube stub coming out of economizer header
Final Corrective Action:	Ground the crack out - inspected for ID Pitting to determine failure from inside or out. Applied lace pad weld overlay.
Mechanism Causing:	Outside bend - Thermal fatigue
Final Root Cause	Thermal Fatigue
Scope to Correct Root Cause:	Applied lace pad weld overlay.
Additional Scope:	N/A
If outage Extended for Additional Work & Why:	N/A

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INFORMATION FOR UNIT - Karn Unit 1
PERIODIC OUTAGE

Sequence Number:	Karn Unit 1-2019-3
Plant/Unit:	Karn Unit 1
MW Derate:	
Event Year:	2019
Event Number:	110
Start Date:	3/22/2019 23:59
End Date:	3/27/2019 23:59
Outage Type:	U1
Duration (Hours):	120.00
MWh Loss:	30600.00
NERC Cause Code:	9590
NERC Cause Code Description:	Miscellaneous Regulatory...
Root Cause Description:	Unit operating certificate was set to expire.
Event Description:	Removed unit from service to facilitate completion of boiler inspection for certification
Additional Description:	Unit operating certificate was set to expire and a variance was denied.
Mode of Failure:	Unit was issued a 36 month operating certificate that was set to expire and no variance allowed.
Final Corrective Action:	Unit was inspected and an insurance audit completed.
Mechanism Causing:	The scheduled March outage was postponed in anticipation of possible variance.
Final Root Cause	Unit was scheduled for March outage but deferred for 27 days based on a verbal issuance of a variation from our Authorized Inspector which we later removed based on a review of the state boiler law.
Scope to Correct Root Cause:	A internal review of the state boiler law was performed.
Additional Scope:	A complete rebuild of the RH ash pit, Boiler MATS inspections and repairs to prepare for post outage boiler tuning.
If outage Extended for Additional Work & Why:	N/A

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INFORMATION FOR UNIT - Karn Unit 1
PERIODIC OUTAGE

Sequence Number:	Karn Unit 1-2019-4
Plant/Unit:	Karn Unit 1
MW Derate:	
Event Year:	2019
Event Number:	106
Start Date:	3/27/2019 23:59
End Date:	4/19/2019 11:58
Outage Type:	PO
Duration (Hours):	539.98
MWh Loss:	137695.75
NERC Cause Code:	1190
NERC Cause Code Description:	Other Tube Slagging or Fouling...
Root Cause Description:	The RH portion of the ash pit needed replacement
Event Description:	RH Ash Pit Repair
Additional Description:	The Karn 1 ashpit was leaking severely from the walls and doors prior to the outage
Mode of Failure:	Internal refractory degradation led to accelerated deterioration of the ash pit steel structure.
Final Corrective Action:	The ash pit was replaced completely from below the seal trough down.
Mechanism Causing:	Ash pit refractory lining at end of life due to normal operation. Attempts were made to apply temporary patching to extend remaining life to an outage of suitable duration.
Final Root Cause	The RH ash pit refractory liner repairs failed resulting in higher erosion rates and damage to the ash pit structure.
Scope to Correct Root Cause:	The replacement of the RH ash pit material restored the system to as new condition.
Additional Scope:	Boiler MATS inspections and repairs to prepare for post outage boiler tuning.
If outage Extended for Additional Work & Why:	During startup the DI water line return from Karn 3-4 clearwells, which provides water on startup, ruptured. The repairs to this line delayed startup.

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INFORMATION FOR UNIT - Karn Unit 1
PERIODIC OUTAGE

Sequence Number:	Karn Unit 1-2019-5
Plant/Unit:	Karn Unit 1
MW Derate:	
Event Year:	2019
Event Number:	129
Start Date:	4/22/2019 13:14
End Date:	4/23/2019 4:10
Outage Type:	SF
Duration (Hours):	14.93
MWh Loss:	3808.00
NERC Cause Code:	3399
NERC Cause Code Description:	Other Miscellaneous Condensate System Problems...
Root Cause Description:	Insufficient water supply to bring unit online
Event Description:	Startup stopped due to lack of condensate. K2 tube leak step change shut down.
Additional Description:	DI water return line from clear well developed unmanageable leak.
Mode of Failure:	Lack of supply water
Final Corrective Action:	Placed unit into standby mode until water supply could be repaired
Mechanism Causing:	Piping corrosion
Final Root Cause	Insufficient water resulting from leak in water supply line
Scope to Correct Root Cause:	Unit was put into standby until DI water line repair
Additional Scope:	N/A
If outage Extended for Additional Work & Why:	N/A

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INFORMATION FOR UNIT - Karn Unit 1
PERIODIC OUTAGE

Sequence Number:	Karn Unit 1-2019-6
Plant/Unit:	Karn Unit 1
MW Derate:	
Event Year:	2019
Event Number:	115
Start Date:	4/23/2019 4:10
End Date:	4/28/2019 8:00
Outage Type:	U1
Duration (Hours):	123.83
MWh Loss:	31577.50
NERC Cause Code:	3499
NERC Cause Code Description:	Other Feedwater System Problems...
Root Cause Description:	DI Water line leak
Event Description:	DI water line rupture
Additional Description:	Through wall water leak in DI return from clear wells
Mode of Failure:	Corrosion
Final Corrective Action:	200' of affected piping was replaced
Mechanism Causing:	Corrosion
Final Root Cause	Material end of life
Scope to Correct Root Cause:	Damaged piping was replaced
Additional Scope:	N/A
If outage Extended for Additional Work & Why:	N/A

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INFORMATION FOR UNIT - Karn Unit 1
PERIODIC OUTAGE

Sequence Number:	Karn Unit 1-2019-7
Plant/Unit:	Karn Unit 1
MW Derate:	
Event Year:	2019
Event Number:	121
Start Date:	4/28/2019 8:00
End Date:	4/29/2019 14:39
Outage Type:	SF
Duration (Hours):	30.65
MWh Loss:	7815.75
NERC Cause Code:	4499
NERC Cause Code Description:	Other Miscellaneous Steam Turbine Problems...
Root Cause Description:	Unit DRX Trip
Event Description:	Failed to reach 550 rpm in 10 min. Turbine tripped. Boiler out. Restart needed.
Additional Description:	Turbine speed parameters during startup did not meet OEM guidelines resulting in the unit to be protectively tripped
Mode of Failure:	
	Turbine did not achieve min speed desired within OEM specified time limit.
Final Corrective Action:	Procedure was reviewed and the unit restarted per the OEM parameters.
Mechanism Causing:	Inexperienced start-up operator
Final Root Cause	Operator failed to adhere to requirements laid out within the procedure
Scope to Correct Root Cause:	Reviewed the procedure with the operations department
Additional Scope:	N/A
If outage Extended for Additional Work & Why:	N/A

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INFORMATION FOR UNIT - Karn Unit 1
PERIODIC OUTAGE

Sequence Number:	Karn Unit 1-2019-5
Plant/Unit:	Karn Unit 1
MW Derate:	
Event Year:	2019
Event Number:	130
Start Date:	5/14/2019 0:39
End Date:	6/1/2019 3:27
Outage Type:	U1
Duration (Hours):	431.35
MWh Loss:	109994.25
NERC Cause Code:	1000
NERC Cause Code Description:	Furnace Wall Leaks
Root Cause Description:	Reheater tube leak
Event Description:	Boiler tube leak
Additional Description:	Several reheat pendants had through wall tube leaks
Mode of Failure:	Boiler Tube Flyash erosion due to laning caused by ash pluggage in the pendants
Final Corrective Action:	Localized tube replacements and weld overlay
Mechanism Causing:	Flyash erosion
Final Root Cause	Excessive ash buildup
Scope to Correct Root Cause:	Deslag to remove ash buildup along with tube replacements
Additional Scope:	remove one layer of catalyst, repair oil leaks for turbine turning gears, clean and repair
If outage Extended for Additional Work & Why:	N/A

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INFORMATION FOR UNIT - Karn Unit 1
PERIODIC OUTAGE

Sequence Number:	Karn Unit 1-2019-6
Plant/Unit:	Karn Unit 1
MW Derate:	
Event Year:	2019
Event Number:	134
Start Date:	6/1/2019 3:27
End Date:	6/5/2019 23:59
Outage Type:	MO
Duration (Hours):	116.53
MWh Loss:	29599.47
NERC Cause Code:	1999
NERC Cause Code Description:	Boiler; Miscellaneous...
Root Cause Description:	Continuation of event 130
Event Description:	Completed welding of pendant clips
Additional Description:	Several reheat pendants had through wall tube leaks
Mode of Failure:	Boiler Tube Flyash erosion due to laning caused by ash pluggage in the pendants
Final Corrective Action:	Localized tube replacements and weld overlay
Mechanism Causing:	Flyash erosion
Final Root Cause	Excessive ash buildup
Scope to Correct Root Cause:	Deslag to remove ash buildup along with tube replacements
Additional Scope:	remove one layer of catalyst, repair oil leaks for turbine turning gears, clean and repair
If outage Extended for Additional Work & Why:	N/A

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INFORMATION FOR UNIT - Karn Unit 1
PERIODIC OUTAGE

Sequence Number:	Karn Unit 1-2019-7
Plant/Unit:	Karn Unit 1
MW Derate:	
Event Year:	2019
Event Number:	181
Start Date:	8/21/2019 18:32
End Date:	8/28/2019 20:17
Outage Type:	U1
Duration (Hours):	169.75
MWh Loss:	43116.50
NERC Cause Code:	1000
NERC Cause Code Description:	Furnace Wall Leaks...
Root Cause Description:	Suspected boiler tube leak.
Event Description:	SH Boiler Leak
Additional Description:	An audible indication along with a slight water chemistry change led the team to suspect a potential boiler tube leak.
Mode of Failure:	Unit was taken offline for a suspected boiler tube leak.
Final Corrective Action:	No boiler leak was identified during pressurization test of tubing circuitry.
Mechanism Causing:	Audible indication indicative of a potential tube leak.
Final Root Cause	Suspected air in-leakage was determined to be the source of the audible indication.
Scope to Correct Root Cause:	All door gaskets in the vicinity of the indication were inspected.
Additional Scope:	N/A
If outage Extended for Additional Work & Why:	All available resources were reassigned to unit 2 to troubleshoot a bunker hot spot. Unit 1 was unavailable until unit 2 was stabilized.

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INFORMATION FOR UNIT - Karn Unit 1
PERIODIC OUTAGE

Sequence Number:	Karn Unit 1-2019-8
Plant/Unit:	Karn Unit 1
MW Derate:	
Event Year:	2019
Event Number:	186
Start Date:	8/28/2019 20:17
End Date:	9/12/2019 9:00
Outage Type:	MO
Duration (Hours):	75.72
MWh Loss:	19232.03
NERC Cause Code:	3420
NERC Cause Code Description:	Feedwater Piping...
Root Cause Description:	Flow accelerated corrosion
Event Description:	K1 STM LK on elbow on BCWP to Drips Tk
Additional Description:	Piping through wall steam leak caused by flow accelerated corrosion
Mode of Failure:	Two-phase flow over time resulting in ID generated through wall corrosion
Final Corrective Action:	Piping replacement
Mechanism Causing:	Pipe corrosion
Final Root Cause	Flow accelerated corrosion
Scope to Correct Root Cause:	Two piping segments replaced with new
Additional Scope:	N/A
If outage Extended for Additional Work & Why:	N/A

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INFORMATION FOR UNIT - Karn Unit 1
PERIODIC OUTAGE

Sequence Number:	Karn Unit 1-2019-12
Plant/Unit:	Karn Unit 1
MW Derate:	
Event Year:	2019
Event Number:	195
Start Date:	10/4/2019 13:45
End Date:	10/6/2019 4:48
Outage Type:	U1
Duration (Hours):	39.05
MWh Loss:	9957.75
NERC Cause Code:	4899
NERC Cause Code Description:	Other Miscellaneous Generator Problems...
Root Cause Description:	Loss of condenser circulating water pump
Event Description:	Tripped on high condenser back pressure from seal oil deluge trip equipment failure.
Additional Description:	After performing deluge testing, the condenser circulating water pump motor was flooded with water causing motor failure
Mode of Failure:	Water ingress to motor
Final Corrective Action:	Unit was started on one pump and failed motor was sent offsite for repair.
Mechanism Causing:	Deluge system failed causing water release which flooded circ water pump motor housing.
Final Root Cause	Failure of deluge system caused damage to pump motor.
Scope to Correct Root Cause:	Failed deluge system was redundant and isolated.
Additional Scope:	Replace hydrogen purity analyzer for generator.
If outage Extended for Additional Work & Why:	N/A

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INFORMATION FOR UNIT - Karn Unit 1
PERIODIC OUTAGE

Sequence Number:	Karn Unit 1-2019-13
Plant/Unit:	Karn Unit 1
MW Derate:	
Event Year:	2019
Event Number:	200
Start Date:	10/6/2019 4:48
End Date:	10/6/2019 12:19
Outage Type:	SF
Duration (Hours):	7.52
MWh Loss:	1916.75
NERC Cause Code:	4140
NERC Cause Code Description:	Ip Turbine Bearings...
Root Cause Description:	Turbine high vibration trip
Event Description:	Unit tripped during startup during 1b 1 bearing vibration
Additional Description:	Turbine bearing 1-B-1 detected to have high vibration as the unit was pushed through a critical frequency during start-up resulting in a unit trip.
Mode of Failure:	Differential temperature between the turbine shell and the turbine rotor were not met before proceeding unit ramp.
Final Corrective Action:	Pulled the fire from unit and bottled it up.
Mechanism Causing:	Conditions within the procedure weren't met prior to proceeding with unit ramp.
Final Root Cause	Conditions within the procedure weren't met prior to proceeding with unit ramp.
Scope to Correct Root Cause:	Unit was allowed to cool off and temperatures equalized prior to restarting the unit.
Additional Scope:	N/A
If outage Extended for Additional Work & Why:	N/A

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INFORMATION FOR UNIT - Karn Unit 1
PERIODIC OUTAGE

Sequence Number:	Karn Unit 1-2019-14
Plant/Unit:	Karn Unit 1
MW Derate:	
Event Year:	2019
Event Number:	203
Start Date:	10/29/2019 3:10
End Date:	
Outage Type:	PO
Duration (Hours):	
MWh Loss:	
NERC Cause Code:	8812
NERC Cause Code Description:	Scr Catalyst...
Root Cause Description:	Planned Periodic Outage
Event Description:	Periodic Outage to replace Catalyst
Additional Description:	Scheduled outage to install layers of the SCR Catalyst
Mode of Failure:	Planned outage activity
Final Corrective Action:	Installed new catalyst layers
Mechanism Causing:	Material end of life
Final Root Cause	Material end of life
Scope to Correct Root Cause:	Replaced 2 catalyst layers
Additional Scope:	Removed the 1B condenser circulating water pump
If outage Extended for Additional Work & Why:	N/A

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INFORMATION FOR UNIT - Karn Unit 1
PERIODIC OUTAGE

Sequence Number:	Karn Unit 1-2019-15
Plant/Unit:	Karn Unit 1
MW Derate:	
Event Year:	2019
Event Number:	205
Start Date:	12/16/2019 15:01
End Date:	12/19/2019 19:52
Outage Type:	MO
Duration (Hours):	76.85
MWh Loss:	19596.75
NERC Cause Code:	0030
NERC Cause Code Description:	Coal Conveyers and Feeders
Root Cause Description:	Approved scheduled outage to replace the impact bed and discharge section of the C-to-D coal conveyor chute
Event Description:	FH C/D Coal Chute Replacement
Additional Description:	Planned replacement of the C-to-D conveyor chute and associated equipment occurred during the previous periodic outage. Chute was improperly designed and did not function.
Mode of Failure:	Improper design
Final Corrective Action:	Modify and replace portions of the C-to-D chute to properly distribute coal onto the D conveyor.
Mechanism Causing:	Improper design
Final Root Cause	Improper design
Scope to Correct Root Cause:	Redesign newly installed chute to provide proper coal distribution.
Additional Scope:	N/A
If outage Extended for Additional Work & Why:	N/A

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INFORMATION FOR UNIT - Karn Unit 2
PERIODIC OUTAGE

Sequence Number:	Karn Unit 2-2019-1
Plant/Unit:	Karn Unit 2
MW Derate:	
Event Year:	2019
Event Number:	2
Start Date:	1/1/2019 0:46
End Date:	2/4/2019 11:29
Outage Type:	U1
Duration (Hours):	826.71
MWh Loss:	2149*46.34
NERC Cause Code:	1090
NERC Cause Code Description:	Other Boiler Tube Leaks...
Root Cause Description:	Forced outage for RH Inlet pendant tube leak
Event Description:	Re-heater tube leak
Additional Description:	Fly ash erosion
Mode of Failure:	Flue gas laning caused localized tube wall erosion resulting in leak
Final Corrective Action:	The tube section was removed and replaced.
Mechanism Causing:	Fly ash erosion and excessive deposit build-up
Final Root Cause	Flue gas laning occurred due to boiler pluggage
Scope to Correct Root Cause:	Increased the backpass cleaning frequency
Additional Scope:	Five (5) subsequent tubes leaks identified during post repair activities. The additional leaks were identified in both the RH pendant and SH sidewalls. Repair method was to remove and replace.
If outage Extended for Additional Work & Why:	Not applicable

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INFORMATION FOR UNIT - Karn Unit 1
PERIODIC OUTAGE

Sequence Number:	Karn Unit 2-2019-1
Plant/Unit:	Karn Unit 1
MW Derate:	
Event Year:	2019
Event Number:	4
Start Date:	2/1/2019 0:00
End Date:	2/4/2019 11:29
Outage Type:	U1
Duration (Hours):	83.48
MWh Loss:	21705.67
NERC Cause Code:	1090
NERC Cause Code Description:	Other boiler tube leaks
Root Cause Description:	Start up delayed to complete vacuuming of pulse jet fabric filter hoppers.
Event Description:	Re-Heater tube leak
Additional Description:	Two hoppers were out of service prior to the outage. The hoppers were found full of ash and needed to be cleared.
Mode of Failure:	Ash accumulation during operation caused flow restrictions.
Final Corrective Action:	Cleared the ash from both hoppers.
Mechanism Causing:	Hardened ash in the throat of the hopper prevented ash flow.
Final Root Cause	Hardened ash in the throat of the hopper caused ash flow to slow and eventually stop.
Scope to Correct Root Cause:	Both hoppers were cleared.
Additional Scope:	N/A
If outage Extended for Additional Work & Why:	N/A

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INFORMATION FOR UNIT - Karn Unit 2
PERIODIC OUTAGE

Sequence Number:	Karn Unit 2-2019-2
Plant/Unit:	Karn Unit 2
MW Derate:	
Event Year:	2019
Event Number:	127
Start Date:	4/22/2019 21:22
End Date:	5/14/2019 23:59
Outage Type:	MO
Duration (Hours):	530.62
MWh Loss:	137960.33
NERC Cause Code:	1000
NERC Cause Code Description:	Furnace Wall Leaks
Root Cause Description:	Boiler tube leak
Event Description:	Boiler leak repair
Additional Description:	Inability to maintain steam drum water level due to boiler tube failures
Mode of Failure:	Ash pluggage in RH pendants caused laneing and subsequent tube erosion.
Final Corrective Action:	Deslagged upper furnace to remove excessive ash deposition. Replaced and repaired failed boiler tubes. Modified fuel blend to better control fuel slagging characteristics.
Mechanism Causing:	Fuel source caused increased ash deposition in the boiler pendant sections. This caused areas of increased localized high velocity laneing resulting in external tube wastage.
Final Root Cause	Fly ash erosion initiated by low temperature ash fusion coal blend
Scope to Correct Root Cause:	Fuel blend causing low ash fusion temperature has been altered to improve slagging characteristics. Deslagging of troublesome areas of ash deposition cleared to restore flue gas lanes to original design.
Additional Scope:	3 year boiler certificate inspection, MATs compliance testing, H2 cooler leaks, H2 discharge tie in, Replace SH by pass valves
If outage Extended for Additional Work & Why:	N/A

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INFORMATION FOR UNIT - Karn Unit 2
PERIODIC OUTAGE

Sequence Number:	Karn Unit 2-2019-3
Plant/Unit:	Karn Unit 2
MW Derate:	
Event Year:	2019
Event Number:	131
Start Date:	5/14/2019 23:59
End Date:	6/7/2019 23:59
Outage Type:	ME
Duration (Hours):	408.02
MWh Loss:	106084.34
NERC Cause Code:	1000
NERC Cause Code Description:	Furnace Wall Leaks
Root Cause Description:	Flyash Pluggage of Pendants and Backpass
Event Description:	Economic reserve shutdown. Deslag of economizer backpass and ash pit cleaning.
Additional Description:	Hard fly ash accumulation between tubes in each pendant and buildup between elements causing high DP and tube degradation during runs.
Mode of Failure:	Fuel blend causing low ash fusion temperature caused unanticipated slagging characteristics.
Final Corrective Action:	Explosive Deslagging of the upper furnace to remove excessive ash deposition. Modified fuel blend to better control fuel slagging characteristics.
Mechanism Causing:	Fuel source caused increased ash deposition in the boiler pendant and backpass sections.
Final Root Cause	Hardened ash deposition caused by low temperature ash fusion coal blend
Scope to Correct Root Cause:	Fuel blend causing low ash fusion temperature has been altered to improve slagging characteristics. Explosive deslagging of troublesome areas of ash deposition cleared to restore flue gas flow lanes.
Additional Scope:	N/A
If outage Extended for Additional Work & Why:	N/A

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INFORMATION FOR UNIT - Karn Unit 2
PERIODIC OUTAGE

Sequence Number:	Karn Unit 2-2019-4
Plant/Unit:	Karn Unit 2
MW Derate:	
Event Year:	2019
Event Number:	135
Start Date:	6/29/2019 0:00
End Date:	7/2/2019 6:33
Outage Type:	U1
Duration (Hours):	105.45
MWh Loss:	26257.05
NERC Cause Code:	9900
NERC Cause Code Description:	Operator Error
Root Cause Description:	Valve misaligned during restoration
Event Description:	H2 analyzer vent valve open (N/C) preventing gen from PMT
Additional Description:	Generator Hydrogen Vent valve opened during purge process, was not properly restored during startup activities
Mode of Failure:	Infrequently used valve not adequately identified for restoration
Final Corrective Action:	Valve closed and generator gassed
Mechanism Causing:	Inadequate checklist
Final Root Cause	Insufficient tracking of valve status
Scope to Correct Root Cause:	Valve closed and operating authority adding valve to checklist
Additional Scope:	N/A
If outage Extended for Additional Work & Why:	N/A

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INFORMATION FOR UNIT - Karn Unit 2
PERIODIC OUTAGE

Sequence Number:	Karn Unit 2-2019-5
Plant/Unit:	Karn Unit 2
MW Derate:	
Event Year:	2019
Event Number:	137
Start Date:	7/9/2019 2:30
End Date:	7/9/2019 20:02
Outage Type:	SF
Duration (Hours):	17.53
MWh Loss:	4365.80
NERC Cause Code:	4720
NERC Cause Code Description:	Generator Synchronization Equipment...
Root Cause Description:	Failed BPD transformer winding
Event Description:	Failed Bushing Potential Device (BPD) main transformer
Additional Description:	The line side voltage and phase angle were not available for synchronization.
Mode of Failure:	End of life
Final Corrective Action:	Item was reconfigured to electrically bypass the failure
Mechanism Causing:	Equipment end of life
Final Root Cause	Voltage and phase angle were mismatched not allowing equipment to be synchronized to grid
Scope to Correct Root Cause:	The grid side BPD transformer tap was reconfigured to electrically bypass the failure
Additional Scope:	N/A
If outage Extended for Additional Work & Why:	N/A

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INFORMATION FOR UNIT - Karn Unit 2
PERIODIC OUTAGE

Sequence Number:	Karn Unit 2-2019-6
Plant/Unit:	Karn Unit 2
MW Derate:	
Event Year:	2019
Event Number:	153
Start Date:	8/1/2019 1:38
End Date:	8/16/2019 22:57
Outage Type:	U1
Duration (Hours):	381.32
MWh Loss:	94947.85
NERC Cause Code:	1040
NERC Cause Code Description:	First Superheater Leaks...
Root Cause Description:	Primary superheat tube leak
Event Description:	SH Boiler Leak NW Corner 6th floor
Additional Description:	Ash laning and sootblower erosion caused tube thinning.
Mode of Failure:	Thin lipped tube failure due to erosion.
Final Corrective Action:	The tube section was removed and replace with new material.
Mechanism Causing:	Flyash Erosion
Final Root Cause	Ash buildup on the tubing caused local areas of high velocity flow which increased the fly ash erosion on exposed tubing surfaces.
Scope to Correct Root Cause:	The failed tubing was replaced with a new section of tubing and the surrounding area inspected for additional damage.
Additional Scope:	Six additional areas of tubing in the surrounding area needed weld buildup (pad welding) to restore lost tube surface area.
If outage Extended for Additional Work & Why:	N/A

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INFORMATION FOR UNIT - Karn Unit 2
PERIODIC OUTAGE

Sequence Number:	Karn Unit 2-2019-7
Plant/Unit:	Karn Unit 2
MW Derate:	
Event Year:	2019
Event Number:	170
Start Date:	8/16/2019 22:57
End Date:	8/30/2019 0:01
Outage Type:	U1
Duration (Hours):	313.07
MWh Loss:	77953.60
NERC Cause Code:	0090
NERC Cause Code Description:	Bunker Fires
Root Cause Description:	Stagnant coal left in the coal bunkers following a unit outage.
Event Description:	Karn 2 Bunkers were smoldering causing a HI CO in the bunkers
Additional Description:	Coal left in the bunkers was exposed to humid air via the feeder sealing air, causing a smoldering event.
Mode of Failure:	Spontaneous combustion of the stagnant coal exposed to a humid air source.
Final Corrective Action:	The hot spots were contained using fire fighting and suppression techniques while the remaining coal was vacuumed from bunkers.
Mechanism Causing:	Smoldering coal presented a fire risk
Final Root Cause	Historically, coal remains in bunkers during outages and CO levels and temperatures are monitored. The seal air from the feeders exacerbated the issue causing hot spots.
Scope to Correct Root Cause:	An Root Cause Analysis (RCA) was performed and the feeder seal air is required to be isolated when a unit comes off line.
Additional Scope:	Fire fighting and suppression techniques resulted in significant clean up activities that needed to be performed prior to returning the unit to service.
If outage Extended for Additional Work & Why:	N/A

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INFORMATION FOR UNIT - Karn Unit 2
PERIODIC OUTAGE

Sequence Number:	Karn Unit 2-2019-8
Plant/Unit:	Karn Unit 2
MW Derate:	
Event Year:	2019
Event Number:	162
Start Date:	9/2/2019 9:04
End Date:	9/3/2019 19:28
Outage Type:	U1
Duration (Hours):	34.40
MWh Loss:	8875.20
NERC Cause Code:	4619
NERC Cause Code Description:	Other Hydrogen System Problems...
Root Cause Description:	Loss of seal oil pressure
Event Description:	2A h2 seal oil pump coupling separated
Additional Description:	External seal oil coupling failed causing the loss of 2A generator seal oil pressure.
Mode of Failure:	Material at end of life
Final Corrective Action:	Replaced external side seal oil coupling
Mechanism Causing:	Material fatigue
Final Root Cause	Failed external side coupling.
Scope to Correct Root Cause:	Replaced the external side seal oil coupling
Additional Scope:	N/A
If outage Extended for Additional Work & Why:	N/A

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INFORMATION FOR UNIT - Karn Unit 2
PERIODIC OUTAGE

Sequence Number:	Karn Unit 2-2019-9
Plant/Unit:	Karn Unit 2
MW Derate:	
Event Year:	2019
Event Number:	169
Start Date:	9/9/2019 15:06
End Date:	9/11/2019 17:18
Outage Type:	SF
Duration (Hours):	50.20
MWh Loss:	12951.60
NERC Cause Code:	0530
NERC Cause Code Description:	Other Main Steam System Problems...
Root Cause Description:	Steam pipe drain line failure
Event Description:	Leak in Superheat drain lines to flash tank
Additional Description:	Superheat steam drain line leak saturated the 2F Primary air fan motor.
Mode of Failure:	Through wall piping failure
Final Corrective Action:	Replaced effected piping material
Mechanism Causing:	Internal Corrosion
Final Root Cause	ID generated corrosion caused a steam pipe leak.
Scope to Correct Root Cause:	Pipe replacement
Additional Scope:	Inspected 2F primary air fan motor
If outage Extended for Additional Work & Why:	N/A

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INFORMATION FOR UNIT - Karn Unit 2
PERIODIC OUTAGE

Sequence Number:	Karn Unit 2-2019-10
Plant/Unit:	Karn Unit 2
MW Derate:	
Event Year:	2019
Event Number:	172
Start Date:	9/13/2019 5:42
End Date:	9/13/2019 6:49
Outage Type:	SF
Duration (Hours):	1.12
MWh Loss:	288.10
NERC Cause Code:	3410
NERC Cause Code Description:	Feedwater Pump...
Root Cause Description:	Water contamination
Event Description:	Water in the oil of 2B BFP
Additional Description:	Condensation found in the 2B boiler feed pump cooling oil supply
Mode of Failure:	Water contamination in the 2B boiler feed pump cooling oil supply
Final Corrective Action:	Removed water contamination from oil
Mechanism Causing:	Condensation of atmospheric moisture in the oil system
Final Root Cause	Condensation from cooling water lines contaminated 2B boiler feed pump oil
Scope to Correct Root Cause:	Increased preventative maintenance frequency for oil filtration.
Additional Scope:	N/A
If outage Extended for Additional Work & Why:	N/A

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INFORMATION FOR UNIT - Karn Unit 2
PERIODIC OUTAGE

Sequence Number:	Karn Unit 2-2019-11
Plant/Unit:	Karn Unit 2
MW Derate:	
Event Year:	2019
Event Number:	173
Start Date:	9/13/2019 20:01
End Date:	9/14/2019 8:30
Outage Type:	U1
Duration (Hours):	12.48
MWh Loss:	3220.70
NERC Cause Code:	4302
NERC Cause Code Description:	Turbine Trip Devices (including Instruments)...
Root Cause Description:	Unit trip during start-up due to turbine differential expansion
Event Description:	Karn 2 Turbine tripped due to Thrust / Differential Expansion
Additional Description:	Rotor exceeded recommended temperatures during start-up turbine soak
Mode of Failure:	Turbine rotor differential expansion exceeded set point due to excess heat (rotor long condition)
Final Corrective Action:	Allowed sufficient cooling to normalize rotor and shell thermal expansion.
Mechanism Causing:	Excessive thermal energy to rotor
Final Root Cause	Turbine rotor heated up to quickly causing rotor long condition
Scope to Correct Root Cause:	Allowed sufficient cooling to normalize rotor and shell thermal expansion.
Additional Scope:	N/A
If outage Extended for Additional Work & Why:	N/A

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INFORMATION FOR UNIT - Karn Unit 2
PERIODIC OUTAGE

Sequence Number:	Karn Unit 2-2019-12
Plant/Unit:	Karn Unit 2
MW Derate:	
Event Year:	2019
Event Number:	174
Start Date:	9/14/2019 8:30
End Date:	9/16/2019 1:56
Outage Type:	SF
Duration (Hours):	41.43
MWh Loss:	10689.80
NERC Cause Code:	4289
NERC Cause Code Description:	Turbine - Other Lube Oil System Problems...
Root Cause Description:	Main turbine lube oil contamination during start-up
Event Description:	Water in Karn 2 Oil Base
Additional Description:	Gland steam system was operating with the low condenser vacuum system which pulled moisture into lube oil.
Mode of Failure:	Improper equipment alignment for plant conditions
Final Corrective Action:	Filtered the oil with the coalescer to remove moisture
Mechanism Causing:	Improper equipment lineup
Final Root Cause	Moisture contamination in turbine oil supply due to improper equipment alignment
Scope to Correct Root Cause:	Removed moisture and restored equipment
Additional Scope:	N/A
If outage Extended for Additional Work & Why:	N/A

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INFORMATION FOR UNIT - Karn Unit 2
PERIODIC OUTAGE

Sequence Number:	Karn Unit 2-2019-13
Plant/Unit:	Karn Unit 2
MW Derate:	
Event Year:	2019
Event Number:	234
Start Date:	10/4/2019 15:45
End Date:	10/5/2019 3:58
Outage Type:	U1
Duration (Hours):	12.22
MWh Loss:	3151.90
NERC Cause Code:	9900
NERC Cause Code Description:	Operator Error...
Root Cause Description:	Operator acted on equipment for incorrect unit.
Event Description:	Operator went to wrong unit breaker
Additional Description:	While attempting to manipulate a breaker on unit 1 an operator performed the switching order on unit 2
Mode of Failure:	Unit tripped due to low steam drum water level
Final Corrective Action:	Unit was stabilized and restored to service
Mechanism Causing:	Human performance
Final Root Cause	Operator error
Scope to Correct Root Cause:	Upon unit restoration training realigned the operator
Additional Scope:	N/A
If outage Extended for Additional Work & Why:	N/A

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INFORMATION FOR UNIT - Karn Unit 2
PERIODIC OUTAGE

Sequence Number:	Karn Unit 2-2019-14
Plant/Unit:	Karn Unit 2
MW Derate:	
Event Year:	2019
Event Number:	239
Start Date:	10/25/2019 13:13
End Date:	10/26/2019 20:27
Outage Type:	U1
Duration (Hours):	31.23
MWh Loss:	8058.20
NERC Cause Code:	1488
NERC Cause Code Description:	Air Heater (Regenerative)...
Root Cause Description:	Air heater drive coupling high vibration
Event Description:	2B Air Preheater coupling failing
Additional Description:	The air heater high vibration forced a outage to correct. Unable to operate unit at existing vibration levels.
Mode of Failure:	Coupling failure
Final Corrective Action:	Replaced coupling
Mechanism Causing:	Coupling at end of life
Final Root Cause	Coupling failed causing air heater drive high vibration
Scope to Correct Root Cause:	Replaced the coupling and raised awareness for preventative maintenance plan inspections.
Additional Scope:	N/A
If outage Extended for Additional Work & Why:	N/A

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INFORMATION FOR UNIT - Karn Unit 2
PERIODIC OUTAGE

Sequence Number:	Karn Unit 2-2019-15
Plant/Unit:	Karn Unit 2
MW Derate:	
Event Year:	2019
Event Number:	240
Start Date:	10/26/2019 20:27
End Date:	10/26/2019 21:09
Outage Type:	SF
Duration (Hours):	0.70
MWh Loss:	180.60
NERC Cause Code:	1700
NERC Cause Code Description:	Feedwater Controls...
Root Cause Description:	Loss of drum level control
Event Description:	Lost Drum Level
Additional Description:	Master fuel trip during startup due to loss sufficient water in the steam drum.
Mode of Failure:	Lack of water in Steam drum
Final Corrective Action:	Cleared master fuel trip and proceeded with restart.
Mechanism Causing:	Operator proficiency
Final Root Cause	Insufficient water in the steam drum during startup.
Scope to Correct Root Cause:	Cleared master fuel trip and proceeded with restart.
Additional Scope:	N/A
If outage Extended for Additional Work & Why:	N/A

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INFORMATION FOR UNIT - Karn Unit 2
PERIODIC OUTAGE

Sequence Number:	Karn Unit 2-2019-16
Plant/Unit:	Karn Unit 2
MW Derate:	
Event Year:	2019
Event Number:	243
Start Date:	10/26/2019 21:09
End Date:	10/27/2019 3:05
Outage Type:	U1
Duration (Hours):	5.93
MWh Loss:	1530.80
NERC Cause Code:	1488
NERC Cause Code Description:	Air Heater (Regenerative)...
Root Cause Description:	Time associated with clearing the failed startup for loss of drum level control.
Event Description:	2B Air Preheater coupling failing
Additional Description:	Master fuel trip during startup due to loss sufficient water in the steam drum.
Mode of Failure:	Lack of water in Steam drum
Final Corrective Action:	Cleared master fuel trip and proceeded with restart.
Mechanism Causing:	Operator proficiency
Final Root Cause	Insufficient water in the steam drum during startup.
Scope to Correct Root Cause:	Cleared master fuel trip and proceeded with restart.
Additional Scope:	N/A
If outage Extended for Additional Work & Why:	N/A

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INFORMATION FOR UNIT - Karn Unit 2
PERIODIC OUTAGE

Sequence Number:	Karn Unit 2-2019-17
Plant/Unit:	Karn Unit 2
MW Derate:	
Event Year:	2019
Event Number:	241
Start Date:	10/27/2019 3:05
End Date:	10/28/2019 3:09
Outage Type:	SF
Duration (Hours):	24.07
MWh Loss:	6209.20
NERC Cause Code:	4099
NERC Cause Code Description:	Other High Pressure Turbine Problems...
Root Cause Description:	South throttle valve HP leakoff flange leak
Event Description:	Gasket on throttle valve leakoff was found blowing. Unit had to stop the startup
Additional Description:	Main steam leak through failed gasket
Mode of Failure:	Normal wear and tear
Final Corrective Action:	Mechanical peening of leak area
Mechanism Causing:	Steam cut material
Final Root Cause	Main steam leak cut gasket face
Scope to Correct Root Cause:	Mechanical peening of leak area
Additional Scope:	N/A
If outage Extended for Additional Work & Why:	N/A

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INFORMATION FOR UNIT - Karn Unit 3
PERIODIC OUTAGE

Sequence Number:	Karn Unit 3-2019-1
Plant/Unit:	Karn Unit 3
MW Derate:	
Event Year:	2019
Event Number:	1
Start Date:	1/1/2019 0:00
End Date:	4/26/2019 23:59
Outage Type:	PO
Duration (Hours):	2782.98
MWh Loss:	1692053.88
NERC Cause Code:	3975
NERC Cause Code Description:	Distributive Control System Upgrades...
Root Cause Description:	Planned Periodic Outage
Event Description:	Unit DCS Upgrade
Additional Description:	DCS Upgraded due to obsolescence
Mode of Failure:	Planned End of life
Final Corrective Action:	Replace Entire control system
Mechanism Causing:	End of life - Parts are no longer available to repair or maintain the control system
Final Root Cause	End of life - Parts are no longer available to repair or maintain the control system
Scope to Correct Root Cause:	Replace the old control system with new DCS control system
Additional Scope:	N/A
If outage Extended for Additional Work & Why:	N/A

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INFORMATION FOR UNIT - Karn Unit 3
PERIODIC OUTAGE

Sequence Number:	Karn Unit 3-2019-2
Plant/Unit:	Karn Unit 3
MW Derate:	
Event Year:	2019
Event Number:	2
Start Date:	4/26/2019 23:59
End Date:	5/7/2019 11:27
Outage Type:	PE
Duration (Hours):	251.47
MWh Loss:	152891.74
NERC Cause Code:	3975
NERC Cause Code Description:	Distributive Control System Upgrades...
Root Cause Description:	Burner fire protection system out of service.
Event Description:	Unit DCS Upgrade
Additional Description:	Burner fire protection control system failed on unit start-up.
Mode of Failure:	Deluge system controls failure
Final Corrective Action:	Replaced control panel with updated system
Mechanism Causing:	Components that failed were no longer supported by OEM
Final Root Cause	Failure of control panel components.
Scope to Correct Root Cause:	Replaced control panel with updated system that is supported by OEM
Additional Scope:	N/A
If outage Extended for Additional Work & Why:	N/A

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INFORMATION FOR UNIT - Karn Unit 3
PERIODIC OUTAGE

Sequence Number:	Karn Unit 3-2019-3
Plant/Unit:	Karn Unit 3
MW Derate:	
Event Year:	2019
Event Number:	3
Start Date:	5/7/2019 12:54
End Date:	5/7/2019 13:48
Outage Type:	PO
Duration (Hours):	0.90
MWh Loss:	547.20
NERC Cause Code:	3975
NERC Cause Code Description:	Distributive Control System Upgrades...
Root Cause Description:	Planned Post-Outage Testing
Event Description:	Unit DCS Upgrade
Additional Description:	Testing of Distributed Control System for syncing unit to grid
Mode of Failure:	Planned maintenance activity
Final Corrective Action:	Performed planned testing
Mechanism Causing:	Planned maintenance activity
Final Root Cause	Performed planned testing
Scope to Correct Root Cause:	N/A
Additional Scope:	N/A
If outage Extended for Additional Work & Why:	N/A

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INFORMATION FOR UNIT - Karn Unit 3
PERIODIC OUTAGE

Sequence Number:	Karn Unit 3-2019-4
Plant/Unit:	Karn Unit 3
MW Derate:	
Event Year:	2019
Event Number:	4
Start Date:	5/7/2019 15:06
End Date:	5/7/2019 19:08
Outage Type:	PO
Duration (Hours):	4.03
MWh Loss:	2452.27
NERC Cause Code:	3975
NERC Cause Code Description:	Distributive Control System Upgrades...
Root Cause Description:	Planned Post-Outage Testing
Event Description:	Unit DCS Upgrade
Additional Description:	Testing of Distributed Control System for syncing unit to grid
Mode of Failure:	Planned maintenance activity
Final Corrective Action:	Performed planned testing
Mechanism Causing:	Planned maintenance activity
Final Root Cause	Performed planned testing
Scope to Correct Root Cause:	N/A
Additional Scope:	N/A
If outage Extended for Additional Work & Why:	N/A

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INFORMATION FOR UNIT - Karn Unit 3
PERIODIC OUTAGE

Sequence Number:	Karn Unit 3-2019-5
Plant/Unit:	Karn Unit 3
MW Derate:	
Event Year:	2019
Event Number:	5
Start Date:	5/7/2019 19:45
End Date:	5/9/2019 8:54
Outage Type:	PO
Duration (Hours):	37.15
MWh Loss:	22587.20
NERC Cause Code:	3975
NERC Cause Code Description:	Distributive Control System Upgrades...
Root Cause Description:	Planned Post-Outage Testing
Event Description:	Unit DCS Upgrade
Additional Description:	Testing of Distributed Control System for establish unit control curve
Mode of Failure:	Planned maintenance activity
Final Corrective Action:	Performed planned testing
Mechanism Causing:	Planned maintenance activity
Final Root Cause	Performed planned testing
Scope to Correct Root Cause:	N/A
Additional Scope:	N/A
If outage Extended for Additional Work & Why:	N/A

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INFORMATION FOR UNIT - Karn Unit 3
PERIODIC OUTAGE

Sequence Number:	Karn Unit 3-2019-6
Plant/Unit:	Karn Unit 3
MW Derate:	
Event Year:	2019
Event Number:	6
Start Date:	5/9/2019 9:35
End Date:	5/9/2019 10:33
Outage Type:	PO
Duration (Hours):	0.97
MWh Loss:	587.73
NERC Cause Code:	3975
NERC Cause Code Description:	Distributive Control System Upgrades...
Root Cause Description:	Planned Post-Outage Testing
Event Description:	Unit DCS Upgrade
Additional Description:	Testing of Distributed Control System for establish unit control curve
Mode of Failure:	Planned maintenance activity
Final Corrective Action:	Performed planned testing
Mechanism Causing:	Planned maintenance activity
Final Root Cause	Performed planned testing
Scope to Correct Root Cause:	N/A
Additional Scope:	N/A
If outage Extended for Additional Work & Why:	N/A

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INFORMATION FOR UNIT - Karn Unit 3
PERIODIC OUTAGE

Sequence Number:	Karn Unit 3-2019-7
Plant/Unit:	Karn Unit 3
MW Derate:	
Event Year:	2019
Event Number:	7
Start Date:	5/7/2019 13:16
End Date:	5/7/2019 17:10
Outage Type:	PO
Duration (Hours):	3.90
MWh Loss:	2371.20
NERC Cause Code:	3975
NERC Cause Code Description:	Distributive Control System Upgrades...
Root Cause Description:	Planned Post-Outage Testing
Event Description:	Unit DCS Upgrade
Additional Description:	Testing of Distributed Control System for establish unit control curve
Mode of Failure:	Planned maintenance activity
Final Corrective Action:	Performed planned testing
Mechanism Causing:	Planned maintenance activity
Final Root Cause	Performed planned testing
Scope to Correct Root Cause:	N/A
Additional Scope:	N/A
If outage Extended for Additional Work & Why:	N/A

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INFORMATION FOR UNIT - Karn Unit 3
PERIODIC OUTAGE

Sequence Number:	Karn Unit 3-2019-8
Plant/Unit:	Karn Unit 3
MW Derate:	
Event Year:	2019
Event Number:	8
Start Date:	5/9/2019 19:54
End Date:	5/10/2019 7:00
Outage Type:	PO
Duration (Hours):	11.10
MWh Loss:	6748.80
NERC Cause Code:	3975
NERC Cause Code Description:	Distributive Control System Upgrades...
Root Cause Description:	Planned Post-Outage Testing
Event Description:	Unit DCS Upgrade
Additional Description:	Testing of Distributed Control System for establish unit control curve
Mode of Failure:	Planned maintenance activity
Final Corrective Action:	Performed planned testing
Mechanism Causing:	Planned maintenance activity
Final Root Cause	Performed planned testing
Scope to Correct Root Cause:	N/A
Additional Scope:	N/A
If outage Extended for Additional Work & Why:	N/A

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INFORMATION FOR UNIT - Karn Unit 3
PERIODIC OUTAGE

Sequence Number:	Karn Unit 3-2019-9
Plant/Unit:	Karn Unit 3
MW Derate:	
Event Year:	2019
Event Number:	9
Start Date:	5/10/2019 19:26
End Date:	5/14/2019 10:58
Outage Type:	PO
Duration (Hours):	87.53
MWh Loss:	53220.27
NERC Cause Code:	3975
NERC Cause Code Description:	Distributive Control System Upgrades...
Root Cause Description:	Oil leak on 3A Induced Draft Fan
Event Description:	Unit DCS Upgrade
Additional Description:	During tuning exercises and oil leak developed on 3A Induced Draft Fan Inboard Bearing
Mode of Failure:	Bearing oil seal leak on hot fan shaft due to plugged oil recirculation system.
Final Corrective Action:	Cleared drain and vent lines to allow oil to be drained from the cavity.
Mechanism Causing:	Fouled lubrication vent and drain line
Final Root Cause	Build up of debris in oil system
Scope to Correct Root Cause:	Cleared drain and vent lines to allow oil to be drained from the cavity.
Additional Scope:	Removed insulation to allow the fan bearing to operate at a lower temperature and to prevent oil accumulation in the insulation.
If outage Extended for Additional Work & Why:	N/A

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INFORMATION FOR UNIT - Karn Unit 3
PERIODIC OUTAGE

Sequence Number:	Karn Unit 3-2019-10
Plant/Unit:	Karn Unit 3
MW Derate:	
Event Year:	2019
Event Number:	10
Start Date:	5/14/2019 18:50
End Date:	5/15/2019 7:26
Outage Type:	PO
Duration (Hours):	12.60
MWh Loss:	7660.80
NERC Cause Code:	3975
NERC Cause Code Description:	Distributive Control System Upgrades...
Root Cause Description:	Planned Post-Outage Testing
Event Description:	Unit DCS Upgrade
Additional Description:	Testing of Distributed Control System for establish unit control curve
Mode of Failure:	Planned maintenance activity
Final Corrective Action:	Performed planned testing
Mechanism Causing:	Planned maintenance activity
Final Root Cause	Performed planned testing
Scope to Correct Root Cause:	N/A
Additional Scope:	N/A
If outage Extended for Additional Work & Why:	N/A

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INFORMATION FOR UNIT - Karn Unit 3
PERIODIC OUTAGE

Sequence Number:	Karn Unit 3-2019-11
Plant/Unit:	Karn Unit 3
MW Derate:	
Event Year:	2019
Event Number:	11
Start Date:	5/15/2019 8:40
End Date:	5/15/2019 9:57
Outage Type:	PO
Duration (Hours):	1.28
MWh Loss:	780.27
NERC Cause Code:	3975
NERC Cause Code Description:	Distributive Control System Upgrades...
Root Cause Description:	Planned Post-Outage Testing
Event Description:	Unit DCS Upgrade
Additional Description:	Testing of Distributed Control System for establish unit control curve
Mode of Failure:	Planned maintenance activity
Final Corrective Action:	Performed planned testing
Mechanism Causing:	Planned maintenance activity
Final Root Cause	Performed planned testing
Scope to Correct Root Cause:	N/A
Additional Scope:	N/A
If outage Extended for Additional Work & Why:	N/A

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INFORMATION FOR UNIT - Karn Unit 3
PERIODIC OUTAGE

Sequence Number:	Karn Unit 3-2019-12
Plant/Unit:	Karn Unit 3
MW Derate:	
Event Year:	2019
Event Number:	12
Start Date:	5/15/2019 11:14
End Date:	5/16/2019 10:49
Outage Type:	PO
Duration (Hours):	23.58
MWh Loss:	14338.67
NERC Cause Code:	3975
NERC Cause Code Description:	Distributive Control System Upgrades...
Root Cause Description:	Planned Post-Outage Testing
Event Description:	Unit DCS Upgrade
Additional Description:	Testing of Distributed Control System for establish unit control curve
Mode of Failure:	Planned maintenance activity
Final Corrective Action:	Performed planned testing
Mechanism Causing:	Planned maintenance activity
Final Root Cause	Performed planned testing
Scope to Correct Root Cause:	N/A
Additional Scope:	N/A
If outage Extended for Additional Work & Why:	N/A

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INFORMATION FOR UNIT - Karn Unit 3
PERIODIC OUTAGE

Sequence Number:	Karn Unit 3-2019-13
Plant/Unit:	Karn Unit 3
MW Derate:	
Event Year:	2019
Event Number:	13
Start Date:	5/17/2019 0:18
End Date:	5/22/2019 1:35
Outage Type:	PO
Duration (Hours):	121.28
MWh Loss:	73740.27
NERC Cause Code:	3975
NERC Cause Code Description:	Distributive Control System Upgrades...
Root Cause Description:	Planned Post-Outage Testing
Event Description:	Unit DCS Upgrade
Additional Description:	Testing of Distributed Control System for establish unit control curve
Mode of Failure:	Planned maintenance activity
Final Corrective Action:	Performed planned testing
Mechanism Causing:	Planned maintenance activity
Final Root Cause	Performed planned testing
Scope to Correct Root Cause:	N/A
Additional Scope:	N/A
If outage Extended for Additional Work & Why:	N/A

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INFORMATION FOR UNIT - Karn Unit 4
PERIODIC OUTAGE

Sequence Number:	Karn Unit 4-2019-1
Plant/Unit:	Karn Unit 4
MW Derate:	
Event Year:	2019
Event Number:	1
Start Date:	1/1/2019 0:00
End Date:	5/29/2019 0:00
Outage Type:	PO
Duration (Hours):	3551.00
MWh Loss:	2169661.00
NERC Cause Code:	3245
NERC Cause Code Description:	Other Cooling Tower Problems…
Root Cause Description:	Planned Periodic - sectional replacement of structure
Event Description:	Cooling water tower outage
Additional Description:	Wooden cooling tower structure is at end of life.
Mode of Failure:	Wood structure is at end of life - wood structure has many failed wood members that could impact integrity and cause collapse
Final Corrective Action:	Replace structural wood, fan and water decks on the 6 worst cells.
Mechanism Causing:	Environment - water/moisture/thermal cycles
Final Root Cause	Age of wood, past end of expected life.
Scope to Correct Root Cause:	Replace cooling tower cells 6 per year, taking the worse condition ones first to mitigate any safety issues.
Additional Scope:	N/A
If outage Extended for Additional Work & Why:	N/A

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INFORMATION FOR UNIT - Karn Unit 4
PERIODIC OUTAGE

Sequence Number:	Karn Unit 4-2019-2
Plant/Unit:	Karn Unit 4
MW Derate:	
Event Year:	2019
Event Number:	2
Start Date:	5/29/2019 0:00
End Date:	6/19/2019 2:32
Outage Type:	PE
Duration (Hours):	506.53
MWh Loss:	272556.53
NERC Cause Code:	3245
NERC Cause Code Description:	Other Cooling Tower Problems…
Root Cause Description:	Oil ingress into the Generator
Event Description:	Cooling water tower outage
Additional Description:	Seal oil leak indication on #6 leak detector.
Mode of Failure:	Oil contamination of generator
Final Corrective Action:	Thorough cleaning of the generator to remove oil contamination
Mechanism Causing:	Oil seepage into the generator due closed oil outlet/return valve.
Final Root Cause	Improper valve alignment.
Scope to Correct Root Cause:	Review seal oil valve alignment with Operations when returning the unit to service
Additional Scope:	N/A
If outage Extended for Additional Work & Why:	N/A

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INFORMATION FOR UNIT - Karn Unit 4
PERIODIC OUTAGE

Sequence Number:	Karn Unit 4-2019-3
Plant/Unit:	Karn Unit 4
MW Derate:	
Event Year:	2019
Event Number:	3
Start Date:	6/19/2019 2:32
End Date:	6/19/2019 8:54
Outage Type:	SF
Duration (Hours):	6.37
MWh Loss:	3348.87
NERC Cause Code:	4310
NERC Cause Code Description:	Steam Turbine Control System - Data Highway...
Root Cause Description:	Automated startup controls stopped as designed waiting for operator interaction
Event Description:	Issue with FGA control system
Additional Description:	Automated startup controls stopped as designed waiting for operator interaction. Operator was required to reset auxiliary panel before process could continue.
Mode of Failure:	Automated startup control stopped as designed waiting on available operator support.
Final Corrective Action:	Operator identified need and reset the auxiliary control panel
Mechanism Causing:	Automated startup control recognized need to reset auxiliary control panel per design
Final Root Cause	Automated startup controls stopped as designed waiting for operator interaction
Scope to Correct Root Cause:	Reset auxiliary control panel
Additional Scope:	N/A
If outage Extended for Additional Work & Why:	N/A

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INFORMATION FOR UNIT - Karn Unit 4
PERIODIC OUTAGE

Sequence Number:	Karn Unit 4-2019-4
Plant/Unit:	Karn Unit 4
MW Derate:	
Event Year:	2019
Event Number:	4
Start Date:	6/19/2019 8:54
End Date:	7/10/2019 1:35
Outage Type:	PO
Duration (Hours):	496.68
MWh Loss:	261255.44
NERC Cause Code:	3245
NERC Cause Code Description:	Other Cooling Tower Problems…
Root Cause Description:	4A ID fan outboard bearing weep line oil leak
Event Description:	Cooling tower upgrades
Additional Description:	Oil leaked from oil console
Mode of Failure:	Excessive oil flow
Final Corrective Action:	Throttled oil flow control valve to optimize flow to the bearing.
Mechanism Causing:	Excessive oil flow overcame the capacity of the oil return line allowing the oil to overflow into system.
Final Root Cause	Excessive oil flow overcame the capacity of the oil return line allowing the oil to overflow into system.
Scope to Correct Root Cause:	Adjusted flow control valve
Additional Scope:	Oil contamination of generator windings.
If outage Extended for Additional Work & Why:	Oil in generator as identified by generator leak detectors prompted a generator internal cleaning along with the associated gas rack and gas piping.

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INFORMATION FOR UNIT - Karn Unit 4
PERIODIC OUTAGE

Sequence Number:	Karn Unit 4-2019-5
Plant/Unit:	Karn Unit 4
MW Derate:	
Event Year:	2019
Event Number:	5
Start Date:	7/10/2019 1:35
End Date:	7/10/2019 20:25
Outage Type:	SF
Duration (Hours):	18.83
MWh Loss:	9906.33
NERC Cause Code:	4612
NERC Cause Code Description:	Hydrogen Storage System...
Root Cause Description:	Hydrogen gas system vent valve was inadvertently left open during the process of gassing the generator
Event Description:	H2 was delivered at 19:00 and was off loaded and placed into the H2 bulk tanks
Additional Description:	The vent valve was left open for several hours which lowered site's stored hydrogen supply to the point at which the Karn 4 generator could not be adequately filled.
Mode of Failure:	Loss of stored hydrogen capacity
Final Corrective Action:	Vent valve was closed and hydrogen bulk tanks refilled
Mechanism Causing:	Loss of stored hydrogen capacity
Final Root Cause	Procedural error during the execution of the tagging iteration
Scope to Correct Root Cause:	The event was reviewed with all Operations staff and procedures were reinforced.
Additional Scope:	N/A
If outage Extended for Additional Work & Why:	N/A

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INFORMATION FOR UNIT - Karn Unit 4
PERIODIC OUTAGE

Sequence Number:	Karn Unit 4-2019-6
Plant/Unit:	Karn Unit 4
MW Derate:	
Event Year:	2019
Event Number:	27
Start Date:	7/10/2019 20:25
End Date:	7/11/2019 5:50
Outage Type:	PO
Duration (Hours):	9.42
MWh Loss:	4953.17
NERC Cause Code:	3245
NERC Cause Code Description:	Other Cooling Tower Problems…
Root Cause Description:	Planned Periodic Outage Extension
Event Description:	Cooling tower upgrades
Additional Description:	Gassing generator and going thru startup preps
Mode of Failure:	Planned outage activity
Final Corrective Action:	Planned outage activity
Mechanism Causing:	Planned outage activity
Final Root Cause	Planned outage activity
Scope to Correct Root Cause:	Planned outage activity
Additional Scope:	N/A
If outage Extended for Additional Work & Why:	N/A

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INFORMATION FOR UNIT - Karn Unit 4
PERIODIC OUTAGE

Sequence Number:	Karn Unit 4-2019-7
Plant/Unit:	Karn Unit 4
MW Derate:	
Event Year:	2019
Event Number:	7
Start Date:	7/11/2019 7:23
End Date:	7/11/2019 8:48
Outage Type:	U1
Duration (Hours):	1.42
MWh Loss:	745.17
NERC Cause Code:	3410
NERC Cause Code Description:	Feedwater Pump...
Root Cause Description:	Main boiler feed pump tripped during main turbine shutdown
Event Description:	Loss unit to feed pump controls
Additional Description:	EHC pressure decreased below trip set-point
Mode of Failure:	Precharge of main boiler feed pump accumulators dropped below set point
Final Corrective Action:	Not enough data to make appropriate corrective decision
Mechanism Causing:	Low EHC pressure
Final Root Cause	Low EHC pressure. Unknown cause
Scope to Correct Root Cause:	Run unit to collect additional data
Additional Scope:	N/A
If outage Extended for Additional Work & Why:	N/A

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INFORMATION FOR UNIT - Karn Unit 4
PERIODIC OUTAGE

Sequence Number:	Karn Unit 4-2019-8
Plant/Unit:	Karn Unit 4
MW Derate:	
Event Year:	2019
Event Number:	9
Start Date:	7/11/2019 20:58
End Date:	7/12/2019 10:18
Outage Type:	PO
Duration (Hours):	13.33
MWh Loss:	7013.33
NERC Cause Code:	3245
NERC Cause Code Description:	Other Cooling Tower Problems…
Root Cause Description:	Deaerator vent valve failed to open
Event Description:	Cooling tower upgrades
Additional Description:	Deaerator vent valve failing to open caused a water hammer event
Mode of Failure:	Tank overpressurization
Final Corrective Action:	Increased deadband for Deaerator vent valves during load ramp evolutions
Mechanism Causing:	Rapid load changes toggled the actuation of the DA vent valves preventing valve reset
Final Root Cause	Signal to control logic did not allow adequate time to complete valve cycle prior to the next control system change
Scope to Correct Root Cause:	Increased deadband for Deaerator vent valves during load ramp evolutions
Additional Scope:	N/A
If outage Extended for Additional Work & Why:	N/A

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INFORMATION FOR UNIT - Karn Unit 4
PERIODIC OUTAGE

Sequence Number:	Karn Unit 4-2019-9
Plant/Unit:	Karn Unit 4
MW Derate:	
Event Year:	2019
Event Number:	18
Start Date:	7/12/2019 10:18
End Date:	7/15/2019 16:45
Outage Type:	U1
Duration (Hours):	78.45
MWh Loss:	41264.70
NERC Cause Code:	3410
NERC Cause Code Description:	Feedwater Pump...
Root Cause Description:	MBFPT tripped during main turbine shutdown
Event Description:	Boiler Feed pump issue
Additional Description:	EHC pressure decreased below trip set-point
Mode of Failure:	Precharge of MBFPT accumulators less than design
Final Corrective Action:	Charged MBFPT accumulators to design pressure
Mechanism Causing:	Accumulator piston seals leaking by
Final Root Cause	Degraded MBFPT accumulator piston seals/o-rings
Scope to Correct Root Cause:	Charged MBFPT accumulators to design pressure; Seals/O-rings to be replaced during Fall 2019/Winter 2019/Spring 2020 outage
Additional Scope:	N/A
If outage Extended for Additional Work & Why:	N/A

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INFORMATION FOR UNIT - Karn Unit 4
PERIODIC OUTAGE

Sequence Number:	Karn Unit 4-2019-10
Plant/Unit:	Karn Unit 4
MW Derate:	
Event Year:	2019
Event Number:	19
Start Date:	7/15/2019 16:45
End Date:	7/16/2019 11:30
Outage Type:	PO
Duration (Hours):	18.75
MWh Loss:	9862.50
NERC Cause Code:	3245
NERC Cause Code Description:	Other Cooling Tower Problems…
Root Cause Description:	Planned Post-Outage Testing
Event Description:	Cooling tower upgrades
Additional Description:	Planned Unit start-up and diagnostic activities
Mode of Failure:	Planned maintenance activity
Final Corrective Action:	Performed planned testing
Mechanism Causing:	Planned maintenance activity
Final Root Cause	Performed planned testing
Scope to Correct Root Cause:	N/A
Additional Scope:	N/A
If outage Extended for Additional Work & Why:	N/A

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INFORMATION FOR UNIT - Karn Unit 4
PERIODIC OUTAGE

Sequence Number:	Karn Unit 4-2019-12
Plant/Unit:	Karn Unit 4
MW Derate:	
Event Year:	2019
Event Number:	42
Start Date:	10/13/2019 0:00
End Date:	1/1/2020 0:00
Outage Type:	PO
Duration (Hours):	1921.00
MWh Loss:	1020051.00
NERC Cause Code:	3241
NERC Cause Code Description:	Cooling Tower Efficiency Below Design...
Root Cause Description:	Planned Periodic - sectional replacement of structure
Event Description:	Repairs to be made to EHC system and the Cooling Towers
Additional Description:	Wooden cooling tower structure is at end of life.
Mode of Failure:	Wood structure is at end of life - wood structure has many failed wood members that could impact integrity and cause collapse
Final Corrective Action:	Replace structural wood, fan and water decks on the 6 worst cells.
Mechanism Causing:	Environment - water/moisture/thermal cycles
Final Root Cause	Age of wood, past end of expected life.
Scope to Correct Root Cause:	Replace cooling tower cells 6 per year, taking the worse condition ones first to mitigate any safety issues.
Additional Scope:	EHC system obsolete. Began replacement with new design.
If outage Extended for Additional Work & Why:	N/A

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INFORMATION FOR UNIT - Allegan unit 3
PERIODIC OUTAGE

Sequence Number:	Allegan Unit 3-2019-1
Plant/Unit:	Allegan Unit 3
MW Derate:	
Event Year:	2019
Event Number:	1
Start Date:	6/20/2019 8:36
End Date:	8/16/2019 8:36
Outage Type:	PO
Duration (Hours):	1368.00
MWh Loss:	820.80
NERC Cause Code:	7140
NERC Cause Code Description:	Wicket Gate Assembly
Root Cause Description:	Age and corrosion
Event Description:	Wicket Gate Replacement
Additional Description:	Wicket Gate sealing faces corroded due to age and no coating, not allowing wicket gates to seal properly to stop the water flow.
Mode of Failure:	Corrosion
Final Corrective Action:	Replaced wicket gates with like in kind gates that were coated with a 2 part epoxy
Mechanism Causing:	Age and corrosion
Final Root Cause	Age and corrosion
Scope to Correct Root Cause:	New wicket gates have a 2 part epoxy coating on them
Additional Scope:	N/A
If outage Extended for Additional Work & Why:	N/A

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INFORMATION FOR UNIT - Allegan unit 3
PERIODIC OUTAGE

Sequence Number:	Allegan Unit 3-2019-2
Plant/Unit:	Allegan Unit 3
MW Derate:	
Event Year:	2019
Event Number:	2
Start Date:	8/16/2019 8:36
End Date:	1/1/2020 0:00
Outage Type:	PE
Duration (Hours):	3304.40
MWh Loss:	2597.73
NERC Cause Code:	7140
NERC Cause Code Description:	Wicket Gate Assembly
Root Cause Description:	Age and condition of lifting crane
Event Description:	Wicket Gate Replacement
Additional Description:	The site crane was found degraded and unable to support the load needed to complete disassembly of the unit.
Mode of Failure:	Age of supporting structures.
Final Corrective Action:	Reinforced crane structure.
Mechanism Causing:	Age and corrosion
Final Root Cause	Age and corrosion
Scope to Correct Root Cause:	Reinforced crane structure.
Additional Scope:	N/A
If outage Extended for Additional Work & Why:	N/A

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INFORMATION FOR UNIT - Cooke unit 2
PERIODIC OUTAGE

Sequence Number:	Cooke Unit 2-2019-1
Plant/Unit:	Cooke Unit 2
MW Derate:	
Event Year:	2019
Event Number:	3
Start Date:	7/1/2019 9:12
End Date:	10/1/2019 9:12
Outage Type:	PO
Duration (Hours):	2208.00
MWh Loss:	5696.64
NERC Cause Code:	7140
NERC Cause Code Description:	Wicket Gate Assembly
Root Cause Description:	Planned Periodic Outage
Event Description:	Wicket Gate Outage/Head Gate Inspection Unit 2
Additional Description:	Replacement of all Wicket Gates, Pins, bushing and Head plates.
Mode of Failure:	End of life
Final Corrective Action:	Replacement of all Wicket Gates, Pins, bushings and head covers
Mechanism Causing:	End of life
Final Root Cause	End of life
Scope to Correct Root Cause:	Replaced all wicket gates, pins, bushings and head plates.
Additional Scope:	Inspection of Taintor style Head gate during this outage.
If outage Extended for Additional Work & Why:	N/A

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INFORMATION FOR UNIT - Cooke unit 2
PERIODIC OUTAGE

Sequence Number:	Cooke Unit 2-2019-2
Plant/Unit:	Cooke Unit 2
MW Derate:	
Event Year:	2019
Event Number:	4
Start Date:	10/1/2019 9:12
End Date:	12/25/2019 9:20
Outage Type:	PE
Duration (Hours):	2041.13
MWh Loss:	5266.12
NERC Cause Code:	7140
NERC Cause Code Description:	Wicket Gate Assembly
Root Cause Description:	Planned Periodic Outage
Event Description:	Wicket Gate Outage/Head Gate Inspection Unit 2
Additional Description:	Replacement of all Wicket Gates, Pins, bushing and Head plates.
Mode of Failure:	End of life
Final Corrective Action:	Replacement of all Wicket Gates, Pins, bushings and head covers
Mechanism Causing:	End of life
Final Root Cause	End of life
Scope to Correct Root Cause:	Replaced all wicket gates, pins, bushings and head plates.
Additional Scope:	Inspection of Taintor style Head gate during this outage. Unit alignment required
If outage Extended for Additional Work & Why:	Inspection identified need for replacement head covers and wicket gates. Extension was due to manufacturing of required parts and alignment.

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INFORMATION FOR UNIT - Croton unit 2
PERIODIC OUTAGE

Sequence Number:	Croton unit 2-2019-1
Plant/Unit:	Croton unit 2
MW Derate:	
Event Year:	2019
Event Number:	1
Start Date:	9/15/2019 13:18
End Date:	1/1/2020 0:00
Outage Type:	U1
Duration (Hours):	2579.70
MWh Loss:	4385.49
NERC Cause Code:	3644
NERC Cause Code Description:	Protection Devices...
Root Cause Description:	The Generator Y phase shorted to ground.
Event Description:	Blown Lightning Arrestor/245 Trip
Additional Description:	Failed generator windings
Mode of Failure:	Windings shorted to ground
Final Corrective Action:	Rewind the Generator
Mechanism Causing:	Age, failure of the windings
Final Root Cause	Age, failure of the windings
Scope to Correct Root Cause:	Generator rewind required
Additional Scope:	N/A
If outage Extended for Additional Work & Why:	N/A

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INFORMATION FOR UNIT - Croton unit 3
PERIODIC OUTAGE

Sequence Number:	Croton unit 3-2019-1
Plant/Unit:	Croton unit 3
MW Derate:	
Event Year:	2019
Event Number:	3
Start Date:	7/23/2019 12:30
End Date:	9/12/2019 16:14
Outage Type:	U1
Duration (Hours):	1227.73
MWh Loss:	778.68
NERC Cause Code:	7009
NERC Cause Code Description:	Bearing Oil System
Root Cause Description:	Outage to support Unit 4 overhaul
Event Description:	Support Unit 4 Outage Work
Additional Description:	Unit 3 & 4 use the same Penstock (Combined). Unit 4 is in a complete overhaul the Penstock has to be drained.
Mode of Failure:	Planned unit overhaul
Final Corrective Action:	Removal of Unit 4 components in the Penstock and install a draft tube.
Mechanism Causing:	Planned unit overhaul
Final Root Cause	Planned unit overhaul
Scope to Correct Root Cause:	Removal of Unit 4 components in the Penstock and install a draft tube.
Additional Scope:	N/A
If outage Extended for Additional Work & Why:	N/A

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INFORMATION FOR UNIT - Croton unit 3
PERIODIC OUTAGE

Sequence Number:	Croton unit 3-2019-2
Plant/Unit:	Croton unit 3
MW Derate:	
Event Year:	2019
Event Number:	5
Start Date:	10/31/2019 10:00
End Date:	1/1/2020 0:00
Outage Type:	U2
Duration (Hours):	1479.00
MWh Loss:	1109.25
NERC Cause Code:	7009
NERC Cause Code Description:	Bearing Oil System
Root Cause Description:	Unit 4 reassembly, units have combined penstock
Event Description:	Support Unit 4 Outage Work
Additional Description:	Combined penstock, required draining for reassembly
Mode of Failure:	Unit 4 reassembly
Final Corrective Action:	Reassemble unit 4
Mechanism Causing:	Unit 4 reassembly
Final Root Cause	Unit 4 reassembly
Scope to Correct Root Cause:	Reassemble unit 4
Additional Scope:	N/A
If outage Extended for Additional Work & Why:	N/A

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INFORMATION FOR UNIT - Croton unit 4
PERIODIC OUTAGE

Sequence Number:	Croton Unit 4-2019-1
Plant/Unit:	Croton Unit 4
MW Derate:	
Event Year:	2019
Event Number:	1
Start Date:	1/1/2019 0:00
End Date:	1/1/2020 0:00
Outage Type:	U1
Duration (Hours):	8760.00
MWh Loss:	6238.80
NERC Cause Code:	3644
NERC Cause Code Description:	Protective devices
Root Cause Description:	The turbine guide bearing failed from old age and poor condition
Event Description:	Failed Turbine Guide Bearing
Additional Description:	The outage started due to the failure of the Unit 4 bearings. The unit will remain out of service until economics warrant repair.
Mode of Failure:	Failed Turbine Guide Bearing
Final Corrective Action:	The unit has not been repaired
Mechanism Causing:	Old age of original equipment
Final Root Cause	Old age of original equipment
Scope to Correct Root Cause:	The unit will remain out of service until economics warrant repair.
Additional Scope:	The Electrical Safety Project was completed during this unplanned outage
If outage Extended for Additional Work & Why:	N/A

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INFORMATION FOR UNIT - 5 Channel Unit 1
PERIODIC OUTAGE

Sequence Number:	5 Channel Unit 1-2019-1
Plant/Unit:	5 Channel Unit 1
MW Derate:	
Event Year:	2019
Event Number:	8
Start Date:	10/14/2019 8:45
End Date:	11/2/2019 8:45
Outage Type:	PO
Duration (Hours):	456.00
MWh Loss:	1341.70
NERC Cause Code:	7201
NERC Cause Code Description:	Hydro/pump Storage Inspection...
Root Cause Description:	Planned periodic outage
Event Description:	Periodic Outage
Additional Description:	Normal periodic maintenance every 2 years
Mode of Failure:	Periodic maintenance
Final Corrective Action:	Completed the periodic maintenance
Mechanism Causing:	Periodic maintenance
Final Root Cause	Periodic maintenance
Scope to Correct Root Cause:	Completed periodic maintenance
Additional Scope:	Replaced one cracked Wicket Gate that was found during inspection
If outage Extended for Additional Work & Why:	The Wicket Gate that was replaced had to be manufactured

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INFORMATION FOR UNIT - 5 Channel Unit 1
PERIODIC OUTAGE

Sequence Number:	5 Channel Unit 1-2019-2
Plant/Unit:	5 Channel Unit 1
MW Derate:	
Event Year:	2019
Event Number:	9
Start Date:	11/2/2019 8:45
End Date:	11/19/2019 10:59
Outage Type:	PE
Duration (Hours):	411.23
MWh Loss:	1303.61
NERC Cause Code:	7201
NERC Cause Code Description:	Hydro/pump Storage Inspection...
Root Cause Description:	Wicket gate found cracked during inspection and Periodic Outage
Event Description:	PE of 'Periodic Inspection Outage
Additional Description:	New Wicket Gate had to be manufactured
Mode of Failure:	A Cracked Wicket Gate due to age
Final Corrective Action:	Replaced Wicket Gate with a new one that had to be manufactured
Mechanism Causing:	Age
Final Root Cause	Age related failure of the Wicket Gate
Scope to Correct Root Cause:	Replaced Wicket Gate with a new one that had to be manufactured
Additional Scope:	N/A
If outage Extended for Additional Work & Why:	N/A

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INFORMATION FOR UNIT -Hardy unit 1
PERIODIC OUTAGE

Sequence Number:	Hardy Unit 1-2019-1
Plant/Unit:	Hardy unit 1
MW Derate:	
Event Year:	2019
Event Number:	4
Start Date:	6/13/2019 12:32
End Date:	10/1/2019 12:32
Outage Type:	PO
Duration (Hours):	2640.00
MWh Loss:	28512.00
NERC Cause Code:	7199
NERC Cause Code Description:	Other Hydro/ps Water Supply/discharge Problems
Root Cause Description:	2014 High water event
Event Description:	Spill Tube Re-Line
Additional Description:	2014 high water event caused sections of the lining in the spill tube to be ripped out.
Mode of Failure:	High turbulence
Final Corrective Action:	Installed a spilltube flow path aeration pipe to reduce turbulence.
Mechanism Causing:	Significant rain fall created the need to spill large amounts water through the spill tubes. High spill tube flow resulted in excessive turbulence which damaged the spill liners.
Final Root Cause	High turbulence due to the high water event.
Scope to Correct Root Cause:	New designed aeration pipe in stalled to reduce turbulence.
Additional Scope:	N/A
If outage Extended for Additional Work & Why:	N/A

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INFORMATION FOR UNIT -Hardy unit 1
PERIODIC OUTAGE

Sequence Number:	Hardy Unit 1-2019-2
Plant/Unit:	Hardy unit 1
MW Derate:	
Event Year:	2019
Event Number:	7
Start Date:	10/1/2019 12:32
End Date:	10/9/2019 7:55
Outage Type:	PE
Duration (Hours):	187.38
MWh Loss:	2023.74
NERC Cause Code:	7199
NERC Cause Code Description:	Other Hydro/ps Water Supply/discharge Problems
Root Cause Description:	Late Start to outage due to safety
Event Description:	Spill Tube Re-Line
Additional Description:	Secondary head gate not able to provide sufficient sealing against headwaters
Mode of Failure:	Insufficient water tightness of secondary head gate
Final Corrective Action:	Refurbishment of the secondary head gate
Mechanism Causing:	Normal wear and deterioration of secondary head gate
Final Root Cause	Insufficient water tightness of secondary head gate
Scope to Correct Root Cause:	Refurbishment of the secondary head gate
Additional Scope:	N/A
If outage Extended for Additional Work & Why:	N/A

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INFORMATION FOR UNIT -Hardy unit 1
PERIODIC OUTAGE

Sequence Number:	Hardy Unit 1-2019-3
Plant/Unit:	Hardy unit 1
MW Derate:	
Event Year:	2019
Event Number:	8
Start Date:	10/9/2019 7:55
End Date:	10/14/2019 10:30
Outage Type:	U1
Duration (Hours):	122.58
MWh Loss:	1323.90
NERC Cause Code:	4609
NERC Cause Code Description:	Other Exciter Problems...
Root Cause Description:	No Excitation
Event Description:	Excitation problems
Additional Description:	Could not excite the field to generate
Mode of Failure:	Blown fuse in the voltage regulator
Final Corrective Action:	Replaced fuse
Mechanism Causing:	Blown fuse in the voltage regulator
Final Root Cause	Blown fuse in the voltage regulator
Scope to Correct Root Cause:	Replaced fuse
Additional Scope:	N/A
If outage Extended for Additional Work & Why:	N/A

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INFORMATION FOR UNIT -Hardy unit 2
PERIODIC OUTAGE

Sequence Number:	Hardy Unit 2-2019-1
Plant/Unit:	Hardy unit 2
MW Derate:	
Event Year:	2019
Event Number:	1
Start Date:	2/11/2019 15:39
End Date:	2/23/2019 15:39
Outage Type:	PO
Duration (Hours):	288.00
MWh Loss:	3024.00
NERC Cause Code:	7201
NERC Cause Code Description:	Hydro/pump Storage Inspection...
Root Cause Description:	Planned periodic outage
Event Description:	Periodic Outage
Additional Description:	A planned and scheduled periodic outage to conduct required maintenance on the unit.
Mode of Failure:	Scheduled periodic outage to perform required maintenance
Final Corrective Action:	Completed required maintenance
Mechanism Causing:	Planned periodic outage
Final Root Cause	Complete required maintenance
Scope to Correct Root Cause:	Required maintenance - required to keep the unit reliable for service.
Additional Scope:	N/A
If outage Extended for Additional Work & Why:	N/A

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INFORMATION FOR UNIT -Hardy unit 2
PERIODIC OUTAGE

Sequence Number:	Hardy Unit 2-2019-2
Plant/Unit:	Hardy unit 2
MW Derate:	
Event Year:	2019
Event Number:	2
Start Date:	2/23/2019 15:39
End Date:	3/15/2019 17:30
Outage Type:	PE
Duration (Hours):	480.85
MWh Loss:	5048.93
NERC Cause Code:	7201
NERC Cause Code Description:	Hydro/pump Storage Inspection...
Root Cause Description:	Spill valve aspiration tube bulkhead penetration leak
Event Description:	Periodic Outage
Additional Description:	The bulkhead penetration for the aspiration tube weld cracked
Mode of Failure:	Loss of weld integrity
Final Corrective Action:	Excavated existing weld and reapplied weld using updated inspection requirements.
Mechanism Causing:	Aligned weld porosity
Final Root Cause	Poor quality weld applied to joint
Scope to Correct Root Cause:	Excavated existing weld and reapplied weld using updated inspection requirements.
Additional Scope:	N/A
If outage Extended for Additional Work & Why:	N/A

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INFORMATION FOR UNIT - Mio Unit 1

PERIODIC OUTAGE

Sequence Number:	Mio Unit 1-2019-1
Plant/Unit:	Mio Unit 1
MW Derate:	
Event Year:	2019
Event Number:	1
Start Date:	1/1/2019 0:00
End Date:	1/15/2019 10:30
Outage Type:	PO
Duration (Hours):	346.50
MWh Loss:	277.20
NERC Cause Code:	7050
NERC Cause Code Description:	Hydro/pump Storage - Turbine Governor...
Root Cause Description:	Auxiliary Oil Pump thermal issues and Main oil pump high oil pressure.
Event Description:	Extended into 2019 - Governor Replacement Project
Additional Description:	New oil pump motor tripped due to high amp draw
Mode of Failure:	Motor on auxiliary oil pump drawing high amperage
Final Corrective Action:	Changed auxiliary motor pulley ratio
Mechanism Causing:	Improper pulley ratio causing high motor amps
Final Root Cause	Improper auxiliary oil pump motor pulley ratio
Scope to Correct Root Cause:	Replaced the pulleys with the proper ratio
Additional Scope:	Adjusted valve throttling position to bearings for proper flow.
If outage Extended for Additional Work & Why:	N/A

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INFORMATION FOR UNIT - Rogers unit 1

PERIODIC OUTAGE

Sequence Number:	Rogers unit 1-2019-1
Plant/Unit:	Rogers unit 1
MW Derate:	
Event Year:	2019
Event Number:	1
Start Date:	1/1/2019 0:00
End Date:	3/1/2019 0:00
Outage Type:	U1
Duration (Hours):	1430.00
MWh Loss:	1144.00
NERC Cause Code:	3644
NERC Cause Code Description:	Protective devices
Root Cause Description:	Inadvertent trip of the 166 breaker
Event Description:	Unit tripped due to inadvertent operation of the 166
Additional Description:	An inadvertent breaker trip caused an over voltage condition in the plant resulting in damage to the Unit 1 Electric Gate operator control board.
Mode of Failure:	Inadvertent trip of the breaker
Final Corrective Action:	A guard was placed over the breaker handle.
Mechanism Causing:	Inadvertent activation of the breaker handle.
Final Root Cause	Original design of breaker handle left handle exposed to unintended operation
Scope to Correct Root Cause:	Guard installed over breaker handle.
Additional Scope:	N/A
If outage Extended for Additional Work & Why:	N/A

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INFORMATION FOR UNIT - Rogers unit 1

PERIODIC OUTAGE

Sequence Number:	Rogers unit 1-2019-2
Plant/Unit:	Rogers unit 1
MW Derate:	
Event Year:	2019
Event Number:	3
Start Date:	9/6/2019 8:15
End Date:	11/3/2019 4:56
Outage Type:	PO
Duration (Hours):	1389.68
MWh Loss:	1111.75
NERC Cause Code:	7050
NERC Cause Code Description:	Hydro/pump Storage - Turbine Governor...
Root Cause Description:	Governor Replacement project for reliability and reduced risk of environmental contamination.
Event Description:	Electrical Upgrade/Governor Replacement Project
Additional Description:	Plant electrical upgrade replacement for safety and reliability.
Mode of Failure:	Out dated electrical systems/ Out dated Governor control system with an excessive amount of oil required to operate the system.
Final Corrective Action:	Electrical system replacement, all wiring, switch gear and control panels. Governors are being replaced with a PLC based control system.
Mechanism Causing:	Age, design and code requirements
Final Root Cause	Age, design and code requirements
Scope to Correct Root Cause:	Electrical system replacement, all wiring, switch gear and control panels. Governors are being replaced with a PLC based control system.
Additional Scope:	N/A
If outage Extended for Additional Work & Why:	N/A

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INFORMATION FOR UNIT - Rogers unit 1

PERIODIC OUTAGE

Sequence Number:	Rogers unit 1-2019-3
Plant/Unit:	Rogers unit 1
MW Derate:	
Event Year:	2019
Event Number:	4
Start Date:	11/3/2019 4:56
End Date:	12/16/2019 8:39
Outage Type:	PE
Duration (Hours):	1035.72
MWh Loss:	828.57
NERC Cause Code:	7050
NERC Cause Code Description:	Hydro/pump Storage - Turbine Governor...
Root Cause Description:	Delayed start due to adjacent unplanned unit outages
Event Description:	PE of Electrical Upgrade/Governor Replacement Project
Additional Description:	Priority work was ongoing on Units 3 & 4 which pushed the start of the work on the unit by approximately 1 month
Mode of Failure:	Out dated electrical systems/ Out dated Governor control system with an excessive amount of oil required to operate the system.
Final Corrective Action:	Return adjacent units to service prior to starting planned outage
Mechanism Causing:	Unit design configuration
Final Root Cause	Unit design configuration
Scope to Correct Root Cause:	Return adjacent units to service prior to starting planned outage
Additional Scope:	N/A
If outage Extended for Additional Work & Why:	N/A

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INFORMATION FOR UNIT - Rogers unit 1

PERIODIC OUTAGE

Sequence Number:	Rogers unit 1-2019-4
Plant/Unit:	Rogers unit 1
MW Derate:	
Event Year:	2019
Event Number:	8
Start Date:	12/17/2019 9:20
End Date:	12/20/2019 13:57
Outage Type:	PO
Duration (Hours):	76.62
MWh Loss:	61.29
NERC Cause Code:	7050
NERC Cause Code Description:	Hydro/pump Storage - Turbine Governor...
Root Cause Description:	Startup and Testing of new electrical and governor systems
Event Description:	PE of Electrical Upgrade/Governor Replacement Project
Additional Description:	All plant electrical system replacement/ All Governor system replacement
Mode of Failure:	Startup and Testing
Final Corrective Action:	Continue with start up and testing until complete
Mechanism Causing:	Electrical system replacement/ Governor system replacement
Final Root Cause	Start up and Testing
Scope to Correct Root Cause:	Continue with start up and testing until complete
Additional Scope:	N/A
If outage Extended for Additional Work & Why:	N/A

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INFORMATION FOR UNIT - Rogers unit 1

PERIODIC OUTAGE

Sequence Number:	Rogers unit 1-2019-5
Plant/Unit:	Rogers unit 1
MW Derate:	
Event Year:	2019
Event Number:	9
Start Date:	12/20/2019 15:50
End Date:	12/21/2019 7:52
Outage Type:	PO
Duration (Hours):	16.03
MWh Loss:	12.83
NERC Cause Code:	7050
NERC Cause Code Description:	Hydro/pump Storage - Turbine Governor...
Root Cause Description:	Startup and Testing of new electrical and governor systems
Event Description:	PE of Electrical Upgrade/Governor Replacement Project
Additional Description:	All plant electrical system replacement/ All Governor system replacement
Mode of Failure:	Startup and Testing
Final Corrective Action:	Continue with start up and testing until complete
Mechanism Causing:	Electrical system replacement/ Governor system replacement
Final Root Cause	Start up and Testing
Scope to Correct Root Cause:	Continue with start up and testing until complete
Additional Scope:	N/A
If outage Extended for Additional Work & Why:	N/A

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INFORMATION FOR UNIT - Rogers unit 1

PERIODIC OUTAGE

Sequence Number:	Rogers unit 1-2019-6
Plant/Unit:	Rogers unit 1
MW Derate:	
Event Year:	2019
Event Number:	10
Start Date:	12/21/2019 10:59
End Date:	12/21/2019 11:17
Outage Type:	PO
Duration (Hours):	0.30
MWh Loss:	0.24
NERC Cause Code:	7050
NERC Cause Code Description:	Hydro/pump Storage - Turbine Governor...
Root Cause Description:	Startup and Testing of new electrical and governor systems
Event Description:	PE of Electrical Upgrade/Governor Replacement Project
Additional Description:	All plant electrical system replacement/ All Governor system replacement
Mode of Failure:	Startup and Testing
Final Corrective Action:	Continue with start up and testing until complete
Mechanism Causing:	Electrical system replacement/ Governor system replacement
Final Root Cause	Start up and Testing
Scope to Correct Root Cause:	Continue with start up and testing until complete
Additional Scope:	N/A
If outage Extended for Additional Work & Why:	N/A

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INFORMATION FOR UNIT - Rogers unit 2

PERIODIC OUTAGE

Sequence Number:	Rogers unit 2-2019-2
Plant/Unit:	Rogers unit 2
MW Derate:	
Event Year:	2019
Event Number:	4
Start Date:	9/6/2019 8:15
End Date:	11/3/2019 5:01
Outage Type:	PO
Duration (Hours):	1389.68
MWh Loss:	1111.75
NERC Cause Code:	7050
NERC Cause Code Description:	Hydro/pump Storage - Turbine Governor...
Root Cause Description:	Governor Replacement project for reliability and reduced risk of environmental contamination.
Event Description:	Electrical Upgrade/Governor Replacement Project
Additional Description:	Plant electrical upgrade replacement for safety and reliability.
Mode of Failure:	Out dated electrical systems/ Out dated Governor control system with an excessive amount of oil required to operate the system.
Final Corrective Action:	Electrical system replacement, all wiring, switch gear and control panels. Governors are being replaced with a PLC based control system.
Mechanism Causing:	Age, design and code requirements
Final Root Cause	Age, design and code requirements
Scope to Correct Root Cause:	Electrical system replacement, all wiring, switch gear and control panels. Governors are being replaced with a PLC based control system.
Additional Scope:	N/A
If outage Extended for Additional Work & Why:	N/A

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INFORMATION FOR UNIT - Rogers unit 2

PERIODIC OUTAGE

Sequence Number:	Rogers unit 2-2019-3
Plant/Unit:	Rogers unit 2
MW Derate:	
Event Year:	2019
Event Number:	5
Start Date:	11/3/2019 5:01
End Date:	12/20/2019 11:26
Outage Type:	PE
Duration (Hours):	1134.42
MWh Loss:	907.53
NERC Cause Code:	7050
NERC Cause Code Description:	Hydro/pump Storage - Turbine Governor...
Root Cause Description:	Delayed start due to adjacent unplanned unit outages
Event Description:	PE of Electrical Upgrade/Governor Replacement Project
Additional Description:	Priority work was ongoing on Units 3 & 4 which pushed the start of the work on the unit by approximately 1 month
Mode of Failure:	Out dated electrical systems/ Out dated Governor control system with an excessive amount of oil required to operate the system.
Final Corrective Action:	Return adjacent units to service prior to starting planned outage
Mechanism Causing:	Unit design configuration
Final Root Cause	Unit design configuration
Scope to Correct Root Cause:	Return adjacent units to service prior to starting planned outage
Additional Scope:	N/A
If outage Extended for Additional Work & Why:	N/A

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INFORMATION FOR UNIT - Rogers unit 3

PERIODIC OUTAGE

Sequence Number:	Rogers unit 3-2019-1
Plant/Unit:	Rogers unit 3
MW Derate:	
Event Year:	2019
Event Number:	1
Start Date:	1/1/2019 0:00
End Date:	9/20/2019 15:30
Outage Type:	U1
Duration (Hours):	6302.50
MWh Loss:	4710.80
NERC Cause Code:	7007
NERC Cause Code Description:	Hydro/pump Storage - Turbine Bearings...
Root Cause Description:	Thrust Bearing failure
Event Description:	Thrust bearing wiped
Additional Description:	Thrust Bearing failed while the unit was operating
Mode of Failure:	The cast iron bearing material failed
Final Corrective Action:	A new redesigned Thrust Bearing will be installed
Mechanism Causing:	Age, design and material
Final Root Cause	Age, design and material
Scope to Correct Root Cause:	Install a redesigned bearing of different material
Additional Scope:	N/A
If outage Extended for Additional Work & Why:	N/A

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INFORMATION FOR UNIT - Rogers unit 3

PERIODIC OUTAGE

Sequence Number:	Rogers unit 3-2019-2
Plant/Unit:	Rogers unit 3
MW Derate:	
Event Year:	2019
Event Number:	2
Start Date:	9/20/2019 15:30
End Date:	11/23/2019 15:30
Outage Type:	PO
Duration (Hours):	1537.00
MWh Loss:	1229.60
NERC Cause Code:	7050
NERC Cause Code Description:	Hydro/pump Storage - Turbine Governor...
Root Cause Description:	Governor Replacement Project
Event Description:	Electrical Safety Upgrade Project
Additional Description:	Replacing all electrical wiring and switch gear to eliminate age related open buss work and failing wiring.
Mode of Failure:	Old mechanical governors were outdated and required significant amounts of oil.
Final Corrective Action:	Replace governors with PLC based governors that require a third of the amount of oil with self containment.
Mechanism Causing:	Age
Final Root Cause	Old mechanical governors were obsolete and required significant amounts of oil.
Scope to Correct Root Cause:	Replaced governors with new PLC based controllers
Additional Scope:	Replaced out of date electrical wiring and thrust bearing replacement.
If outage Extended for Additional Work & Why:	N/A

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INFORMATION FOR UNIT - Rogers unit 3

PERIODIC OUTAGE

Sequence Number:	Rogers unit 3-2019-3
Plant/Unit:	Rogers unit 3
MW Derate:	
Event Year:	2019
Event Number:	3
Start Date:	11/23/2019 15:30
End Date:	12/17/2019 16:11
Outage Type:	PE
Duration (Hours):	576.68
MWh Loss:	461.35
NERC Cause Code:	7050
NERC Cause Code Description:	Hydro/pump Storage - Turbine Governor...
Root Cause Description:	Outage work extended due to unanticipated concrete work associated with turbine rebuild.
Event Description:	Electrical Safety Upgrade Project
Additional Description:	Outage extended due to unanticipated work scope on thrust bearings.
Mode of Failure:	Deteriorated concrete surrounding aged turbine support structures
Final Corrective Action:	Rebuild concrete prior to starting reassembly
Mechanism Causing:	Age and cumulative damage due to turbine vibrations.
Final Root Cause	Deterioration of supporting concrete structure
Scope to Correct Root Cause:	Rebuild concrete prior to starting reassembly
Additional Scope:	N/A
If outage Extended for Additional Work & Why:	N/A

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INFORMATION FOR UNIT - Rogers unit 3

PERIODIC OUTAGE

Sequence Number:	Rogers unit 3-2019-4
Plant/Unit:	Rogers unit 3
MW Derate:	
Event Year:	2019
Event Number:	4
Start Date:	12/17/2019 18:30
End Date:	12/18/2019 8:56
Outage Type:	PO
Duration (Hours):	14.43
MWh Loss:	11.55
NERC Cause Code:	7050
NERC Cause Code Description:	Hydro/pump Storage - Turbine Governor...
Root Cause Description:	Startup and Testing of new electrical and governor systems
Event Description:	PE of Electrical Upgrade/Governor Replacement Project
Additional Description:	All plant electrical system replacement/ All Governor system replacement
Mode of Failure:	Startup and Testing
Final Corrective Action:	Continue with start up and testing until complete
Mechanism Causing:	Electrical system replacement/ Governor system replacement
Final Root Cause	Start up and Testing
Scope to Correct Root Cause:	Continue with start up and testing until complete
Additional Scope:	N/A
If outage Extended for Additional Work & Why:	N/A

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INFORMATION FOR UNIT - Rogers unit 3

PERIODIC OUTAGE

Sequence Number:	Rogers unit 3-2019-5
Plant/Unit:	Rogers unit 3
MW Derate:	
Event Year:	2019
Event Number:	5
Start Date:	12/18/2019 18:03
End Date:	12/19/2019 11:16
Outage Type:	PO
Duration (Hours):	17.22
MWh Loss:	13.77
NERC Cause Code:	7050
NERC Cause Code Description:	Hydro/pump Storage - Turbine Governor...
Root Cause Description:	Startup and Testing of new electrical and governor systems
Event Description:	PE of Electrical Upgrade/Governor Replacement Project
Additional Description:	All plant electrical system replacement/ All Governor system replacement
Mode of Failure:	Startup and Testing
Final Corrective Action:	Continue with start up and testing until complete
Mechanism Causing:	Electrical system replacement/ Governor system replacement
Final Root Cause	Start up and Testing
Scope to Correct Root Cause:	Continue with start up and testing until complete
Additional Scope:	N/A
If outage Extended for Additional Work & Why:	N/A

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INFORMATION FOR UNIT - Rogers unit 3

PERIODIC OUTAGE

Sequence Number:	Rogers unit 3-2019-6
Plant/Unit:	Rogers unit 3
MW Derate:	
Event Year:	2019
Event Number:	6
Start Date:	12/19/2019 11:18
End Date:	12/19/2019 11:21
Outage Type:	PO
Duration (Hours):	0.05
MWh Loss:	0.04
NERC Cause Code:	7050
NERC Cause Code Description:	Hydro/pump Storage - Turbine Governor...
Root Cause Description:	Startup and Testing of new electrical and governor systems
Event Description:	PE of Electrical Upgrade/Governor Replacement Project
Additional Description:	All plant electrical system replacement/ All Governor system replacement
Mode of Failure:	Startup and Testing
Final Corrective Action:	Continue with start up and testing until complete
Mechanism Causing:	Electrical system replacement/ Governor system replacement
Final Root Cause	Start up and Testing
Scope to Correct Root Cause:	Continue with start up and testing until complete
Additional Scope:	N/A
If outage Extended for Additional Work & Why:	N/A

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INFORMATION FOR UNIT - Rogers unit 4

PERIODIC OUTAGE

Sequence Number:	Rogers unit 4-2019-1
Plant/Unit:	Rogers unit 4
MW Derate:	
Event Year:	2019
Event Number:	2
Start Date:	5/29/2019 13:43
End Date:	9/20/2019 15:30
Outage Type:	U2
Duration (Hours):	2977.78
MWh Loss:	2051.03
NERC Cause Code:	7007
NERC Cause Code Description:	Hydro/pump Storage - Turbine Bearings...
Root Cause Description:	Thrust Bearing failure
Event Description:	Thrust Bearing Replacement Outage
Additional Description:	Thrust Bearing failed while the unit was operating
Mode of Failure:	The cast iron bearing material failed
Final Corrective Action:	A new redesigned Thrust Bearing will be installed
Mechanism Causing:	Bearing at end of life, design and material
Final Root Cause	Bearing at end of life, design and material
Scope to Correct Root Cause:	Install a redesigned bearing utilizing improved material
Additional Scope:	N/A
If outage Extended for Additional Work & Why:	N/A

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INFORMATION FOR UNIT - Rogers unit 4

PERIODIC OUTAGE

Sequence Number:	Rogers unit 4-2019-2
Plant/Unit:	Rogers unit 4
MW Derate:	
Event Year:	2019
Event Number:	3
Start Date:	9/20/2019 15:30
End Date:	11/23/2019 15:30
Outage Type:	PO
Duration (Hours):	1537.00
MWh Loss:	1229.60
NERC Cause Code:	7050
NERC Cause Code Description:	Hydro/pump Storage - Turbine Governor...
Root Cause Description:	Governor Replacement Project
Event Description:	Electrical Safety Upgrade Project
Additional Description:	Replacing all electrical wiring and switch gear to eliminate age related open buss work and failing wiring.
Mode of Failure:	Old mechanical governors were outdated and required significant amounts of oil.
Final Corrective Action:	Replace governors with PLC based governors that require a third of the amount of oil with self containment.
Mechanism Causing:	Age
Final Root Cause	Old mechanical governors were obsolete and required significant amounts of oil.
Scope to Correct Root Cause:	Replaced governors with new PLC based controllers
Additional Scope:	Replaced out of date electrical wiring and thrust bearing replacement.
If outage Extended for Additional Work & Why:	N/A

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INFORMATION FOR UNIT - Rogers unit 4

PERIODIC OUTAGE

Sequence Number:	Rogers unit 4-2019-3
Plant/Unit:	Rogers unit 4
MW Derate:	
Event Year:	2019
Event Number:	4
Start Date:	11/23/2019 15:30
End Date:	12/20/2019 12:00
Outage Type:	PE
Duration (Hours):	644.50
MWh Loss:	515.60
NERC Cause Code:	7050
NERC Cause Code Description:	Hydro/pump Storage - Turbine Governor...
Root Cause Description:	Outage work extended due to unanticipated concrete work associated with turbine rebuild.
Event Description:	Electrical Safety Upgrade Project
Additional Description:	Outage extended due to unanticipated work scope on thrust bearings.
Mode of Failure:	Deteriorated concrete surrounding aged turbine support structures
Final Corrective Action:	Rebuild concrete prior to starting reassembly
Mechanism Causing:	Age and cumulative damage due to turbine vibrations.
Final Root Cause	Deterioration of supporting concrete structure
Scope to Correct Root Cause:	Rebuild concrete prior to starting reassembly
Additional Scope:	N/A
If outage Extended for Additional Work & Why:	N/A

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INFORMATION FOR UNIT - Webber Unit 1

PERIODIC OUTAGE

Sequence Number:	Webber Unit 1-2019-2
Plant/Unit:	Webber Unit 1
MW Derate:	
Event Year:	2019
Event Number:	6
Start Date:	7/29/2019 8:17
End Date:	8/27/2019 13:48
Outage Type:	PO
Duration (Hours):	701.52
MWh Loss:	589.27
NERC Cause Code:	7050
NERC Cause Code Description:	Hydro/pump Storage - Turbine Governor...
Root Cause Description:	Governor Replacement project for reliability and reduced risk of environmental contamination.
Event Description:	Governor Replacement Project
Additional Description:	Plant electrical upgrade replacement for safety and reliability.
Mode of Failure:	Out dated electrical systems/ Out dated Governor control system with an excessive amount of oil required to operate the system.
Final Corrective Action:	Electrical system replacement, all wiring, switch gear and control panels. Governors are being replaced with a PLC based control system.
Mechanism Causing:	Age, design and code requirements
Final Root Cause	Age, design and code requirements
Scope to Correct Root Cause:	Electrical system replacement, all wiring, switch gear and control panels. Governors are being replaced with a PLC based control system.
Additional Scope:	N/A
If outage Extended for Additional Work & Why:	N/A

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INFORMATION FOR UNIT - Webber Unit 2

PERIODIC OUTAGE

Sequence Number:	Webber Unit 2-2019-1
Plant/Unit:	Webber Unit 2
MW Derate:	
Event Year:	2019
Event Number:	1
Start Date:	1/1/2019 0:00
End Date:	7/2/2019 18:51
Outage Type:	U1
Duration (Hours):	4385.85
MWh Loss:	1647.54
NERC Cause Code:	4500
NERC Cause Code Description:	Generator Rotor Windings...
Root Cause Description:	Expanded outage scope based on inspection findings
Event Description:	Scheduled overhaul continued as well as generator rewind
Additional Description:	The overhaul outage was extended due to discovery items with the Generator and Rotor Poles which require a rewind to resolve these findings.
Mode of Failure:	Inability to adequately pass megger test on stator and rotor.
Final Corrective Action:	Rewind stator and rotor
Mechanism Causing:	Insulation failure on windings due to age of unit.
Final Root Cause	Insulation failure on windings due to age of unit.
Scope to Correct Root Cause:	Rewind stator and rotor
Additional Scope:	N/A
If outage Extended for Additional Work & Why:	N/A

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INFORMATION FOR UNIT - Ludington Unit 1
PERIODIC OUTAGE

Sequence Number:	Ludington Unit 1-2019-1
Plant/Unit:	Ludington Unit 1
MW Derate:	
Event Year:	2019
Event Number:	1
Start Date:	1/1/2019 0:00
End Date:	5/21/2019 4:57
Outage Type:	PO
Duration (Hours):	3363.95
MWh Loss:	1040884.16
NERC Cause Code:	7200
NERC Cause Code Description:	major hydro/pump storage overhaul
Root Cause Description:	Major Overhaul of unit 1
Event Description:	MOH of Unit #1
Additional Description:	Planned overhaul of unit 1
Mode of Failure:	Planned overhaul of operating unit
Final Corrective Action:	Overhaul and uprating of unit
Mechanism Causing:	Normal wear and tear in conjunction with implementation of improved equipment design
Final Root Cause	Normal wear and tear
Scope to Correct Root Cause:	Planned overhaul of operating unit
Additional Scope:	NA
If outage Extended for Additional Work & Why:	NA

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INFORMATION FOR UNIT - Ludington Unit 1
PERIODIC OUTAGE

Sequence Number:	Ludington Unit 1-2019-2
Plant/Unit:	Ludington Unit 1
MW Derate:	
Event Year:	2019
Event Number:	2
Start Date:	5/21/2019 4:57
End Date:	6/16/2019 8:12
Outage Type:	PE
Duration (Hours):	627.25
MWh Loss:	198838.25
NERC Cause Code:	7200
NERC Cause Code Description:	major hydro/pump storage overhaul
Root Cause Description:	Major Overhaul of unit 1
Event Description:	Continuation MOH of Unit #1
Additional Description:	Planned overhaul of unit 1
Mode of Failure:	Extended outage
Final Corrective Action:	Owner provided technical assistance and contractor increased craft hours.
Mechanism Causing:	Predictions for overhaul work were insufficient due to unit site conditions.
Final Root Cause	Insufficient schedule contingency.
Scope to Correct Root Cause:	Review and adjust schedule to match similar unit configuration.
Additional Scope:	NA
If outage Extended for Additional Work & Why:	NA

MICHIGAN PUBLIC SERVICE COMMISSION
CONSUMERS ENERGY COMPANY

INFORMATION FOR UNIT - Ludington Unit 1
PERIODIC OUTAGE

Sequence Number:	Ludington Unit 1-2019-3
Plant/Unit:	Ludington Unit 1
MW Derate:	
Event Year:	2019
Event Number:	3
Start Date:	6/16/2019 21:22
End Date:	6/19/2019 8:12
Outage Type:	PO
Duration (Hours):	58.83
MWh Loss:	18650.17
NERC Cause Code:	7200
NERC Cause Code Description:	major hydro/pump storage overhaul
Root Cause Description:	Unit 1 Commissioning Exceptions
Event Description:	MOH of Unit #1
Additional Description:	Unplanned Inspection Of Thrust Bearing Reservoir & Oil Filters
Mode of Failure:	Metallic Debris In Bearing Oil System Filters
Final Corrective Action:	Inspection Of Thrust Bearing Reservoir, Replacement & Inspection Of Filters
Mechanism Causing:	Unconfirmed Source Of Metallic Debris, Attributed To Initial Wear In & Residual Contamination.
Final Root Cause	Initial Wear In & Residual Contamination.
Scope to Correct Root Cause:	Replaced Oil Filters and instituted advanced monitoring program.
Additional Scope:	N/A
If outage Extended for Additional Work & Why:	N/A

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CONSUMERS ENERGY COMPANY

INFORMATION FOR UNIT - Ludington Unit 1
PERIODIC OUTAGE

Sequence Number:	Ludington Unit 1-2019-4
Plant/Unit:	Ludington Unit 1
MW Derate:	
Event Year:	2019
Event Number:	4
Start Date:	6/19/2019 8:19
End Date:	6/19/2019 8:45
Outage Type:	PO
Duration (Hours):	0.43
MWh Loss:	137.37
NERC Cause Code:	7200
NERC Cause Code Description:	major hydro/pump storage overhaul
Root Cause Description:	Unit 1 Commissioning
Event Description:	MOH of Unit #1
Additional Description:	Planned System(s) Reset Outage Following 100MW Load Rejection Test
Mode of Failure:	Planned commissioning activity
Final Corrective Action:	Performed planned commissioning inspection following load rejection test
Mechanism Causing:	Planned commissioning activity
Final Root Cause	Planned commissioning activity
Scope to Correct Root Cause:	N/A
Additional Scope:	N/A
If outage Extended for Additional Work & Why:	N/A

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INFORMATION FOR UNIT - Ludington Unit 1
PERIODIC OUTAGE

Sequence Number:	Ludington Unit 1-2019-5
Plant/Unit:	Ludington Unit 1
MW Derate:	
Event Year:	2019
Event Number:	5
Start Date:	6/19/2019 9:15
End Date:	6/19/2019 9:44
Outage Type:	PO
Duration (Hours):	0.48
MWh Loss:	153.22
NERC Cause Code:	7200
NERC Cause Code Description:	major hydro/pump storage overhaul
Root Cause Description:	Unit 1 Commissioning
Event Description:	MOH of Unit #1
Additional Description:	Planned System(s) Reset Outage Following 200MW Load Rejection Test
Mode of Failure:	Planned commissioning activity
Final Corrective Action:	Performed planned commissioning inspection following load rejection test
Mechanism Causing:	Planned commissioning activity
Final Root Cause	Planned commissioning activity
Scope to Correct Root Cause:	N/A
Additional Scope:	N/A
If outage Extended for Additional Work & Why:	N/A

MICHIGAN PUBLIC SERVICE COMMISSION
CONSUMERS ENERGY COMPANY

INFORMATION FOR UNIT - Ludington Unit 1
PERIODIC OUTAGE

Sequence Number:	Ludington Unit 1-2019-6
Plant/Unit:	Ludington Unit 1
MW Derate:	
Event Year:	2019
Event Number:	6
Start Date:	6/19/2019 10:16
End Date:	6/19/2019 10:46
Outage Type:	PO
Duration (Hours):	0.50
MWh Loss:	158.50
NERC Cause Code:	7200
NERC Cause Code Description:	major hydro/pump storage overhaul
Root Cause Description:	Unit 1 Commissioning
Event Description:	MOH of Unit #1
Additional Description:	Planned System(s) Reset Outage Following 300MW Load Rejection Test
Mode of Failure:	Planned commissioning activity
Final Corrective Action:	Performed planned commissioning inspection following load rejection test
Mechanism Causing:	Planned commissioning activity
Final Root Cause	Planned commissioning activity
Scope to Correct Root Cause:	N/A
Additional Scope:	N/A
If outage Extended for Additional Work & Why:	N/A

MICHIGAN PUBLIC SERVICE COMMISSION
CONSUMERS ENERGY COMPANY

INFORMATION FOR UNIT - Ludington Unit 1
PERIODIC OUTAGE

Sequence Number:	Ludington Unit 1-2019-7
Plant/Unit:	Ludington Unit 1
MW Derate:	
Event Year:	2019
Event Number:	7
Start Date:	6/19/2019 11:50
End Date:	6/21/2019 12:24
Outage Type:	PO
Duration (Hours):	48.57
MWh Loss:	15395.63
NERC Cause Code:	7200
NERC Cause Code Description:	major hydro/pump storage overhaul
Root Cause Description:	Unit 1 Commissioning
Event Description:	MOH of Unit #1
Additional Description:	Planned Inspections Following 100% Load Rejection Testing
Mode of Failure:	Planned commissioning activity
Final Corrective Action:	Performed planned commissioning inspection following load rejection test
Mechanism Causing:	Planned commissioning activity
Final Root Cause	Planned commissioning activity
Scope to Correct Root Cause:	N/A
Additional Scope:	N/A
If outage Extended for Additional Work & Why:	N/A

MICHIGAN PUBLIC SERVICE COMMISSION
CONSUMERS ENERGY COMPANY

INFORMATION FOR UNIT - Ludington Unit 1
PERIODIC OUTAGE

Sequence Number:	Ludington Unit 1-2019-8
Plant/Unit:	Ludington Unit 1
MW Derate:	
Event Year:	2019
Event Number:	16
Start Date:	6/21/2019 21:01
End Date:	6/22/2019 7:07
Outage Type:	PO
Duration (Hours):	10.10
MWh Loss:	3201.70
NERC Cause Code:	7200
NERC Cause Code Description:	major hydro/pump storage overhaul
Root Cause Description:	Unit 1 Scheduled Commissioning
Event Description:	MOH of Unit #1
Additional Description:	Planned Unit Commissioning Activities
Mode of Failure:	Planned commissioning activity
Final Corrective Action:	Performed planned testing
Mechanism Causing:	Planned commissioning activity
Final Root Cause	Performed planned testing
Scope to Correct Root Cause:	N/A
Additional Scope:	N/A
If outage Extended for Additional Work & Why:	N/A

MICHIGAN PUBLIC SERVICE COMMISSION
CONSUMERS ENERGY COMPANY

INFORMATION FOR UNIT - Ludington Unit 1
PERIODIC OUTAGE

Sequence Number:	Ludington Unit 1-2019-9
Plant/Unit:	Ludington Unit 1
MW Derate:	
Event Year:	2019
Event Number:	17
Start Date:	6/22/2019 13:38
End Date:	6/22/2019 14:53
Outage Type:	PO
Duration (Hours):	1.25
MWh Loss:	396.25
NERC Cause Code:	7200
NERC Cause Code Description:	major hydro/pump storage overhaul
Root Cause Description:	Unit 1 Scheduled Commissioning
Event Description:	MOH of Unit #1
Additional Description:	Planned Unit Commissioning Activities
Mode of Failure:	Planned commissioning activity
Final Corrective Action:	Performed planned testing
Mechanism Causing:	Planned commissioning activity
Final Root Cause	Performed planned testing
Scope to Correct Root Cause:	N/A
Additional Scope:	N/A
If outage Extended for Additional Work & Why:	N/A

MICHIGAN PUBLIC SERVICE COMMISSION
CONSUMERS ENERGY COMPANY

INFORMATION FOR UNIT - Ludington Unit 1
PERIODIC OUTAGE

Sequence Number:	Ludington Unit 1-2019-10
Plant/Unit:	Ludington Unit 1
MW Derate:	
Event Year:	2019
Event Number:	18
Start Date:	6/22/2019 15:17
End Date:	6/24/2019 20:10
Outage Type:	PO
Duration (Hours):	52.88
MWh Loss:	16764.02
NERC Cause Code:	7200
NERC Cause Code Description:	major hydro/pump storage overhaul
Root Cause Description:	Unit 1 Scheduled Commissioning
Event Description:	MOH of Unit #1
Additional Description:	Planned Unit Commissioning Activities
Mode of Failure:	Planned commissioning activity
Final Corrective Action:	Performed planned testing
Mechanism Causing:	Planned commissioning activity
Final Root Cause	Performed planned testing
Scope to Correct Root Cause:	N/A
Additional Scope:	N/A
If outage Extended for Additional Work & Why:	N/A

MICHIGAN PUBLIC SERVICE COMMISSION
CONSUMERS ENERGY COMPANY

INFORMATION FOR UNIT - Ludington Unit 1
PERIODIC OUTAGE

Sequence Number:	Ludington Unit 1-2019-11
Plant/Unit:	Ludington Unit 1
MW Derate:	
Event Year:	2019
Event Number:	19
Start Date:	6/24/2019 21:36
End Date:	6/25/2019 20:32
Outage Type:	PO
Duration (Hours):	22.93
MWh Loss:	7269.87
NERC Cause Code:	7200
NERC Cause Code Description:	major hydro/pump storage overhaul
Root Cause Description:	Unit 1 Scheduled Commissioning
Event Description:	MOH of Unit #1
Additional Description:	Planned Unit Commissioning Activities
Mode of Failure:	Planned commissioning activity
Final Corrective Action:	Performed planned testing
Mechanism Causing:	Planned commissioning activity
Final Root Cause	Performed planned testing
Scope to Correct Root Cause:	N/A
Additional Scope:	N/A
If outage Extended for Additional Work & Why:	N/A

MICHIGAN PUBLIC SERVICE COMMISSION
CONSUMERS ENERGY COMPANY

INFORMATION FOR UNIT - Ludington Unit 1
PERIODIC OUTAGE

Sequence Number:	Ludington Unit 1-2019-12
Plant/Unit:	Ludington Unit 1
MW Derate:	
Event Year:	2019
Event Number:	20
Start Date:	6/25/2019 21:50
End Date:	6/26/2019 20:11
Outage Type:	PO
Duration (Hours):	22.35
MWh Loss:	7084.95
NERC Cause Code:	7200
NERC Cause Code Description:	major hydro/pump storage overhaul
Root Cause Description:	Unit 1 Scheduled Commissioning
Event Description:	MOH of Unit #1
Additional Description:	Planned Unit Commissioning Activities
Mode of Failure:	Planned commissioning activity
Final Corrective Action:	Performed planned testing
Mechanism Causing:	Planned commissioning activity
Final Root Cause	Performed planned testing
Scope to Correct Root Cause:	N/A
Additional Scope:	N/A
If outage Extended for Additional Work & Why:	N/A

MICHIGAN PUBLIC SERVICE COMMISSION
CONSUMERS ENERGY COMPANY

INFORMATION FOR UNIT - Ludington Unit 1
PERIODIC OUTAGE

Sequence Number:	Ludington Unit 1-2019-13
Plant/Unit:	Ludington Unit 1
MW Derate:	
Event Year:	2019
Event Number:	21
Start Date:	6/26/2019 21:29
End Date:	6/26/2019 22:30
Outage Type:	PO
Duration (Hours):	1.02
MWh Loss:	322.28
NERC Cause Code:	7200
NERC Cause Code Description:	major hydro/pump storage overhaul
Root Cause Description:	Unit 1 Scheduled Commissioning
Event Description:	MOH of Unit #1
Additional Description:	Planned Unit Commissioning Activities
Mode of Failure:	Planned commissioning activity
Final Corrective Action:	Performed planned testing
Mechanism Causing:	Planned commissioning activity
Final Root Cause	Performed planned testing
Scope to Correct Root Cause:	N/A
Additional Scope:	N/A
If outage Extended for Additional Work & Why:	N/A

MICHIGAN PUBLIC SERVICE COMMISSION
CONSUMERS ENERGY COMPANY

INFORMATION FOR UNIT - Ludington Unit 2
PERIODIC OUTAGE

Sequence Number:	Ludington Unit 2-2019-2
Plant/Unit:	Ludington Unit 2
MW Derate:	
Event Year:	2019
Event Number:	421
Start Date:	10/6/2019 4:19
End Date:	10/15/2019 16:19
Outage Type:	PO
Duration (Hours):	228.00
MWh Loss:	87096.00
NERC Cause Code:	7201
NERC Cause Code Description:	Hydro/pump Storage Inspection...
Root Cause Description:	Planned Regulatory Reservoir/Tailrace Inspection Outage
Event Description:	2019 Pond Outage
Additional Description:	Planned unit outage due to regulatory inspection of tailrace & reservoir.
Mode of Failure:	Planned outage inspections
Final Corrective Action:	Perform planned inspections
Mechanism Causing:	Planned inspection activities
Final Root Cause	Planned outage activities
Scope to Correct Root Cause:	Perform planned inspections
Additional Scope:	N/A
If outage Extended for Additional Work & Why:	N/A

MICHIGAN PUBLIC SERVICE COMMISSION
CONSUMERS ENERGY COMPANY

INFORMATION FOR UNIT - Ludington Unit 2
PERIODIC OUTAGE

Sequence Number:	Ludington Unit 2-2019-3
Plant/Unit:	Ludington Unit 2
MW Derate:	
Event Year:	2019
Event Number:	428
Start Date:	10/15/2019 16:19
End Date:	12/6/2019 19:30
Outage Type:	PE
Duration (Hours):	1252.18
MWh Loss:	473730.53
NERC Cause Code:	7201
NERC Cause Code Description:	Hydro/pump Storage Inspection...
Root Cause Description:	Failure of discharge ring material/base weld.
Event Description:	Unplanned outage extension due to emergent findings from planned inspections.
Additional Description:	Emergent finding of rejectable material defects in the OEM supplied discharged ring assembly during planned inspections.
Mode of Failure:	Rejectable material defects in discharge ring assembly.
Final Corrective Action:	Repair welding of select rejectable defects by OEM.
Mechanism Causing:	Fracture and spalling of discharge ring material.
Final Root Cause	Failure of material/base weld.
Scope to Correct Root Cause:	Excavation of select defects and repair welding.
Additional Scope:	N/A
If outage Extended for Additional Work & Why:	N/A

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INFORMATION FOR UNIT - Ludington Unit 3
PERIODIC OUTAGE

Sequence Number:	Ludington Unit 3-2019-1
Plant/Unit:	Ludington Unit 3
MW Derate:	
Event Year:	2019
Event Number:	181
Start Date:	5/13/2019 6:01
End Date:	1/1/2020 0:00
Outage Type:	PO
Duration (Hours):	5586.98
MWh Loss:	1833667.48
NERC Cause Code:	7200
NERC Cause Code Description:	major hydro/pump storage overhaul
Root Cause Description:	Major Overhaul of unit 3
Event Description:	MOH of Unit #3
Additional Description:	Planned overhaul of unit 3
Mode of Failure:	Planned overhaul of operating unit
Final Corrective Action:	Overhaul and uprating of unit
Mechanism Causing:	Normal wear and tear in conjunction with implementation of improved equipment design
Final Root Cause	Normal wear and tear
Scope to Correct Root Cause:	Planned overhaul of operating unit
Additional Scope:	NA
If outage Extended for Additional Work & Why:	NA

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CONSUMERS ENERGY COMPANY

INFORMATION FOR UNIT - Ludington Unit 4
PERIODIC OUTAGE

Sequence Number:	Ludington Unit 4-2019-3
Plant/Unit:	Ludington Unit 4
MW Derate:	
Event Year:	2019
Event Number:	308
Start Date:	9/3/2019 7:25
End Date:	11/4/2019 18:25
Outage Type:	PO
Duration (Hours):	1500.00
MWh Loss:	538078.83
NERC Cause Code:	3620
NERC Cause Code Description:	Main Transformer...
Root Cause Description:	Planned Replacement Of GSU Transformer
Event Description:	#2 MTB outage
Additional Description:	Planned Removal Of Existing GSU. Installation, Testing, & Commissioning Of New GSU Transformer.
Mode of Failure:	Planned End Of Life For Existing Generator Step Up (GSU) Transformer
Final Corrective Action:	Replacement Of GSU Transformer With New Equivalent
Mechanism Causing:	Planned End Of Life For Generator Step Up (GSU) Transformer
Final Root Cause	End Of Service Life For Existing GSU Transformer
Scope to Correct Root Cause:	Replacement Of GSU Transformer
Additional Scope:	N/A
If outage Extended for Additional Work & Why:	N/A

MICHIGAN PUBLIC SERVICE COMMISSION
CONSUMERS ENERGY COMPANY

INFORMATION FOR UNIT - Ludington Unit 4
PERIODIC OUTAGE

Sequence Number:	Ludington Unit 4-2019-4
Plant/Unit:	Ludington Unit 4
MW Derate:	
Event Year:	2019
Event Number:	311
Start Date:	11/4/2019 18:25
End Date:	12/9/2019 15:30
Outage Type:	PE
Duration (Hours):	837.08
MWh Loss:	314163.33
NERC Cause Code:	3620
NERC Cause Code Description:	Main Transformer...
Root Cause Description:	Isophase bus replacement upgrade
Event Description:	#2 MTB outage
Additional Description:	Installation of isophase bus upgrade from generator to the Main Transformer Bank during outage.
Mode of Failure:	Planned generator upgrade
Final Corrective Action:	Perform work scope in an expedient manner
Mechanism Causing:	Work scope was pushed from 2018 into 2019 to accommodate change in the sequence of the major unit overhauls
Final Root Cause	Planned generator upgrade
Scope to Correct Root Cause:	Perform work scope in an expedient manner
Additional Scope:	Planned inspection & characterization of thrust bearing pad.
If outage Extended for Additional Work & Why:	N/A

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CONSUMERS ENERGY COMPANY

INFORMATION FOR UNIT - Ludington Unit 4
PERIODIC OUTAGE

Sequence Number:	Ludington Unit 4-2019-5
Plant/Unit:	Ludington Unit 4
MW Derate:	
Event Year:	2019
Event Number:	325
Start Date:	12/9/2019 15:30
End Date:	12/19/2019 11:30
Outage Type:	U1
Duration (Hours):	236.00
MWh Loss:	83780.00
NERC Cause Code:	7012
NERC Cause Code Description:	Casing, wear ring, or liner cavitation damage
Root Cause Description:	Failure of wicket gate, stay vane, and head cover coatings.
Event Description:	Unplanned outage extension due to emergent findings from planned inspections.
Additional Description:	Unplanned outage extension due to emergent findings of rejectable coatings failure & resultant cavitation on the wicket gates, stay vanes, and head cover during planned inspections.
Mode of Failure:	Loss of water passage coating and resultant cavitation.
Final Corrective Action:	Repair of the cavitation damage and recoating of the base metal.
Mechanism Causing:	Separation & spalling of the coatings from the base metal.
Final Root Cause	Failure of the water passage coating.
Scope to Correct Root Cause:	Repair of the cavitation damage and subsequent recoating of base metal.
Additional Scope:	N/A
If outage Extended for Additional Work & Why:	N/A

MICHIGAN PUBLIC SERVICE COMMISSION
CONSUMERS ENERGY COMPANY

INFORMATION FOR UNIT - Ludington Unit 4
PERIODIC OUTAGE

Sequence Number:	Ludington Unit 4-2019-6
Plant/Unit:	Ludington Unit 4
MW Derate:	
Event Year:	2019
Event Number:	314
Start Date:	12/19/2019 12:30
End Date:	12/20/2019 13:02
Outage Type:	PO
Duration (Hours):	0.53
MWh Loss:	189.33
NERC Cause Code:	3620
NERC Cause Code Description:	Main Transformer...
Root Cause Description:	Planned Thrust Bearing Pad Inspection
Event Description:	Planned Post Maintenance Testing Following Event 311.
Additional Description:	Planned post maintenance testing of unit following thrust bearing pad inspection performed during event 311.
Mode of Failure:	Planned post-maintenance inspection activity
Final Corrective Action:	Perform the planned inspection prior to returning the unit to service.
Mechanism Causing:	Planned post-maintenance inspection activity
Final Root Cause	Planned post-maintenance inspection activity
Scope to Correct Root Cause:	Perform the planned inspection prior to returning the unit to service.
Additional Scope:	N/A
If outage Extended for Additional Work & Why:	N/A

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INFORMATION FOR UNIT - Ludington Unit 5
PERIODIC OUTAGE

Sequence Number:	Ludington Unit 5 -2019-2
Plant/Unit:	Ludington Unit 5
MW Derate:	
Event Year:	2019
Event Number:	366
Start Date:	10/6/2019 4:19
End Date:	10/15/2019 16:19
Outage Type:	PO
Duration (Hours):	228.00
MWh Loss:	87096.00
NERC Cause Code:	7201
NERC Cause Code Description:	Hydro/pump Storage Inspection...
Root Cause Description:	Planned Regulatory Reservoir/Tailrace Inspection Outage
Event Description:	2019 Pond Outage
Additional Description:	Planned unit outage due to regulatory inspection of tailrace & reservoir.
Mode of Failure:	Planned outage inspections
Final Corrective Action:	Perform planned inspections
Mechanism Causing:	Planned inspection activities
Final Root Cause	Planned outage activities
Scope to Correct Root Cause:	Perform planned inspections
Additional Scope:	N/A
If outage Extended for Additional Work & Why:	N/A

MICHIGAN PUBLIC SERVICE COMMISSION
CONSUMERS ENERGY COMPANY

INFORMATION FOR UNIT - Ludington Unit 5
PERIODIC OUTAGE

Sequence Number:	Ludington Unit 5 -2019-2
Plant/Unit:	Ludington Unit 5
MW Derate:	
Event Year:	2019
Event Number:	372
Start Date:	10/15/2019 16:19
End Date:	12/17/2019 9:43
Outage Type:	PE
Duration (Hours):	1506.40
MWh Loss:	561664.72
NERC Cause Code:	7201
NERC Cause Code Description:	Hydro/pump Storage Inspection...
Root Cause Description:	Failure of discharge ring material/base weld.
Event Description:	Unplanned outage extension due to emergent findings from planned inspections.
Additional Description:	Emergent finding of rejectable material defects in the OEM supplied discharged ring assembly during planned inspections.
Mode of Failure:	Rejectable material defects in discharge ring assembly.
Final Corrective Action:	Repair welding of select rejectable defects by OEM.
Mechanism Causing:	Fracture and spalling of discharge ring material.
Final Root Cause	Failure of material/base weld.
Scope to Correct Root Cause:	Excavation of select defects and repair welding.
Additional Scope:	N/A
If outage Extended for Additional Work & Why:	N/A

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Consumers Energy Company

Case No.: U-20220
Exhibit No.: A-7 (NJK-4)
Page No.: 1 of 1
Witness: NJKapala
Date: March 2020

2019 FOSSIL AND PUMPED STORAGE OUTAGES OCCURRING FOR TWENTY EIGHT DAYS OR MORE

Line No.	(a) Unit	(b) Planned Days in 2019	(c) Actual Days in 2019	(d) Event Number
1	Ludington 1	146	177	1-7, 16-21
2	Karn 4	147	196	1-5, 7, 9, 18-19, 27
3	Karn 3	115	141	1-13
4	Karn 1	60	38	106, 110, 115, 121, 129
5	Ludington 3	248	233	181
6	Karn 4	96	80	42
7	Campbell 3	55	50	380
8	Karn 1	—	49	203
9	Karn 2	—	34	2, 4
10	Karn 2	—	67	127, 131
11	Karn 2	—	29	153, 170
12	Ludington 2	—	62	421, 428
13	Ludington 4	—	107	308, 311, 314, 325
14	Ludington 5	—	72	366, 372

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Consumers Energy Company

Case No.: U-20220
Exhibit No.: A-8 (NJK-5)
Page: 1 of 1
Witness: NJKapala
Date: March 2020

GENERATION PERFORMANCE STATISTICS
JANUARY 1, 2019 TO DECEMBER 31, 2019

Line No.	(a) Unit	(b) Unit Availability	(c) MWh Availability	(d) Periodic Factor	(e) Random Outage Rate
1	Campbell 1	91.55%	85.78%	0.01%	14.21%
2	Campbell 2	83.92%	63.36%	17.95%	22.78%
3	Campbell 3 (CE)	81.14%	78.44%	13.88%	8.92%
4	Karn 1	60.41%	53.06%	24.90%	29.35%
5	Karn 2	60.41%	65.41%	5.81%	30.56%
6	Karn 3	46.75%	45.03%	44.83%	18.38%
7	Karn 4	20.25%	19.71%	74.39%	23.04%
8	Zeeland Simple Cycle	89.56%	88.70%	8.13%	3.45%
9	Zeeland Combined Cycle	89.47%	88.82%	7.04%	4.45%
10	Jackson CC	98.17%	93.51%	3.48%	3.12%
11	Total Fossil CE[1]	84.06%	79.71%	10.09%	11.35%
12	Base Load Fossil CE	77.60%	68.71%	13.16%	20.88%
13	Ludington 1-6	65.11%	65.11%	32.03%	4.21%
14	Total Hydro	87.71%	87.49%	7.63%	5.28%

[1] Does not include Karn 3 and Karn 4.

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COMPARISON OF CONSUMERS ENERGY AND GADS AVERAGES FOR SIMILAR UNITS
EQUIVALENT AVAILABILITY

Line No.	(a)	(b)	(c)	(d)	(e)	(f)
	UNIT	GADS AVERAGES		CONSUMERS ENERGY		CE VERSUS
		2014-2018	2018	2015-2019	2019	GADS **
1	Campbell 1	77.30%	76.75%	78.94%	85.78%	Higher
2	Campbell 2	78.82%	77.10%	66.67%	63.36%	Lower
3	Campbell 3	79.17%	74.15%	80.95%	78.44%	Higher
4	Karn 1	77.30%	76.75%	56.42%	53.06%	Lower
5	Karn 2	77.30%	76.75%	61.38%	65.41%	Lower

** Higher indicates one-year and/or five-year were higher than the GADs average.
Lower indicates both tests were lower than the GADS average.

MICHIGAN PUBLIC SERVICE COMMISSION

Consumers Energy Company

Case No.: U-20220
Exhibit No.: A-10 (NJK-7)
Page: 1 of 1
Witness: NJKapala
Date: March 2020

2019 BASE LOAD GENERATION POWER PLANT COST EFFICIENCY

Line No.	(a)	(b)	(c)	(d)	(e)	(f)	(g)
			FERC Form 1 data	GADS Perf measure report	GADS Perf measure report	GADS Gen Sum report	GADS Gen Sum report
		Heat Rate	On-line Hours	Planned Outage	Unplanned Outage	Gross MWh	Net MWh
	Plant	BTU/kWh	Hours	Factor	Factor	Generated	Delivered
1	Campbell 1	10,781	7,497	0.00%	8.45%	1,454,882	1,451,789
2	Campbell 2	10,685	7,354	0.00%	16.17%	1,676,670	1,671,619
3	Campbell 3	9,875	7,109	13.84%	5.00%	5,282,695	5,267,977
4	Karn 1	10,525	4,640	19.48%	20.13%	896,956	876,282
5	Karn 2	10,506	4,894	0.00%	39.38%	901,451	885,578

MICHIGAN PUBLIC SERVICE COMMISSION

Consumers Energy Company

Case No.: U-20220
Exhibit No.: A-11 (NJK-8)
Page: 1 of 1
Witness: NJKapala
Date: March 2020

CHEMICAL REAGENT EXPENSE
JANUARY 1, 2019 TO DECEMBER 31, 2019

Line No.	(a)	(b)	(c)	(d)	(e)	(f)	(g)	(h)	(i)	(j)	(k)
	UNIT	UREA EXPENSE		AQUEOUS AMMONIA		LIME		ACTIVATED CARBON		TOTAL	
		Projected	Actual	Projected	Actual	Projected	Actual	Projected	Actual	Projected	Actual
1	Campbell 1	$ -	$ -	$ -	$ -	$ 5,414,718	$ 5,317,735	$ 783,490	$ 785,504	$ 6,499,652	$ 6,760,243
2	Campbell 2	$ 301,444	$ 657,004	$ -	$ -						
3	Campbell 3	$ 1,982,124	$ 1,430,450	$ -	$ -	$ 2,957,645	$ 2,045,011	$ 640,268	$ 160,648	$ 5,580,037	$ 3,636,109
4	Karn 1	$ -	$ -	$ 996,183	$ 584,593	$ 1,350,650	$ 659,647	$ 247,424	$ 100,819	$ 2,594,257	$ 1,345,058
5	Karn 2										
6	Zeeland	$ -	$ -	$ 135,056	$ 99,634	$ -	$ -	$ -	$ -	$135,056	$99,634
7	Total	$ 2,283,568	$ 2,087,454	$ 1,131,239	$ 684,227	$ 9,723,013	$ 8,022,393	$ 1,671,182	$ 1,046,971	$ 14,809,002	$ 11,841,045

STATE OF MICHIGAN

BEFORE THE MICHIGAN PUBLIC SERVICE COMMISSION

In the matter of the application of **CONSUMERS ENERGY COMPANY** for reconciliation of its power supply cost recovery plan (Case No. U-20219) for the 12 months ended December 31, 2019.	))))))	Case No. U-20220

DIRECT TESTIMONY

OF

STEPHEN J. NADEAU

ON BEHALF OF

CONSUMERS ENERGY COMPANY

March 2020

Q. Would you please state your name and business address.

A. My name is Stephen J. Nadeau, and my business address is 1945 West Parnall Road, Jackson, Michigan 49201.

Q. By whom are you employed?

A. I am employed by Consumers Energy Company ("Consumers Energy" or the "Company") as the Manager of Natural Gas Supply for Generation in Fossil Fuel Supply.

Q. Would you please describe your educational background and business experience?

A. I graduated from Alma College in 2001 with a Bachelor of Science Degree in Biochemistry and from Spring Arbor University in 2011 with a Master of Business Administration Degree. I began working on contract for Consumers Energy in 2002, and became a Company employee in 2005. I have held several positions in the Laboratory Services and Environmental Strategies departments, and began working in the Fossil Fuel Supply group in February of 2007.

Q. What are your duties as the Manager of Natural Gas Supply for Generation?

A. My duties include supporting the Executive Director of Fossil Fuel Supply through managing the natural gas supply used at the Company's electric generating plants; administering the Fuels Management System that tracks all coal shipments, inventory levels, coal consumption, and accounting information; and the preparation of testimony and filings for presentation before the Michigan Public Service Commission ("MPSC" or the "Commission").

Q. Have you previously testified before the MPSC?

A. Yes. I have previously provided testimony in the following Power Supply Cost Recovery ("PSCR") proceedings:

- Case No U-16432-R (2011 PSCR Reconciliation case);
- Case No U-16890-R (2012 PSCR Reconciliation case);
- Case No U-17095-R (2013 PSCR Reconciliation case);
- Case No U-17317-R (2014 PSCR Reconciliation case);
- Case No U-17678-R (2015 PSCR Reconciliation case);
- Case No U-18402 (2018 PSCR Plan case);
- Case No U-20068 (2017 PSCR Reconciliation case);
- Case No U-20219 (2019 PSCR Plan case); and
- Case No U-20525 (2020 PSCR Plan case).

Q. What is the purpose of your direct testimony in this proceeding?

A. I am sponsoring direct testimony with respect to the Company's 2019 actual volumes and costs of oil and gas used for electric generation.

Q. Are you sponsoring any exhibits with your direct testimony?

A. Yes, I am sponsoring the following exhibit:

Exhibit A-12 (SJN-1) Comparison of 2019 As-Burned Costs of Oil & Gas.

Q. Was the exhibit prepared by you or under your direction or supervision?

A. Yes.

<u>Burned Oil and Gas Volumes and Costs</u>

Q. What were the projected and actual oil and gas burn values for electric generation during 2019?

A. The projected and actual burn volumes and costs are shown on Exhibit A-12 (SJN-1).

Q. Please explain the major differences between the projected and actual costs of oil and gas burned for electric generation during 2019 as outlined in Exhibit A-12 (SJN-1).

A. In total, the actual costs of oil and gas burned on Consumers Energy's system in 2019 were less than projected. The major difference was due to the Zeeland Plant burning much less gas than had been forecasted.

Q. Please elaborate on the actual costs for oil burned for electric generation in 2019.

A. All of Consumers Energy's oil purchases are made through a competitive bidding process, selecting the lowest cost bidder. The Company projected burning no No. 6 fuel oil at D.E. Karn ("Karn") Units 3 and 4; these units actually consumed 14,949 barrels at an average cost of $29.736 per barrel.

Q. Please elaborate on the actual costs for gas burned for electric generation in 2019.

A. The arrangements for gas purchases for the Zeeland Plant, the Jackson Plant, and Karn Units 3 and 4 were made pursuant to competitive bidding processes, with all three utilizing gas management services agents. The projected cost of gas burned at the Zeeland Plant was $3.042 per MCF, while the actual cost was $2.713 per MCF. The projected cost of gas burned at the Jackson Plant was $3.429 per MCF, while the actual cost was $3.010 per MCF. The projected cost of gas burned at Karn Units 3 and 4 was $9.560 per MCF, while the actual cost of gas was $8.727 per MCF. The per unit price difference for gas burned at the plants was mainly due to lower than anticipated prices for natural gas. For the two gas peakers, the PSCR Plan costs shown are for MDNR fees that were included in the PSCR Plan but not incurred during 2019. These two units were

retired and services to these facilities were terminated in November and August of 2018, respectively.

Gas Management Services Agents

Q. Can you elaborate on why the Company utilizes Gas Management Services ("GMS") agents for Jackson, Zeeland, and Karn?

A. Utilizing GMS agents allows the Company to take advantage of the Agent's diversity of gas purchasing/transportation contracts, gas purchasing experience, as well as the portfolio of arrangements the Agent has with pipelines in North America. This expertise enables the Agent to provide transportation and balancing services to the Company more economically than if the Company were required to obtain firm transportation and storage directly from the pipeline companies. By using GMS agents, the Company only pays for most of the transportation costs when natural gas is needed. If the Company were to obtain its own transportation contracts, such services would cost the customers every day of the contract term regardless if the services were being fully utilized at that time or not.

Q. Does the method for managing the gas supplies for the Jackson, Zeeland, and Karn plants through the use of GMS agents ensure a reliable and reasonably priced gas supply to these facilities?

A. The requirement for the Agent to hold the necessary firm transportation assets with the pipelines to deliver the gas to the plants' delivery point (or utilize transportation assets held by the Company) and gas pricing based on published indices ensures these facilities are reliable and competitive participants in the Midcontinent Independent System Operator, Inc. energy market.

Conclusion

Q. Based on your previous responses and on your familiarity with the Company's oil and gas purchases, do you believe that 2019 oil and gas purchases were made in a reasonable and prudent manner and that the costs incurred were reasonable and prudent?

A. Yes, I do.

Q. Does this complete your direct testimony?

A. Yes.

S T A T E O F M I C H I G A N

BEFORE THE MICHIGAN PUBLIC SERVICE COMMISSION

In the matter of the application of **CONSUMERS ENERGY COMPANY** for reconciliation of its power supply cost recovery plan (Case No. U-20219) for the 12 months ended December 31, 2019.	))))))	Case No. U-20220

EXHIBIT OF

OF

STEPHEN J. NADEAU

ON BEHALF OF

CONSUMERS ENERGY COMPANY

March 2020

Comparison of 2019 As-Burned Cost of Oil & Gas

Line	Plant	Plan* Burn Volumes	Plan* Cost	Planned Cost per Unit	Actual Burn Volumes	Actual Cost	Actual Cost per Unit
	(a)	(b)	(c)	(d)	(e)	(f)	(g)
1	**Gas & Oil Units (MCF/bbls)**						
2	Karn 3-4 (Gas)	901,768	$ 8,620,807	$ 9.560	999,942	$ 8,726,563	$ 8.727
3	Karn 3-4 (Oil)	0	$ 28	N/A	14,949	$ 444,519	$ 29.736
4	Jackson (Gas)	14,061,983	$ 48,216,743	$ 3.429	16,282,706	$ 49,014,027	$ 3.010
5	Zeeland (Gas)	38,422,192	$ 116,886,571	$ 3.042	27,820,820	$ 75,466,873	$ 2.713
6	**Total Gas & Oil (lines 2-5):**		**$ 173,724,149**			**$ 133,651,982**	
7	**Peaking Units (MCF/bbls)**						
8	Gaylord (Gas)	0	$ 5,455	N/A	0	$ 5,455	N/A
9	Thetford (Gas)	0	$ 9,775	N/A	0	$ 5,455	N/A
10	**Total Peaking (lines 8-9):**		**$ 15,229**			**$ 10,909**	
11	**Total Gas & Oil Generation (lines 6, 10):**		**$ 173,739,378**			**$ 133,662,891**	

* 2019 PSCR Plan Case U-20219.

STATE OF MICHIGAN

BEFORE THE MICHIGAN PUBLIC SERVICE COMMISSION

In the matter of the application of **CONSUMERS ENERGY COMPANY** for reconciliation of its power supply cost recovery plan (Case No. U-20219) for the 12 months ended December 31, 2019.	))))))	Case No. U-20220

DIRECT TESTIMONY

OF

HANNAH L. PATTON

ON BEHALF OF

CONSUMERS ENERGY COMPANY

March 2020

Q. Please state your name and business address.

A. My name is Hannah L. Patton, and my business address is One Energy Plaza, Jackson, Michigan 49201.

Q. By whom are you employed?

A. I am employed by Consumers Energy Company ("Consumers Energy" or the "Company").

Q. What is your position at Consumers Energy?

A. I am a Senior Accounting Analyst II in the Electric Revenue and Fuel Reconciliation section of the General Accounting Department.

Q. Please state your educational background and work experience.

A. I graduated from Albion College in May 2009 with a Bachelor of Arts degree in Economics and Management. I began working for the Company in January 2012 in the Electric Revenue and Fuel Reconciliation section of the General Accounting Department. I was an external auditor employed by Rehmann Robson from December 2007 through December 2011. I obtained my Certified Public Accountant license in February 2011.

Q. What are your responsibilities in your present position?

A. My primary responsibilities include the accounting for power supply expenses, power supply cost, over- or under-recoveries, and the Company's mandatory and voluntary Renewable Energy ("RE") programs, as well as electric revenue and gross margin analysis.

Q. Have you previously filed testimony with the Michigan Public Service Commission ("MPSC" or the "Commission")?

A. Yes. I filed testimony in the following cases:

- MPSC Case No. U-17631, the Company's 2013 RE Reconciliation Case;
- MPSC Case No. U-17803, the Company's 2014 RE Reconciliation Case;
- MPSC Case No. U-18081, the Company's 2015 RE Reconciliation Case;
- MPSC Case No. U-18241, the Company's 2016 RE Reconciliation Case;
- MPSC Case No. U-17918-R, the Company's 2016 Power Supply Cost Recovery ("PSCR") Reconciliation Case;
- MPSC Case No. U-20068, the Company's 2017 PSCR Reconciliation Case; and
- MPSC Case No. U-20202, the Company's 2018 PSCR Reconciliation Case.

Q. What is the purpose of your direct testimony in this proceeding?

A. The purpose of my direct testimony is to provide the methodology and calculation of the Company's over- or under-recovery amount related to the operation of the PSCR clause during 2019.

Q. Are you sponsoring any exhibits?

A. Yes. I am sponsoring the following exhibits:

Exhibit A-13 (HLP-1)	2019 Power Supply Cost Recovery Reconciliation; and
Exhibit A-14 (HLP-2)	PSCR Interest Calculation – 2019.

Q. Were these exhibits prepared by you or under your supervision?

A. Yes.

PSCR

Q. Would you please describe the procedures used by the Company to derive the amount of over- or under-recovery recorded each month during 2019 under the PSCR clause?

A. The monthly over- or under-recovery amounts were derived by comparing the Company's PSCR revenues for a given month with the PSCR costs for the same month. Exhibit A-13 (HLP-1) provides such a comparison.

Q. How did the Company determine the monthly amount of PSCR Revenue as shown on Exhibit A-13 (HLP-1), line 16?

A. The PSCR cycle billed sales revenue as shown on Exhibit A-13 (HLP-1), line 13 (PSCR cycle billed sales multiplied by the sum of the current month's PSCR factor and the base cost recovery factor) is added to the current month's unbilled PSCR revenue as shown on Exhibit A-13 (HLP-1), line 14, (current month's unbilled PSCR sales multiplied by the sum of the next month's PSCR factor and the base cost recovery factor). From this sum is subtracted the prior month's unbilled PSCR revenue as shown on Exhibit A-13 (HLP-1), line 15, (prior month's unbilled PSCR sales multiplied by the sum of the prior month's PSCR factor and the base cost recovery factor).

Q. How were recoverable power supply costs determined?

A. Recoverable power supply costs are power supply costs actually incurred during 2019, which include costs incurred in accordance with the Company's 2019 PSCR Plan filed in Case No. U-20219. These costs consist of the Company's fuel and purchased power costs, transmission costs, urea and aqueous ammonia costs, costs for lime, costs for activated carbon, net oxides of nitrogen ("NO_x") and sulfur dioxide ("SO_2") emission

allowance costs, and "Transfer Costs" associated with RE, less the cost to supply non-PSCR sales.

Q. Are all Company sales included in this PSCR Reconciliation case?

A. No.

Q. Please describe non-PSCR sales and identify how the costs of these sales are determined.

A. Non-PSCR sales include three categories of sales: (i) sales to our nonjurisdictional interruptible wholesale customer, which are priced at the current monthly incremental fuel and purchased and interchanged power cost; (ii) firm nonjurisdictional wholesale sales and the Grand Rapids special contract sales, both of which are priced at the average monthly power supply cost excluding the cost of the incrementally priced sales; and (iii) sales to Rate GSG-2 customers, which are priced at the Midcontinent Independent System Operator, Inc. real-time locational marginal price plus allocated capacity and transmission charges.

Q. Have you prepared an exhibit that sets forth the Company's PSCR revenues and the recoverable costs for 2019?

A. Yes, Exhibit A-13 (HLP-1) provides this information. This exhibit has been prepared on the same basis and using the same methodology that the Company has presented in previous PSCR Reconciliation cases. As shown on line 28, column (n), of this exhibit, the 2019 PSCR Reconciliation results in a total net over-recovery of $22,407,410. Including statutory interest, as set forth on Exhibit A-14 (HLP-2), the total net over-recovery for 2019 is $24,326,335. This over-recovery includes the 2018 over-recovery discussed later in my direct testimony.

Q. How does the Company propose to treat this over-recovery?

A. The Company has rolled in the over-recovery amount into the calculation of its 2019 PSCR factors. This roll-in approach was approved by the Commission in its December 21, 2006 Order in Case No. U-15001.

Q. Please continue.

A. Exhibit A-13 (HLP-1) details the PSCR Reconciliation Report for the 12-month period ended December 31, 2019, for all classes of customers. Lines 1 through 3 show PSCR sales in kWh by month and in total. Lines 5 through 7 calculate total sales less interruptible wholesale and Rate GSG-2 sales for each of the 12 months and in total. Line 8 depicts the percentage of PSCR sales to system sales less interruptible wholesale and Rate GSG-2 sales for each of the 12 months. Lines 9 through 12 show the authorized PSCR factor for the entire year 2019, including the base recovery factor (line 9) as well as the monthly factors (lines 10 through 12) per kWh for each of the 12 months. Lines 13 through 15 show PSCR revenues for each of the 12 months and in total. The total for lines 13 through 15 is shown on line 16. Lines 17 and 18 show fuel for generation and purchased and interchange power costs for each month and in total. Line 19 shows environmental costs for each month and in total. Line 19 includes costs related to urea, NO_x and SO_2 allowances, aqueous ammonia, lime, and activated carbon. Line 20 shows the estimated reduction to PSCR costs due to the movement of certain assets and revenues to Federal Energy Regulatory Commission ("FERC") jurisdiction. The total for lines 17 through 20 is shown on line 21. Line 22 shows the reduction to PSCR costs for the costs related to the interruptible wholesale and Rate GSG-2 sales. Line 23 is the difference between line 21 and line 22. Line 24 is the same as line 8 described above.

Line 25 is the product of lines 23 and 24 and represents the costs allocated to PSCR customers. Line 26 shows the over- or under-recovery for each month and for the 12-month period. Line 27 shows the roll-in of the 2018 over-recovery. Line 28 shows the cumulative over- or under-recovery by month during the PSCR year.

Q. Please describe further the purpose of line 20 of Exhibit A-13 (HLP-1).

A. As described by Company witness Daniel L. Harry in Case No. U-18322, FERC approved a settlement agreement which resulted in reclassifying certain assets and offsetting lease revenue to be transferred to FERC jurisdiction. Since the FERC jurisdictional rates are based on historical data, this update would not be reflected in FERC rates until June 1, 2019. As a result, the Company proposed to include a reduction in its PSCR Reconciliation in the same amount by which the Company's transmission rates are expected to be reduced once the modified Attachment O is reflected in its FERC rates. This reduction in PSCR expense became effective on April 1, 2019, in accordance with the March 29, 2019 Order in Case No. U-18322 (i.e., coincident with the reclassification of certain assets, expense, and rent from Consumers Energy's retail rates).

Q. How was the monthly amount calculated that is shown on line 20 of Exhibit A-13 (HLP-1)?

A. As described by Company witness Harry in Case No. U-18322, the expected annual revenue effect of assets and revenues transferred to FERC jurisdiction was $1,800,000. This annual amount divided by 12 results in a monthly figure of $150,000. This was the estimated amount included in the months of January – June as a reduction to PSCR expense. The additional $630,012 reduction to PSCR expense shown in July was based

on the final calculation of the impact of the assets and revenue transferred to FERC jurisdiction.

Q. How was the percentage on line 8 ("Percentage PSCR Sales to Net of Incremental Total") determined?

A. This percentage was determined by dividing total PSCR calendar sales by total system sales less interruptible wholesale and Rate GSG-2 sales (i.e., line 4 divided by line 7).

Q. How were PSCR revenues shown on line 16 determined?

A. Monthly PSCR revenues consist of billed PSCR revenues and net unbilled PSCR revenues. Billed PSCR revenues result from multiplying current cycle billed sales by the sum of the base fuel factor and the billed PSCR factor (line 1 multiplied by the sum of line 9 and line 10). Current month unbilled PSCR revenues result from multiplying current month unbilled sales by the sum of the base fuel factor and the current month unbilled PSCR factor (line 2 multiplied by the sum of line 9 and line 11). Prior month unbilled PSCR revenues result from multiplying prior month unbilled sales by the sum of the base fuel factor and the prior month PSCR factor (line 3 multiplied by the sum of line 9 and line 12). The sum of lines 13 through 15 equals the total PSCR revenue amount on line 16.

Q. Please discuss the derivation of the power supply costs allocated to PSCR customers on line 25.

A. This amount was derived by adding fuel for generation costs with net purchased and interchange power costs (which include transmission costs) and environmental costs. Total costs were then reduced by the costs associated with interruptible wholesale and

Rate GSG-2 sales. This result was then multiplied by the jurisdictional percentage to arrive at the total recoverable power supply costs allocated to PSCR customers.

Q. How is the over- or under-recovery amount shown on line 26 calculated?

A. The amount on line 26 is the difference between line 16 and line 25. When line 16 is larger than line 25 there is an over-recovery. When line 16 is smaller than line 25 there is an under-recovery.

Q. Please explain line 27.

A. In its December 21, 2006 Order in Case No. U-15001, the Commission granted the Company authority to roll in prior year under- and over-recoveries into its future PSCR plans. The amount on line 26 represents the Company's 2018 PSCR over-recovery of $1,498,775 as identified by MPSC Staff witness Gretchen M. Wagner on Exhibit S-1 in Case No. U-20202.

Q. How were the monthly interest amounts on Exhibit A-14 (HLP-2) calculated?

A. The monthly interest amounts on Exhibit A-14 (HLP-2) were calculated in a manner consistent with the assumption that each month's over- or under-recovery was incurred uniformly over the current month. Monthly interest was calculated using the following formula: (half of the current month's over- or under-recovery plus the over- or under-recovery balance at the beginning of the current month) multiplied by (the applicable annual interest rate divided by 12). The applicable interest rate is the Company's monthly average short-term annual interest rate of borrowing for under-recoveries, or the authorized rate of return on common equity in the electric business for over-recoveries. The monthly over/(under) recovery amounts on Exhibit A-14 (HLP-2) are from Exhibit A-13 (HLP-1).

Q. What does the total interest amount on Exhibit A-14 (HLP-2) represent?

A. This exhibit sets forth the interest owed to the Company or to our customers as a result of any under- or over-recovery. The total interest amount on line 13, column (f), of Exhibit A-14 (HLP-2) represents the amount of interest owed to customers for the 2019 PSCR over-recovery.

Q. Does this conclude your direct testimony in this proceeding?

A. Yes.

S T A T E O F M I C H I G A N

BEFORE THE MICHIGAN PUBLIC SERVICE COMMISSION

In the matter of the application of **CONSUMERS ENERGY COMPANY** for reconciliation of its power supply cost recovery plan (Case No. U-20219) for the 12 months ended December 31, 2019.	))))))	Case No. U-20220

EXHIBITS OF

OF

HANNAH L. PATTON

ON BEHALF OF

CONSUMERS ENERGY COMPANY

March 2020

Consumers Energy Company
2019 Power Supply Cost Recovery Reconciliation

MICHIGAN PUBLIC SERVICE COMMISSION
Consumers Energy Company

MICHIGAN PUBLIC SERVICE COMMISSION
Consumers Energy Company

Case No.: U-20220
Exhibit No.: A-13 (HLP-1)
Page: 1 of 1
Witness: HLPatton
Date: March 2020

(kWh)	(a)	January (b)	February (c)	March (d)	April (e)	May (f)	June (g)	July (h)	August (i)	September (j)	October (k)	November (l)	December (m)	Total (n)
1.	Cycle Billed PSCR Sales (a)	2,881,129,464	2,959,010,285	2,693,271,298	2,533,903,400	2,470,902,373	2,461,301,121	3,020,197,083	3,115,332,213	2,812,713,789	2,566,255,127	2,461,248,489	2,576,570,143	32,551,834,785
2.	Current Month Unbilled PSCR Sales	2,009,325,188	1,627,878,712	1,656,252,499	1,575,765,688	1,566,977,744	1,713,591,024	2,076,296,476	1,946,111,853	1,762,071,594	1,709,152,568	1,874,969,295	2,009,169,795	21,527,562,434
3.	Prior Month Unbilled PSCR Sales	(1,940,900,000)	(2,009,325,188)	(1,627,878,712)	(1,656,252,499)	(1,575,765,688)	(1,566,977,744)	(1,713,591,024)	(2,076,296,476)	(1,946,111,853)	(1,762,071,594)	(1,709,152,568)	(1,874,969,295)	(21,459,292,639)
4.	Total Calendar PSCR Sales (Sum of Lines 1 through 3)	2,949,554,652	2,577,563,809	2,721,645,085	2,453,416,589	2,462,114,429	2,607,914,401	3,382,902,536	2,985,147,590	2,628,673,530	2,513,336,102	2,627,065,216	2,710,770,643	32,620,104,580
5.	Total Calendar Sales	2,979,470,100	2,612,855,460	2,754,643,716	2,487,992,632	2,494,194,163	2,648,876,635	3,420,036,406	3,021,084,259	2,667,614,493	2,549,289,785	2,664,995,648	2,748,676,954	33,049,730,251
6.	Interruptible Wholesale and GSG-2 sales (b)	7,710,179	4,389,581	9,933,981	6,648,425	7,810,828	9,516,555	11,762,120	12,062,774	10,473,911	10,340,049	9,971,864	10,910,145	111,530,412
7.	Total Sales Less Interruptible Wholesale and GSG-2	2,971,759,921	2,608,465,879	2,744,709,735	2,481,344,207	2,486,383,335	2,639,360,080	3,408,274,286	3,009,021,485	2,657,140,582	2,538,949,736	2,655,023,784	2,737,766,809	32,938,199,839
8.	Percentage PSCR Sales to Net of Incremental Total	99.25%	98.82%	99.16%	98.87%	99.02%	98.81%	99.26%	99.21%	98.93%	98.99%	98.95%	99.01%	
	(Fuel Factor in Dollars per kWh)													
9.	Base Recovery Factor		0.06011	0.06011	0.06011	0.06011	0.06011	0.06011	0.06011	0.06011	0.06011	0.06011	0.06011	
10.	Billed PSCR Factor (c)	0.00106	0.00047	(0.00004)	(0.00049)	(0.00089)	(0.00192)	(0.00225)	(0.00366)	(0.00489)	(0.00520)	(0.00497)	(0.00639)	
11.	Current Month Unbilled PSCR Factor (c)	0.00047	(0.00004)	(0.00049)	(0.00089)	(0.00192)	(0.00225)	(0.00366)	(0.00489)	(0.00520)	(0.00497)	(0.00639)	(0.00048)	
12.	Prior Month Unbilled PSCR Factor (c)	0.00106	0.00047	(0.00004)	(0.00049)	(0.00089)	(0.00192)	(0.00225)	(0.00366)	(0.00489)	(0.00520)	(0.00497)	(0.00639)	
	(Dollars)													
13.	Billed PSCR (Line 1*(Line 9 + Line 10))	176,406,083	179,269,271	161,784,807	151,071,321	146,326,839	143,223,112	174,748,603	175,860,503	155,318,055	140,913,069	135,713,242	138,413,348	1,879,048,253
14.	Current Month Unbilled PSCR (Line 2*(Line 9 + Line 11))	121,738,974	97,786,674	98,745,774	93,316,844	91,182,435	99,148,377	117,206,936	107,464,297	96,755,351	94,242,673	100,723,351	119,806,795	1,238,118,480
15.	Prior Month Unbilled PSCR (Line 3*(Line 9 + Line 12))	(118,860,716)	(121,738,974)	(97,786,674)	(98,745,774)	(93,316,844)	(91,182,435)	(99,148,377)	(117,206,936)	(107,464,297)	(96,755,351)	(94,242,673)	(100,723,351)	(1,237,172,401)
16.	Total PSCR Revenue	179,284,341	155,316,971	162,743,907	145,642,391	144,192,429	151,189,054	192,807,163	166,117,864	144,609,110	138,400,390	142,193,920	157,496,792	1,879,994,332
	(Power Supply Cost)													
17.	Fuel for Generation (d)	29,584,728	31,175,819	41,434,637	31,810,024	24,978,738	29,565,692	37,977,708	30,168,480	30,684,482	24,505,376	23,931,170	30,602,337	366,419,191
18.	Purchased and Interchange Power (e)	143,522,984	120,094,778	114,321,628	105,365,640	113,948,628	131,505,882	157,252,136	145,774,042	122,901,672	114,325,631	119,370,487	117,000,356	1,505,383,864
19.	Environmental Costs (f)	1,305,039	613,232	1,487,917	1,275,525	1,017,900	816,921	1,032,221	1,083,530	713,295	1,162,635	440,822	899,022	11,848,059
20.	PSCR Adjustment -Transfers to FERC Jurisdiction	(150,000)	(150,000)	(150,000)	(150,000)	(150,000)	(150,000)	(630,012)		0	0	0	0	(1,530,012)
21.	Total Costs (Sum of Lines 17 through 20)	174,262,751	151,733,829	157,094,182	138,301,189	139,795,266	161,738,495	195,632,053	177,026,052	154,299,449	139,993,642	143,742,479	148,501,715	1,882,121,102
22.	Less Costs of Interruptible Wholesale/GSG-2 Sales	462,042	207,405	419,774	419,562	308,313	399,158	488,861	473,731	371,616	399,147	465,307	495,535	4,910,450
23.	Total Costs Less Incremental Costs (Line 21 - Line 22)	173,800,709	151,526,424	156,674,408	137,881,627	139,486,953	161,339,337	195,143,192	176,552,321	153,927,833	139,594,495	143,277,173	148,006,181	1,877,210,652
24.	Jurisdictional Percentage	99.25%	98.82%	99.16%	98.87%	99.02%	98.81%	99.26%	99.21%	98.93%	98.99%	98.95%	99.01%	
25.	Total Cost Allocated to PSCR (Line 23 * Line 24)	172,502,054	149,731,315	155,357,824	136,329,764	138,125,459	159,417,119	193,690,515	175,151,536	152,278,740	138,186,227	141,768,401	146,546,743	1,859,085,697
26.	Current Year Over/(Under) Recovery (Line 16 - Line 25)	6,782,287	5,585,656	7,386,082	9,312,626	6,066,970	(8,228,065)	(883,352)	(9,033,672)	(7,669,630)	214,164	425,519	10,950,049	20,908,635
27.	Prior Year Over/(Under) Recovery (g)	1,498,775												1,498,775
28.	Cumulative Over/(Under) Recovery	8,281,062	13,866,718	21,252,801	30,565,427	36,632,397	28,404,332	27,520,980	18,487,308	10,817,678	11,031,842	11,457,361	22,407,410	22,407,410

(a) Provided by Customer Billing System
(b) Interruptible Wholesale Sales and GSG-2 Sales
(c) Monthly PSCR factor letters filed with MPSC
(d) Provided by Company witnesses Stephen J. Nadeau and Angela K. Rissman
(e) Provided by Company witness Keith G. Troyer
(f) Provided by Company witness Norman J. Kapala
(g) From U-20202 Gretchen Wagner (S-1)

MICHIGAN PUBLIC SERVICE COMMISSION
Consumers Energy Company

Consumers Energy Company
PSCR Interest Calculation 2019

Case No.: U-20220
Exhibit No.: A-14 (HLP-2)
Page: 1 of 1
Witness: HLPatton
Date: March 2020

	Month	Prior Month Cumulative Over/(Under) Recovery	Current Month Over/(Under) Recovery	O/(U) for Interest	Interest Rate	Interest (Income)/Expense
	(a)	(b)	(c)	(d)	(e)	(f)
1.	January	1,498,775	6,782,287	4,889,919	0.0083	40,749
2.	February	8,281,062	5,585,656	11,073,890	0.0083	92,282
3.	March	13,866,718	7,386,082	17,559,760	0.0083	146,331
4.	April	21,252,801	9,312,626	25,909,114	0.0083	215,909
5.	May	30,565,427	6,066,970	33,598,912	0.0083	279,991
6.	June	36,632,397	(8,228,065)	32,518,365	0.0083	270,986
7.	July	28,404,332	(883,352)	27,962,656	0.0083	233,022
8.	August	27,520,980	(9,033,672)	23,004,144	0.0083	191,701
9.	September	18,487,308	(7,669,630)	14,652,493	0.0083	122,104
10.	October	10,817,678	214,164	10,924,760	0.0083	91,040
11.	November	11,031,842	425,519	11,244,601	0.0083	93,705
12.	December	11,457,361	10,950,049	16,932,385	0.0083	141,103
13.			20,908,635			1,918,925

S T A T E O F M I C H I G A N

BEFORE THE MICHIGAN PUBLIC SERVICE COMMISSION

In the matter of the application of **CONSUMERS ENERGY COMPANY** for reconciliation of its power supply cost recovery plan (Case No. U-20219) for the 12 months ended December 31, 2019.	))))))	Case No. U-20220

DIRECT TESTIMONY

OF

JENNY L. RICKARD

ON BEHALF OF

CONSUMERS ENERGY COMPANY

March 2020

Q. Please state your name and business address.

A. My name is Jenny L. Rickard, and my business address is 1945 West Parnall Road, Jackson, Michigan 49201.

Q. By whom are you employed and in what capacity?

A. I am employed by Consumers Energy Company ("Consumers Energy" or the "Company") as a Senior Business Support Consultant in the Electric Transactions and Wholesale Settlements Section of the Energy Supply Operations Department.

Q. Please describe your educational background and work experience.

A. I received a Bachelor of Science Degree in Accounting from Indiana University in 1987. In 2009, I earned a Master of Business Administration from Spring Arbor University. I was hired by Consumers Energy in August 2013 as a Technical Analyst supporting the Non-Utility Generation Contract Settlements Group. This support consisted of programming settlement templates for virtually all of the Company's Power Purchase Agreements ("PPAs"). In May 2014, I was promoted to supervise the Contract Settlements Group.

Prior to my employment at Consumers Energy, I worked for 30 years in various accounting positions. The majority of my experience is in the legal, real estate, and publishing industries. The position I most recently held before I began work at Consumers Energy was Controller at The Daily Telegram, an Adrian, Michigan based daily newspaper and a subsidiary of Gatehouse Media, Inc.

Q. What are your responsibilities as Contract Settlements Supervisor?

A. The Contract Settlements Group settles approximately 70 contracts each month and recommends payment of approximately $1,300,000,000 per year for the purchase of over 17,000 gigawatt hours of electricity.

Q. Have you previously provided testimony before the Michigan Public Service Commission ("MPSC" or the "Commission")?

A. Yes, I provided direct testimony in MPSC Case No. U-17678-R, Consumers Energy's 2015 Power Supply Cost Recovery ("PSCR") Reconciliation Case, regarding settlements with the Biomass Merchant Plants ("BMPs")[1] and billing adjustments. I provided direct testimony in MPSC Case No. U-17918-R, Consumers Energy's 2016 PSCR Reconciliation Case, MPSC Case No. U-20068, Consumers Energy's 2017 PSCR Reconciliation Case, and Consumers Energy's 2018 PSCR Reconciliation Case, MPSC Case No. U-20202 regarding settlements with the BMPs.

Q. What is the purpose of your testimony in this proceeding?

A. The purpose of my testimony is to address settlements with certain suppliers, referred to as BMPs, in accordance with the Commission's Order in MPSC Case No. U-16048 pursuant to MCL 460.6a(9), (10), and (11).

Q. Are you sponsoring any exhibits with your testimony?

A. No.

[1] The BMPs include: Cadillac Renewable Energy, LLC; Genesee Power Station, Limited Partnership; Grayling Generating Station, Limited Partnership; Hillman Power Company, LLC; T.E.S. Filer City Station, Limited Partnership; Viking Energy of Lincoln, LLC; and Viking Energy of McBain, LLC.

BMPs

Q. Please describe the Company's transactions with the BMP's.

A. Consumers Energy has PPAs with seven wood waste fueled electric generation facilities, which are generally referred to as the BMPs. In 2019, the BMPs performed in accordance with their respective PPAs and were paid in accordance with their respective PPAs. The amount of energy delivered and payments booked are shown on Exhibit A-21 (KGT-3), sponsored by Company witness Keith G. Troyer. Additionally, the BMPs invoiced Consumers Energy for recovery of certain operating costs under MCL 460.6a(9), (10), and (11), in accordance with a Settlement Agreement approved by the Commission's August 11, 2009 Order in MPSC Case No. U-16048, in excess of the variable energy payments they receive under their PPAs with the Company.

Q. What amount was booked by the Company for the certain operating costs invoiced that are in excess of the amount provided by the PPAs?

A. Exhibit A-21 (KGT-3), line 48 includes the booked expense for the time period November 2018 through October 2019 in accordance with the procedure approved by the Commission in MPSC Case No. U-16048. Based on invoices received, the Company believes that BMPs are allowed to recover approximately $12 million for expenses incurred in 2019.

This amount consists of monthly expenses of not greater than $1 million resulting in annual recoverable expense of $12 million. To the extent that the amount recorded on the Company's books for payments to the BMPs is different than the amount invoiced or expected to be invoiced by the BMPs, in accordance with the procedure approved by the Commission in MPSC Case No. U-16048, that difference is also included in the values presented in Exhibit A-21 (KGT-3).

Q. Does this conclude your direct testimony?

A. Yes.

STATE OF MICHIGAN

BEFORE THE MICHIGAN PUBLIC SERVICE COMMISSION

In the matter of the application of **CONSUMERS ENERGY COMPANY** for reconciliation of its power supply cost recovery plan (Case No. U-20219) for the 12 months ended December 31, 2019.	))))))	Case No. U-20220

DIRECT TESTIMONY

OF

ANGELA K. RISSMAN

ON BEHALF OF

CONSUMERS ENERGY COMPANY

March 2020

Q. Would you please state your name and business address.

A. My name is Angela K. Rissman, and my business address is 1945 West Parnall Road, Jackson, Michigan 49201.

Q. By whom are you employed?

A. I am employed by Consumers Energy Company ("Consumers Energy" or the "Company") as the Manager of Coal Procurement in Fossil Fuel Supply.

Q. Would you please describe your educational background and business experience?

A. I graduated from Western Michigan University in 1996 with a Bachelor of Business Administration in Accountancy and from Central Michigan University in 1999 with a Master of Science in Administration. I began working for CMS Enterprises in 2005 and for Consumers Energy in 2007. I have held several positions of increasing responsibility in the Electric Grid Integration organization, and specifically began work in the Fossil Fuel Supply group in November of 2013. I was promoted to Manager of Coal Procurement in November 2017.

Q. What are your duties as the Manager for Coal Procurement?

A. My responsibilities include purchasing the coal used at the Company's electric generating plants; negotiating and managing associated contracts; assuring coal quality standards are met; supporting relevant accounting functions; and the preparation of testimony and filings for presentation before the Michigan Public Service Commission ("MPSC" or the "Commission").

Q. Have you testified in other cases?

A. Yes. I have previously provided testimony in the following cases:

- MPSC Case No. U-18142; 2017 Power Supply Cost Recovery ("PSCR") Plan;

- MPSC Case No. U-20068-R: 2017 PSCR Reconciliation;
- MPSC Case No. U-18402; 2018 PSCR Plan;
- MPSC Case No. U-20202; 2018 PSCR Reconciliation;
- MPSC Case No. U-20219; 2019 PSCR Plan; and
- MPSC Case No. U-20525; 2020 PSCR Plan.

Q. What is the purpose of your direct testimony in this proceeding?

A. I am sponsoring testimony with respect to the Company's 2019 actual volumes and costs of coal used for electric generation.

Q. Are you sponsoring any exhibits with your testimony?

A. Yes, I am sponsoring the following exhibits that were prepared by me or under my supervision:

Exhibit A-15 (AKR-1)	2019 Coal Receipts – Plan and Actual; and
Exhibit A-16 (AKR-2)	Comparison of 2019 As-Burned Cost of Fuel.

Coal Procurement Strategy

Q. Can you describe the Company's coal procurement strategy it employed to provide its coal supply for 2019?

A. Yes. The Company's strategy for coal procurement provides for purchasing and securing quantities of coal over time that typically enable the Company to have approximately 70% to 90% of its anticipated volume requirements secured by the fall of each year for the following calendar year. The Company employs this strategy because the spot coal market by its nature can be unpredictable and can easily become constrained by forces affecting both supply and demand. Accordingly, the Company believes it is best to manage its coal supply in a manner such that the risk of having an insufficient supply of coal is minimized, while at the same time balancing pricing considerations by retaining

some exposure to the spot market. To manage this risk, the Company limits its exposure to the spot market by contracting for a large percentage of its projected requirements ahead of time because it does not believe it is reasonable or prudent to speculate that large quantities of coal will be available when needed from the spot market. Furthermore, this strategy provides coal supply protection should the Company's actual coal requirements change from its projected requirements.

In addition, the Company layers its coal purchases in such a way that each year it has a portfolio of coal purchase contracts that provides dollar cost averaging which is instrumental in minimizing price risk to Consumers Energy's customers and also limits their exposure to price volatility in the spot market. The portfolio for a given year consists of contracts of various vintages, volumes, length of term, and prices. Exhibit A-15 (AKR-1) outlines all of the coal contracts the Company had in place during 2019.

Q. Can you provide a more detailed comparison of volumes actually received versus those that were planned?

A. Yes. Exhibit A-15 (AKR-1) details the 2019 planned coal receipts, the 2019 actual coal receipts, and the number of tons by which each contract varied from the plan. For a variety of reasons, it is not uncommon for there to be differences between planned and actual contract volumes. These reasons may include: 1) allowed contract tolerances; 2) shipments that loaded in 2018 but were not received at a Company generating plant until 2019; 3) shipments that loaded in 2019 but were not received at a Company generating plant until 2020; 4) provisions that allowed the Company to receive any remaining contracted quantities in 2019 that were not delivered in 2018; 5) provisions

that allowed the Company to receive any remaining contracted quantities in 2020 that were not delivered in 2019, and 6) variances that arose when coal was shipped through intermediate points (*i.e.*, vessel terminals).

Q. In general, how was coal evaluated for purchase?

A. For all coal purchases, the Company solicited competitive bids. All such bids were evaluated on a delivered-cost basis with purchases made from the lowest cost eligible suppliers that met our purchase specifications.

Delivered Coal Volumes & Costs

Q. How did actual 2019 delivered-coal volumes and costs compare with projected 2019 delivered-coal volumes and costs presented by the Company in the 2019 PSCR Plan?

A. During 2019, 58,615 more tons of coal were delivered than projected, an increase of 1%. The projected and actual 2019 delivered coal costs are as follows:

	Plan $/MMBtu	Actual $/MMBtu	Variation
Western	$2.426	$2.087	(14%)
Eastern	N/A	N/A	N/A
Total	$2.426	$2.087	(14%)

Q. Please elaborate on the volumes received and the prices paid for coal in 2019.

A. The Company projected the delivered price of western coal to average $2.426/MMBtu for 5,991,606 tons. The actual average price for western coal delivered was $2.087/MMBtu for 6,050,219 tons. The price difference of western coal was primarily due to: 1) lower commodity costs than planned; 2) lower transportation costs than

planned; and 3) receiving coal with a higher average heat content than planned (BTU/lb of coal), which effectively lowers the total delivered cost on a MMBtu basis.

Because the Company did not plan to purchase eastern coal in 2019, the delivered price of eastern coal was not projected. There were no eastern coal purchases or deliveries in 2019.

Q. Based on your previous responses, do you believe that the Company's 2019 coal purchases were reasonable and prudent?

A. Yes, I do.

Burned Coal Volumes & Costs

Q. How did actual coal burn volumes and costs compare with those projected in 2019?

A. For 2019, the Company projected its coal burn requirements to be 5,804,170 tons. To support this projected coal burn, the Company anticipated receiving 5,991,606 tons of coal of which 4,191,606 tons (70%) were from contract purchases and 1,800,000 tons (30%) were from spot purchases. This plan was consistent with the Company's strategy for coal procurement and was instrumental in minimizing supply and price risk as discussed previously in this testimony. The Company's actual 2019 coal burn was 5,690,899 tons, 113,271 tons (2%) lower than projected with as-burned costs $17,620,548 (7%) lower than those projected in the 2019 PSCR Plan case. To support the actual coal burn, the Company received 6,050,221 tons of coal of which 4,274,108 tons (71%) were from contract purchases and 1,776,113 tons (29%) were from spot purchases. Exhibit A-16 (AKR-2) shows a comparison by generating plant of the as-burned volumes and costs of coal projected in the 2019 PSCR Plan filing with the actual as-burned volumes and costs incurred during 2019.

Q. Why were the as-burned volumes and costs lower than projected?

A. On a system-wide basis, coal-fired generating units experienced a lower capacity factor than was projected which translated into the need to consume less coal.

Q. Based on your previous responses and on your familiarity with the Company's coal purchases, do you believe that 2019 as burned coal costs were reasonable and prudent?

A. Yes, I do.

Q. Does this complete your direct testimony?

A. Yes.

S T A T E O F M I C H I G A N

BEFORE THE MICHIGAN PUBLIC SERVICE COMMISSION

In the matter of the application of **CONSUMERS ENERGY COMPANY** for reconciliation of its power supply cost recovery plan (Case No. U-20219) for the 12 months ended December 31, 2019.	))))))	Case No. U-20220

EXHIBITS OF

OF

ANGELA K. RISSMAN

ON BEHALF OF

CONSUMERS ENERGY COMPANY

March 2020

MICHIGAN PUBLIC SERVICE COMMISSION
Consumers Energy Company

Case No.: U-20220
Exhibit No.: A-15 (AKR-1)

Witness: AKRissman
Date: March 2020

2019 Coal Receipts - Plan and Actual

Line	Contract ID	Contract Start Date	Contract End Date	Plan Volume (Tons)	Actual Received Volume (Tons)	Variation from Plan (Tons)
	(a)	(b)	(c)	(d)	(e)	(f)
1	**Western Contract Receipts**					
2	279	1/1/2019	12/31/2019	561,600	555,071	(6,529)
3	289	1/1/2019	12/31/2021	1,684,800	-	(1,684,800)
4	232	1/1/2019	12/31/2019	510,000	505,135	(4,865)
5	332	1/1/2019	12/31/2021	-	1,392,410	1,392,410
6	334	1/1/2019	12/31/2021	-	1,821,492	1,821,492
7	(New)	N/A	N/A	1,435,206	-	(1,435,206)
8	**Total Western Contract Receipts (lines 2-7):**			**4,191,606**	**4,274,108**	**82,502**
9	**Western Spot Receipts**					
10	333	11/1/2018	3/31/2019		394,843	394,843
11	338	6/1/2019	12/31/2019		746,904	746,904
12	337	4/1/2019	6/30/2019		191,203	191,203
13	326	6/15/2019	12/31/2019		63,548	63,548
14	326	2018 COMMITMENT			63,402	63,402
15	328	2018 COMMITMENT			316,213	316,213
16	(New)	N/A	N/A	1,800,000	-	(1,800,000)
17	**Total Western Spot Receipts (lines 10-16):**			**1,800,000**	**1,776,113**	**(23,887)**
18	**Total Western Receipts (lines 8,17):**			**5,991,606**	**6,050,221**	**58,615**
19	**Eastern Contract Receipts**					
20	(New)	N/A	N/A	-	-	-
21	**Total Eastern Contract Receipts (line 20):**			**-**	**-**	**-**
22	**Eastern Spot Receipts**					
23	(New)	N/A	N/A	-	-	-
24	**Total Eastern Spot Receipts (line 23):**			**-**	**-**	**-**
25	**Total Eastern Receipts (line 20,23):**			**-**	**-**	**-**
26	**Total Coal Receipts (lines 18,25):**			**5,991,606**	**6,050,221**	**58,615**

MICHIGAN PUBLIC SERVICE COMMISSION
Consumers Energy Company

Case No.: U-20220
Exhibit No.: A-16 (AKR-2)
Page: 1 of 1
Witness: AKRissman
Date: March 2020

Comparison of 2019 As-Burned Cost of Fuel

Line	Plant	Plan Burn Volumes	Plan Cost	Actual Burn Volumes	Actual Cost
	(a)	(b)	(c)	(d)	(e)
1	**Coal Units (Tons)**				
2	Campbell 1-2	1,758,460	$ 76,874,152	1,888,127	$ 77,393,778
3	Campbell 3	2,529,276	$ 110,485,321	2,729,627	$ 110,823,549
4	Karn 1-2	1,516,433	$ 63,017,374	1,073,146	$ 44,538,972
5	**Total Coal (lines 2-4):**	**5,804,170**	**$ 250,376,847**	**5,690,899**	**$ 232,756,300**
6	**Total Expenditures:**				**$ 232,756,300**

STATE OF MICHIGAN

BEFORE THE MICHIGAN PUBLIC SERVICE COMMISSION

In the matter of the application of **CONSUMERS ENERGY COMPANY** for reconciliation of its power supply cost recovery plan (Case No. U-20219) for the 12 months ended December 31, 2019	))))))	Case No. U-20220

DIRECT TESTIMONY

OF

RAYMOND T. SCAIFE

ON BEHALF OF

CONSUMERS ENERGY COMPANY

March 2020

Q. Please state your name and business address.

A. My name is Raymond T. Scaife, and my business address is 1945 West Parnall Road, Jackson, Michigan 49201.

Q. By whom are you employed and in what capacity?

A. I am employed by Consumers Energy Company ("Consumers Energy" or the "Company") as Midcontinent Independent System Operator, Inc. ("MISO") Settlements Manager of the Electric Transactions & Wholesale Settlements section of the Electric Supply Department.

Qualifications

Q. Please describe your educational background and work experience.

A. I received the degree of Bachelor of Business Administration with a Marketing emphasis from Adrian College in 2001. I began my employment with Consumers Energy in December 2001 in the Real-Time Market Operations. I worked in the operations department as Generation Dispatcher and Energy Scheduler from 2001 through 2005. In 2005, I participated in the MISO Market as a MISO Market Energy Coordinator. In 2007, I became a Technical Analyst with responsibility to provide analysis regarding MISO Settlements to the Operations Superintendent. I then coordinated the Company's Real-Time Operations entry into the MISO Ancillary Services Market in January of 2009. In the fall of 2009, I was hired as the MISO Settlements Manager, which is the position I currently hold, reporting to the Director of Wholesale Settlements and Support. As the MISO Settlements Manager, I am responsible for managing the settlement activities related to the MISO Energy and Ancillary Services Market, the MISO

Transmission Market, and the team of analysts employed to support the Company's MISO Settlement process.

Q. Have you previously provided testimony before the Michigan Public Service Commission ("MPSC" or the "Commission")?

A. Yes. I provided testimony in Case Nos. U-17095-R, U-17317-R, U-17678-R, U-17918-R, U-20068, and U-20202.

Q. What is the purpose of your direct testimony in this proceeding?

A. My direct testimony will address the settlement of market transactions and transmission expenses incurred with MISO.

Q. Are you sponsoring any exhibits with your direct testimony?

A. Yes. I am sponsoring the following exhibits:

Exhibit A-17 (RTS-1)	2019 – Summary of MISO Market and Tariff Administration Charges/(Credits) Settlement; and
Exhibit A-18 (RTS-2)	2019 – Energy Sales Revenue Net of Fuel Cost.

Q. Were these exhibits prepared by you or under your direction or supervision?

A. Yes.

<u>Midwest Energy Markets</u>

Q. Please describe Exhibit A-17 (RTS-1).

A. Exhibit A-17 (RTS-1) provides a summary of MISO Market Charges and Credits that were assessed to the Company from January 1, 2019 through December 31, 2019, MISO Market Charges Characterized as Transmission Charges, and an accounting Accrual and Adjustments total.

Q. What is the source of the data from which Exhibit A-17 (RTS-1) is derived?

A. The Company has summarized this data from the daily settlement statements that MISO sends the Company for each operating day.

Q. What does the Adjusted Total Settlement of MISO Market and Tariff Administration Charges/(Credits) represent?

A. This value represents the expenses incurred and credits received by the Company associated with procuring or providing energy, ancillary services, and financial transmission rights. The amount for 2019 was $44,264,842, as shown on Exhibit A-17 (RTS-1), line 10. Exhibit A-17 (RTS-1), line 10, ties to Exhibit A-19 (KGT-1), line 16, labeled as Net MISO Interchange. Net MISO Interchange is the result of the Company offering its generation into the Market and obtaining energy from the Market to meet its load obligations

MISO Transmission Expense

Q. Please describe the MISO transmission settlement process.

A. The MISO transmission settlement process settles transmission customer charges and credits based on use of MISO's transmission system and mandated non-competitive ancillary services on a monthly calendar basis. The transmission expenses include: Network Integrated Transmission Service expense, costs of other transmission-related purchases — including various MISO transmission-related Schedules (i.e., Schedules 1, 2, 10, 10-FERC-METC, and 26), MISO administrative fees, and the Network upgrade charges from MISO's Transmission Expansion Plan. Charges to transmission customers are calculated based on the MISO tariff approved by the Federal Energy Regulatory Commission. In 2019, the Company expensed $389,268,276 for Transmission service as

shown on Exhibit A-19 (KGT-1), line 5. In 2019, the Company received $6,217,939 for Schedule 2 Reactive service supplied to MISO.

Non-MISO Interchange

Q. Please describe Non-MISO Interchange Received and Delivered Net Energy.

A. Non-MISO Interchange Received Net Energy is the product of bilateral transactions outside of the MISO Market where the Company pays a counterparty for energy received. These transactions are listed on Exhibit A-19 (KGT-1), line 3. Non-MISO Interchange Delivered Net Energy are bilateral transactions outside of the MISO Market where the Company is paid. These transactions can be found on Exhibit A-19 (KGT-1), line 8.

Q. Please describe Exhibit A-18 (RTS-2).

A. Exhibit A-18 (RTS-2) is the separate reconciliation of the amounts forecasted pursuant to MCL 460.6w(3)(b) against actual amounts as part of the State Reliability Mechanism as described in the MPSC's November 21, 2017 Order in Case No. U-18239.

Q. Does this conclude your direct testimony?

A. Yes, it does.

S T A T E O F M I C H I G A N

BEFORE THE MICHIGAN PUBLIC SERVICE COMMISSION

In the matter of the application of **CONSUMERS ENERGY COMPANY** for reconciliation of its power supply cost recovery plan (Case No. U-20219) for the 12 months ended December 31, 2019.	))))))	Case No. U-20220

EXHIBITS OF

OF

RAYMOND T. SCAIFE

ON BEHALF OF

CONSUMERS ENERGY COMPANY

March 2020

MICHIGAN PUBLIC SERVICE COMMISSION
Consumers Energy Company

Case No.: U-20220
Exhibit No.: A-17 (RTS-1)
Page: 1 of 1
Witness: RTScaife
Date: March 2020

2019 - Summary of MISO Market and Tariff Administration Charges/(Credits) Settlement

Line	Year	Charge Description	
1	2019	MISO Financial Transmission and Auction Revenue Rights	($9,224,788)
2	2019	Schedule 16 - Financial Transmission Rights Administration Service Cost	$130,245
3	2019	Schedule 24 - Local Balancing Authority Cost Recovery	$863,635
4	2019	MISO Energy Market Purchases and Sales	$53,906,250
5	2019	Schedule 17 - Energy Market Support Administration Service Cost	$6,276,948
6	2019	MISO Ancillary Service Market Transactions	($932,333)
7		**Total Settlement of MISO Market and Tariff Administration Charges/(Credits)**	**$51,019,957**
8		MISO Market Charges Charactized as Transmission Charges (Sum of lines 2,3,5, and 6)	($6,338,495)
9		Accrual, Adjustments, and Other	($416,620)
10		**Adjusted Total Settlement of MISO Market and Tariff Administation Charges/(Credits)**	**$44,264,842**

MICHIGAN PUBLIC SERVICE COMMISSION
Consumers Energy Company

Case No.: U-20220
Exhibit No.: A-18 (RTS-2)
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Witness: RTScaife
Date: March 2020

2019 Energy Sales Revenue Net of Fuel Cost

Line	Description	U-20134 ($ millions)	2019 Actual ($ millions)	Variance ($ millions)
	Energy Sales Revenue			
1	2019 Energy Market Sales	$ 1,055	$ 899	$ 156
2	Off-System Energy Sales	11	10	1
3	Ancillary Service Sales -Schedule 2	23	6	16
4	Ancillary Service Sales -Regulation, Spinning, and Supplemental		4	(4)
5	Bilateral Energy Sales			-
6	Total 2019 Energy Sales Revenue	$ 1,089	$ 920	$ 169
	Fuel Related Generation Costs			
7	Total 2019 Fuel & Fuel Related Generation Expense	$ 468	$ 378	$ 89
8	2019 Energy Sales Net of Fuel Related Costs	621	542	80

STATE OF MICHIGAN

BEFORE THE MICHIGAN PUBLIC SERVICE COMMISSION

In the matter of the application of **CONSUMERS ENERGY COMPANY** for reconciliation of its power supply cost recovery plan (Case No. U-20219) for the 12 months ended December 31, 2019.	))))))	Case No. U-20220

DIRECT TESTIMONY

OF

KEITH G. TROYER

ON BEHALF OF

CONSUMERS ENERGY COMPANY

March 2020

Q. Please state your name and business address.

A. My name is Keith G. Troyer, and my business address is 1945 West Parnall Road, Jackson, Michigan 49201.

Q. By whom are you employed and in what capacity?

A. I am employed by Consumers Energy Company ("Consumers Energy" or the "Company") as the Director of Electric Grid Integration Contracts and Settlements in the Electric Supply Department.

QUALIFICATIONS

Q. Please describe your educational background and work experience.

A. I received the degree of Bachelor of Science in Engineering with a specialty in Civil Engineering from Michigan State University in 2008. In 2015, I became a Registered Professional Engineer in the state of Michigan. In 2018, I received a Master of Business Administration ("MBA") through Michigan State University's Executive MBA Program.

In July 2009, I joined Consumers Energy as an Electric System Owner. In January 2011, I accepted a position as an Engineer in the Transactions and Resource Planning section of Energy Supply. In that role, I was responsible for administration and coordination of the Company's Experimental Advanced Renewable Program ("EARP") – Solar, part of the Company's Renewable Energy ("RE") Plan. I was involved in the development and implementation of the EARP-Solar expansion in 2011. In June 2013, I began taking on additional responsibilities associated with the RE Plan, including the calculation of the Transfer Price associated with RE and capacity and the tracking of RE Credits ("RECs"). In 2014, I was also responsible for supervision of the implementation of the EARP-Anaerobic Digestion pilot. In December 2016, I transitioned to a new role

where my supervisory and direct responsibilities included administering Power Purchase Agreements ("PPAs"), issuing solicitations for energy and capacity, and managing the Company's capacity position with Midcontinent Independent System Operator, Inc. ("MISO").

Q. What are your responsibilities as Director of Electric Grid Integration Contracts and Settlements?

A. My responsibilities include oversight of the Company's distribution agreements and PPAs, solicitations for energy and capacity, RE compliance, distributed generation programs, and electric wholesale settlement activities.

Q. Have you previously provided testimony before the Michigan Public Service Commission ("MPSC" or the "Commission")?

A. Yes. I provided testimony in:

- Case No. U-17095-R (direct), the Company's 2013 Power Supply Cost Recovery ("PSCR") Reconciliation Case, regarding 2013 RE Plan expenses recovered through PSCR;
- Case No. U-17631 (direct), the Company's 2013 RE Reconciliation Case, regarding 2013 RE Plan expenses recovered through PSCR, RE compliance, and new renewable capacity compliance;
- Case No. U-17317-R (direct), the Company's 2014 PSCR Reconciliation Case, regarding 2014 RE Plan expenses recovered through PSCR;
- Case No. U-17792 (direct and rebuttal), the 2015 biennial review of the Company's RE Plan, regarding RE Plan expenses recovered through the PSCR, RE compliance, new renewable capacity compliance, and RE programs;
- Case No. U-17803 (direct), the Company's 2014 Renewable Cost Reconciliation Case, regarding 2014 RE Plan expenses recovered through PSCR, RE compliance, and new renewable capacity compliance;
- Case No. U-17678-R (direct), the Company's 2015 PSCR Reconciliation Case, regarding 2015 RE Plan expenses recovered through PSCR;

- Case No. U-17918 (rebuttal), the Company's 2016 PSCR Plan and five-year forecast, regarding the impacts of net electric metering on energy supply;

- Case No. U-18081 (direct and revised), the Company's 2015 Renewable Reconciliation case, regarding 2015 RE Plan expenses recovered through PSCR, RE compliance, and new renewable capacity compliance;

- Case No. U-18090 (direct, rebuttal, reopened rebuttal, and second reopened rebuttal and affidavit), the Company's 2016 Public Utility Regulatory Policies Act of 1978 ("PURPA") case to establish a method and calculation for avoided costs;

- Case No. U-17918-R (direct), the Company's 2016 PSCR Reconciliation Case, regarding 2016 RE Plan expenses recovered through PSCR;

- Case No. U-18241 (direct), the Company's 2016 RE Cost Reconciliation Case, regarding 2016 RE Plan expenses recovered through PSCR;

- Case No. U-18402 (direct), the Company's 2018 PSCR Plan and five-year forecast, regarding long term PPAs and capacity forecast;

- Case No. U-18231 (direct and rebuttal), the 2017 review of the Company's RE Plan, regarding the Company's Request for Proposal process for new resources, the cost of new RE resources included in the RE Plan, and the risks that may drive performance to vary, associated with these topics;

- Case No. U-20068 (direct), the Company's 2017 PSCR Reconciliation Case, regarding purchased power supply costs and the allocation of costs to the renewable resource fund;

- Case No. U-18351 (rebuttal), the Company's 2017 Application to comply with Section 61 of 2016 PA 342, regarding customer credits in voluntary RE programs and competitive solicitations;

- Case No. U-20165 (direct, rebuttal, and supplemental rebuttal), the Company's 2018 Integrated Resource Plan ("IRP"), regarding long-term PPAs, proposed changes to the Company's PURPA avoided cost implementation, the Company's proposal to utilize competitive solicitations, and the implementation of the Financial Compensation Mechanism;

- Case No. U-20219 (direct and rebuttal), the Company's 2019 PSCR Plan and five-year forecast, regarding long-term PPAs and MISO revenue and expenses;

- Case No. U-20202 (direct), the Company's 2018 PSCR Reconciliation Case, regarding purchased power supply costs and the allocation of costs to the renewable resource fund;

- Case No. U-20496 (direct), the Company's Application for approval of Amendments to the PPA with Viking Energy of Lincoln, LLC and Viking Energy of McBain, LLC.;

- Case No. U-20469 (affidavit), the Company's Application requesting an Order Rescinding Avoided Cost Rates, regarding the Company's avoided costs, obligations to enter new PPAs, and establishment of new avoided costs in the Company's IRP;

- Case No. U-20604 (direct), the Company's Application for approval of PPAs with Commonwealth Power Company and North American Natural Resources, Inc.;

- Case No. U-15805-S (affidavit), the Company's Application for approval of an RE purchase agreement with River Fork Solar, LLC;

- Case No. U-20525 (direct), the Company's 2020 PSCR Plan and five-year forecast, regarding long-term PPAs and the treatment of MISO revenue and expenses; and

- Case No. U-20697 (direct), the Company's 2020 electric rate case, regarding PSCR expenses, transmission cost analysis, state reliability mechanism methodology, and IRP supply implementation activities.

PURPOSE OF DIRECT TESTIMONY

Q. What is the purpose of your direct testimony in this proceeding?

A. My direct testimony will address: (i) Purchased Power Supply Costs incurred by the Company in 2019; (ii) Allocation of Costs to the Renewable Resource Fund ("RRF"); and (iii) Purchases and Sales with third parties in 2019.

Q. Are you sponsoring any exhibits?

A. Yes. I am sponsoring the following exhibits:

Exhibit A-19 (KGT-1)	Purchased, Interchanged, and Renewable Power Transactions;
Exhibit A-20 (KGT-2)	2019 Interchange Delivered by Counterparties to MISO;
Exhibit A-21 (KGT-3)	Purchased Power and Cogeneration – Energy and Expense; and

Exhibit A-22 (KGT-4) Purchased Power Contract Rates and MPSC Approval Orders.

Q. Were these exhibits created by you or under your supervision?

A. Yes.

2018 Purchased, Interchange, and Renewable Power Transactions

Q. Please describe Exhibit A-19 (KGT-1).

A. Exhibit A-19 (KGT-1) provides a summary of the Company's Purchased, Interchanged, and Renewable Power Transactions booked for 2019.

Q. Please describe Exhibit A-19 (KGT-1), line 1.

A. Exhibit A-19 (KGT-1), line 1, "Purchased Power," provides volumes and costs for capacity and energy that was purchased by Consumers Energy from cogenerators, small power producers, and independent power producers who had agreements to sell capacity and energy to Consumers Energy on a long-term basis. For purchases from the Company's Renewable Resource Program ("RRP") suppliers, only the average PSCR cost associated with those purchases is included in line 1, which is described in more detail later in my direct testimony.

Q. Please describe Exhibit A-19 (KGT-1), line 2.

A. Exhibit A-19 (KGT-1), line 2, "Purchased Power & Programs – PA 295," provides volumes and costs for capacity and energy that was purchased under PPAs that provided RECs in accordance with MCL 460.1028, from purchases under the Company's EARP, and subscription credits to participants in the Company's Large Customer RE Program. Consumers Energy witness Emily J. Warners discusses renewable transfer costs and RE Plan programs associated with Public Act 295 of 2008 ("PA 295") in more detail in her direct testimony.

Q. Please explain line 3, "Interchange Received – Non-MISO," and line 8, "Interchange Delivered – Non-MISO," of Exhibit A-19 (KGT-1).

A. The entry for "Interchange Received – Non-MISO," shown on Exhibit A-19 (KGT-1), line 3, provides the volumes and costs for the purchase of energy and capacity from a counterparty other than purchases from the Company's long-term contract suppliers (shown on line 1), and the costs of an Independent Administrator to conduct the 2019 IRP competitive solicitation. The entry "Interchange Delivered – Non-MISO," shown on Exhibit A-19 (KGT-1), line 8, provides the volumes and revenues for sales of energy and capacity to a counterparty, other than sales to the energy market operated by MISO. Company witness Raymond T. Scaife discusses the energy expenses and revenues in more detail in his direct testimony.

Q. Please explain the expense associated with the Independent Administrator.

A. The details for administering the competitive solicitations are included in the IRP settlement agreement in Case No. U-20165. Paragraph 7(c) of the IRP settlement agreement requires the use of an independent third party to administer competitive bids related to the Proposed Course of Action approved in the IRP. The Company used an Independent Administrator to conduct the solicitation, complete the proposal evaluations, and provide a blind ranking of projects to the Company for selection. The Company has included the cost associated with the service agreement with the Independent Administrator in this PSCR Reconciliation.

Q. Please explain "Interchange Received – MISO" and "Interchange Delivered – MISO," on Exhibit A-19 (KGT-1), lines 4 and 9, respectively.

A. The entry for "Interchange Received – MISO," shown on Exhibit A-19 (KGT-1), line 4, includes the purchase of energy from MISO in column (e) and the MISO capacity

purchases described later in my direct testimony in column (g). The entry for "Interchange Delivered – MISO," shown on Exhibit A-19 (KGT-1), line 9, includes the sale of energy to the MISO energy market in column (e) and the MISO capacity sales described later in my direct testimony in column (g). The amount of Interchange Energy Received and Delivered is a result of the operation of the MISO energy market and the Security Constrained Economic Dispatch that is performed by MISO. Company witness Scaife discusses the net of lines 4 and 9, column (h), as shown on line 16, column (h), of Exhibit A-19 (KGT-1) in greater detail in his direct testimony.

Q. Please describe the Transmission expenses included in Exhibit A-19 (KGT-1), line 5.

A. The transmission expenses included in Exhibit A-19 (KGT-1), line 5, are charges to transmission customers based on the MISO tariff approved by the Federal Energy Regulatory Commission. Company witness Scaife provides more detail on this topic in his direct testimony.

Q. Please describe "Short-Term Capacity Purchases," on Exhibit A-19 (KGT-1), line 6.

A. Exhibit A-19 (KGT-1), line 6, "Short-Term Capacity Purchases," includes bilateral purchases made to meet or maintain Consumers Energy's reserve margin requirements for the MISO 2018 Planning Year that ended on May 31, 2019 and for the MISO 2019 Planning Year that began on June 1, 2019.

Q. What is the total short-term bilateral capacity expense associated with the MISO 2018 and 2019 Planning Years for which recovery is sought in this proceeding?

A. That expense is described later in my direct testimony in connection with purchases from a reverse capacity auction that the Company conducted in September 2014.

Q. Please describe "Interchange Delivered by Counterparties – MISO," on Exhibit A-19 (KGT-1), line 10.

A. Exhibit A-19 (KGT-1), line 10, includes energy sales to MISO executed on behalf of the Company by the Company's RE Counterparties for 2019 and is discussed in detail below.

Q. Please describe "Schedule 2 Reactive," on Exhibit A-19 (KGT-1), line 11.

A. Exhibit A-19 (KGT-1), line 11, includes the revenue received pursuant to MISO's Schedule 2 for reactive service which the Company provides as a service necessary for the transmission of power.

Q. Please describe "PA 295 New Build Renewables," on Exhibit A-19 (KGT-1), line 13.

A. Exhibit A-19 (KGT-1), line 13, includes the transfer costs calculated in accordance with MCL 460.1047(2)(b)(iv) associated with provider-owned RE systems. Consumers Energy witness Warners discusses this item in more detail in her direct testimony.

2019 Interchange Delivered by Counterparties to MISO

Q. Please describe Exhibit A-20 (KGT-2).

A. Exhibit A-20 (KGT-2) details the production delivered to the MISO energy market and revenue received from each of the Company's RE contract generators for 2019. The RE purchase agreements applicable to these generators are designed to limit the Company's exposure to market participation risks, while providing the economic benefits to the Company's customers. The contracts require the generator owners to be the Market Participant for their generators. The generator owner sells the energy produced into the MISO energy market on behalf of the Company. The Company receives the revenue for these sales at the Day Ahead locational marginal prices. Exhibit A-20 (KGT-2) details the revenue received from these suppliers. The totals from lines 9 and

18, of Exhibit A-20 (KGT-2), are reported on Exhibit A-19 (KGT-1), line 10 in columns (h) and (b), respectively.

Allocation of Costs to the RRF

Q. Please explain the RRP.

A. In Case No. U-13843, the Commission directed the Company to develop an RRP in which the Company purchases RE from various suppliers and recovers the cost of such purchases through several funding mechanisms, including the PSCR, voluntary contributions from customers, and an RRF.

Q. How will the purchase of RE for this program be treated for purposes of the PSCR reconciliation?

A. In Case No. U-13843, the Commission authorized Consumers Energy to implement a renewable resource funding mechanism to recover Green Power Program costs. The Commission established the RRF to be used exclusively for compensating Consumers Energy for costs associated with offering the program as follows:

> The fund will be used to compensate Consumers Energy for costs that are not recovered from customers who voluntarily choose the Green Power Program or are not recovered through the PSCR process. Renewable energy contracts entered into by Consumers Energy will be included in its PSCR factor at the average PSCR cost so that inclusion of these contracts will have no effect on the PSCR factor. The difference between the contract price and the average PSCR cost will be recovered through the fund, except for those costs that are being recovered from customers who voluntarily choose the Green Power Program. Consumers Energy should enter into renewable contracts commensurate with the anticipated amount of the fund. [May 18, 2004 Order in Case No. U-13843, pages 20-21.]

The energy purchased for the RRP is recognized as part of the total mix of energy supplied by Consumers Energy to its customers. However, the purchase cost of the RE in

excess of the average PSCR costs will not have any impact on the PSCR because the cost of the energy purchased for the RRP is included in this reconciliation at the average PSCR cost.

Q. How have the Company's RRF credits been reflected in the calculation of the Company's Purchased and Interchange ("P&I") Power Expense?

A. The cost of energy delivered by suppliers under this program consists of two components: (i) the average PSCR cost, which is booked as P&I Power Expense; and (ii) the cost in excess of average PSCR costs, which are paid from the RRF and are not booked as P&I Power Expense.

Q. Did any new generating facilities associated with the RRP's PPAs commence operations in 2019?

A. No.

Q. How many facilities are currently operating to supply energy for the RRP?

A. The Company had four Green Generation Program supply facilities in operation in 2019. These facilities are identified on Exhibit A-22 (KGT-4), page 3. Exhibit A-22 (KGT-4) also includes facilities for which the Company did not receive deliveries for the Green Generation Program, but booked expenses in 2019 associated with deliveries from prior periods.

Q. How much energy was delivered from the RRP facilities during 2019?

A. There were 63,121 MWh of energy purchases booked by Consumers Energy under the RRP agreements during 2019. Expense booked for the RRP deliveries during the year totaled $4,816,567.

Q. How is the cost of energy purchased under these agreements handled so that the PSCR is not impacted, as directed by the Commission?

A. The RRP PPAs are structured such that payment occurs in two parts: (i) an energy purchase expense; and (ii) a renewable purchase expense. The renewable purchase expense of $1,652,528 is offset by the RRF and is not a PSCR expense. The booked energy purchase expense of $3,164,039 is based on the estimated average PSCR cost of energy, less the administrative charge included in the PPAs. The PSCR will not be impacted by the energy purchase expenses under these agreements since these expenses are equal to the average PSCR expense that would have been incurred absent these expenses.

Q. You stated that the energy purchase expense is based on the estimated average PSCR cost of energy. How is Consumers Energy proposing to handle the difference between the actual average PSCR cost of energy and the estimated average PSCR cost of energy?

A. Since the actual average PSCR cost of energy for 2019 is being determined by this proceeding, Consumers Energy cannot reconcile the difference between estimated and actual until the Commission issues an order in this case and the actual cost has been established. Any reconciled amount will be booked in the year that the Commission's order is issued and reconciliation occurs.

Purchases and Sales with Third Parties in 2019

Q. Please describe Exhibit A-21 (KGT-3).

A. Exhibit A-21 (KGT-3) summarizes the capacity and energy charges recoverable as PSCR costs in accordance with prior Commission orders paid to each Purchased Power and

Cogeneration entity in 2019. Additionally, Exhibit A-21 (KGT-3), line 48, includes the booked expense associated with payments invoiced or expected to be invoiced by the Biomass Merchant Plants for certain expenses as explained in Consumers Energy witness Jenny L. Rickard's direct testimony.

Q. How much replacement energy did the Company receive under its PPA with Entergy Nuclear Power Marketing ("ENPM")?

A. In 2019, the Company booked a total of 6,946,495 MWh under its PPA with ENPM, 6,752,858 MWh of which was generated by the Palisades Nuclear Plant.

Q. Have you prepared a summary of the purchased power contract rates and the MPSC approval Orders for facilities that were in operation during 2019?

A. Yes. Exhibit A-22 (KGT-4) summarizes the capability, energy, and capacity rates for each of the Company's purchased power contracts along with the MPSC Orders which approved the capacity rates for each facility.

Q. During 2019, were there any capacity charges paid to third parties under transactions with terms exceeding six months in duration that have not been previously approved by the Commission?

A. Yes. These transactions include: (i) purchases of Zonal Resource Credits ("ZRCs") in MISO's annual Planning Resource Auctions ("PRAs"); and (ii) compensation paid to Michigan Wind 1 for the 57 MW portion of the 69 MW plant, which capacity under a Letter Agreement is priced at the MISO PRA auction clearing price.

Q. Has Consumers Energy entered into any other contracts for which the Company has booked energy, capacity, or expense in 2019 for which it will seek approval but have not yet been approved by the Commission?

A. No.

Purchases and Sales of ZRCs in MISO's Annual PRAs

Q. Please describe the expense of purchases of ZRCs made by the Company in MISO's annual PRAs.

A. The Company did not incur any expense in 2019 associated with the purchase of ZRCs from the Planning Year 2018 PRA. The 2019 expense associated with the purchase of ZRCs in the Planning Year 2019 PRA is $21,415 as shown in Exhibit A-19 (KGT-1), line 4, column (g).

Q. Please describe the revenue of sales of ZRCs made by the Company in MISO's annual PRAs.

A. The 2019 revenue associated with the Zonal Deliverability Benefit and net sale of ZRCs in the 2018 and 2019 PRAs is $320,512 as shown on Exhibit A-19 (KGT-1), line 9, column (g).

Q. What was the total net revenue in 2019 associated with ZRCs and Zonal Deliverability Benefits for the Company's participation in the MISO PRAs?

A. The difference between line 9 and line 4, column (g), of Exhibit A-19 (KGT-1) is a net revenue of $299,097 received by the Company in 2019 associated with the purchases and sales of ZRCs and Zonal Deliverability Benefits from MISO PRAs.

Reverse Capacity Auction

Q. Did Consumers Energy incur any expense in 2019 for ZRCs purchased to meet its Planning Reserve Margin Requirement for Planning Year 2018 or 2019?

A. Yes. The Company conducted a reverse auction on September 23, 2014 for the purchase of 20 ZRCs in both Planning Year 2018 and Planning Year 2019.

Q. Did the Company receive approval from the Commission for these purchases?

A. Yes, the Commission approved the purchases made in these auctions in its January 27, 2015 Order in Case No. U-17725.

Q. How much expense did the Company incur for the purchase of these ZRCs during 2019?

A. The Company booked $1,153,470 for the purchase of these ZRCs during 2019, which is included in the $1,156,746 of short-term capacity purchase expense shown on Exhibit A-19 (KGT-1), line 6, column (g).

Conclusion

Q. Please summarize your direct testimony.

A. In this direct testimony, I have presented the basis for recovery of $1,505,383,864 in net P&I and renewable power supply expense for 2019 as shown on Exhibit A-19 (KGT-1), line 15, column (h). My direct testimony has identified the parties with whom the Company has long-term supply contracts, the amount of power received from each party, and the amount paid to each party. For those contracts for which Commission approval is required, I have identified the case in which approval was received. I have accounted for the treatment of expense associated with the RRP as approved by the Commission in Case No. U-13843, resulting in the as-booked supply of 63,121 MWh of certified RE at

no incremental cost to customers, except the contributions customers elected to provide on a voluntary basis.

Q. Do you believe that all of the expenses and revenues summarized on Exhibit A-19 (KGT-1) were prudently incurred?

A. Yes.

Q. Does this complete your direct testimony?

A. Yes, it does.

STATE OF MICHIGAN

BEFORE THE MICHIGAN PUBLIC SERVICE COMMISSION

In the matter of the application of **CONSUMERS ENERGY COMPANY** for reconciliation of its power supply cost recovery plan (Case No. U-20219) for the 12 months ended December 31, 2019.	)	Case No. U-20220

EXHIBITS OF

OF

KEITH G. TROYER

ON BEHALF OF

CONSUMERS ENERGY COMPANY

March 2020

MICHIGAN PUBLIC SERVICE COMMISSION
Consumers Energy Company

Case No.: U-20220
Exhibit No.: A-19 (KGT-1)
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Date: March 2020

Purchased, Interchanged, and Renewable Power Transactions
Total Year 2019

Line	(a) Description	(b) MWH	(c) Variable Energy	(d) Admin Fees	(e) Net Energy $	(f) Fixed Energy $	(g) Capacity $	(h) Total $	(i) Energy Cost $/Mwh	(j) Total Cost $/Mwh
	Purchased & Interchange Power Received									
1	Purchased Power	15,505,605	286,899,893	(610,413)	298,289,482	77,498,704	580,557,686	956,345,873	19.24	61.68
2	Purchased Power & Programs - PA 295[1]	1,222,637	72,991,718	-	72,991,718	-	17,270,892	90,262,610	59.70	73.83
3	Interchange Received - Non-MISO	-	-	-	84,109	-	-	84,109	0.00	0.00
4	Interchange Received - MISO	6,165,530	-	-	124,411,522	-	21,415	124,432,937	20.18	20.18
5	Transmission	-	-	-	389,268,276	-	-	389,268,276	0.00	0.00
6	Short-Term Capacity Purchases	-	-	-	-	-	1,156,746	1,156,746	0.00	0.00
7	Total P & I Received	22,893,772	359,891,611	(610,413)	885,045,107	77,498,704	599,006,739	1,561,550,550	38.66	68.21
	Purchased & Interchange Power Delivered									
8	Interchange Delivered - Non-MISO	-	-	-	0	-	98,456.00	98,456	0.00	0.00
9	Interchange Delivered - MISO	3,310,163	-	-	79,847,583	-	320,512	80,168,095	24.12	24.22
10	Interchange Delivered by Counterparties - MISO	796,033			21,334,308			21,334,308	26.80	26.80
11	Schedule 2 Reactive	-			6,217,939			6,217,939	0.00	0.00
12	Total P & I Delivered	4,106,196	-	-	107,399,830	-	418,968	107,818,798	26.16	26.26
	Non PPA PA 295 PSCR Cost									
13	PA 295 New Build Renewables	625,691	37,657,046	-	37,657,046	-	13,995,066	51,652,112	60.18	82.55
14	Total PA 295 New Build Renewables	625,691	37,657,046	-	37,657,046	-	13,995,066	51,652,112	60.18	82.55
15	Total Net Purchased & Interchanged Power (line 7 - line 12 + line 14)	19,413,267	397,548,657	(610,413)	815,302,323	77,498,704	612,582,837	1,505,383,864	42.00	77.54
16	Net MISO Interchange (line 4 - line 9)	2,855,367	-	-	44,563,939	-	(299,097)	44,264,842	15.61	15.50

[1] Sum of Exhibit A-xx (EJW-1) rows 19 and 28

MICHIGAN PUBLIC SERVICE COMMISSION
Consumers Energy Company

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2019 Interchange Delivered by Counterparties to MISO

	(a)	(b)	(c)	(d)	(e)	(f)	(g)	(h)	(i)	(j)	(k)	(l)	(m)	(n)
							Revenue Received ($)							
line		**January**	**February**	**March**	**April**	**May**	**June**	**July**	**August**	**September**	**October**	**November**	**December**	**Total By Counterparty**
1	Beebe Renewable Energy	$ (609,180)	$ (760,629)	$ (520,050)	$ (728,999)	$ (451,400)	$ (360,157)	$ (347,898)	$ (207,295)	$ (411,684)	$ (453,505)	$ (159,098)	$ -	$ (5,009,895)
2	Harvest II	$ (583,693)	$ (654,131)	$ (489,975)	$ (531,894)	$ (346,034)	$ (313,688)	$ (212,551)	$ (222,123)	$ (376,000)	$ (437,629)	$ (444,838)	$ (13,247)	$ (4,625,803)
3	Heritage Garden Wind	$ (192,175)	$ (102,494)	$ (162,535)	$ (165,192)	$ (105,943)	$ (59,253)	$ (100,273)	$ (71,844)	$ (123,639)	$ (132,829)	$ (151,716)	$ (107,873)	$ (1,475,765)
4	Heritage Garden Solar	$ (935)	$ (1,907)	$ (1,305)	$ (5,544)	$ (4,753)	$ (5,461)	$ (7,792)	$ (6,122)	$ (3,607)	$ (1,288)	$ (1,482)	$ (617)	$ (40,814)
5	Heritage Stoney Corners I Phase 2	$ (105,736)	$ (75,772)	$ (94,519)	$ (93,387)	$ (67,838)	$ (46,097)	$ (61,027)	$ (41,682)	$ (68,064)	$ (88,759)	$ (79,242)	$ (27,890)	$ (850,013)
6	Heritage Stoney Corners I Phase 3	$ (65,944)	$ (48,241)	$ (65,214)	$ (60,809)	$ (44,481)	$ (29,771)	$ (40,383)	$ (26,535)	$ (43,402)	$ (59,054)	$ (43,669)	$ (48,277)	$ (575,779)
7	Michigan Wind 2	$ (946,999)	$ (1,091,904)	$ (838,627)	$ (985,749)	$ (622,909)	$ (509,377)	$ (343,898)	$ (399,603)	$ (613,803)	$ (532,234)	$ -	$ -	$ (6,885,102)
8	WM Renewable Pine Tree Acres	$ (225,455)	$ (172,316)	$ (231,651)	$ (213,819)	$ (187,719)	$ (147,025)	$ (112,510)	$ (91,602)	$ (31,751)	$ (141,506)	$ (162,687)	$ (153,097)	$ (1,871,137)
9	Total	$ (2,730,117)	$ (2,907,393)	$ (2,403,877)	$ (2,785,394)	$ (1,831,077)	$ (1,470,830)	$ (1,226,332)	$ (1,066,806)	$ (1,671,950)	$ (1,846,802)	$ (1,042,731)	$ (351,001)	$ (21,334,308)

							Energy Delivered (MWh)							
		January	**February**	**March**	**April**	**May**	**June**	**July**	**August**	**September**	**October**	**November**	**December**	**Total By Counterparty**
10	Beebe Renewable Energy	(20,625)	(25,599)	(18,273)	(26,879)	(17,077)	(15,166)	(12,161)	(10,824)	(14,247)	(19,426)	(6,428)	-	(186,705)
11	Harvest II	(19,905)	(21,901)	(17,626)	(19,998)	(13,303)	(13,303)	(7,247)	(10,967)	(13,385)	(19,829)	(16,057)	(523)	(174,043)
12	Heritage Garden Wind	(5,520)	(3,684)	(5,477)	(5,158)	(4,046)	(2,463)	(3,082)	(2,718)	(4,683)	(5,769)	(5,643)	(4,489)	(52,733)
13	Heritage Garden Solar	(35)	(50)	(41)	(173)	(153)	(179)	(205)	(182)	(122)	(57)	(54)	(26)	(1,277)
14	Heritage Stoney Corners I Phase 2	(3,010)	(2,835)	(3,235)	(3,458)	(2,530)	(1,974)	(2,158)	(1,631)	(2,633)	(3,564)	(2,712)	(1,009)	(30,749)
15	Heritage Stoney Corners I Phase 3	(1,958)	(1,775)	(2,240)	(2,246)	(1,649)	(1,283)	(1,425)	(1,038)	(1,673)	(2,345)	(1,508)	(1,869)	(21,008)
16	Michigan Wind 2	(32,027)	(36,445)	(29,962)	(36,463)	(24,279)	(22,238)	(13,159)	(19,725)	(22,025)	(23,899)	-	-	(260,221)
17	WM Renewable Pine Tree Acres	(7,209)	(6,236)	(7,845)	(7,564)	(7,143)	(6,037)	(4,029)	(3,676)	(1,346)	(5,863)	(5,864)	(6,485)	(69,298)
18	Total	(90,288)	(98,525)	(84,698)	(101,939)	(70,182)	(62,644)	(43,466)	(50,761)	(60,113)	(80,751)	(38,267)	(14,401)	(796,033)

MICHIGAN PUBLIC SERVICE COMMISSION
Consumers Energy Company

Case No.: U-20220
Exhibit No.: A-21 (KGT-3)
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Date: March 2020

PURCHASED POWER AND COGENERATION - ENERGY AND EXPENSE
TOTAL 2019

	(a)	(b)	(c)	(d)	(e)	(f)	(g)	(h)	(i)	(j)
Line	**Company Name**	**MWH**	**Variable Energy $**	**Admin Fees $**	**Net Energy $**	**Fixed Energy $**	**Capacity $**	**Total $**	**Variable Energy Cost $/Mwh**	**Total Cost $/Mwh**
1	Bay Windpower[1]	2,245	108,679	(2,196)	106,484	0	5,261	111,745	47.43	49.78
2	Black River	4,133	150,429	(5,167)	145,262	0	79,470	224,732	35.14	54.37
3	City of Beaverton	3,593	122,191	(3,593)	118,599	0	110,736	229,335	33.01	63.84
4	City of Midland	948	20,581	(4,768)	15,813	0	0	15,813	16.68	16.68
5	Commonwealth Irving	1,296	45,013	(998)	44,015	0	11,172	55,186	33.95	42.57
6	Commonwealth Labarge	4,832	214,797	(2,591)	212,206	0	130,119	342,326	43.92	70.85
7	Commonwealth Middleville	794	28,710	(755)	27,956	0	29,576	57,532	35.22	72.48
8	C & C Energy LLC (C&C Electric 2)	18,372	983,508	(18,372)	965,136	0	0	965,136	52.53	52.53
9	Elk Rapids 2 (Energy Only)	9	(885)	0	(885)	0	0	(885)	(103.67)	(103.67)
10	Granger - Seymour	6,227	186,516	(6,227)	180,289	40,067	264,948	485,304	28.95	77.94
11	Great Lake Tissue	33	1,054	(33)	1,021	0	0	1,021	30.50	30.50
12	Grenfell Hydro	2,021	99,336	(373)	98,963	0	37,367	136,331	48.98	67.47
13	MAHLE Engine Components	211	5,660	(4,411)	1,249	0	0	1,249	5.92	5.92
14	Michiana Hydro	270	10,275	(270)	10,005	0	13,490	23,495	37.10	87.12
15	Michigan State University	7,176	210,089	(2,393)	207,696	0	0	207,696	28.94	28.94
16	NANR - Rathbun[2]	5,081	200,656	(2,077)	198,578	0	79,378	277,956	39.08	54.71
17	Otsego Paper	3,897	106,971	(3,897)	103,074	0	0	103,074	26.45	26.45
18	STS Cascade	1,525	50,447	(1,525)	48,922	0	59,147	108,069	32.07	70.85
19	STS Fallasburg	1,233	41,710	(1,233)	40,477	0	34,871	75,348	32.83	61.11
20	STS Morrow	3,805	118,893	(3,498)	115,396	0	126,968	242,363	30.33	63.70
21	STS Ada	6,008	205,899	(6,008)	199,891	0	185,182	385,073	33.27	64.09
22	Venice Park	15,940	851,332	(15,940)	835,392	0	0	835,392	52.41	52.41
23	White's Bridge	4,231	153,373	(4,231)	149,143	0	145,697	294,839	35.25	69.69
24	Ada Cogeneration	139,437	4,121,709	(22,003)	4,099,706	1,465,858	8,836,969	14,402,532	29.40	103.29
25	Adrian Energy	13,496	490,468	(13,528)	476,940	0	587,624	1,064,564	35.34	78.88
26	Boyce Hydro	24,069	1,008,849	0	1,008,849	0	524,568	1,533,417	41.91	63.71
27	Cadillac Renewable	92,954	2,618,753	(20,000)	2,598,753	1,345,648	8,666,449	12,610,850	27.96	135.67
28	Entergy Palisades	6,946,495	48,608,891	0	48,608,891	0	346,122,517	394,731,409	7.00	56.82
29	Filer City	454,946	16,399,957	(24,000)	16,375,957	0	22,723,051	39,099,008	36.00	85.94
30	C & C Energy LLC (C&C Electric 1)	9,387	280,677	(9,131)	271,545	60,805	400,049	732,399	28.93	78.02
31	Genesse Power Station	86,646	2,289,580	(24,000)	2,265,580	1,768,350	12,394,355	16,428,286	26.15	189.60
32	Granger - Byron Center	27,783	829,773	(27,693)	802,081	179,143	1,130,193	2,111,416	28.87	76.00
33	Granger - Grand Blanc	21,509	643,424	(21,694)	621,731	138,929	921,326	1,681,986	28.91	78.20
34	Granger - Ottawa	26,111	781,150	(26,007)	755,143	169,007	1,111,732	2,035,882	28.92	77.97
35	Granger - Pinconning	22,786	682,515	(22,721)	659,794	147,357	962,013	1,769,164	28.96	77.64
36	Grayling	171,237	4,967,440	(44,156)	4,923,284	1,978,897	12,430,768	19,332,950	28.75	112.90
37	Hillman Limited	124,412	4,760,396	(43,894)	4,716,502	0	3,786,133	8,502,636	37.91	68.34
38	Kent County	96,315	3,755,667	(22,741)	3,732,927	0	4,426,443	8,159,369	38.76	84.72
39	Michigan Power Limited	991,684	35,981,564	(24,000)	35,957,563	0	37,378,842	73,336,406	36.26	73.95
40	Michigan Wind 1, LLC (PPA 1)[3]	135,714	3,553,565	0	3,553,565	0	34,218	3,587,783	26.18	26.44
41	Michigan Wind 1, LLC (PPA 2)	27,504	1,332,277	(27,791)	1,304,486	0	0	1,304,486		
42	North American Resources (Peoples)	22,794	679,823	(22,259)	657,564	146,429	970,264	1,774,258	28.85	77.84
43	Viking - Lincoln	144,025	5,276,115	(43,751)	5,232,364	0	2,752,757	7,985,121	36.33	55.44
44	Viking - McBain	143,446	5,255,203	(43,993)	5,211,210	0	2,829,064	8,040,274	36.33	56.05
45	WM Renewable Energy	12,473	373,673	(12,498)	361,175	80,626	507,019	948,820	28.96	76.07
46	MCV	5,676,501	138,293,189	(24,000)	138,269,189	69,977,589	109,747,948	317,994,726	24.36	56.02
47	**Subtotal**	15,505,605	286,899,893	(610,413)	286,289,480	77,498,704	580,557,686	944,345,871	18.46	60.90
48	Biomass Merchant Plant	0	0	0	12,000,002	0	0	12,000,002	0.00	0.00
49	**TOTAL**	15,505,605	286,899,893	(610,413)	298,289,482	77,498,704	580,557,686	956,345,873	19.24	61.68

[1] Includes 1,306 MWh and $70,131 related to RRP.
[2] Includes ($3,387) related to RRP.
[3] Includes ($7,719) related to RRP.

MICHIGAN PUBLIC SERVICE COMMISSION
Consumers Energy Company

Case No.: U-20220
Exhibit No.: A-22 (KGT-4)
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Witness: KGTroyer
Date: March 2020

PURCHASED POWER CONTRACT RATES AND MPSC APPROVAL ORDERS

ENERGY AND CAPACITY CONTRACTS

	(a)	(b)	(c)	(d)	(e)	(f)	(g)	(h)	(i)	(j)	(k)	(l)
Line	Energy & Capacity Company	Contract Capacity	Fuel Type	Variable Energy Rate On-Peak	Variable Energy Rate Off-Peak	Capacity Rate On-Peak	Capacity Rate Off-Peak	Capacity Rate $/ZRC-month	Admistrative Charge Rate	Admistrative Charge Special Notes	MPSC Order Approving Capacity Rate	Expected Termination Date
		MW		¢/kWh	¢/kWh	¢/kWh	¢/kWh		¢/kWh			
1	Ada Cogeneration Ltd Partnership	29.400	Nat Gas	Twelve-month rolling average cost of CE coal generation		4.024	3.822	N/A	0.100	Not to exceed $2,000/month	June 22, 1989 – U-8871/U-8833	1/4/26
2	Adrian Energy Associates	2.500	Landfill Gas	Twelve-month rolling average cost of CE coal generation		4.476	4.253	N/A	0.100	Not to exceed $2,000/month	March 31, 1993 – U-10127	12/12/29
3	Bay Windpower I (Start Date of June 1, 2019)	1.800	Wind	3.957		N/A	N/A	8,768.50		Included in variable energy rate	November 14, 2019 - U-20604	5/31/21
4	Black River Power Limited Partnership	0.840	Hydro	Twelve-month rolling average cost of CE coal generation		2.090	1.780	N/A	0.100	Not to exceed $2,000/month	December 12, 1988 - U-8866	5/31/19
5	Beaverton, City of (End Date of May 31, 2019)	0.500	Hydro	Twelve-month rolling average cost of CE coal generation		3.510	2.750	N/A	0.100	Not to exceed $2,000/month	December 12, 1988 - U-8866	5/31/2019
6	Boyce Hydro Power, LLC (f/k/a Wolverine Power Corporation)	11.000	Hydro	4.670	3.660	2.330	1.970	N/A	None		December 13, 1988 - U-8866	5/30/22
7	C&C Energy, LLC - C&C 1 (f/k/a Gas Recovery Systems)	2.750	Landfill Gas	Twelve-month rolling average cost of CE coal generation		4.374	4.155	N/A	0.100	Min of $364/Mo, but not to exceed $3,643/Mo	July 21, 1993 – U-10270	2/19/30
8	Cadillac Renewable Energy	34.000	Landfill Gas	Twelve-month rolling average cost of CE coal generation		4.320	4.110	N/A	0.100	Not to exceed $2,000/month	June 22, 1989 – U-8871	7/15/28
9	Commonwealth Power Company – Irving	0.240	Hydro	Twelve-month rolling average cost of CE coal generation		4.034	3.832	N/A	0.100	Not to exceed $2,000/month	March 31, 1993 – U-10127	8/24/30
10	Commonwealth Power Company – LaBarge (End Date of May 31, 2019)	0.700	Hydro	Twelve-month rolling average cost of CE coal generation		4.520	3.970	N/A	0.100	Not to exceed $2,000/month	December 13, 1988 - U-8866	5/31/19
11	Commonwealth Power Company – LaBarge (Start Date of June 1, 2019)	0.700	Hydro	5.400		N/A	N/A	8,768.50		Included in variable energy rate	September 26, 2019 - U-20604	5/31/39
12	Commonwealth Power Company – Middleville	0.200	Hydro	Twelve-month rolling average cost of CE coal generation		4.034	3.832	N/A	0.100	Not to exceed $2,000/month	March 31, 1993 – U-10127	12/31/30
13	Entergy Nuclear Power Marketing (Palisades)	813.000	Nuclear	0.664		4.479		N/A	None		March 27, 2007 - U-14992	4/10/22
14	Genesee Power Station Limited Partnership	35.000	Wood Waste	Twelve-month rolling average cost of CE coal generation		4.650	4.420	N/A	0.100	Min of $200/mo, but not to exceed $2,000/mo	June 22, 1989 - U-8871	12/12/30
15	Energy Developments Grand Blanc, LLC (f/k/a Granger Electric Company – Grand Blanc)	3.812	Landfill Gas	Twelve-month rolling average cost of CE coal generation		4.402	4.182	N/A	0.100	Min of $364/Mo, but not to exceed $3,643/Mo	July 21, 1993 - U-10276	11/20/30
16	Energy Developments Pinconning, LLC (f/k/a Granger Electric of Pinconning)	3.042	Landfill Gas	Twelve-month rolling average cost of CE coal generation		4.348	4.136	N/A	0.100	Min of $240/mo, but not to exceed $2,400/mo	June 22, 1989 - U-8871/U-10267	4/9/26
17	Energy Developments Byron Center, LLC (f/k/a Granger Electric of Byron Center)	3.792	Landfill Gas	Twelve-month rolling average cost of CE coal generation		4.184	3.970	N/A	0.100	Min of $264/mo, but not to exceed $2,646/mo	June 22, 1989 - U-8871/U-10273	6/20/29
18	Energy Developments Coopersville, LLC (f/k/a Granger Electric of Coopersville, LLC - Ottawa)	4.565	Landfill Gas	Twelve-month rolling average cost of CE coal generation		4.374	4.155	N/A	0.100	Min of $364/Mo, but not to exceed $3,643/Mo	July 21, 1993 - U-10268	7/26/29
19	Energy Developments Coopersville, LLC (f/k/a Granger Electric Company of Coopersville – Seymour)	0.752	Landfill Gas	Twelve-month rolling average cost of CE coal generation		4.374	4.155	N/A	0.100	Min of $364/Mo, but not to exceed $3,643/Mo	July 21, 1993 - U-10275	1/21/28
20	Good Fruit Storage	0.179	Solar	3.732	3.248	N/A	N/A	11,708.75	0.100	Included in variable energy rate	December 6, 2019 - U-20604	5/31/39
21	Grayling Generating Station Limited Partnership	36.170	Wood Waste	Twelve-month rolling average cost of CE coal generation		4.180	3.970	N/A	0.100	Min of $364/Mo, but not to exceed $3,643/Mo	June 22, 1989 - U-8871/U-10274	12/31/27
22	Grenfell Hydro, Inc (End Date of December 31, 2019)	0.300	Hydro	Twelve-month rolling average cost of CE coal generation		4.020	3.420	N/A	0.100		December 13, 1988 - U-8866	12/31/18
23	Grenfell Hydro, Inc (Start Date January 1, 2019)	0.300	Hydro	5.405		N/A	N/A	8,768.50		Included in variable energy rate	November 14, 2019 - U-20604	5/31/39
24	Hillman Power Company LLC	18.000	Wood Waste	Twelve-month rolling average cost of CE coal generation		3.850	3.270	N/A	0.100		August 18, 1984 - U-7990	12/31/2019
25	Hillman Power Company LLC (Amendment Start Date June 1, 2019)	18.000	Wood Waste	4.000		N/A	N/A	11,708.75	0.100	Not to exceed $2,000/month	July 2, 2019 - U-20496	5/31/2022
26	Kent County	15.680	Solid Waste	Twelve-month rolling average cost of CE coal generation		5.340	4.540	N/A	0.100	Not to exceed $2,000/month	February 19, 1987 - U-8639	5/31/19
27	Michiana Hydroelectric Co (Bellevue)	0.075	Hydro	Twelve-month rolling average cost of CE coal generation		5.360	4.760	N/A	0.100		December 13, 1988 - U-8866	5/31/19
28	Michigan Power Limited Partnership	123.000	Nat Gas	Twelve-month rolling average cost of CE coal generation		3.880	3.686	N/A	0.100	Not to exceed $2,000/month	March 31, 1993 – U-10127	MTM
29	Michigan Wind I, LLC (f/k/a Noble Thumb Windpark, LLC.)	57.000	Wind	Average Day Ahead LMP		LMP	LMP	PRA	0.100	Min of $364/Mo, but not to exceed $3,643/Mo	N/A	MTM
30	Midland Cogeneration Venture Limited Partnership	1240.000	Nat Gas	MCV Cost of Production		1.014	1.014	N/A	0.100	Not to exceed $2,000/month	June 10, 2008 - U-15320	3/15/25

PURCHASED POWER CONTRACT RATES AND MPSC APPROVAL ORDERS

ENERGY AND CAPACITY CONTRACTS - CONTINUED

(a)		(b)	(c)	(d)	(e)	(f)	(g)	(h)	(i)	(j)	(k)	(l)
Line	**Energy & Capacity Company**	**Contract Capacity**	**Fuel Type**	**Variable Energy Rate**		**Capacity Rate**			**Admistrative Charge**		**MPSC Order Approving Capacity Rate**	**Expected Termination Date**
				On-Peak	**Off-Peak**	**On-Peak**	**Off-Peak**	**$/ZRC-month**	**Rate**	**Special Notes**		
		MW		¢/kWh	¢/kWh	¢/kWh	¢/kWh		¢/kWh			
31	North American Natural Resources -Peoples	3.061	Landfill Gas	Twelve-month rolling average cost of CE coal generation		4.374	4.155	N/A	0.100	Min of $364/Mo, but not to exceed $3,643/Mo	July 21, 1993 – U-10266	9/7/30
32	North American Natural Resources -Rathbun (Start Date October 5, 2018)	1.600	Landfill Gas	4.688		N/A	N/A	8768,50		Included in variable energy rate	September 26, 2019 - U-20604	5/31/39
33	STS Hydropower Ltd - Ada Hydro Plant	1.400	Hydro	3.670	2.870	3.350	2.850	N/A	0.100		June 23, 2017 -U-18425	5/31/22
34	STS Hydropower Ltd – Cascade Hydro Plant	1.400	Hydro	3.670	2.870	4.250	3.610	N/A	0.100		December 13, 1988 - U-8866	12/31/18
35	STS Hydropower Ltd – Fallasburg Hydro Plant	0.850	Hydro	3.670	2.870	3.090	2.630	N/A	0.100		December 13, 1988 - U-8866	5/31/19
36	STS Hydropower Ltd – Morrow Hydro Plant	1.000	Hydro	3.670	2.870	3.970	3.370	N/A	0.100		December 13, 1988 - U-8868	12/31/19
37	T.E.S. Filer City Station Limited Partnership	50.000	Coal	Twelve-month rolling average cost of CE coal generation		6.550	5.550	N/A	0.100	Not to exceed $2,000/month	February 19, 1987 - U-8562	6/16/25
38	Viking Energy of Lincoln, LLC	18.000	Wood Waste	Twelve-month rolling average cost of CE coal generation		4.300	3.660	N/A	0.100		November 14, 1984 - U-8062	12/31/19
39	Viking Energy of Lincoln, LLC (Amendment Start Date January 1, 2019)	18.000	Wood Waste	3.681		N/A	N/A	11708.750	0.100	Min of $200/mo, but not to exceed $2,000/mo	April 18, 2019 - U-20496	5/31/27
40	Viking Energy of McBain, LLC	18.000	Wood Waste	Twelve-month rolling average cost of CE coal generation		4.300	3.660	N/A	0.100		November 14, 1984 - U-8062	12/31/19
41	Viking Energy of McBain, LLC (Amendment Start Date January 1, 2019)	18.000	Wood Waste	3.681		N/A	N/A	11708.750	0.100	Min of $200/mo, but not to exceed $2,000/mo	April 18, 2019 - U-20496	5/31/27
42	White's Bridge Hydro Company	0.817	Hydro	Twelve-month rolling average cost of CE coal generation		3.760	3.200	N/A	0.100		December 17, 1985 - U-8042	5/31/19
43	WM Renewable Energy - Venice Park (f/k/a Bio Energy Partners)	1.500	Landfill Gas	Twelve-month rolling average cost of CE coal generation		4.190	3.980	N/A	0.100	Min of $200/mo, but not to exceed $2,000/mo	June 22, 1989 – U-8871/U-10272	5/3/27

PURCHASED POWER CONTRACT RATES AND MPSC APPROVAL ORDERS

ENERGY-ONLY CONTRACTS

Line	**Energy-Only Company**	**Contract Capacity**	**Fuel Type**	**Variable Energy Rate**		**Capacity Rate**			**Admistrative Charge**		**MPSC Order Approving Capacity Rate**	**Expected Termination Date**
				On-Peak	**Off-Peak**	**On-Peak**	**Off-Peak**	**$/ZRC-month**	**Rate**	**Special Notes**		
		MW		¢/kWh	¢/kWh	¢/kWh	¢/kWh		¢/kWh			
44	Great Lakes Tissue Company	N/A	Hydro	Three-month rolling average top incremental cost		-	-	-	0.100	Not to exceed $2,000/month	N/A	YTY
45	Michigan State University	N/A	Coal	Three-month rolling average top incremental cost		-	-	-	0.100	Not to exceed $200/month	N/A	YTY
46	City of Midland	N/A	Landfill Gas	90% of (Load Locational Marginal Price - $5/MWh)		-	-	-	0.100	Min of $348/Mo, but not to exceed $3,480/Mo	N/A	MTM
47	Western Michigan University	N/A	Nat Gas	Hourly top incremental cost		-	-	-	0.100	Min of $348/Mo, but not to exceed $3,480/Mo	N/A	MTM
48	Grand Valley State University	N/A	Fuel Cell	90% of the hourly top incremental cost		-	-	-	None		N/A	MTM
49	Mahle Engine Components USA, Inc.	N/A	Waste Energy	90% of (Load Locational Marginal Price - $5/MWh)		-	-	-	0.100	Min of $348/Mo, but not to exceed $3,480/Mo	N/A	MTM
50	Otsego Paper (Start Date July 1, 2019)	20.000	Natural Gas	MISO Real - Time LMP		-	-	-	0.100		N/A	MTM

MICHIGAN PUBLIC SERVICE COMMISSION
Consumers Energy Company

Case No.: U-20220
Exhibit No.: A-22 (KGT-4)
Page: 3 of 5
Witness: KGTroyer
Date: March 2020

PURCHASED POWER CONTRACT RATES AND MPSC APPROVAL ORDERS
RENEWABLE RESOURCE PROGRAM CONTRACTS

(a)	(b)	(c)	(d)	(e)	(f)	(g)	(h)	(i)	(j)	(k)
Line	**Renewable Resource Company**	**Contract Capacity** MW	**Fuel Type**	**Variable Energy Rate** On-Peak ¢/kWh / Off-Peak ¢/kWh		**Renewable Rate** On-Peak ¢/kWh	**Renewable Rate** Off-Peak ¢/kWh	**Admistrative Charge** Rate ¢/kWh	**Admistrative Charge** Special Notes	**MPSC Order Approving Capacity Rate**	**Expected Termination Date**
51	Bay Windpower I	1.800	Wind	Average PSCR cost		Redacted	Redacted	0.100	Min of $364/Mo, but not to exceed $3,643/Mo	October 18, 2005 - U-14626	5/31/19
52	C&C Energy, LLC (C&C Electric 2 Plant)	2.500	Landfill Gas	Average PSCR cost		4.392	4.392	0.100	Min of $364/Mo, but not to exceed $3,643/Mo	October 18, 2005 - U-14626	2/27/27
53	North American Natural Resources (Venice Park), combination of White Lake, Venice Park second unit, Peoples fourth unit	3.200	Landfill Gas	Average PSCR cost		3.723	3.523	0.100	Min of $364/Mo, but not to exceed $3,643/Mo	October 18, 2005 - U-14626	2/9/26
54	Michigan Wind I, LLC (f/k/a Noble Thumb Windpark, LLC.)	57.000	Wind	Average PSCR cost		Redacted	Redacted	0.100	Min of $364/Mo, but not to exceed $3,643/Mo	October 18, 2005 - U-14626	12/17/2018
55	Michigan Wind I, LLC (f/k/a Noble Thumb Windpark, LLC.)	12.000	Wind	Average PSCR cost		Redacted	Redacted	0.100	Min of $364/Mo, but not to exceed $3,643/Mo	October 18, 2005 - U-14626	12/17/2028
56	North American Natural Resources (Rathbun)	1.600	Landfill Gas	Average PSCR cost		3.723	3.523	0.100	Min of $364/Mo, but not to exceed $3,643/Mo	January 25, 2010 - U-15675	10/4/18

PURCHASED POWER CONTRACT RATES AND MPSC APPROVAL ORDERS

PUBLIC ACT 295 CONTRACTS

	(a)	(b)	(c)	(d)	(e)	(f)	(g)	(h)	(i)
Line	**Public Act 295 Company**	**Contract Capacity** MW	**Fuel Type**	**Capacity Price** $/ZRC - Month	**Variable Energy Rate** **On-Peak** $/MWh	**Off-Peak** $/MWh	**REC Price** $/REC	**MPSC Order Approving Capacity Rate**	**Expected Termination Date**
57	Apple Blossom Wind, LLC (f/k/a Geronimo Huron Wind, LLC)	100.000	Wind	Redacted	Redacted		Redacted	November 19, 2015 - U-15805	5/31/33
58	Beebe Renewable Energy (f/k/a Blissfield)	81.600	Wind	Redacted	2009 Renewable Energy Plan forecasted LMP		Redacted	July 27, 2010 - U-15805	12/17/32
59	Elk Rapids	0.700	Hydro	0.00	Day-Ahead LMP		53.00	October 13, 2009 - U-15805	10/12/19
60	Generate Fremont Digester, LLC (f/k/a Fremont Community Digester)	2.850	Gas Digester	29,963.06	Day-Ahead LMP		45.56	October 13, 2009 - U-15805	12/26/32
61	Harvest II Windfarm	59.400	Wind	Redacted	2009 Renewable Energy Plan forecasted LMP		Redacted	July 27, 2010 - U-15805	10/31/32
62	Heritage Garden Wind Farm I	20.880	Wind/Solar	Redacted	2009 Renewable Energy Plan forecasted LMP		Redacted	November 19, 2010 - U-15805	9/13/32
63	Heritage Stoney Corners Wind Farm I (Phase 2)	12.250	Wind	Redacted	2009 Renewable Energy Plan forecasted LMP		Redacted	November 19, 2010 - U-15805	12/31/31
64	Heritage Stoney Corners Wind Farm I (Phase 3)	8.350	Wind	Redacted	2009 Renewable Energy Plan forecasted LMP		Redacted	January 26, 2012 - U-15805	12/31/31
65	Michigan Wind 2	90.000	Wind	Redacted	2009 Renewable Energy Plan forecasted LMP		Redacted	July 27, 2010 - U-15805	12/31/31
66	North American Natural Resources (Lennon)	1.600	Landfill Gas	0.00	Day-Ahead LMP		48.52	October 13, 2009 - U-15805	12/15/30
67	WM Renewable Energy (Northern Oaks)	1.600	Landfill Gas	3,000.00	Day-Ahead LMP		12.00	October 13, 2009 - U-15805	11/10/30
68	WM Renewable Energy (Pine Tree Acres)	12.800	Landfill Gas	Redacted	2009 Renewable Energy Plan forecasted LMP		Redacted	July 27, 2010 - U-15805	2/28/32

PURCHASED POWER CONTRACT RATES AND MPSC APPROVAL ORDERS

PUBLIC ACT 295 CONTRACTS - EXPERIMENTAL ADVANCED RENEWABLE PROGRAM - ANAEROBIC DIGESTION

Line	**Public Act 295 Company**	**Contract Capacity** MW	**Fuel Type**	**Capacity Price** $/ZRC - Month	**Variable Energy Rate** **On-Peak** $/MWh	**Off-Peak** $/MWh	**REC Price** $/REC	**MPSC Order Approving Capacity Rate**	**Expected Termination Date**
69	Brook View Dairy	0.600	Gas Digester	0.00	86		0.00	April 23, 2015 - U-15805	12/31/35
70	Green Meadow Farms, Inc.	0.800	Gas Digester	0.00	Scheduled Rate 76.39 - 106.39		0.00	April 23, 2015 - U-15805	7/14/27
71	Scenic View Dairy	0.400	Gas Digester	0.00	86		0.00	April 23, 2015 - U-15805	12/31/35

PURCHASED POWER CONTRACT RATES AND MPSC APPROVAL ORDERS

PUBLIC ACT 295 CONTRACTS - EXPERIMENTAL ADVANCED RENEWABLE PROGRAM - SOLAR

	(a)	(b)	(c)	(d)	(e)	(f)	(g)	(h)	(i)
Line	**Public Act 295 Company**	**Contract Capacity**	**Fuel Type**	**Capacity Price**	**Variable Energy**		**REC Price**	**MPSC Order Approving Capacity Rate**	**Expected Termination Date[2]**
					On-Peak	**Off-Peak**			
		MW		$/ZRC - Month	$/MWh	$/MWh	$/REC		
72	Experimental Advanced Renewable Program ("EARP") residential Phase 1	0.180	Solar	-	650		-	December 21, 2010 - U-15805	Varies
73	Experimental Advanced Renewable Program ("EARP") non- residential Phase 1	1.002	Solar	-	450		-	December 21, 2010 - U-15805	Varies
74	Experimental Advanced Renewable Program ("EARP") residential Phase 2	0.291	Solar	-	525		-	May 10, 2011 - U-15805	Varies
75	Experimental Advanced Renewable Program ("EARP") non-residential Phase 2	0.548	Solar	-	375		-	May 10, 2011 - U-15805	Varies
76	Experimental Advanced Renewable Program ("EARP") non-residential Phase 3	0.024	Solar	-	229 [1]		-	February 28, 2013 - U-15805	Varies
77	Experimental Advanced Renewable Program ("EARP") residential Phase 4	0.108	Solar	-	259 [1]		-	February 28, 2013 - U-15805	Varies
78	Experimental Advanced Renewable Program ("EARP") non-residential Phase 5	0.050	Solar	-	229 [1]		-	February 28, 2013 - U-15805	Varies
79	Experimental Advanced Renewable Program ("EARP") residential Phase 6	0.093	Solar	-	259 [1]		-	February 28, 2013 - U-15805	Varies
80	Experimental Advanced Renewable Program ("EARP") residential Phase 7	0.091	Solar	-	249 [1]		-	February 28, 2013 - U-15805	Varies
81	Experimental Advanced Renewable Program ("EARP") non-residential Phase 8	0.029	Solar	-	219 [1]		-	February 28, 2013 - U-15805	Varies
82	Experimental Advanced Renewable Program ("EARP") residential Phase 9	0.105	Solar	-	249 [1]		-	February 28, 2013 - U-15805	Varies
83	Experimental Advanced Renewable Program ("EARP") residential Phase 10	0.078	Solar	-	249 [1]		-	May 2, 2014 - U-15805	Varies
84	Experimental Advanced Renewable Program ("EARP") non-residential Phase 11	0.334	Solar	-	209 [1]		-	May 2, 2014 - U-15805	Varies
85	Experimental Advanced Renewable Program ("EARP") residential Phase 12	0.068	Solar	-	249 [1]		-	May 2, 2014 - U-15805	Varies
86	Experimental Advanced Renewable Program ("EARP") residential Phase 13	0.051	Solar	-	243 [1]		-	May 2, 2014 - U-15805	Varies
87	Experimental Advanced Renewable Program ("EARP") non-residential Phase 14	0.281	Solar	-	199 [1]		-	May 2, 2014 - U-15805	Varies
88	Experimental Advanced Renewable Program ("EARP") residential Phase 15	0.133	Solar	-	243 [1]		-	May 2, 2014 - U-15805	Varies
89	Experimental Advanced Renewable Program ("EARP") residential Phase 16	0.104	Solar	-	243 [1]		-	April 23, 2015 - U-15805	Varies
90	Experimental Advanced Renewable Program ("EARP") non-residential Phase 17	0.171	Solar	-	199 [1]		-	April 23, 2015 - U-15805	Varies
91	Experimental Advanced Renewable Program ("EARP") residential Phase 18	0.085	Solar	-	243 [1]		-	April 23, 2015 - U-15805	Varies
92	Experimental Advanced Renewable Program ("EARP") residential Phase 19	0.119	Solar	-	243 [1]		-	April 23, 2015 - U-15805	Varies
93	Experimental Advanced Renewable Program ("EARP") non-residential Phase 20	0.580	Solar	-	199 [1]		-	April 23, 2015 - U-15805	Varies
94	Experimental Advanced Renewable Program ("EARP") residential Phase 21	0.149	Solar	-	240 [1]		-	April 23, 2015 - U-15805	Varies
95	Experimental Advanced Renewable Program ("EARP") residential Phase 26	0.179	Solar	-	240 [1]		-	February 11, 2016 - U-15805	Varies
96	Experimental Advanced Renewable Program ("EARP") non-residential Phase 27	0.430	Solar	-	199 [1]		-	February 11, 2016 - U-15805	Varies
97	Experimental Advanced Renewable Program ("EARP") residential Phase 28	0.161	Solar	-	240 [1]		-	February 11, 2016 - U-15805	Varies
98	Experimental Advanced Renewable Program ("EARP") residential Phase 29	0.222	Solar	-	240 [1]		-	February 11, 2016 - U-15805	Varies
99	Experimental Advanced Renewable Program ("EARP") non-residential Phase 30	0.208	Solar	-	199 [1]		-	February 11, 2016 - U-15805	Varies
100	Experimental Advanced Renewable Program ("EARP") residential Phase 31	0.118	Solar	-	240 [1]		-	February 11, 2016 - U-15805	Varies
101	Experimental Advanced Renewable Program ("EARP") residential Phase 32	0.091	Solar	-	240 [1]		-	February 11, 2016 - U-15805	Varies
102	Experimental Advanced Renewable Program ("EARP") non-residential Phase 33	0.148	Solar	-	199 [1]		-	February 11, 2016 - U-15805	Varies
103	Experimental Advanced Renewable Program ("EARP") residential Phase 34	0.068	Solar	-	240 [1]		-	February 11, 2016 - U-15805	Varies
104	Experimental Advanced Renewable Program ("EARP") non-residential Phase 35	0.101	Solar	-	199 [1]		-	February 11, 2016 - U-15805	Varies

[1] Contracts awarded as part of EARP since Phase 3 inlcude a provision to pay an additional $1/MWh if certain conditions are satisfied. Most participants failed to satisfy the incentive provision.

[2] Contracts terminate no later than August 31, 2029

STATE OF MICHIGAN

BEFORE THE MICHIGAN PUBLIC SERVICE COMMISSION

In the matter of the application of **CONSUMERS ENERGY COMPANY** for reconciliation of its power supply cost recovery plan (Case No. U-20219) for the 12 months ended December 31, 2019.	))))))	Case No. U-20220

DIRECT TESTIMONY

OF

EMILY J. WARNERS

ON BEHALF OF

CONSUMERS ENERGY COMPANY

March 2020

Q. Please state your name and business address.

A. My name is Emily J. Warners, and my business address is 1945 West Parnall Road, Jackson, Michigan 49201.

Q. By whom are you employed?

A. I am employed by Consumers Energy Company ("Consumers Energy" or the "Company").

Q. In what capacity are you employed?

A. I am a Senior Engineer responsible for Supply Contracts in the Electric Grid Integration Contracts and Settlements section of the Electric Supply Department.

QUALIFICATIONS

Q. Please describe your educational background and business experience.

A. I received the degree of Bachelor of Science in Engineering with a specialty in Civil Engineering from Michigan State University in 2011. In 2018, I became a Professional Engineer in the state of Michigan.

In June 2011, I joined NTH Consultants, Ltd as a Staff Engineer where I performed field services and issued reports for heavy underground projects and environmental due diligence projects. In January 2013, I joined Consumers Energy as a Project Engineer in the Enterprise Project Management department where I managed multi-million dollar engineering and fabrication contractors. During my tenure in the Enterprise Project Management department, I fulfilled multiple roles. I was the lead engineer for the 111 MW installation of Consumers Energy's Cross Winds Energy Park. I was the project manager for the construction of the 3 MW solar facility at Grand Valley State University and a second 1 MW solar facility at Western Michigan University, as

well as the Quality Manager for the 44 MW expansion of Cross Winds Energy Park. In March of 2018, I accepted a position as Senior Engineer in the Supply Contracts section of the Electric Grid Integration Contracts and Settlements department of Electric Supply. In this role, I am responsible for administration and coordination of the Company's Experimental Advanced Renewable Program ("EARP") – Solar and EARP-Anaerobic Digestion. I am also responsible for the Renewable Energy Plan as well as the calculation of the Transfer Price associated with renewable energy and capacity and the tracking of Renewable Energy Credits ("RECs").

Q. Have you previously provided testimony before the Michigan Public Service Commission ("MPSC" or the "Commission")?

A. Yes. I provided testimony in:

- Case No. U-20171 (direct), the Company's 2017 Renewable Reconciliation case, regarding Renewable Energy Plan expenses recovered through Power Supply Cost Recovery ("PSCR"), renewable energy compliance, and new renewable capacity compliance;
- Case No. U-20202 (direct), the Company's Reconciliation of Power Supply Cost and Revenues for the Calendar Year 2018; and
- Case No. U-20483 (direct), the Company's 2018 Renewable Reconciliation case, regarding Renewable Energy Plan expenses recovered through the PSCR, renewable energy compliance, and new renewable capacity compliance.

Q. What is the purpose of your testimony?

A. My testimony will address the Renewable Energy Transfer Price ("Transfer Price") included in PSCR expenses.

Q. **Are you sponsoring any exhibits?**

A. Yes. I am sponsoring the following exhibit:

Exhibit A-23 (EJW-1)	PA 295 Purchased Power and New Build Renewables - 2019.

Q. Was this exhibit created by you or under your direction or supervision?

A. Yes.

TRANSFER PRICE

Q. What is the Transfer Price?

A. The Transfer Price is the price at which the cost of renewable energy is recovered through the Company's PSCR clause pursuant to MCL 460.1047 and MCL 460.1049 of 2008 PA 295 ("PA 295") and as established by the Commission.

Q. What is the estimated Transfer Price for 2019?

A. The estimated Transfer Price for 2019 is approximately $80.26 per MWh, as shown on Exhibit A-23 (EJW-1), line 27, column (g).

Q. What is the Transfer Cost?

A. The Transfer Cost is the total cost that the Company will transfer to power supply costs, in accordance with MCL 460.1047(2)(b)(iv), associated with renewable generation obtained in accordance with MCL 460.1028.

Q. How much renewable generation, for which the Transfer Price applies, was produced in 2019?

A. A total of 1,731,626 MWh of Transfer Price-applicable renewable generation was booked in 2019, as shown on Exhibit A-23 (EJW-1), line 27, column (b).

Q. Please describe Exhibit A-23 (EJW-1).

A. Exhibit A-23 (EJW-1) is the calculation of the total amount of Transfer Price-applicable renewable energy expenses to be recovered through the PSCR mechanism from renewable generation delivered in 2019. Exhibit A-23 (EJW-1), column (a), lists all generators, counterparties, or Company-owned facilities from which the Company received renewable energy or renewable energy capacity in 2019 for which costs were

expensed in 2019. Column (b) details the Energy Delivered in MWh's or the applicable generation production for counterparties and Company-owned facilities to which the transfer price methodology was applied in 2019. Column (c) shows the total Energy Cost associated with energy production for 2019. Column (d) shows the total Capacity Cost associated with capacity value of each generator. Column (e) shows the Total Transfer Cost expensed in 2019 for each generator. Total Transfer Cost is calculated by summing columns (c) and (d). Column (f) represents the energy portion of the Transfer Price for each generator by dividing column (c) by column (b). Column (g) is the total Transfer Price for each unit calculated by dividing the total Transfer Cost in column (e) by the Transfer Price-applicable generation in column (b).

Q. How are the total transfer costs associated with PA 295 Power Purchase Agreements ("PPAs") and Company-owned New Build Renewables as shown on Exhibit A-23 (EJW-1) reflected in this PSCR Reconciliation?

A. The Transfer Price-applicable generation, total Transfer Cost, and calculated Transfer Price for all of the PA 295 PPAs and the subscribed portions of the Solar Gardens Program is shown on Exhibit A-23 (EJW-1), line 19. The subscribed portion of the Large Customer Renewable Energy Pilot Program ("LC-REP") is shown on Exhibit A-23 (EJW-1), line 28. The sum of these values is included on Exhibit A-19 (KGT-1), line 2, as Purchased Power & Programs – PA 295. The Transfer Price-applicable generation, total Transfer Cost, and calculated Transfer Price of the Company-owned New Build Renewables and the unsubscribed portions of the Solar Gardens Program and the unsubscribed portion of the LC-REP are shown on Exhibit A-23 (EJW-1), line 26. These values are included as PA 295 New Build Renewables on Exhibit A-19 (KGT-1), line 13.

Q. Please describe the LC-REP – Unsubscribed and Subscribed as shown on lines 20 and 28, respectively, of Exhibit A-23 (EJW-1).

A. The "LC-REP – Unsubscribed" line item consists of Cross Winds Energy Park – Phase II generation that was not utilized by the LC-REP. The generation is handled in the same manner as other New Build Renewables. The "LC-REP – Subscribed" line item consists of the credits provided to customers through the LC-REP. Participants of the LC-REP pay $0.045 per kWh as the subscription fee and are credited on their monthly bills at a rate based on the Midcontinent Independent System Operator, Inc. ("MISO") Locational Marginal Price and annual Planning Reserve Auction clearing price for that year. LC-REP is designed in such a way that the customers who voluntarily enroll in the Program are paying for the costs of the renewable energy subscribed. Therefore, the subscription fees collected will be treated as revenue and directly offset the costs in the Renewable Energy Plan. The revenue the Company has received from selling the renewable energy and capacity of the subscribed portion of the LC-REP into the MISO market, and booked in the PSCR, has been directly offset by credits to participating customers.

Q. Please describe the impact of the LC-REP – Subscribed to the PSCR value and the total Transfer Cost.

A. The LC-REP – Subscribed has no effect on the overall value of PSCR or total Transfer Cost. As shown on Exhibit A-23 (EJW-1), line 28, the subscribed portion of the LC-REP is not included in the calculation of the Transfer Cost (line 25). Expenses shown in Exhibit A-23 (EJW-1), line 28, are credited to the subscribed customers in the LC-REP.

This same amount is offset by the revenue received from MISO for the generation which is included in Exhibit A-19 (KGT-1), line 4.

Q. Please describe the Orders from Case Nos. U-17792 and U-20483 and their impacts on the Transfer Price.

A. Prior to the Commission's March 29, 2016 Opinion and Order in Case No. U-17792 for Company-owned Renewable Energy Plan facilities, the Company transferred to the PSCR up to the amount specified on the applicable Transfer Price schedule without limiting the Transfer Price to the projects' levelized cost of energy. On page 28 of the Case No. U-17792 March 29, 2016 Order, the Commission directed that, "beginning with Consumers' 2015 renewable cost reconciliation, the transfer cost associated with company-owned projects shall be limited to the lesser of the transfer price or the actual levelized cost over the asset life." On January 23, 2020 the Commission issued an Order Approving Settlement Agreement in the Company's 2018 Renewable Energy Cost Reconciliation Case No. U-20483. The approved settlement agreement provided, in part, that "the Company would transfer to the PSCR up to the Transfer Price amount specified on the applicable Transfer Price schedule without limiting the Transfer Price to the projects' levelized cost of energy." This reversion to the previous Transfer Price methodology does not change the overall costs of renewable energy in any given year but allows for the costs to be collected in a manner that will reduce the amount and duration of the projected asset position and allow for a zero-dollar surcharge of the renewable energy plan to continue for customers.

Q. Please explain new Cross Winds Energy Park III – New Build Renewables in Exhibit A-23 (EJW-1), line 24.

A. Cross Winds Energy Park III is a 76 MW expansion of the Company-owned wind farm in Tuscola County, Michigan. The Cross Winds Energy Park III utilizes GE 2.3-116 technology and achieved Commercial Operation on December 4, 2019. The facility is part of the Company's Renewable Energy Plan and will be subject to the applicable Transfer Price methodology.

Q. Based on these calculations, what is the Transfer Price?

A. As discussed above, the Company calculates the Transfer Price for 2019 to be $80.26 per MWh and is shown on Exhibit A-23 (EJW-1), line 27, column (g). The Company calculates the total Transfer Cost to be $138,978,646, as shown on Exhibit A-23 (EJW-1), line 27, column (e).

Q. Does this complete your direct testimony?

A. Yes, it does.

S T A T E O F M I C H I G A N

BEFORE THE MICHIGAN PUBLIC SERVICE COMMISSION

In the matter of the application of **CONSUMERS ENERGY COMPANY** for reconciliation of its power supply cost recovery plan (Case No. U-20219) for the 12 months ended December 31, 2019.	))))))	Case No. U-20220

EXHIBIT OF

OF

EMILY J. WARNERS

ON BEHALF OF

CONSUMERS ENERGY COMPANY

March 2020

MICHIGAN PUBLIC SERVICE COMMISSION
Consumers Energy Company

Case No.: U-20220
Exhibit No.: A-23 (EJW-1)
Page: 1 of 1
Witness: EJWarners
Date: March 2020

PA 295 PURCHASED POWER AND NEW BUILD RENEWABLES - 2019

Line No.	(a) Generator	(b) Energy Delivered (MWh)	(c) Energy Cost ($)	(d) Capacity Cost ($)	(e) Total Transfer Cost ($)	(f) Average Energy Cost ($/MWh)	(g) Average Total Cost ($/MWh)
1	Apple Blossom Wind Farm	264,743	6,042,076	5,341,888	11,383,963	22.82	43.00
2	Blissfield Renewable (Beebe)	186,705	15,623,873	2,043,134	17,667,008	83.68	94.63
3	Brook View Dairy-AD	2,422	84,281	78,353	162,634	34.80	67.16
4	Elk Rapids 2	1,665	78,862	66,662	145,524	47.37	87.41
5	Generate Fremont Digester LLC	5,358	92,025	447,935	539,961	17.18	100.78
6	Green Meadow Farms	3,435	131,924	111,095	243,019	38.40	70.75
7	Harvest II Windfarm	174,043	14,399,877	1,911,572	16,311,449	82.74	93.72
8	Heritage Garden Wind Farm I	52,733	3,992,440	621,301	4,613,741	75.71	87.49
9	Heritage Garden Solar	1,277	115,437	0	115,437	90.41	90.41
10	Heritage Stoney Corners I	30,749	2,118,316	363,012	2,481,328	68.89	80.70
11	Heritage Stoney Corners I (Phase 3)	21,008	1,591,278	242,008	1,833,286	75.74	87.26
12	Michigan Wind 2	260,221	19,982,719	2,880,778	22,863,497	76.79	87.86
13	NANR Lennon Generating	11,314	620,474	228,074	848,547	54.84	75.00
14	EARP	6,135	372,267	302,517	674,784	60.68	109.99
15	Scenic View Dairy-AD	2,620	74,619	84,769	159,388	28.48	60.82
16	WM Renewable - Northern Oaks	7,740	299,101	245,527	544,629	38.64	70.37
17	WM Renewable Pine Tree Acres	69,298	4,297,757	2,109,573	6,407,330	62.02	92.46
18	Solar Gardens - Subscribed	4,468	183,422	147,587	331,009	41.05	74.08
19	**SUBTOTAL-Purchased Power**	**1,105,934**	**70,100,748**	**17,225,786**	**87,326,534**	**63.39**	**78.96**
20	LC-REP - Unsubscribed	11,566	386,566	325,368	711,934	33.42	61.55
21	Solar Gardens-Unsubscribed - New Build Renewables	484	19,853	15,974	35,827	41.05	74.08
22	Cross Winds Energy Park - New Build Renewables	320,235	13,824,561	9,699,930	23,524,491	43.17	73.46
23	Lake Winds Energy Park - New Build Renewables	268,591	22,324,273	3,058,693	25,382,966	83.12	94.50
24	Cross Winds III Energy Park - New Build Renewables	24,121	1,073,163	871,991	1,945,154	44.49	80.64
25	Circuit West	694	28,630	23,110	51,740	41.24	74.53
26	**SUBTOTAL - New Build Renewables**	**625,691**	**37,657,046**	**13,995,066**	**51,652,112**	**60.18**	**82.55**
27	**SUBTOTAL - Transfer Price Applicable**	**1,731,626**	**107,757,794**	**31,220,852**	**138,978,646**	**62.23**	**80.26**
28	LC-REP-Subscribed	116,703	2,890,970	45,106	2,936,077	24.77	25.16

STATE OF MICHIGAN

BEFORE THE MICHIGAN PUBLIC SERVICE COMMISSION

In the matter of the application of **CONSUMERS ENERGY COMPANY** for reconciliation of its power supply cost recovery plan (Case No. U-20219) for the 12 months ended December 31, 2019.	))))))	Case No. U-20220

PROOF OF SERVICE

STATE OF MICHIGAN)
) SS
COUNTY OF JACKSON)

Jennifer Joy Yocum, being first duly sworn, deposes and says that she is employed in the Legal Department of Consumers Energy Company; that on March 31, 2020, she served an electronic copy of Consumers Energy Company's Application and the Testimony and Exhibits of Consumers Energy Company's witnesses Joshua W. Hahn, Norman J. Kapala, Stephen J. Nadeau, Hannah L. Patton, Jenny L. Rickard, Angela K. Rissman, Raymond T. Scaife, Keith G. Troyer, and Emily J. Warners upon the persons listed in Attachment 1 hereto, at the e-mail addresses listed therein.

Digitally signed by Jennifer Joy Yocum
Date: 2020.03.31 13:56:50 -04'00'

Jennifer Joy Yocum

Subscribed and sworn to before me this 31st day of March, 2020.

Digitally signed by Melissa K. Harris
Date: 2020.03.31 13:55:15 -04'00'

Melissa K. Harris, Notary Public
State of Michigan, County of Jackson
My Commission Expires: 06/11/20
Acting in the County of Jackson

ATTACHMENT 1 TO CASE NO. U-20220
(Parties from Case No. U-20219)

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