Founded in 1852
by Sidney Davy Miller

MILLER CANFIELD

MICHIGAN
ILLINOIS
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WASHINGTON, D.C.
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CANADA
CHINA
MEXICO
POLAND
QATAR

Paul Michael Collins
TEL +1.517.483.4908
FAX +1.517.374.6304
E-MAIL Collinsp@MillerCanfield.com

Miller, Canfield, Paddock and Stone, P.L.C.
120 N. Washington Square, Suite 900
One Michigan Avenue Building
Lansing, Michigan 48933
TEL (517) 487-2070
FAX (517) 374-6304
millercanfield.com

October 15, 2021

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

Re: Case No U-21081: In the matter of Upper Michigan Energy Resources Corporation for Approval of an Integrated Resource Plan under MCL 460.6t and for other relief.

Dear Ms. Felice:

Enclosed for electronic filing in the above case please find Upper Michigan Energy Resources Corporation's Direct Case, which includes the following:

1. Application;
   a. Attachment A. Letter of Transmittal;
   b. Attachment B. Proposed Protective Order;
2. Direct Testimony and Exhibits of Richard F. Stasik;
3. Direct Testimony and Exhibits of Aaron L. Nelson;
4. Direct Testimony and Exhibits of Kim M. Keller;
5. Direct Testimony and Exhibits of Jared J. Peccarelli;
6. Direct Testimony and Exhibits of Robert A. Greco; and
7. Appearances of Paul Collins and Sherri Wellman.

The proposed Notice of Hearing has also been e-mailed to Angela Sanderson.

Should you have any questions, please contact me.

Very truly yours,

Miller, Canfield, Paddock and Stone, P.L.C.

Paul M. Collins

Digitally signed by: Paul M. Collins
DN: CN = Paul M. Collins email = collinsp@millercanfield.com C = US O = Miller Canfield
Date: 2021.10.15 15:02:37 -04'00'

By: _____
Paul M. Collins

PMC:ark
Enclosures
cc w/enc: Ted Eidukas
Richard Stasik
Koby Bailey

STATE OF MICHIGAN

BEFORE THE MICHIGAN PUBLIC SERVICE COMMISSION

*** * * * ***

In the matter of the application of **UPPER MICHIGAN ENERGY RESOURCES** **CORPORATION** for approval of its integrated resource plan pursuant to MCL 460.6t and for other relief.	)))))	Case No. U-21081

APPLICATION

Upper Michigan Energy Resources Corporation ("UMERC" or the "Company") files this Application with the Michigan Public Service Commission ("MPSC" or the "Commission") requesting approval of its Integrated Resource Plan ("IRP") pursuant to Section 6t of 2016 PA 341, MCL 460.6t ("Act 341"). In support of this Application, UMERC respectfully represents to the Commission as follows:

I. Introduction

1. UMERC is a public service corporation organized under the laws of Michigan with service centers located at 800 Industrial Park Drive, Iron Mountain, Michigan, and 1717 Tenth Avenue, Menominee, Michigan. On December 9, 2016, the Commission issued its order approving settlement agreement in Case No. U-18061, pursuant to which, effective January 1, 2017, UMERC was formed as a Michigan jurisdictional regulated utility to provide, among other things, electric service to all retail customers within the former public utility service territories of Wisconsin Electric Power Company ("Wisconsin Electric") and Wisconsin Public Service Company in the state of Michigan, with the initial exception of Tilden Mining Company L.C. ("Tilden") and the

Empire Iron Mining Partnership ("Empire")[1]. On October 25, 2017, in its Opinion and Order issued in Case No. U-18224, the Commission granted UMERC a Certificate of Necessity ("CON") to construct two reciprocating internal combustion engines ("RICE") generation facilities (a/k/a "UP Generation Project"). Further, the Commission approved a special contract between UMERC and Tilden pursuant to which UMERC began providing electrical service to Tilden on the first day of the month following the commercial operation date of the UP Generation Project, and as of March 31, 2019, ensuing with the onset of operations of the RICE units, Wisconsin Electric ceased providing retail electric service in the State of Michigan and effective April 1, 2019, Tilden became UMERC's customer.

2. UMERC provides retail electric service in cities, villages and townships in the counties of Alger, Baraga, Delta, Dickinson, Gogebic, Houghton, Iron, Marquette, Menominee, and Ontonagon.

3. Pursuant to 1909 PA 106, as amended, MCL 460.551 et seq.; 1909 PA 300, amended, MCL 462.2 et seq.; 1919 PA 419, as amended, MCL 460.51 et seq.; and 1939 PA 3, as amended, MCL 460.1 et seq., UMERC's retail electric business in the state of Michigan is subject to the Commission's jurisdiction.

4. On December 21, 2016, Public Act 341 of 2016 ("Act 341") was signed into law and became effective on April 20, 2017. Section 6t of Act 341, MCL 460.6t (3), calls for all regulated electric utilities to file an IRP, and for the Commission to conduct contested proceedings to review the IRP. Section 6t (5) of Act 341 dictates the content of IRPs. In its December 20,

[1] In its December 9, 2016 Order in Case No. U-17862, the Commission approved the termination of the special contract between WEPCO and Empire.

2017 Opinion and Order issued in Case Nos. U-15896 and U-18461, the Commission approved filing instructions for IRPs.

5. On April 19, 2019, UMERC filed its first IRP with the Commission in Case No. U-20470, and on October 17, 2019, the MPSC issued its Order approving a settlement agreement and directing UMERC to file its next IRP not later than two years from the date of the order.

6. In Case No. U-18095, the Commission addressed the Public Utility Regulatory Policies Act of 1978 ("PURPA") as relating to UMERC's PURPA avoided costs of capacity and energy and directed that Company should address the avoided costs, thereafter, in biennial avoided cost review proceedings. On February 8, 2021, following the filing of a motion by UMERC in Case No. U-20470, et al., the Commission issued its Order granting the Company's request to extend the filing date for UMERC's biennial PURPA avoided cost review until October 15, 2021 and consolidate it within this IRP proceeding.

7. In this filing, UMERC is presenting its comprehensive IRP and addressing PURPA. In developing this IRP, the Company assessed its capacity resource portfolio in light of capacity and energy needs, regulatory and environmental compliance, and the planning objectives as set forth by the Commission and the Company. The remainder of this Application describes the development and an overview of the Company's IRP and addresses UMERC's PURPA avoided cost proposal.

II. Development and Overview of IRP

8. The required components of an IRP filing are specifically provided in MCL 460.6t(5)(a)-(o). MCL 460.6t(8) states that the Commission shall approve a proposed IRP if it determines that the IRP represents the most reasonable and prudent means of meeting the electric utility's energy and capacity needs. To make such a determination, the Commission must

consider whether the proposed IRP appropriately balances the following factors: (i) Resource adequacy and capacity to serve anticipated peak electric load, applicable reserve margins, and local clearing requirement; (ii) Compliance with applicable state and federal environmental regulations; (iii) Competitive pricing; (iv) Reliability; (v) Commodity price risks; (vi) Diversity of generation supply; and (vii) Proposed levels of peak load reduction and energy waste reduction are reasonable and cost effective.

9. The Company's IRP meets the statutory requirements for an IRP filed before the Commission. The Company's testimony and exhibits, which accompany this Application, address the components required to be included in an IRP, and address the factors that the Commission shall consider in approving an IRP, and establish that the Company's plan represents "the most reasonable and prudent means of meeting the electric utility's energy and capacity needs."

10. UMERC's IRP also meets the Commission's adopted modeling scenarios, assumptions and filing requirements. The modeling process used by the Company to develop the IRP was rigorous and comprehensive, consistent with good utility practice, followed all applicable Commission rules, and ultimately ensures the identification of the most reasonable and prudent resources to serve customers in a cost-effective and reliable manner.

11. UMERC conducted public outreach during its IRP modeling efforts which sought to inform the public regarding the Company's IRP activities and solicit feedback. Specifically, Exhibit A-1 (RFS-1) provides greater detail concerning these efforts and the feedback received by the Company.

12. Following the completion of the Company's IRP modeling efforts, the Company established a plan which represents the Company's preferred course of action ("PCA") for

meeting the energy and capacity needs of its customers through the five, ten, fifteen, and twenty-year planning periods. To be sure, the Company's PCA reflects the Commission's approval granted in Case No. U-18224 and the subsequent build and operation of UMERC's generation fleet of 10 RICE units with total capacity of 183 MW. These RICE units sufficiently cover the needs of its customers, including Tilden, and a firm load obligation of approximately 81.1 MW. As such UMERC's PCA includes (i) continued use and maintenance of the RICE units as well as; (ii) continuation of the Company's energy waste reduction and demand reduction programs; and (iii) the addition of 100 MW of solar generation, reducing UMERC's air emissions from the Company's generating portfolio and displacing forecasted higher-cost market energy purchases the Company's Business as Usual scenario.

13. The Company's PCA was evaluated with a complex and robust risk assessment methodology, which also addressed the two additional scenarios required by the Commission in its February 18, 2021 Order in Case No. U-20633, et al. intended to illustrate a path toward an electrification future and achieving the goal of 28% carbon reduction by 2025 as dictated in ED 2020-10. The Company's risk assessment is contained in Exhibit A-6 (KMK-1).

14. The Company's plan is a fully integrated proposal that ties the planned evolution of UMERC's resource portfolio as described above and in the Company's testimony and exhibits filed in this case. Since the Company's plan is a fully integrated proposal with numerous components, modification to, or rejection of, a proposal made in the plan impacts the plan's viability and the Company's willingness to execute on the remaining portions of the plan not modified or rejected. As such, the Company reserves the right to abandon or amend its plan if the Commission rejects or modified any of the Company's proposals presented in this IRP.

III. PURPA Proposal

15. Michigan law requires all rates to be just and reasonable, MCL 460.54, MCL 460.557(4), and MCL 462.22(a).

16. PURPA provides that no state Commission in setting rates for a utility to pay a Qualifying Facility ("QF") "shall provide for a rate which exceeds the incremental cost to the electric utility of alternative energy." 16 USC 824a-3(b). PURPA defines the "incremental cost of alternative electric energy" as "the cost to the electric utility of the electric energy which, but for the purchase from such co-generator or small producer, such utility would generate or purchase from another source." 16 USC 824a-3(d). The Federal Energy Regulatory Commission ("FERC") regulations which implement PURPA provide that the rates set by state commissions must "[b]e just and reasonable to the electric consumers of the electric utility" and that [n]othing in [the regulations] requires any electric utility to pay more than the avoided costs for purchases." 18 CFR 292.304(a)(1)-(2). The regulations define "avoided costs" as "the incremental costs to an electric utility of electric energy or capacity or both which, but for the purchase from the qualifying facility or qualifying facilities, such utility would generate itself or purchase from another source." 18 CFR 292.101(b)(6).

17. The Commission found in its December 20, 2018 Opinion and Order in Case No. U-18095 that UMERC should adopt an avoided capacity cost based on Midcontinent Independent System Operator ("MISO") capacity market values; and that for energy payments, UMERC should adopt an avoided energy cost based on the MISO Locational Marginal Price ("LMP") for UMERC's load. With this filing, UMERC is proposing to continue that practice. The Company represents that its proposal will result in just and reasonable customer rates and will avoid a situation in which the Company will pay more than the avoided costs of purchases.

IV. Testimony and Exhibits, and Other Matters

18. Concurrent with the filing of this Application, UMERC is filing the direct testimony and exhibits of Richard F. Stasik, Aaron L. Nelson, Kim M. Keller, Jared J. Peccarelli, and Robert A. Greco in support of its IRP and PURPA proposal.

19. In addition to the issues described above, it is possible that other pending or to-be-filed proceedings or other events may have impacts upon the Company's requests in this proceeding. These impacts will be evaluated for materiality and may need to be considered in the results of this proceeding.

20. As required in the Commission's IRP filing requirements, UMERC has included a Letter of Transmittal as Attachment A to this Application. The Company's Letter of Transmittal expresses a commitment to the Company's approved resource plan and resource acquisition strategy and has been signed by an officer of the Company with authority to commit the Company to the resource acquisition strategy acknowledging that the Company reserves the right to make changes to its resource acquisition strategies as appropriate due to changing circumstances.

21. Furthermore, due to the confidential nature of information contained in and included with the Company's IRP filing UMERC is proposing entry of a protective order. The Company's proposed protective order is included as Attachment B to this Application. The Company requests that the entry of its proposed protective order be considered during the prehearing conference in this matter.

WHEREFORE, Upper Michigan Energy Resources Corporation respectfully requests that the Commission issue its order:

A. Finding that its Integrated Resource Plan meets the requirements of MCL 460.6t;

B. Approving the Proposed Course of Action, inclusive of all proposals presented by Upper Michigan Energy Resources Corporation in this case, as the most reasonable and prudent means of meeting the Company's energy and capacity needs;

C. Determining that Upper Michigan Energy Resources Corporation has no Public Utility Regulatory Policies Act of 1978 capacity need so long as the Company is implementing the Proposed Course of Action;

D. Approving Upper Michigan Energy Resource Company's proposal for determining avoided cost rates pursuant to the Public Utility Regulatory Policies Act of 1978; and

E. Granting such other and further relief as is lawful and proper.

Respectfully submitted,

UPPER MICHIGAN ENERGY RESOURCES CORPORATION

Dated: October 15, 2021

By: Paul M. Collins

Digitally signed by: Paul M. Collins
DN: CN = Paul M. Collins email = collinsp@millercanfield.com C = US O = Miller Canfield
Date: 2021.10.15 15:04:17 -04'00'

One of Its Attorneys
Sherri A. Wellman (P38989)
Paul M. Collins (P69719)
MILLER, CANFIELD, PADDOCK AND STONE, P.L.C.
One Michigan Avenue, Suite 900
Lansing, MI 48933
(517) 487-2070

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STATE OF MICHIGAN

BEFORE THE MICHIGAN PUBLIC SERVICE COMMISSION

* * * *

In the matter of the application of **UPPER MICHIGAN ENERGY RESOURCES CORPORATION** for approval of its integrated resource plan pursuant to MCL 460.6t and for other relief.	)))))	Case No. U-21081

LETTER OF TRANSMITTAL

I, Kevin Fletcher, hereby express Upper Michigan Energy Resources Corporation's commitment to the Company's proposed Integrated Resource Plan, which represents the Company's preferred resource plan and resource acquisition strategy, and hereby sign this Letter of Transmittal as an officer of the Company having the authority to commit the Company to the Plan, acknowledging that the Company reserves the right to make changes to its Plan as appropriate due to changing circumstances.

Dated: October 15, 2021

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 **UPPER MICHIGAN ENERGY RESOURCES CORPORATION** for approval of its integrated resource plan pursuant to MCL 460.6t and for other relief.	))))	Case No. U-21081

PROTECTIVE ORDER

This Protective Order governs the use and disposition of Protected Material that Upper Michigan Energy Resources Corporation ("Applicant") or any other Party discloses to another Party during the course of this proceeding. The Applicant or other Party disclosing Protected Material is referred to as the "Disclosing Party"; the recipient is the "Receiving Party" (defined further below). The intent of this Protective Order is to protect non-public, confidential information and materials so designated by the Applicant or by any other party, which information and materials contain confidential, proprietary, or commercially sensitive information. This Protective Order defines "Protected Material" and describes the manner in which Protected Material is to be identified and treated. Accordingly, it is ordered:

I. "Protected Material" and Other Definitions

A. For the purposes of this Protective Order, "Protected Material" consists of trade secrets or confidential, proprietary, or commercially sensitive information provided in Disclosing Party's discovery or audit responses, any witness' related exhibit and testimony, and any arguments of counsel describing or relying upon the Protected Material. Subject to challenge under Paragraph IV.A, Protected Material shall consist of non-public confidential information and

materials including, but not limited to, the following information disclosed during the course of this case if it is marked as required by this Protective Order:

1. Trade secrets or confidential, proprietary, or commercially sensitive information provided in response to discovery, in response to an order issued by the presiding hearing officer or the Michigan Public Service Commission ("MPSC" or the "Commission"), in testimony or exhibits filed later in this case, or in arguments of counsel;

2. To the extent permitted, information obtained under license from a third-party licensor, to which the Disclosing Party or witnesses engaged by the Disclosing Party is a licensee, that is subject to any confidentiality or non-transferability clause. This information includes reports; analyses; models (including related inputs and outputs); trade secrets; and confidential, proprietary, or commercially sensitive information that the Disclosing Party or one of its witnesses receives as a licensee and is authorized by the third- party licensor to disclose consistent with the terms and conditions of this Protective Order; and

3. Information that could identify the bidders and bids, including the winning bid, in a competitive solicitation for a power purchase agreement or in a competitively bid engineering, procurement, or construction contract at any stage of the selection process *(i.e.*, before the Disclosing Party has entered into a power purchase agreement or selected a contractor).

B. The information subject to this Protective Order does not include:

1. Information that is or has become available to the public through no fault of the Receiving Party or Reviewing Representative and no breach of this Protective Order, or information that is otherwise lawfully known by the Receiving Party without any obligation to hold it in confidence;

2. Information received from a third party free to disclose the information without restriction;

3. Information that is approved for release by written authorization of the Disclosing Party, but only to the extent of the authorization;

4. Information that is required by law or regulation to be disclosed, but only to the extent of the required disclosure; or

5. Information that is disclosed in response to a valid, non-appealable order of a court of competent jurisdiction or governmental body, but only to the extent the order requires.

C. "Party" refers to the Applicant, MPSC Staff ("Staff'), Michigan Attorney General, or any other person, company, organization, or association that is granted intervention in Case No. U-21081 under the Commission's Rules of Practice and Procedure, Mich Admin Code, R 792.10401 et al.

D. "Receiving Party" means any Party to this proceeding who requests or receives access to Protected Material, subject to the requirement that each Reviewing Representative sign a Nondisclosure Certificate attached to this Protective Order as Attachment 1.

E. "Reviewing Representative" means a person who has signed a Nondisclosure Certificate and who is:

1. An attorney who has entered an appearance in this proceeding for a Receiving Party;

2. An attorney, paralegal, or other employee associated, for the purpose of this case, with an attorney described in Paragraph I.E.1;

3. An expert or employee of an expert retained by a Receiving Party to advise, prepare for, or testify in this proceeding; or

4. An employee or other representative of a Receiving Party with significant responsibility in this case.

A Reviewing Representative is responsible for assuring that persons under his or her supervision and control comply with this Protective Order.

F. "Nondisclosure Certificate" means the certificate attached to this Protective Order as Attachment 1, which is signed by a Reviewing Representative who

has been granted access to Protected Material and agreed to be bound by the terms of this Protective Order.

II. Access to and Use of Protected Material

A. This Protective Order governs the use of all Protected Material that is marked as required by Paragraph III.A and made available for review by the Disclosing Party to any Receiving Party or Reviewing Representative. This Protective Order protects: (i) the Protected Material; (ii) any copy or reproduction of the Protected Material made by any person; and (iii) any memorandum, handwritten notes, or any other form of information that copies, contains, or discloses Protected Material. All Protected Material in the possession of a Receiving Party shall be maintained in a secure place. Access to Protected Material shall be limited to persons authorized to have access subject to the provisions of this Protective Order.

B. Protected Material shall be used and disclosed by the Receiving Party solely in accordance with the terms and conditions of this Protective Order. A Receiving Party may authorize access to, and use of, Protected Material by a Reviewing Representative identified by the Receiving Party, subject to Paragraphs III and V below, only as necessary to analyze the Protected Material; make or respond to discovery; present evidence; prepare testimony, argument, briefs, or other filings; prepare for cross-examination; consider strategy; and evaluate settlement. These individuals shall not release or disclose the content of Protected Material to any other person or use the information for any other purpose.

C. The Disclosing Party retains the right to object to any designated Reviewing Representative if the Disclosing Party has reason to believe that there is an unacceptable risk of misuse of confidential information. If a Disclosing Party objects to a Reviewing Representative, the Disclosing Party and the Receiving Party will attempt to reach an agreement to accommodate that Receiving Party's request to review Protected Material. If no agreement is reached, then either the Disclosing Party or the Receiving Party may submit the dispute to the presiding hearing officer. If the Disclosing Party notifies a Receiving Party of an objection to a Reviewing Representative, then the Protected Material shall not be provided to that Reviewing Representative until the objection is resolved by agreement or by the presiding hearing officer.

D. Before reviewing any Protected Material, including copies, reproductions, and copies of notes of Protected Material, a Receiving Party and Reviewing Representative shall sign a copy of the Nondisclosure Certificate (Attachment 1 to this Protective Order) agreeing to be bound by the terms of this Protective Order. The Reviewing Representative shall also provide a copy of the executed Nondisclosure Certificate to the Disclosing Party.

E. Even if no longer engaged in this proceeding, every person who has signed a Nondisclosure Certificate continues to be bound by the provisions of this Protective Order. The obligations under this Protective Order are not extinguished or nullified by entry of a final order in this case and are enforceable by the MPSC or a court of competent jurisdiction. To the extent Protected Material is not returned to a Disclosing Party, it remains subject to this Protective Order.

F. Members of the Commission, Commission staff assigned to assist the Commission with its deliberations, and the presiding hearing officer shall have access to all Protected Material that is submitted to the Commission under seal without the need to sign the Nondisclosure Certificate.

G. A Party retains the right to seek further restrictions on the dissemination of Protected Material to persons who have or may subsequently seek to intervene in this MPSC proceeding.

H. Nothing in this Protective Order precludes a Party from asserting a timely evidentiary objection to the proposed admission of Protected Material into the evidentiary record for this case.

III. Procedures

A. The Disclosing Party shall mark any information that it considers confidential as "CONFIDENTIAL: SUBJECT TO THE PROTECTIVE ORDER ISSUED IN CASE NO. U-21081." If the Receiving Party or a Reviewing Representative makes copies of any Protected Material, they shall conspicuously mark the copies as Protected Material. Notes of Protected Material shall also be conspicuously marked as Protected Material by the person making the notes.

B. If a Receiving Party wants to quote, refer to, or otherwise use Protected Material in pleadings, pre-filed testimony, exhibits, cross-examination, briefs, oral argument, comments, or in some other form in this proceeding (including administrative or judicial appeals), the Receiving Party shall do so consistent with procedures that will maintain the confidentiality of the Protected Material. For purposes of this Protective Order, the following procedures apply:

1. Written submissions using Protected Material shall be filed in a sealed record to be maintained by the MPSC's Docket Section, or by a court of competent jurisdiction, in envelopes clearly marked on the outside, "CONFIDENTIAL —SUBJECT TO THE PROTECTIVE ORDER ISSUED IN CASE NO. U-21081. Simultaneously, identical documents and materials, with the Protected Material redacted, shall be filed and disclosed the same way that evidence or briefs are usually filed;

2. Oral testimony, examination of witnesses, or argument about Protected Material shall be conducted on a separate record to be maintained by the MPSC's Docket Section or by a court of competent jurisdiction. These separate record proceedings shall be closed to all persons except those furnishing the Protected Material and persons otherwise subject to this Protective Order. The Receiving Party presenting the Protected Material during the course of the proceeding shall give the presiding officer or court sufficient notice to allow the presiding officer or court an opportunity to take measures to protect the confidentiality of the Protected Material; and

3. Copies of the documents filed with the MPSC or a court of competent jurisdiction, which contain Protected Material, including the portions of the exhibits, transcripts, or briefs that refer to Protected Material, must be sealed and maintained in the MPSC's or court's files with a copy of the Protective Order attached.

C. It is intended that the Protected Material subject to this Protective Order should be shielded from disclosure by a Receiving Party. If any person files a request under the Freedom of Information Act with a governmental agency participating in this proceeding, including, but not limited to, the MPSC, the MPSC Staff, and the Michigan Attorney General, seeking access to documents subject to this Protective Order, the governmental agency shall immediately notify the Disclosing Party, and the Disclosing Party may take whatever legal actions it deems appropriate to protect the Protected Material from disclosure. In light of Section 5 of the Freedom of Information Act, MCL 15.235, the notice must be given at least five (5) business days before the governmental agency grants the request in full or in part.

IV. Termination of Protected Status

A. Receiving Party reserves the right to challenge whether a document or information is Protected Material and whether this information can be withheld under this Protective Order. In response to a motion, the Commission or the presiding hearing officer in this case may revoke a document's protected status after notice and hearing. If the presiding hearing officer revokes a document's protected status, then the document loses its protected status after 14 days unless a Party files an application for leave to appeal the ruling to the Commission within that time period. Any Party opposing the application for leave to appeal shall file an answer with the Commission no more than 14 days after the filing and service of the appeal. If an application is filed, then the information will continue to be protected from disclosure until either the time for appeal of the Commission's final order resolving the issue has expired under MCL 462.26 or, if the order is appealed, until judicial review is completed and the time to take further appeals has expired.

B. If a document's protected status is challenged under Paragraph IV.A, the Receiving Party challenging the protected status of the document shall explicitly state its reason for challenging the confidential designation. The Disclosing Party bears the burden of proving that the document should continue to be protected from disclosure.

V. Retention of Documents

Protected Material remains the property of the Disclosing Party and only remains available to the Receiving Party until the time expires for petitions for rehearing of a final MPSC order in Case No. U-21081 or until the MPSC has ruled on all petitions for rehearing in this case (if any). However, an attorney for a Receiving Party who has

signed a Nondisclosure Certificate and who is representing the Receiving Party in an appeal from an MPSC final order in this case may retain copies of Protected Material until either the time for appeal of the Commission's fmal order resolving the issue has expired under MCL 462.26 or, if the order is appealed, until judicial review is completed and the time to take further appeals has expired. On or before the time specified by the preceding sentences, the Receiving Party shall return to the Disclosing Party all Protected Material in its possession or in the possession of its Reviewing Representatives-including all copies and notes of Protected Material-or certify in writing to the Disclosing Party that the Protected Material has been destroyed.

VI. Limitations and Disclosures

The provisions of this Protective Order do not apply to a particular document, or portion of a document, described in Paragraph II.A if a Receiving Party can demonstrate that it has been previously disclosed by the Disclosing Party on a non-confidential basis or meets the criteria set forth in Paragraphs I.B.1 through I.B.S. A Receiving Party intending to disclose information taken directly from materials identified as Protected Material must-before actually disclosing the information-do one of the following: (i) contact the Disclosing Party's counsel of record and obtain written permission to disclose the information, or (ii) challenge the confidential nature of the Protected Material and obtain a ruling under Paragraph IV that the information is not confidential and may be disclosed in or on the public record.

VII. Remedies

If a Receiving Party violates this Protective Order by improperly disclosing or using Protected Material, the Receiving Party shall take all necessary steps to remedy the improper disclosure or use. This includes immediately notifying the MPSC, the presiding hearing officer, and the Disclosing Party, in writing, of the identity of the person known or reasonably suspected to have obtained the Protected Material. A Party or person that violates this Protective Order remains subject to this paragraph regardless of whether the Disclosing Party could have discovered the violation earlier than it was discovered. This paragraph applies to both inadvertent and intentional violations. Nothing in this Protective Order limits the Disclosing Party's rights and remedies, at law or in equity, against a Party or person using Protected Material in a manner not authorized by this Protective Order, including the right to obtain injunctive relief in a court of competent jurisdiction to prevent violations of this Protective Order.

Administrative Law Judge

Attachment 1

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	)	
UPPER MICHIGAN ENERGY RESOURCES	)	Case No. U-21081
CORPORATION	)	
for approval of its integrated resource plan	)	
pursuant to MCL 460.6t and for other relief.		

NONDISCLOSURE CERTIFICATE

By signing this Nondisclosure Certificate, I acknowledge that access to Protected Material is provided to me under the terms and restrictions of the Protective Order issued in Case No. U-21081, that I have been given a copy of and have read the Protective Order, and that I agree to be bound by the terms of the Protective Order. I understand that the substance of the Protected Material (as defined in the Protective Order), any notes from Protected Material, or any other form of information that copies or discloses Protected Material, shall be maintained as confidential and shall not be disclosed to anyone other than in accordance with the Protective Order.

Reviewing Representative

Date: _____, 2021

_____

Title:
Representing:

_____

Printed Name

MPSC Case No. U-21081
UMERC Index of Exhibits

UMERC Exhibit No.	Title	Witness
A-1 (RFS-1)	Outreach Activities	Richard F. Stasik
A-2 (RFS-2)	Survey Results	Richard F. Stasik
A-3 (RFS-3)	IRP Filing Requirements	Richard F. Stasik
A-4 (ALN-1)	Proposed Tariff Modifications Redline	Aaron L. Nelson
A-5 (ALN-2)	Cost Per kWh of Preferred Course of Action	Aaron L. Nelson
A-6 (KMK-1)	Economic Evaluation (CONFIDENTIAL)	Kim M. Keller
A-7 (KMK-2)	Summary Inputs and Outputs (CONFIDENTIAL)	Kim M. Keller
A-8 (KMK-3)	Net Run Costs (CONFIDENTIAL)	Kim M. Keller
A-9 (KMK-4)	LMP Forecast (CONFIDENTIAL)	Kim M. Keller
A-10 (KMK-5)	Market Price Forecast	Kim M. Keller
A-11 (KMK-6)	IRP Builds	Kim M. Keller
A-12 (JJP-1)	Annual Energy and Peak Demand Forecasts	Jared J. Peccarelli
A-13 (JJP-2)	Annual Sales Forecast by Customer Class	Jared J. Peccarelli
A-14 (RAG-1)	Emissions Data and Environmental Justice Discussion	Robert A. Greco

STATE OF MICHIGAN

BEFORE THE MICHIGAN PUBLIC SERVICE COMMISSION

*** * * * ***

In the matter of the application of **UPPER MICHIGAN ENERGY RESOURCES CORPORATION** for approval of its integrated resource plan pursuant to MCL 460.6t and for other relief.	))))	Case No. U-21081

DIRECT TESTIMONY AND EXHIBITS OF

RICHARD F. STASIK

FOR

UPPER MICHIGAN ENERGY RESOURCES CORPORATION

Q. Please state your name, business address and position.

A. My name is Richard Stasik. My business address is 231 W. Michigan Street, Milwaukee, Wisconsin 53203. I am employed by WEC Business Services, LLC ("WBS"), serving all of the WEC Energy Group, Inc. ("WEC") utilities, including Upper Michigan Energy Resources Corporation ("UMERC" or the "Company"). WBS and UMERC are wholly-owned subsidiaries of WEC.

Q. For whom are you providing testimony?

A. I am providing testimony on behalf of UMERC.

Q. Please describe briefly your educational, professional, and utility background.

A. I received a Bachelor of Science Degree with a double major in Accounting and Management Information Systems from the University of Wisconsin – Milwaukee in 1999.

I have been employed by Wisconsin Energy Corporation – the predecessor to WEC Energy Group, since 2013. I worked as the IT Audit Manager within the Internal Audit Department before joining State Regulatory Affairs as the Manger – Regulatory Planning and Systems in January 2016. I was promoted to Director – State Regulatory Affairs in 2018. In this position I am responsible for overseeing and managing all of WEC Energy Group's operating utilities' regulatory matters in Wisconsin, Michigan, and Minnesota.

Q. Have you previously testified before any regulatory agency?

A. Yes. I have provided testimony to the Federal Energy Regulatory Commission ("FERC") on rate and accounting issues associated with WEC retired power plant dockets (Docket Nos. ER19-226-000, AC19-49-000, AC18-231-000, and ER19-103-000) and to the Public Service Commission of Wisconsin ("PSCW") on rate making issues in rate case dockets (Docket Nos. 5-UR-109 and 6690-UR-126). I also provided direct testimony to the Michigan Public Service Commission ("MPSC" or the "Commission") on UMERC's preferred criteria for legally enforceable obligations in Case No. U-21130.

Q. What is the purpose of your direct testimony?

A. The purpose of my direct testimony is to provide: (i) an overview of the Company's required Integrated Resource Plan ("IRP") filing; (ii) a summary of the objectives and principles used when preparing this IRP filing; (iii) an overview of the study process used to complete this IRP filing; (iv) a summary of the Proposed Course of Action ("PCA") including the financial and rate impacts thereof; and (v) a synopsis of UMERC's stakeholder and public outreach, a discussion of what the Company learned from the feedback received through its outreach efforts, and how that feedback influenced UMERC's IRP.

Q. Are you sponsoring any exhibits in this proceeding?

A. Yes.

Exhibit A-1(RFS-1) – Outreach Activities

Exhibit A-2(RFS-2) – Survey Results

Exhibit A-3(RFS-3) – IRP Filing Requirements

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

A. Yes, they were.

Section I. IRP Introduction and Overview

Q. Please describe UMERC's existing IRP.

A. UMERC's existing IRP was approved by the Commission in its October 17, 2019 Order Approving Revised Corrected Settlement Agreement. This IRP consisted chiefly of retiring the Company's only existing coal generation facility (the Presque Isle Power Plant) on March 31, 2019 and utilizing the Company's newly constructed natural gas-fired plants (Kuester Generating Station and Mihms Generating Station) beginning April 1, 2019, while maintaining the Company's already substantial Energy Waste Reduction ("EWR") and Demand Reduction ("DR") programs. The retirement of the existing coal-fired generating facility and construction of new natural gas-fired plants had previously been approved by the Commission in its October 25, 2017 Opinion and Order in Case No. U-18224 granting a certificate of necessity pursuant to MCL 460.6s. UMERC's EWR plan was approved by the Commission in its July 23, 2020 Order in Case No. U-20377, UMERC's existing DR program consists of interruptible tariffs for the Company's industrial customers.

Q. Please provide an introduction and overview of UMERC's 2021 IRP.

A. The Company assessed its capacity resource portfolio considering expected capacity and energy needs, electric supply reliability, cost, environmental requirements and goals, financial impacts, diversity of generation resources, and the price risk to customers associated with energy procurement from the MISO market. The assessment also sought to obtain through customer input the options for generation resources that customers valued. In doing so, the Company has provided a comprehensive IRP that, after stakeholder input, modeling, and analysis, represents the most reasonable and prudent course of action to meet customer capacity and energy needs that is clean, reliable, preferred by customers, and affordable now and in the future.

Q. Summarize the results of this IRP Filing.

A. UMERC's robust modeling process and thorough analysis of the various scenarios required by Michigan statute have resulted in a PCA that will add 100 MW of solar generation to UMERC's generation portfolio. This additional renewable generation will result in approximately of $25.5 million dollars, on a net present value basis, of incremental costs while reducing UMERC's dependence on MISO market energy purchases and the associated pricing risk. Additionally, UMERC's environmental impacts should only improve with the addition of renewable generation, reducing carbon emissions from the Company's natural gas fired generation and the non-renewable energy purchased from MISO. This will further reduce UMERC's environmental footprint in the Upper Peninsula of Michigan. UMERC is seeking approval of the costs associated with construction new solar generation in Michigan's Upper Peninsula to provide customers with additional price stability, energy reliability, and further reducing the Company's greenhouse gas emissions in this IRP filing.

Q. What statutes influenced UMERC's planning objectives?

A. Section 6t of Act 341 influenced UMERC's planning objectives. This statute requires the Commission to approve an IRP if it determines the plan represents the most reasonable and prudent means of meeting the electric utility's energy and capacity needs. To make this determination, the Commission shall consider whether the plan appropriately balances all the following factors:

i. Resource adequacy and capacity enough in quantity to serve anticipated peak electric load plus applicable Planning Reserve Margin Requirement ("PRMR") and Local Clearing Requirement ("LCR");

ii. Compliance with applicable state and federal environmental regulations;

iii. Competitive pricing;

iv. Reliability;

v. Commodity price risks;

vi. Diversity of generation supply; and

vii. Whether the proposed levels of peak load reduction and EWR are reasonable and cost effective.

In the context of the Commission's definition of what constitutes the standard for the most reasonable and prudent plan, the Company examined its own planning objectives.

Q. Does this IRP filing meet the Commission's filing requirements?

A. Yes. This filing meets the requirements set forth by the Commission in Case No. U-18418 ("Michigan IRP Modeling Parameters"), Case No. U-15896, *et al.* ("Michigan IRP Filing Requirements"), and Case No. U-20633 ("Carbon Modeling Scenarios and Emissions Reporting"). The Company's filing also meets the requirements in Section 6t

of Act 341. My Exhibit A-3 (RFS-3) includes a listing of IRP Filing Requirements and UMERC's responses. This exhibit also serves as the table of contents for UMERC's IRP.

Q. Please discuss the directives made by the Commission in approving UMERC's first IRP.

A. In its October 17, 2019 Order Approving Corrected Revised Settlement Agreement in Case No. U-20470, the Commission directed UMERC to include in its next IRP more information concerning EWR, DR, energy and capacity purchased or produced from a cogen source, potential transmission options, commodity price risks, and diversity of generation supply. All of these topics are addressed by Company witness Keller in her Direct Testimony and Exhibits. These topics are also cross-referenced in my Exhibit A-3 (RFS-3).

Q. Did any other factors influence the development of UMERC's new IRP?

A. Yes. UMERC also considered the extensive state and regional strategic energy planning efforts being conducted by the Commission and the Michigan Department of Environment, Great Lakes, and Energy ("EGLE"), among others. In particular, UMERC took the recommendations from the Statewide Energy Assessment and U.P. Energy Task Force into consideration when crafting this IRP. Consistent with these planning initiatives, UMERC's IRP will further develop U.P.-based renewable energy sources that will diversify the Company's supply portfolio, while stabilizing and lowering customer energy costs in comparison to market energy purchases that would likely involve out-of-state, fossil-fuel generation.

Q. What are the primary attributes of UMERC's 2021 IRP filing?

A. UMERC's 2021 IRP contains the following attributes which were drivers of the strategy for completing this IRP filing:

i. Stakeholder input. Throughout the IRP preparation process, UMERC has engaged with Commission Staff; EGLE Staff; customers; and other key stakeholders. UMERC has incorporated feedback, where appropriate, to improve the plan and the process used to develop this IRP filing.

ii. Clean, sustainable energy sources. While UMERC's parent company, WEC, has already taken a leadership position by retiring its Michigan-based coal fired generation prior to UMERC being formed, today the Company embraces the changing paradigm as sources of new, clean, renewable energy are becoming cost competitive with traditional forms of power supply. WEC has already retired the Presque Isle Power Plant, which reduced the Company's reliance on company-owned coal fired generation to zero and closed the only coal-fired power plant the Company owned in the State of Michigan.

iii. Stable pricing that is insulated from market sensitivities. In addition to being sourced from clean and renewable generation, the addition of 100 MW of solar capacity to UMERC's power supply portfolio mix will naturally hedge UMERC customers from typical market price volatility (e.g. gas prices) and risk present in the Midcontinent Independent System Operator ("MISO") market.

v. UMERC would confirm, via a competitive bidding process, any future renewable generation or energy storage project that is competitive within the broader market for similar utility scale developments. There is an active market for wind, solar, and battery projects. In conducting its competitive bidding process, UMERC intends to follow the Competitive Procurement Guidelines recently adopted by the Commission in its September

9, 2021 Order in Case No. U-20852. Through such a competitive bidding process, UMERC will ensure the economics of any chosen project will provide the best value for its customers.

vi. Rigorous and thorough analysis. Even though UMERC is a small electric utility serving less than 1,000,000 customers, and as such, could seek waiver from the full filing requirements established by the Commission in Case No. U-18461, UMERC believes it has adhered to all the required and recommended modeling scenarios, assumptions, inputs, and sources in order to present as robust a solution as possible.

vii. UMERC's IRP modeling includes considerations of environmental justice and health impacts under the Michigan Natural Resources and Environmental Protection Act. The modeling includes analysis of that evidence from both State of Michigan and the U.S. Environmental Protection Agency ("EPA") data sources consistent with the Company's discussions with the MPSC and EGLE staff throughout this process.

Section II. Company Witnesses and Support

Q. Please provide an overview of Company witnesses and the topics they will present evidence in support of this IRP filing.

A. In addition to my testimony and exhibits, the following witnesses are also presenting testimony and exhibits in support of UMERC's IRP:

Company Witness Aaron L. Nelson, describes the revenue requirement impacts of the Company's PCA and UMERC's proposal for establishing the Public Utility Regulatory Policies Act ("PURPA") avoided cost in this proceeding.

Company Witness, Kim M. Keller, describes/provides: (i) the Company's existing, owned generation resources and planned efforts to maximize the benefits of these

resources; (ii) UMERC's current power supply procurement strategy, resource adequacy, and risk mitigation; (iii) UMERC's LMP forecast used in the IRP modeling scenarios; (iv) an overview of the Company's new generation project evaluation process; and (v) the Company's need for new generation units included in the PCA of 100 MW of solar.

Company Witness Jared J. Peccarelli describes the development of the Company's electric sales and peak demand forecast from 2022 – 2041.

Company Witness Robert A. Greco, Sr. describes an overview of UMERC's PCA impacts on environmental justice and health impacts as prescribed by EGLE. Witness Greco, also provides an overview of the applicable environmental regulation.

Q. Please provide an overview of the scenarios and sensitivities presented in this IRP.

A. The IRP is based on modeling scenarios—future outlooks—to account for a range of potential outcomes for a study period of 2022 through 2041 to evaluate a 5, 10, 15, and 20-year time horizon consistent with Section 6t and the Commission's filing parameters approved in Case No. U-15896, *et al.*, and recent additional modeling scenarios required by the Commission's February 18, 2021 Order in Case No. U-20633, *et al.* Various sensitivities—changes in key assumptions that are varied one parameter at a time within any given scenario—were then applied to account for uncertainties in the scenarios themselves. Modeling several scenarios and sensitivities provides a representation of external factors that could influence resource availability and selection, while seeking the most reliable, efficient, and economic results. By developing and studying several scenarios and sensitivities, the Company was able to assess the risks of various future outcomes to deliver its customers reliable, safe, cost-effective, and environmentally friendly service through the planning window.

The process used to develop the IRP was rigorous and comprehensive, consistent with all Commission requirements, resulting in the most reasonable, prudent, and cost-effective plan to serve customers safely and reliably for many years to come.

Q. Please summarize the actual scenarios and sensitivities considered in this IRP.

A. This IRP includes four scenarios required by the MPSC:

(i) Business As Usual ("BAU") – (current conditions continue into the future);

(ii) Emerging Technology ("ET") – (current conditions continue except renewable resources, EWR, and DR become materially less expensive);

(iii) High Market Price ("HMP") – (significantly higher than expected natural gas prices and energy market prices); and,

(iv) Carbon Reduction (replica of the required Environmental Policy scenario at 1.5% year-over-year load growth with the Company's PCA forced into that scenario, optimized and then evaluated for achieving a 28% and 32% reduction in carbon emissions from 2005 by 2025).

In addition to these four scenarios, there were a collection of sensitivities required to be evaluated on each scenario. The Company's scenarios and sensitivities are aligned with the scenarios and sensitivities mandated by the Commission's November 21, 2017 Order in Case No. U-18418. The Commission later added the Carbon Reduction scenario to the IRP scenarios and sensitivities by its February 18, 2021 Order in Case No. U-20633.

In support of these scenarios and sensitivities, assumptions necessary to translate the scenarios and sensitivities into models were developed. This included assumptions such as, but not limited to, customer demand forecasts, fuel cost forecasts, technology characteristics and costs, and program levels for EWR and DR. The Company also

performed screening evaluation to produce a set of resource options for consideration in the subsequent generation portfolio optimization analysis. The scenarios, sensitivities, assumptions, and modeling approach are discussed in detail in the direct testimony of Witness Keller.

Section III. Proposed Course of Action ("PCA")

Q. What is the Company's PCA?

A. The Company's PCA proposes the following to invest in 100 MW of solar generation while further reducing emissions of its generating portfolio and reducing UMERC's reliance on renewable energy credits for emissions compliance. As discussed in greater detail in Witness Keller's testimony, the addition of 100 MW of solar will provide customer benefits by displacing higher-cost and potentially more volatile market energy purchases.

The PCA also includes maintaining UMERC's existing natural gas-fired generating units to maintain reliability for customers and allowing these units to sell excess energy or capacity offsetting costs for customers. UMERC's PCA also maintains EWR and DR at current levels because UMERC's existing non-firm load exceeds its firm load which provides presents limited cost-effective benefits to customers during the IRP planning period which is discussed by Company Witness Keller.

Q. Does the PCA represent the most reasonable and prudent means of meeting UMERC's capacity and energy needs over the planning period?

A. Yes. This PCA (i) represents the most reasonable and prudent means of meeting the Company's energy and capacity needs through 2041 and (ii) provides for reliable electric service, at a reasonable cost. In developing this PCA, UMERC assessed its power supply resource portfolio considering both capacity and energy needs, as well as, regulatory and

environmental compliance, and the planning objectives[1] set forth by the Commission and the Company. Being mindful of renewable generation resources as a value stream in providing power to its customers over the long run, as well as the natural hedge value for UMERC's customers of these resources against long-term market price volatility of energy and capacity prices in the MISO market, UMERC sought to balance long-term price stability with resource sustainability, as discussed in Company Witness Keller's testimony.

Q. As a result of UMERC's PCA, what are the total customer impacts?

A. Customers are likely to see a slight increase to their energy costs. UMERC customers will see an approximate $0.01 per kwh increase in the first full year the facility is in service. This is derived entirely from the new solar unit's fixed O&M and capital revenue requirements net of revenue requirement reductions from market energy sales, reduced REC purchases, and the sale of capacity of the solar generation facility. The PCA will reduce UMERC's reliance of volatile energy purchases and provide the benefit of additional Michigan renewable energy credits to all of UMERC's customers.

Q. Why does the PCA not include an additional DR component?

A. UMERC does not propose additional DR because the Company has more interruptible load than firm load. A significantly large portion of UMERC's large commercial and industrial customers already participate in demand response programs, so the Company does not believe the additional DR efforts would be cost-effective. Company Witness Keller discusses this further.

IV. New Generation Project Evaluations and Results

[1] UMERC's objective is implementing its balanced resource portfolio approach, its customers will receive reliable, low-cost energy that is adequately hedged against future market price volatility while exceeding current goals for reductions in air emissions.

Q. Please describe the process UMERC utilized for evaluating new generating facilities to identify potential resources that would be considered as part of this required IRP filing.

A. UMERC's parent company, WEC, evaluates potential future renewable generation or energy storage projects regionally and nationally to confirm that a potential project is competitive within the market for similar utility scale developments. There is an active market for wind, solar, and battery projects. UMERC has utilized this process to preliminarily evaluate the market for cost competitive generation projects that could meet UMERC customers' needs as identified in UMERC's PCA within this IRP filing. In so doing, UMERC has ensured the economics of a project will compare favorably to the alternative sources of generation available to UMERC and WEC's other electric utility subsidiaries. Prior to selecting a specific project, UMERC will employ a competitive bidding process conducted according to the Competitive Bidding Guidelines adopted by the Commission in Case No. U-20852 to assess the economics of available projects and to ensure any selected project is competitive with prevailing market conditions and an appropriate value for UMERC's customers.

Q Is UMERC currently evaluating projects in connection with this IRP filing?

A. Yes, as noted above, UMERC has reviewed potential projects available through multiple third parties in regard to projects with existing interconnect agreements and that have the available size and in-service dates needed by UMERC, as identified in this IRP filing. The PLEXOS modeling completed and discussed by Witness Keller reflects utility ownership, which results in cost savings and enhances rate stability to UMERC's customers.

Q. Please describe the generation projects considered for inclusion in the Company's PCA.

A. As explained at greater length by UMERC Witness Keller, the Company has included generic solar and wind units in the PLEXOS modeling. UMERC is currently working to select specific renewable generating resources to fulfill the modeling goal of balancing UMERC's generation portfolio and will utilize a competitive procurement process during that evaluation. Once these resources have been identified and specific costs have been identified, UMERC plans to supplement its application with the identified costs. UMERC expects to have the cost updates within the 150-day window to supplement its IRP application.

Q. Please describe the options scoped within the solar generation evaluation process.

A. UMERC considered two generic solar generating units in its PLEXOS modeling. These generating units were based on UMERC's understanding of current market costs for two solar generating units sited in Michigan's Upper Peninsula.

Q. Were wind generation projects selected for inclusion in the Company's PCA.

A. No wind generation projects were included in the PCA because the generation resource modeling performed by UMERC only identified the addition of 100 MW of solar generating capacity as being cost-effective for UMERC's customers. To be clear, a generic wind generation project was *considered* in the IRP modeling process with cost assumptions based on current market costs in the UP, but the generic wind project was not selected as the best alternative during the modeling process and, therefore, was not included in the PCA. Company Witness Keller explains how the selection of generation resources was determined for UMERC's PCA.

Q. Please summarize your observations from the generic project development costs provided.

A. The two generic solar projects and the single wind project were based on projects that could achieve an in-service date consistent with PLEXOS' identified in-service date to meet UMERC's customer needs, which is 2025, and are located in Michigan's Upper Peninsula and reflect current development costs in UMERC's service territory. Based on the PLEXOS modeling discussed by Witness Keller, the two solar projects were selected by the Company's PLEXOS modeling as the most cost-effective and were included in the PCA.

Q. Why is the addition of 100 MW of solar capacity justified in this case?

A. UMERC has a high degree of confidence in the evaluation process which was undertaken. With its preferred project price identified, UMERC ran an additional IRP modeling scenario to include a Business-As-Usual modeling run with 100 MW of additional solar generation capacity. As evidenced in Company Witness Keller's testimony, the 100 MW of capacity came back with the balanced portfolio benefits of increased rate stability and limited impact on customer costs. Specifically, the addition of 100 MW of solar generating capacity is expected to ensure compliance with RPS standards, provide rate stability, and improve upon carbon reduction while maintaining reliability.

V. Stakeholder Engagement

Q. Please explain in detail UMERC's stakeholder and public outreach activities.

A. UMERC engaged in robust stakeholder and public outreach activities, which entailed the following:

- An IRP landing page was added to UMERC's current website. Through the IRP landing

page, it was possible to 1) locate general information relative to integrated resource planning, 2) complete UMERC's resource preference survey, 3) email the Company, and 4) participate in a virtual public open house session. Exhibit A-1 (RFS-1) shows the general IRP information that was available on the landing page.

- An IRP email account was created and a link to send an email to that account was added to the UMERC IRP landing page to allow customers to communicate directly with Company representatives to ask questions or provide comments. The Company received only one email during the period March 5, 2021 through May 5, 2021 and that email was not related to integrated resource planning.[2]
- An online IRP survey questionnaire was developed to solicit feedback on energy resource preferences. The survey questionnaire could be accessed through the Company's IRP landing page and was available for the period March 5, 2021 through May 5, 2021. During this period, 67 surveys were submitted. A summary of the survey responses and the insight gained from the survey results will be discussed in more detail below. The survey questionnaire is shown in Exhibit A-1 (RFS-1) and survey results are provided in Exhibit A-2 (RFS-2).
- Bill inserts were sent to all UMERC customers during the period March 5, 2021 through April 5, 2021. The bill insert informed customers that UMERC was preparing an integrated resource plan; encouraged customers to participate in its resource preference survey to share their energy preferences; informed customers of the virtual public open house sessions to take place in mid-April and directed customers to the UMERC website to obtain additional information on integrated resource planning and open house participation. The

[2] A single email to the UMERC IRP mailbox was received on April 19, 2021 regarding a request for student summer employment and made no reference to the IRP filing.

virtual public open house format was selected to ensure the safety of UMERC's staff and public during the pandemic. See Exhibit A-1 (RFS-1).

- Letters to past intervenors (stakeholders) were sent on March 8, 2021 informing them that the Company was preparing an IRP and was seeking feedback. The letter provided information on survey participation; open house sessions, and how to attend a virtual open house or get additional information. A copy of the letter sent to intervenors is shown in Exhibit A-1 (RFS-1).
- The Company identified and directly engaged its business customers with average loads greater than 500 kW. Some business customers were sent emails, some letters, and some participated in group meetings. Regardless of the outreach method, the message communicated was that the Company was developing an IRP and was encouraging its business customers to participate in the process by taking the resource preference survey to provide feedback on energy preferences and attending a virtual open house session. Company Account Managers and the Director of UMERC met with some of our largest customers to personally discuss the IRP process and answer any questions and solicit feedback. No specific questions or concerns were shared with Company representatives relative to the IRP process or energy preferences through the emails, letters, or personal interactions. A copy of the template used for the large customer email or letter is shown on Exhibit A-1 (RFS-1).
- Display ads were placed in daily newspapers of general circulation in UMERC's electric and gas service areas. The display ads encouraged customer feedback through survey participation and attending a virtual open house session as well as directed customers to

the Company website for additional information. Exhibit A-1 (RFS-1) shows the display ads and proofs of publication.

- Virtual public open house sessions were held on April 13, 2021 and April 14, 2021 at 11:00 a.m. and 6:00 p.m. EST each day. As stated earlier, stakeholders and the general public were informed of the open house sessions via the bill insert, display ad, letters, emails and/or personal contacts, and UMERC's website. Despite the Company's robust efforts and multiple notifications of the virtual open houses, no members of the public attended any sessions. The only attendees were WEC staff and the external moderator. Each open house session was held open for 15 minutes following the start of the session to provide an opportunity for participants to join. The Company recorded each session. See Exhibit A-1 (RFS-1) for the open house slide presentation and script the Company had prepared to use during the open house sessions.

Q. Please describe what the Company learned from its stakeholder and public outreach?

A. In analyzing the survey results it was clear that UMERC's customers overwhelmingly prefer that their energy come from the most reliable resources, with the lowest costs, through a balanced portfolio of renewable and non-renewable resources. Specifically, the survey indicated the following:

<u>Customer Identification:</u>

Question 1 – 79% of our respondents identified as UMERC residential, 8% were UMERC commercial and industrial ("C&I") customers, and 13% were not UMERC customers.

<u>Customer Generation Source Preferences:</u>

Question 2 – When ranking energy resources from highest (1) to lowest (6), the four highest overall weighted rankings for residential customers were for the lowest cost resources (ranked 2.35), a balanced portfolio of renewable and non-renewable resources (ranked 3.14), natural gas fueled generators (ranked 3.14), and renewable resources (ranked 3.41). The C&I customers weighted ranked the lowest cost resources and nuclear power the highest at 2, then natural gas fueled generators and a balanced portfolio of renewable and non-renewable resources at 3.67. Non-UMERC customers had weighted rankings of 2.00, 2.71, 3.00, and 3.50, for a balance of renewable and non-renewable resources, the lowest cost resources, renewable resources, and natural gas fueled generators, respectively.

Question 3 – When rating the importance of the possible mix of resources in UMERC's IRP, residential customers replied that it was ***very important*** to: (i) include the most reliable resources, regardless of cost(41%); (ii) include only the lowest cost resources, regardless of source (35%), and (iii) have a balanced portfolio of renewable and non-renewable resources that provide reliable and affordable power (30%). Additionally, 43% of respondents indicated that it was ***not at all important*** that only renewable resources, regardless of cost, make up the possible mix of resources.

C&I customers responded that it was ***very important*** to: (i) include only the lowest cost resources, regardless of source (50%) and (ii) include only the most reliable resources regardless of source (50%). Similarly, 50% of C&I customer respondents indicated that it was ***not at all important*** that only renewable resources, regardless of cost, make up the possible mix of resources.

Non-UMERC customer respondents replied that it was ***very important*** to (i) include a balanced portfolio of renewable and non-renewable resources that provide reliable and

affordable power (71.43%) and (ii) have a balanced portfolio of renewable and non-renewable resources that provide reliable and only the most reliable resources regardless of source 29% of the time. Additionally, 57% of the Non-UMERC respondents indicated that it was ***not at all important*** that only the lowest cost resources, regardless of source.

Question 4 – When ranking renewable energy resource preferences, residential respondents ranked as their highest preference hydroelectric resources (42%), lowest cost renewable resource (42%), and solar (14%). C&I customers ranked as their highest preference to be equally split between biomass, solar, and the lowest cost renewable resources. Non-UMERC customer respondents ranked as their highest preference hydroelectric resources (43%), solar (29%) , and wind (14%).

Customer Cost Preferences

Question 5 –A significant majority (65% of residential and 75% of C&I) customer respondents indicated they would not be willing to pay more for renewable resources to be included in UMERC's energy portfolio. The non-UMERC customers respondent indicated that 43% would be willing to pay as much as 10% more for renewable resources while 29% would be willing to pay as much as 5% more for renewable resources. However, it should be noted that these respondents self-identified as not being customers of UMERC.

State of Michigan Policy Preferences

Question 6 – Responding residential customers were roughly split between whether renewable energy resources should be generated in the Upper Peninsula of Michigan at 39% or they had no preference at 46%. Of responding C&I customers, 50% preferred renewable energy resources located in the Upper Peninsula. The non-UMERC customer

respondents also preferred renewable energy resources located in the Upper Peninsula at 57%.

Question 7 – When asked how strongly residential respondents agreed or disagreed that UMERC should exceed the state of Michigan renewable energy mandate of 15% in 2021; 50% of respondents strongly agreed or somewhat agreed with exceeding the Michigan renewable energy mandate, while 39% of respondents strongly disagreed or somewhat disagreed with exceeding the mandated level. Similarly, for non-UMERC customer respondents 43% strongly agreed or agreed with exceeding the renewable energy mandate, while 29% strongly disagreed or disagreed. UMERC's C&I customers responded with 50% with strong disagreement or disagreement while 25% strongly agreed or agreed with the 15% renewable energy mandate.

Q. Please explain the direct meetings component of the stakeholder engagement process.

A. The second component of UMERC's IRP stakeholder engagement process was directed at the commercial and industrial customers. By directly meeting with more than 40 individual businesses, UMERC was able to deliver key IRP messaging while receiving critical feedback from its key commercial and industrial stakeholders.

Q. What major themes and lessons emerged from this component of the IRP stakeholder engagement process?

A. First, UMERC's commercial and industrial customers appreciated the direct, one-on-one communication that took place with key UMERC Account Managers. Overall, UMERC's commercial and industrial customers understand the value proposition before the Company regarding building a sustainable and renewable energy future for all customers. In general, fact-based decision making based on a rigorous process with consistent and clear

communication is what UMERC's commercial and industrial customers value most and expect.

Q. In addition to the public forums and direct commercial and industrial customer meetings, what other types of stakeholder engagement took place?

A. The Company has met with the Commission Staff and EGLE Staff to keep them abreast of the IRP's focus and process.

Q. What feedback from these meetings was incorporated into UMERC's IRP?

A. As part of these discussion, UMERC obtained specific expectations of elements that would be included in its IRP filing – all of which have been incorporated in the Company's initial application and supporting direct testimony.

Q. Was the stakeholder engagement process successful?

A. In my opinion, very much so. Specifically, the stakeholder engagement process provided a valuable opportunity for UMERC to continue to build and strengthen its relationship with its customers and interested stakeholders. Through this process, UMERC was able to incorporate insights and feedback into the IRP modeling process and ultimately develop a PCA that is a balanced representation of customers' interests and considerations as well as UMERC's corporate objectives.

Section VI. Regulatory and Statutory Compliance

Q. Why has the Company filed this IRP?

A. The Commission's October 17, 2019 Order in Case No. U-20470 required UMERC to file its next IRP by October 15, 2021.

Q. Please provide an overview of the statutory framework and filing requirements for IRPs.

A. Pursuant to Section 6t of Public Act 341, the Commission issued its November 17, 2017 Order in Case No. U-15895 establishing the IRP Modeling Parameters, and on December 27, 017 the Commission issued its Order in MPSC Case No. U-18461 establishing the IRP Filing Requirements. These documents set forth the IRP modeling scenarios and assumptions, requirements, instructions, and guidelines for utilities preparing and submitting IRPs to the Commission pursuant to MCL 460.6t.

Q. **Does the Company's IRP meet the statutory requirements for an IRP to be filed before the Commission?**

A. Yes. The Company's IRP meets the statutory requirements for an IRP filed before the Commission. The Company's direct testimony and exhibits address the components required to be included in an IRP, as well as the factors that the Commission shall consider in approving an IRP and demonstrate that the Company's PCA represents "the most reasonable and prudent means of meeting the electric utility's energy and capacity needs."

Q. Does the Company's modeling comply with the IRP Filing Requirements from the Commission's December 20, 2017 Order in Case Nos. U-18418, et al.?

A. Yes. Please see Exhibit A-3 (RFS-3) – IRP Filing Requirements, which is a list of the cross-references between the Commission's IRP Filing Requirements and the relevant section in the Company's direct testimony and modeling exhibit.

Q. As outlined in Section VIII of the IRP Modeling Parameters, please describe the modeling scenarios, sensitivities and assumptions utilized by UMERC in its 2021 IRP.

A. Because four modeling scenarios are required for utilities located in the Michigan portion of MISO Zone 2, UMERC utilized the following scenarios:

- Scenario 1: Business as Usual

- Scenario 2: Emerging Technologies
- Scenario 3: High Market Price Variant
- Scenario 4: Carbon Reduction

The scenario analyses and results are described in greater detail in Company Witness Keller's direct testimony.

Q. As recommended in Section IX of the IRP Modeling Parameters, please provide a summary table of UMERC's IRP modeling inputs and assumptions.

A. Please see Exhibit A-6 (KMK-1), which outlines the principal considerations and assumptions utilized in UMERC's 2021 IRP.

Q. Please describe Michigan's renewable portfolio standard.

A. In December 2016, Governor Snyder signed Public Act 342 of 2016 ("PA 342") into law. PA 342, which became effective on April 20, 2017, amending Public Act 295 of 2008 ("PA 295") to increase the renewable portfolio standard from 10% in 2015 to at least 12.5% in both 2019 and 2020, with a final requirement of at least 15% in 2021 and providing a goal of meeting not less than 35% of the state's electric needs through a combination of energy waste reduction and renewable energy by 2025.

Q. Does UMERC's PCA meet the 35% goal of meeting UMERC's electric needs through EWR and renewable resources by 2025?

A. Yes.

Q. Describe the additional carbon reduction modeling runs required by the February 18, 2021 Order in Case Nos. U-20633, *et al.*

A. Witness Keller will discuss in greater detail the following additional modeling requirements included in UMERC's IRP to comply with the February 18, 2021 Order in Case Nos. U-20633, *et al.* These additional modeling requirements included:

1. Load projections:

a. High load growth: Increase the energy and demand growth rates by at least a factor of two above the business-as-usual energy and demand growth rates. In the event that doubling the energy and demand growth rates results in less than a 1.5% spread between the base load projection and the high load sensitivity projection, assume a 1.5% increase in the annual growth rate for energy and demand for this sensitivity.

2. 28% carbon reduction in the utility's service territory, modeled as a hard cap on the amount of carbon emissions, by 2025 as a sensitivity.

3. 32% carbon reduction in the utility's service territory, modeled as a hard cap on the amount of carbon emissions, by 2025 as a sensitivity.

Q. Has the Company integrated the requirements of its PURPA review application into its October 15, 2021 IRP filing?

A. Yes. On January 21, 2021, UMERC filed a motion in Case No. U-20470, *et al.* requesting authority to extend the April 5, 2021 deadline for its biennial PURPA avoided cost review and to integrate the avoided cost review into the Company's IRP proceeding. On February 18, 2021, the Commission issued its order granting the extension until October 15, 2021 and directing UMERC to consolidate its biennial PURPA avoided cost review into its IRP filing. Company Witness Nelson addresses the biennial PURPA avoided cost review in his direct testimony and exhibits.

Section IX: IRP Request for Approval

Q. Please summarize what the Company is requesting in this filing?

A. The Company is requesting that the Commission find that the Company's IRP and PCA represent the most reasonable and prudent means of meeting the electric utility's energy and capacity needs. In reaching that finding, the Company further requests that the Commission:

a. Approve the Company's proposal for the construction of 100 MW of solar generation to be located in UMERC's service territory, in order to provide cost-effective energy to meet the customers' expected needs, while further reducing the Company's reliance on fossil fuels.

b. Approve UMERC's proposal to continue use of the methodology approved in Case No. U-18095 to set PURPA avoided cost rates and recognize that UMERC does not have a PURPA capacity need through at least 2027.

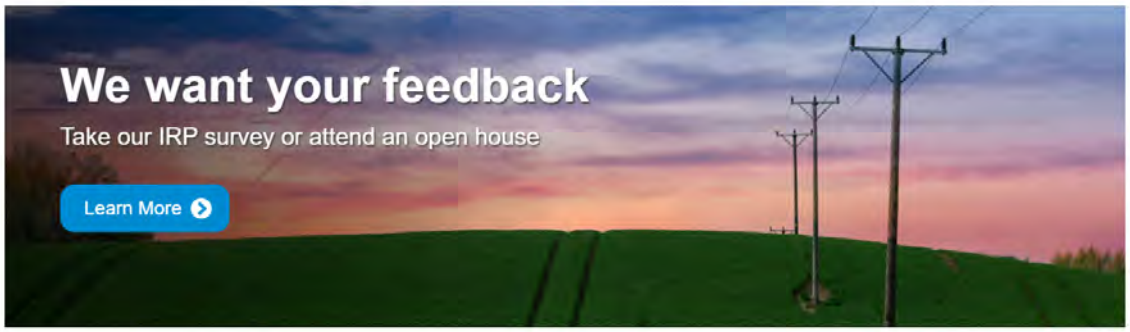
Q. Does this conclude your direct testimony at this time?

A. Yes, it does.

WEBSITE INFORMATION

UPPER MICHIGAN ENERGY RESOURCES

Rates | Regulation | Generation | About



Customer service for Upper Michigan Energy Resources is provided by We Energies and Wisconsin Public Service, the two energy providers that served the area prior to formation of Upper Michigan Energy Resources. Visit their websites for information about payment, programs, services and more.

We Energies
we-energies.com »
Outage map »

Wisconsin Public Service
wisconsinpublicservice.com »
Outage map »

Service area map
Don't know which company serves your location?
View service area map

Upper Michigan Energy Resources

About

Contact
- We Energies: 800-242-9137
- Wisconsin Public Service: 800-450-7260
- Media: 414-221-4444

Ethics violation reporting

Legal statements

Terms and conditions

Privacy

WEC Energy Group

UPPER MICHIGAN ENERGY RESOURCES

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Integrated resource plan (IRP)
We want your feedback

Each **electric** utility, whose rates are regulated by the Michigan Public Service Commission (MPSC), must file a detailed integrated resource plan with the commission. IRPs are electricity system planning efforts that outline how the utility intends to meet its future electric power needs by the most reasonable and prudent means.

The IRP addresses resource needs, policy goals, physical and operational constraints and proposed resource choices, and provides transparency to customers and stakeholders on potential, future resource decisions.

An integral component of the IRP is the system modeling the utility performs to determine its most cost-effective resource mix to meet its customers' electric energy and capacity needs.

The plan is "integrated" in that it looks at both demand-side resources (conservation, energy efficiency, demand response programs) as well as traditional supply-side resources (electric generation facilities/plants) in making assessments on how to best meet future electric energy needs.

Take our IRP survey or attend an open house

Public engagement in the development of UMERC's IRP is a required component of the utility's planning process.

We encourage you to provide feedback on resource planning by taking part in our IRP survey before May 5 or attending a virtual open house.

Begin survey

Open houses

Customers and stakeholders can participate in a virtual open house. Dates and times are listed below. Meeting links will be added closer to the event date.

We Energies service area
Tuesday, April 13
11 a.m. EST (10 a.m. CST) Join meeting
or 6 p.m. EST (5 p.m. CST) Join meeting

WPS service area
Wednesday, April 14
11 a.m. EST (10 a.m. CST) Join meeting
or 6 p.m. EST (5 p.m. CST) Join meeting

About UMERC

Upper Michigan Energy Resources (UMERC) is a Michigan regulated electric and natural gas utility formed on Jan. 1, 2017.

IRP survey

Begin survey

Open houses

We Energies service area
Tuesday, April 13
11 a.m. EST (10 a.m. CST)
Join meeting
or 6 p.m. EST (5 p.m. CST)
Join meeting

WPS service area
Wednesday, April 14
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Join meeting

UPPER MICHIGAN ENERGY RESOURCES

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Detailed integrated resource plan (IRP)

IRPs typically include the following information:

1. Long-term forecast of the electric utility's energy sales and peak demand under various reasonable scenarios.
2. Descriptions of the types of generation technology contained in the plan, including proposed capacity of the generation facility(s) and projected fuel costs under various reasonable scenarios.
3. The utility's plan to eliminate energy waste; including the energy waste reduction (EWR) expected to be achieved, the cost of the utility's EWR plan as well as the expected savings associated with the plan.
4. Load management and demand response programs as well as the savings and projected costs for these programs.
5. Projected energy purchased or produced by the electric utility from a renewable energy resource(s).

1. UMERC'S forecast

UMERC's IRP will include, at a minimum, 5-, 10- and 15-year projections of its peak demand and energy load obligations.

Generally, the energy forecasts are prepared by customer classes. Examples of customer classes include residential, small business and large commercial and industrial. Forecasts for each customer class are developed primarily by using statistical models that identify a historical relationship between energy and factors that influence the use of energy, including weather, economic, operational, energy efficiency and trend variables. Largely, the demand forecasts are developed using a combination of historical demand data, load research data relating energy sales to peak demand, and various statistical modeling tools.

2. UMERC'S currently owned generation resources

UMERC began commercial operation of its natural gas-fueled F.D. Kuester Generating Station and A.J. Mihm Generating Station in the Upper Peninsula of Michigan March 31, 2019.

F.D. Kuester Generating Station (128.1 MW) is located in Negaunee Township, near Marquette, and the A.J. Mihm Generating Station (54.9 MW) is located in Baraga Township, near L'Anse. These generating stations provide long-term, dispatchable, reliable, affordable and clean energy solutions to the Upper Peninsula.

There are seven units at the F.D. Kuester Generating Station and three units at the A.J. Mihm Generating Station. These generating stations use a technology known as RICE – reciprocating internal combustion engines. RICE units are highly efficient and provide tremendous operations flexibility. Fueled with natural gas, each engine is shaft-coupled to an electric generator. The RICE units are housed inside a building with an exterior resembling a warehouse. The exhaust system is located outside the building and includes silencers, air quality control systems and stacks.

The F.D. Kuester and A.J. Mihm generating stations replaced the energy from the Presque Isle Power Plant (PIPP) that was retired the same day the generating stations began operation. PIPP's closure is part of WEC Energy Group's larger plan to reshape its generation fleet to

PIPP's closure is part of WEC Energy Group's larger plan to reshape its generation fleet to balance reliability and customer cost with environmental stewardship. Closure of PIPP helps UMERC significantly reduce its carbon dioxide emissions. Plans for the future use of the retired coal plant site will be developed as the company continues to evaluate potential uses for the property.

The state-of-the-art generating stations are expected to save UMERC customers nearly $161 million net present value over the next 30 years. The new stations will eliminate the need for additional transmission capacity as well as upgrades that would have been needed at the aged PIPP if it had continued to operate.

3. Energy waste reduction

Michigan requires all utility companies in the state to collect funds for an energy waste reduction (EWR) plan for residential, commercial and industrial customers. The monies collected from the EWR charge pays for energy efficiency, weatherization, load management and conservation programs. The EWR surcharges currently in place collect an amount equal to 2% of UMERC's retail electric revenues.

EWR surcharges are volumetric for residential customers; for all other metered customers the EWR surcharges are per-meter, with un-metered customers receiving an appropriate fixture charge. The EWR surcharges are incorporated into other itemized charges on customer bills.

UMERC's EWR programs are administered by Efficiency United. The MPSC selected Efficiency United, a qualified nonprofit organization, to serve as the EWR program administrator through a competitive bid process.

4. Load management/demand response programs

UMERC uses demand side resources to meet some of its capacity requirements. The utility actually has more electric interruptible load than firm load. UMERC has approximately 101 MW of firm load and 180 MW of interruptible load.

UMERC offers several retail electric non-firm tariffs that are open to both new customers to the UMERC system as well as existing customers currently taking firm service and desiring to take non-firm service. UMERC may call upon customers enrolled in its non-firm tariff programs to curtail or interrupt usage when necessary for economic or capacity reasons.

5. Renewable portfolio standard, renewable energy certificates, renewable energy procurement programs

- **Renewable portfolio standard and renewable energy certificates**

  The state of Michigan's renewable portfolio standard (RPS) requires that 15% of the electricity produced come from renewable energy sources in 2021.

  Renewable energy certificates (RECs) support renewable electricity production in the region of generation. A REC represents the environmental benefits of 1 megawatt hour (MWh) of renewable electricity that can be paired with electricity. For every unit of renewable electricity generated and put onto the electricity grid, an equivalent amount of RECs are produced.

  RECs verify exclusive use of the renewable electricity within an electricity market by the REC purchaser, when paired with electricity drawn from that electricity market. Retail purchasers of RECs are using and receiving the benefits of that renewable electricity.

  UMERC offers its retail customers renewable energy procurement programs and includes the demand for its renewable energy procurement programs in its overall strategy for obtaining RECs in order to maintain compliance with the RPS requirements. The strategy currently includes a portfolio of banked RECs and third-party REC-only purchases.

- **Renewable energy procurement programs**

  UMERC offers voluntary renewable energy programs to its customers as a way to participate in clean power procurement without the need to make significant changes or purchase equipment. Each service area offers its own unique voluntary green programs. The voluntary green pricing programs offered are sourced by RECs, which come from certified biogas generation sources located in Michigan, and do not contain electricity.

  The estimated green energy program sales for both rate zones are ~480 MWh annually.

- **Energy for Tomorrow renewable energy program**

  Energy for Tomorrow is an optional rate offered to UMERC's electric customers in the We

Energies service area. The program gives customers the option to pay a per kilowatt-hour (kWh) premium for UMERC to retire RECs to match the customer's selected percentage of electric usage (25, 50 or 100%) or to retire blocks of RECs. The RECs replace equal amounts of electric generation from traditional sources. RECs purchased for Energy for Tomorrow come from locally sourced biogas.

- **NatureWise renewable energy program**
  NatureWise is an optional rate offered to UMERC's electric customers in the WPS service area. The program provides customers with the option to pay a premium to purchase 100 kWh "blocks" of Michigan-based renewable energy where each block represents about 15%–20% of a typical customer's electric use. The amount of renewable energy a customer signs up for each month is totaled over the year, and this amount is then used to determine how many RECs to formally retire based on the energy use. RECs purchased for NatureWise come from locally sourced biogas.

Find out more about UMERC's Energy for Tomorrow and NatureWise renewable energy programs.

WEC Energy Group

Located entirely in the Upper Peninsula of Michigan, UMERC, a subsidiary of WEC Energy Group, serves more than 42,000 energy customers.

UMERC provides retail electric service to the Michigan electric customers formerly served by Wisconsin Electric Power Company (doing business as We Energies) in the service area located in Alger, Baraga, Delta, Dickinson, Gogebic, Houghton, Iron, Marquette, Menominee and Ontonagon Counties.

It also provides retail electric and natural gas service to the Michigan electric and natural gas customers formerly served by Wisconsin Public Service (WPS) in the service area located in Menominee County, Michigan.

UMERC customer service providers

Customer service is provided to UMERC customers by We Energies and Wisconsin Public Service in the areas the two energy providers served before UMERC's formation.

Information about customer services, payment, programs and more can be found by visiting the We Energies and Wisconsin Public Service websites.

UMERC customer service centers are located at 800 Industrial Park Drive, Iron Mountain, Michigan, and 1717 10th Ave., Menominee, Michigan.

Questions

Questions, comments, concerns
Email us

WEC Energy Group

SURVEY

Upper Michigan Energy Resources (UMERC) was formed in 2017 to serve energy customers in the Upper Peninsula of Michigan.

UMERC is preparing to file with the Michigan Public Service Commission (MPSC) a required integrated resource plan (IRP), which will address how UMERC will best serve its customers' future electric power needs. Part of this process includes seeking feedback from customers and stakeholders on where you would like your energy to come from in the future.

If you are taking this survey on a mobile phone, you may want to rotate the screen to view the questions in landscape orientation.

Thank you for your willingness to share your opinions. This survey should take about five minutes to complete.

* Which type of customer are you?

- ◯ UMERC residential
- ◯ UMERC commercial/industrial
- ◯ I am not a UMERC customer
- ◯ Other (please specify)

Thinking about where your energy should come from in the future, please rank from numbers 1-6 the following energy sources from your highest (1) to lowest (6) preference. If you have no preference regarding the source of energy, then leave the boxes below unnumbered and proceed to the next question.

☰ ☐ Natural gas-fueled generators

☰ ☐ Coal-fueled generators

☰ ☐ Renewable resources (hydro, solar, wind, biomass)

☰ ☐ Nuclear power

☰ ☐ A balanced portfolio of renewable and non-renewable resources

☰ ☐ Lowest-cost resources

* Thinking about the possible mix of resources in the UMERC integrated resource plan (IRP), please rate how important it is to reflect each of the following in the IRP, in your opinion.

	1 = Not at all important	2	3 = Neutral	4	5 = Very important
Only renewable resources, regardless of cost	○	○	○	○	○
Only the lowest-cost resources, regardless of source	○	○	○	○	○
Only the most reliable resources, regardless of source	○	○	○	○	○
A balanced portfolio of renewable and non-renewable resources that provide reliable and affordable power	○	○	○	○	○

Please rank from numbers 1-5 the following renewable resources from your highest (1) to lowest (5) preference. If you have no preference, leave the boxes unnumbered and proceed to the next question.

Hydroelectric

Solar

Wind

Biomass

Lowest-cost renewable resource

* Compared to your current energy costs, how much extra on average would you be willing to pay to have renewable resources included in UMERC's energy portfolio?

- 5% more
- 10% more
- 15% more
- I would not be willing to pay more
- Other (please specify)

* Now think about where UMERC's renewable energy could be generated. Please pick your first choice. If you have no preference, pick the No preference option.

- ◯ Upper Peninsula of Michigan
- ◯ Lower Peninsula of Michigan
- ◯ No preference

* The state of Michigan's renewable portfolio standard requires that 15% of the electricity sold to retail customers come from renewable energy sources in 2021. How strongly do you disagree or agree that UMERC should exceed the state mandate of 15%?

1 = Strongly disagree	2 = Somewhat disagree	3 = Neutral	4 = Somewhat agree	5 = Strongly agree
◯	◯	◯	◯	◯

Optional: Please provide your name, address and organization, if applicable. UMERC will use this information only to analyze survey results and will not use this information to contact you.

Name

Organization

Address

City/Town

State -- select state --

ZIP/Postal Code

Please provide any comments, questions, or concerns relating to UMERC's integrated resource plan.

Thank you for completing this survey. UMERC values your feedback.

BILL INSERTS

We want your feedback

Upper Michigan Energy Resources (UMERC) is planning how we will best serve our customers' future electric power needs. To do so, we are preparing an integrated resource plan (IRP), which includes evaluating several resource alternatives and actively seeking feedback from our customers and stakeholders on where they'd like their energy to come from in the future.

CUSTOMER SURVEY

Your participation in a survey to share your energy preferences is an essential part in helping us prepare our IRP. Participation in the survey is completely voluntary, and will take only about five minutes of your time.

To participate in the survey, visit uppermichiganenergy.com.

OPEN HOUSES

UMERC also will hold virtual open houses to gather feedback and provide customers with additional information related to our IRP. To attend a virtual open house or for more information, visit **uppermichiganenergy.com.**

Tuesday, April 13
11 a.m. EST (10 a.m. CST)
or 6 p.m. EST (5 p.m. CST)

UMERC values your feedback and participation. More information is available at **uppermichiganenergy.com**.

UPPER MICHIGAN ENERGY RESOURCES

210046

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11 a.m. EST (10 a.m. CST)
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UMERC values your feedback and participation. More information is available at **uppermichiganenergy.com**.

UPPER MICHIGAN ENERGY RESOURCES

210047

OPEN HOUSE POWER POINT AND SCRIPT

Integrated resource plan (IRP)

Open house

UPPER MICHIGAN ENERGY RESOURCES

Please select “Speaker View” in your Zoom view settings.

This will ensure you’re able to see the speaker.

UPPER MICHIGAN ENERGY RESOURCES

If you would like to ask a question, enter your first and last name in chat.

When your name is called, turn on your camera and microphone and ask your question.

The chat is strictly for indicating you would like to ask a question.

UPPER MICHIGAN ENERGY RESOURCES

Agenda

- Introductions
- Upper Michigan Energy Resources (UMERC) formation and background
- Integrated resource plan (IRP) overview
- IRP details
- Survey
- Discussion

UMERC formation

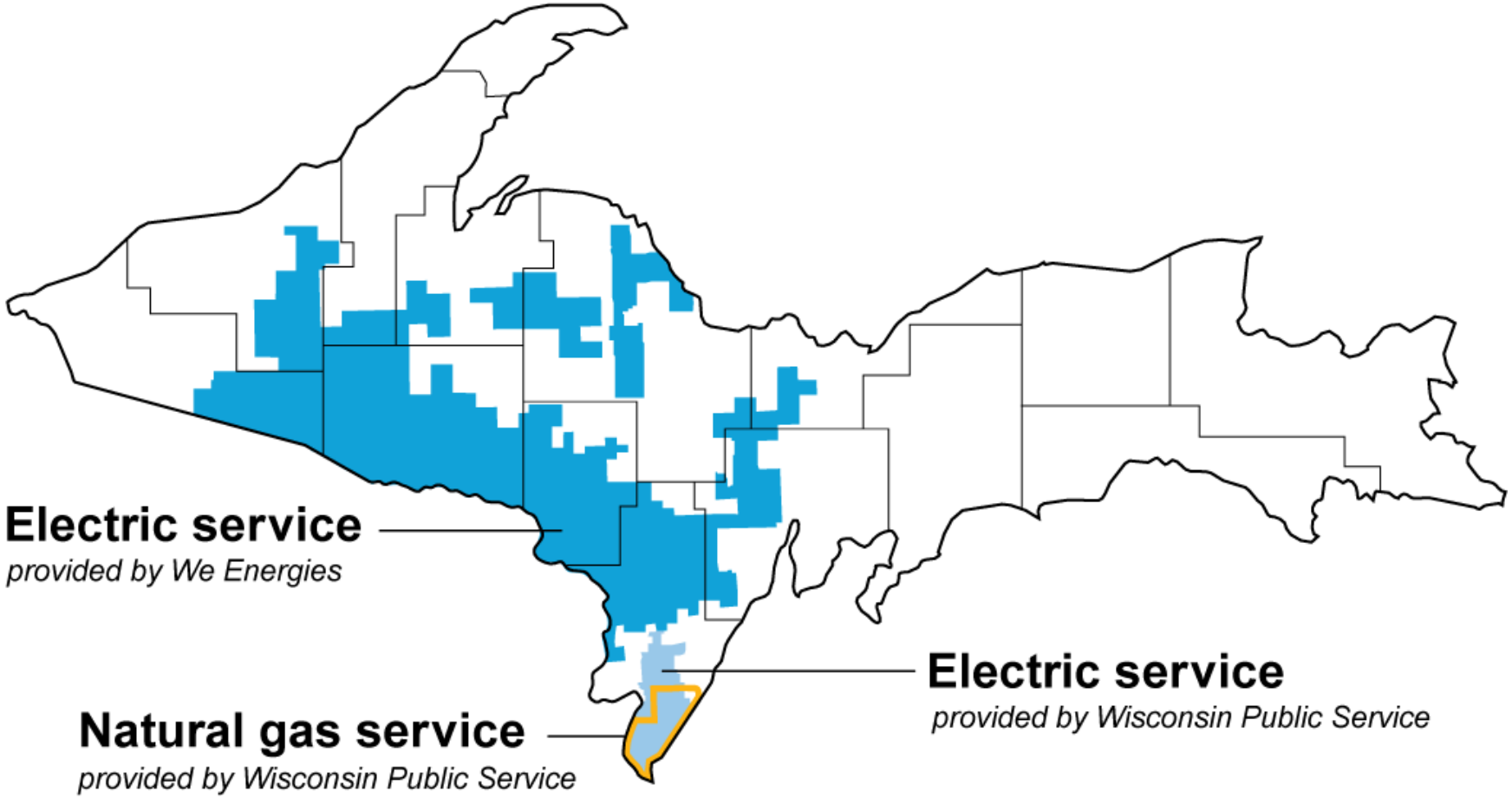
Jan. 1, 2017

Michigan regulated electric and natural gas utility formed

Subsidiary of WEC Energy Group

UMERC service area

Serves more than 42,000 electric and natural gas customers in Michigan's Upper Peninsula



UMERC background

Electric service to customers formerly served by We Energies

Electric and natural gas service to customers formerly served by Wisconsin Public Service (WPS)

Customer service provided by We Energies and WPS

More information can be found at uppermichiganenergyresouces.com.

Integrated resource plan overview

Each **electric** utility regulated by the Michigan Public Service Commission (MPSC) is required to file an IRP

Electric generation system planning outline to meet future electric power needs reasonably and prudently

- Resource needs and choices
- Policy goals
- Constraints
- Transparency
- System modeling
- Demand and supply side resources

Integrated resource plan details

- Long-term forecast of energy sales and peak demand
- Existing and potential future generation resources
- Energy waste reduction plans, savings and costs
- Load management and demand response programs, savings and costs
- Projected energy purchased or produced from a renewable resource(s).

Long-term forecast

- 5- 10- and 15-year projections of peak demand and energy load obligations
- Prepared by customer class
  - Residential
  - Small business
  - Large commercial and industrial
- Prepared by using statistical models

Generation technology

UMERC's owned generation resources

- F.D. Kuester Generating Station (128.1 MW)
- A.J. Mihm Generating Station (54.9 MW)

Generation technology

Kuester and Mihm generating stations

- State-of-the-art natural gas-fueled generation
- RICE – reciprocating internal combustion engines
- Highly efficient and provides tremendous operations flexibility
- Long-term, dispatch able, reliable, affordable and clean energy solution

Energy waste reduction

- State of Michigan requires all utilities to collect funds for an energy waste reduction (EWR) plan
- Current EWR surcharges collect an amount equal to 2% of UMERC's retail electric revenues
- Monies collected from the EWR charge pays for energy efficiency, weatherization, load management and conservation programs
- UMERC's EWR programs are administered by Efficiency United, the organization selected by the MPSC

Load management and demand response programs

- UMERC uses demand side resources to meet some of its capacity requirements
- UMERC offers several retail electric non-firm tariffs, which are open to both new and existing customers
- UMERC may call upon non-firm tariff program participants to curtail or interrupt usage when necessary for economic or capacity reasons

Renewable portfolio standard and renewable energy certificates

- The state of Michigan's renewable portfolio standard (RPS)
- REC = environmental benefits of 1 megawatt-hour (MWh) of renewable electricity
- For a specified amount of renewable electricity generated and put onto the electricity grid, an equivalent amount of RECs are produced
- UMERC purchases and retires RECs to comply with RPS requirements.
- Customers benefit from the environmental attributes of renewable electricity generated in Michigan.

Renewable energy procurement

Customers can participate in renewable energy power procurement through UMERC's voluntary green pricing programs.

Energy for Tomorrow

Customers pay a per kilowatt-hour (kWh) premium for UMERC to retire RECs to match the customer's selected percentage of electric usage (25, 50 or 100%), or to retire blocks of RECs

NatureWise

Customers pay a premium to purchase 100 kwh blocks of renewable energy where each block represents about 15%–20% of a typical customer's electric use

Annual block purchases determine the RECs to be retired

RECs purchased through Energy for Tomorrow and NatureWise come from locally sourced biogas.

We want your feedback

Take our IRP survey

uppermichiganenergy.com

UPPER MICHIGAN ENERGY RESOURCES

Discussion

If you would like to ask a question, enter your first and last name in chat.

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This meeting has ended

Visit uppermichiganenergy.com
for more information

UPPER MICHIGAN ENERGY RESOURCES

Integrated Resource Plan (IRP)

Open House Script

INTRO SLIDES (ROTATING)

SLIDE: INTEGRATED RESOURCE PLAN

SPEAKER: Richard Rayborn

Hello and welcome to Upper Michigan Energy Resources informational meeting about the integrated resource plan. Before we get started, let's go over a couple of housekeeping items.

SLIDE: SELECT SPEAKER VIEW

Please know that today's meeting is being recorded. If you haven't done so already, please select "Speaker View" in your Zoom view settings to ensure you're able to see who is speaking.

SLIDE: IF YOU WOULD LIKE TO ASK A QUESTION

At the end of the meeting, we'll have a question and answer session. Please enter your first and last name in Chat if you have a question and you'll be called upon when it's your turn.

Now, let's get started.

SLIDE: AGENDA

I'm Richard Rayborn, Director of Upper Michigan Energy Resources, and I'm here today with Rich Stasik, Director of State Regulatory Affairs.

During today's presentation, we'll cover:

- The formation and background of Upper Michigan Energy Resources,
- an overview of the integrated resource plan,
- and then, details of what the integrated resource plan includes.

I'll also provide information about how to take our survey so we can gather your feedback; and we'll end by answering any of your questions about the IRP.

SLIDE: UMERC FORMATION

Upper Michigan Energy Resources is a Michigan regulated electric and natural gas utility formed on January 1, 2017.

SLIDE: UMERC SERVICE AREA

Located entirely in the Upper Peninsula of Michigan, UMERC, a subsidiary of WEC Energy Group, serves more than 42,000 energy customers.

UMERC provides retail electric service to the Michigan electric customers formerly served by Wisconsin Electric Power Company, doing business as We Energies, in the service areas located in the counties of:

Alger	Gogebic	Menominee
Baraga	Houghton	Ontonagon
Delta	Iron	
Dickinson	Marquette	

The utility also provides retail electric and natural gas service to Michigan customers formerly served by Wisconsin Public Service in Menominee County, Michigan.

SLIDE: UMERC BACKGROUND

Programs and services for UMERC are provided by We Energies and Wisconsin Public Service in the areas the two energy providers served before UMERC's formation.

Information about UMERC's customer services, payment options, programs and more can be found by visiting our website Upper Michigan Energy dot com.

And now, I'll turn it over to Rich Stasik to talk about the integrated resource plan. Rich …

SLIDE: INTEGRATED RESOURCE PLAN OVERVIEW

SPEAKER: RICH STASIK

Thank you, Richard.

Each **electric** utility, whose rates are regulated by the Michigan Public Service Commission must file a required, detailed integrated resource plan, or IRP, with the Commission.

IRP's are electricity system planning efforts that outline how the utility intends to meet its future electric power needs by the most reasonable and prudent means.

The IRP addresses resource needs, policy goals, physical and operational constraints, and proposed resource choices — and provides transparency to customers and stakeholders on potential, future resource decisions.

An integral component of the IRP is the system modeling the utility performs to determine its most cost-effective resource mix to meet the utility's customers' electric energy and capacity needs. The Commission requires utilities to include modeling runs in their IRP reflecting a carbon emissions reduction of 28% by 2025 and a carbon emissions reduction of 32% by 2025. These requirements are being driven by Governor Gretchen Whitmer's Executive Directive Number 2020-10, issued on September 23, 2020, to transition Michigan to a carbon-neutral state.

This directive specifies that the state of Michigan will aim to achieve economy-wide carbon neutrality no later than 2050, and to maintain net negative greenhouse gas emissions thereafter. The state aims to achieve a 28% reduction below 2005 levels in greenhouse gas emissions by 2025.

The plan is considered “integrated,” because it looks at both demand-side resources (such as conservation, energy efficiency and demand response programs), as well as traditional supply-side resources (such as electric generation facilities and plants) in making assessments on how to best meet future electric energy needs.

SLIDE: INTEGRATED RESOURCE PLAN DETAILS

And now, we’ll get into more detail about the integrated resource plan.

IRP’s typically include several components:

1) Long-term forecasts of the electric utility's energy sales and peak demand under various reasonable scenarios.

2) Descriptions of the types of generation technology contained in the plan, including proposed capacity of the generation facilities and projected fuel costs under various reasonable scenarios.

3) The utility’s plan to eliminate energy waste; including the

energy waste reduction, or EWR, expected to be achieved, the cost of the utility's EWR plan, and the expected savings associated with the plan.

4) Load management and demand response programs as well as the savings and projected costs for these programs.

5) Projected energy purchased or produced by the electric utility from a renewable energy resource(s).

SLIDE: LONG-TERM FORECAST

Let's start with forecasts and generation technology.

UMERC's IRP will include 5-, 10- and 15-year projections of its peak demand and energy load obligations.

Generally, the energy forecasts are prepared by customer classes. Examples of customer classes include residential, small business and large commercial and industrial. Forecasts for each customer class are developed primarily by using statistical models that identify a historical relationship between energy and factors, which influence the use of energy including weather, economic, operational, energy efficiency, and trend variables. Largely, the

demand forecasts are developed using a combination of historical demand data, load research data relating energy sales to peak demand, and various statistical modeling tools.

SLIDE: GENERATION TECHNOLOGY (1)

Regarding UMERC's currently owned generation resources, commercial operation of its natural gas-fueled F.D. Kuester Generating Station and A.J. Mihm Generating Station in the Upper Peninsula of Michigan began on March 31. 2019.

Kuester Generating Station is located in Negaunee Township, near Marquette, and the Mihm Generating Station is located in Baraga Township, near L'Anse. These generating stations provide long-term, dispatchable, reliable, affordable and clean energy solutions to the Upper Peninsula.

SLIDE: GENERATION TECHNOLOGY (2)

There are seven units at the Kuester Generating Station and three units at the Mihm Generating Station. Both of these generating stations use a technology known as RICE – reciprocating internal combustion engines. RICE units are highly efficient and provide tremendous operations flexibility. Fueled with

natural gas, each engine is shaft-coupled to an electric generator. The RICE units are housed inside a building with an exterior resembling a warehouse. The exhaust system is located outside the building and includes silencers, air quality control systems and stacks.

The Kuester and Mihm generating stations replaced the energy from the Presque Isle Power Plant that was retired the same day the generating stations began operation. Presque Isle Power Plant's closure is part of WEC Energy Group's larger plan to reshape its generation fleet to balance reliability and customer cost with environmental stewardship. The closure helps UMERC significantly reduce its carbon dioxide emissions. Plans for future use of the retired coal plant site will be developed as the company continues to evaluate potential uses for the property.

The state-of-the-art generating stations are expected to save UMERC customers nearly $161 million net present value over the next 30 years. The new stations eliminated the need for additional transmission capacity as well as upgrades that would have been needed at the aged Presque Isle Power Plant if it had continued to operate.

SLIDE: ENERGY WASTE REDUCTION SLIDE

Let's move on to energy waste reduction, or EWR.

Michigan requires all utility companies in the state to collect funds for an energy waste reduction plan for residential, commercial and industrial customers. The monies collected from the EWR charge pays for energy efficiency, weatherization, load management and conservation programs. The EWR surcharges currently in place collect an amount equal to 2% of UMERC's retail electric revenues.

These surcharges are volumetric for residential customers, and for all other metered customers, the surcharges are per-meter — with un-metered customers receiving an appropriate fixture charge. The EWR surcharges are incorporated into other itemized charges on customer bills.

UMERC's EWR programs are administered by Efficiency United, the nonprofit organization selected by the MPSC, through a competitive bid process, to serve as the program administrator.

SLIDE: LOAD MANAGEMENT AND DEMAND RESPONSE

Moving on to load management and demand response programs …

UMERC uses demand side resources to meet some of its capacity requirements. The utility actually has more electric interruptible load than firm load … with approximately 101 megawatts of firm load and 180 megawatts of interruptible load.

UMERC offers several retail electric non-firm tariffs that are open to both new customers to the UMERC system, as well as existing customers currently taking firm service and desiring to take non-firm service. UMERC may call upon customers enrolled in its non-firm tariff programs to curtail or interrupt usage when necessary for economic or capacity reasons.

SLIDE: RENEWABLE PORTFOLIO STANDARD

Finally, let's talk about UMERC's renewable energy.

The state of Michigan's renewable portfolio standard requires that 15% of the electricity produced come from renewable energy sources in 2021.

Renewable Energy Certificates, or RECs, support renewable electricity production. A REC represents the environmental benefits of 1 megawatt per hour of renewable electricity. For every specified amount of renewable electricity generated and put

onto the electricity grid, an equivalent amount of RECs are produced.

RECs verify exclusive use of the renewable electricity within an electricity market by the REC owner. Purchasers of RECs are using and receiving the benefits of that renewable electricity.

UMERC offers its customers renewable energy procurement programs and includes the demand for its renewable energy procurement programs in its overall strategy for obtaining RECs in order to maintain compliance with the RPS requirements. The strategy currently includes a portfolio of banked RECs and third-party REC-only purchases.

SLIDE: RENEWABLE ENERGY PROCUREMENT

UMERC offers voluntary renewable energy programs to its customers as a way to participate in clean power procurement without the need to make significant changes or make significant investments in renewable generation equipment. Each service area offers their own unique voluntary green pricing program. The voluntary green pricing programs offered are sourced by

RECs, which come from certified biogas generation sources located in Michigan, and do not contain electricity. The RECs replace equal amounts of electric generation from traditional sources.

The estimated green energy program sales for UMERC's two service areas combined are ~480 megawatts per hour annually.

Energy for Tomorrow is an optional rate offered to UMERC's electric customers in the We Energies service area. This program gives customers the option to pay a per kilowatt-hour premium for UMERC to retire RECs to match the customer's selected percentage of electric use (25, 50 or 100%) or to retire blocks of RECs.

NatureWise is an optional rate offered to UMERC's electric customers in the WPS service area. This program provides customers with the option to pay a premium to purchase 100 kilowatt-hour blocks of Michigan-based renewable energy, where each block represents about 15 to 20% of a typical customer's electric use. The amount of renewable energy a customer signs up for each month is totaled over the year,

and this amount is then used to determine how many RECs to formally retire based on the energy use.

All of the energy purchased through Energy for Tomorrow and NatureWise comes from locally sourced biogas.

More information about Energy for Tomorrow and NatureWise can be found at Upper Michigan Energy dot com.

And, now back to Richard Rayborn to wrap us up.

SLIDE: WE WANT YOUR FEEDBACK

SPEAKER: RICHARD RAYBORN

Thank you, Rich, for that overview of the integrated resource plan.

An essential component of our IRP planning process is public engagement. This, along with Commission requirements, is why we created this opportunity for dialogue and why we encourage you to take our IRP survey. The survey allows you to give us your input on resource planning and help shape future resource decisions.

The survey is available at Upper Michigan Energy dot com.

SLIDE: DISCUSSION

MODERATOR

We will now open the meeting for questions from participants. As a reminder, if you would like to ask a question, enter your first and last name in Chat. I will call on you when it is your turn to ask a question. Remember to turn on your camera and microphone so we can see you and hear your question.

Our first question comes from XXXX.

Our next question is from XXXX.

SPEAKER: RICHARD OR RICH TO ANSWER QUESTIONS

MODERATOR

Thank you. There are no more questions.

SLIDE: WEBSITE

SPEAKER: RICHARD RAYBORN

Thank you everyone for joining us today. As a reminder, the information we discussed today is available on our website: Upper Michigan Energy dot com.

You also will find the link to the survey and an email address if you have additional questions.

Have a good rest of your day.

SLIDE: MEETING HAS ENDED

TEMPLATE OF LETTER/EMAIL SENT TO LARGE BUSINESS CUSTOMERS

EMAIL TEMPLATE FOR LARGE CUSTOMER OUTREACH

Subject: We want your feedback

Dear <First Name>,

As required by the Order in Case No. U-20470 issued by the Michigan Public Service Commission, Upper Michigan Energy Resources (UMERC) is preparing an integrated resource plan (IRP), which includes evaluating resource alternatives and seeking feedback from our business customers on their insights on how UMERC meets its future energy needs.

Customer survey
Customer participation in a survey to share insights is an essential part in helping us prepare our required IRP filing. Participation in the survey is completely voluntary and will take only about five minutes of your time. To participate in the survey, visit uppermichiganenergy.com.

Open houses
UMERC also will hold virtual open houses to gather feedback and provide customers with additional information related to our IRP filing. To attend a virtual open house or for more information, visit uppermichiganenergy.com.

Tuesday, April 13
11 a.m. EST (10 a.m. CST) or 6 p.m. EST (5 p.m. CST)

Wednesday, April 14
11 a.m. EST (10 a.m. CST) or 6 p.m. EST (5 p.m. CST)

We value customer feedback and participation. More information is available at uppermichiganenergy.com. Feel free to contact me with any questions.

Sincerely,
<Name>
<Title>
<Phone>
<Email>

TEMPLATE OF LETTER SENT TO PAST INTERVENORS

Upper Michigan Energy Resources Corporation
231 W. Michigan St.
Milwaukee, WI 53203

March xx, 2021

Name
Company
Address
City, State Zip

Dear Attn:

RE: Upper Michigan Energy Resources - Integrated Resource Plan Feedback

As required by the Order in Case No. U-20470 issued by the Michigan Public Service Commission, Upper Michigan Energy Resources (UMERC) is preparing an integrated resource plan (IRP), which includes evaluating resource alternatives and seeking feedback from stakeholders on their insights on how UMERC meets its future energy needs.

Customer survey
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Sincerely,

Richard Rayborn
Director - Upper Michigan Energy Resources Corporation
WEC Energy Group - Wholesale Energy Marketing

PAST INTERVENORS - STAKEHOLDERS

Attorney General
Michael Moody
525 W. Ottawa Street
P.O. Box 30755
Lansing, MI 48909
moodym2@michigan.gov

Tilden Mining Company L.C.
Jennifer Utter Heston
Fraser Trebilcock Davis & Dunlap, P.C.
124 W. Allegan Street, Suite 1000
Lansing, MI 48933
jheston@fraserlawfirm.com

Fibrek
Richard J. Aaron Jason Hanselman
Dykema Gossett PLLC Capitol View
201 Townsend Street, Suite 900
Lansing, MI 48933 raaron@dykema.com jhanselman@dykema.com

Cloverland Electric Cooperative, Inc.
Richard J. Aaron Jason Hanselman
Dykema Gossett PLLC Capitol View
201 Townsend Street, Suite 900
Lansing, MI 48933 raaron@dykema.com jhanselman@dykema.com

Verso Corporation
Timothy J. Lundgren
The Victor Center, Suite 910 201 N. Washington Square Lansing, MI 48933
tjlungren@varnumlaw.com

Toni L. Newell
Varnum, Riddering, Schmidt & Howlett LLP
P.O. Box 352
Grand Rapids, MI 49501-0352 tlnewell@varnumlaw.com

CUB
John R Liskey Attorney At Law
PO Box 220
Laingsburg, MI 48848
john@liskeypllc.com

Louisiana-Pacific Corporation
Roderick S. Coy
Clark Hill PLC
212 E. Cesar Chavez
Lansing, MI 48906

DISPLAY ADS AND PROOFS OF PUBLICATION

We want your feedback

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Here is how you can provide feedback:

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Visit **uppermichiganenergy.com** to learn more about our IRP and complete a five-minute survey about your energy preferences. Participation in the survey is voluntary.

Virtual open house

Attend an upcoming virtual open house at **uppermichiganenergy.com** to learn more about the resource alternatives we are considering and share your opinions.

Tuesday, April 13
11 a.m. or 6 p.m.

UPPER MICHIGAN ENERGY RESOURCES

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Papers and Publication Dates For Display Ads

UMERC – WPSC Rate Zone

- Eagle Herald March 15, 2021

UMERC – WEPCO Rate Zone

- Ironwood Daily Globe March 16, 2021
- Iron Mountain Daily News March 15, 2021
- Marquette Mining Journal March 15, 2021
- Escanaba Daily Press March 15, 2021
- Houghton Mining Gazette March 15, 2021

DAILY PRESS
Your Local News Leader
600 Ludington Street, Escanaba, MI 49829 * 906-786-2021

AFFIDAVIT OF PUBLICATION
STATE OF MICHIGAN

I KRISTAL SOPER being an authorized representative of the DAILY PRESS Escanaba, Michigan, do hereby affirm that an INTEGRATED RESOURCE PLAN ad for WISCONSIN PUBLIC SERVICE was printed and published in said newspaper on the following date(s): MONDAY, MARCH 15, 2021.

KRISTAL SOPER

Subscribed and sworn to before me this

fifteenth day
Of March,
2021.

Jodi Bourdeau
Notary Public, Delta Co., Michigan

Jodi Bourdeau
Notary Public
Delta County
State of Michigan
Comm Expires 12/26/2026

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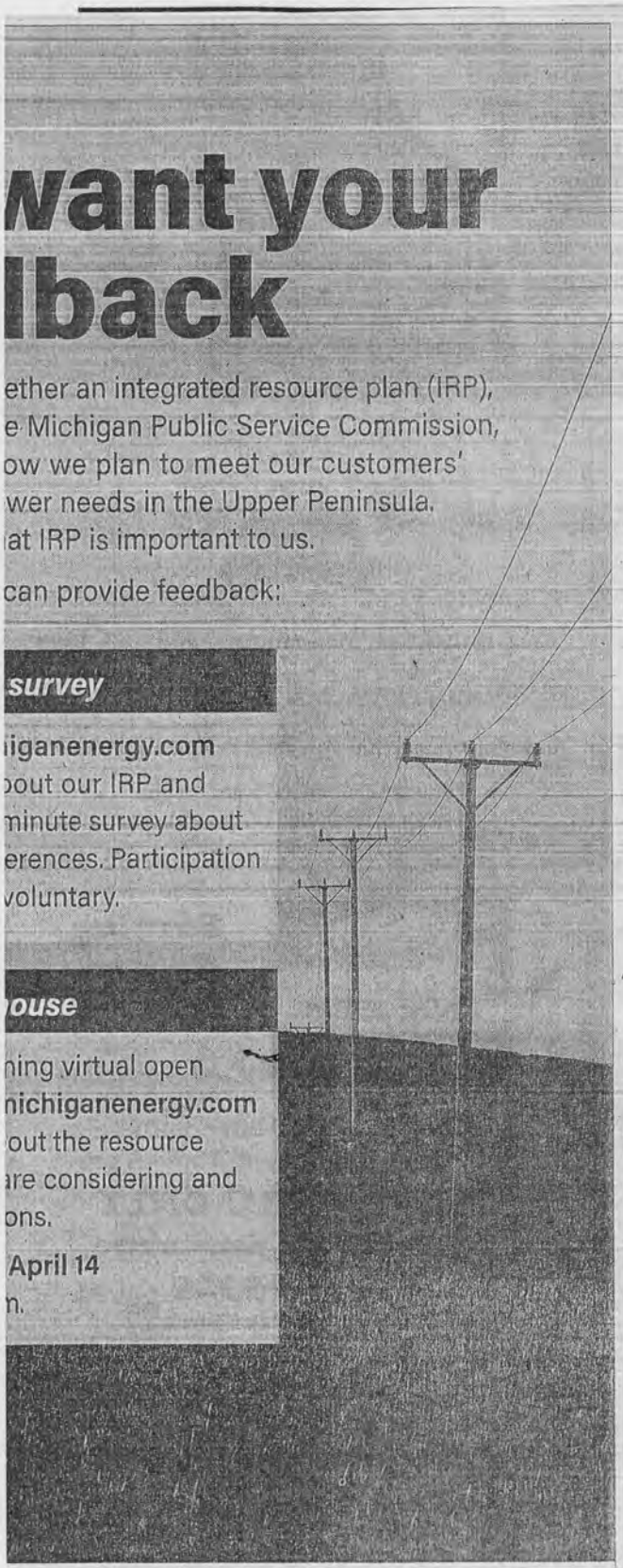
UMERC WE 210048-03-M1-01

AFFIDAVIT OF PUBLICATION



STATE OF WISCONSIN
COUNTY OF MARINETTE } ss

..... Rebecca Minton ..... being duly sworn, says that he/she is the principal clerk of EagleHerald Publishing, LLC, a corporation under and by virtue of the laws of Wisconsin, whose principal place of business is at Marinette, Wisconsin, and that, as such principal clerk he/she makes this affidavit in its behalf and is authorized to do so:

That the said corporation is the publisher and printer of the EagleHerald, a daily newspaper published and printed in the City of Marinette, Marinette County, State of Wisconsin, and that the notice of which the annexed is a copy and which is taken from the paper in which it was published, was published in the said newspaper .....one..... times, ~~once in each week for ..... successive weeks~~: that the first publication of said notice therein was on the ....15th..... day of .....March..... A.D., 2021, ~~and that the last publication of said notice therein was on the ..... day of ..... A.D., 2021~~.

Affiant further says that said newspaper has a bona fide circulation to actual subscribers of more than seven thousand seven hundred copies per day, and is regularly and continuously published in said city of Marinette, Marinette County, State of Wisconsin, at least six days in each calendar week, holidays excepted, and that all facts set forth in the affidavit are true, to his/her personal knowledge.

Rebecca Minton

Rebecca Minton

Subscribed and sworn to before me this 23
day of March, 2021

Kaylyn F. Tarlton

Kaylyn F. Tarlton, Notary Public, Marinette County, Wisconsin

My Commission Expires 10-1-22

Publisher's Fees 3X10 col Lines 1 Insertions $ 56.50

Affidavit $1.00

Received Payment .....(total) $ 56.50

Date ..... By .....

Kaylyn F. Tarlton
Notary Public
State of Wisconsin

Michigan Circulation for 3/15/2021 was 1665

Eagle Herald
www.ehextra.com

Fauci: Trump should urge followers to get COVID-19 vaccine

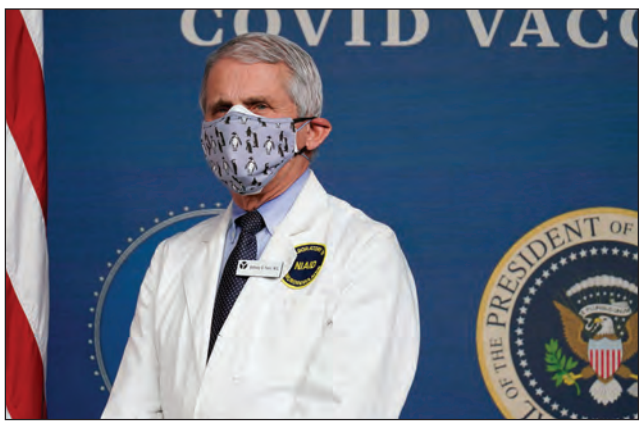
By MICHELLE LIU
Associated Press

Dr. Anthony Fauci said Sunday he wishes former President Donald Trump would use his popularity among Republicans to persuade more of his followers to get the COVID-19 vaccine.

In a round of interviews on the morning news shows, the government's top infectious disease expert lamented polling showing that Trump supporters are more likely to refuse to get vaccinated, saying politics needs to be separated from "common-sense, no-brainer" public health measures.

Fauci said it would be a "game changer" for the country's vaccine efforts if the former president used his "incredible influence" among Republicans.

"If he came out and said, 'Go and get vaccinated. It's really important for your health, the health of your family and the health of the country,' it seems absolutely inevitable that the vast majority of people who are his close followers would listen to him," Fauci told "Fox News Sunday."



The Associated Press
In this Feb. 25 Dr. Anthony Fauci, director of the National Institute of Allergy and Infectious Diseases, listens as President Joe Biden speaks during an event to commemorate the 50 millionth COVID-19 shot in Washington.

Trump has urged people to get vaccinated, doing so again two weeks ago at a conservative political gathering in Florida.

Polls have shown Republicans joining Black people and other groups in expressing greater skepticism than others about the safety of the vaccine.

> *"What is the problem here? This is a vaccine that is going to be life-saving for millions of people."*
>
> **Dr. Anthony Fauci**
> National Institute of Allergy and Infectious Diseases director

Fauci said he doesn't understand the resistance.

"What is the problem here? This is a vaccine that is going to be lifesaving for millions of people," he said on NBC's "Meet the Press." He added: "I mean, I just can't comprehend what the reason for that is when you have a vaccine that's 94-95% effective and it is very safe. I just don't get it."

The Associated Press
In this Jan. 6 file photo, rioters supporting President Donald Trump storm the Capitol in Washington.

Coworkers say man charged in Capitol riot had Hitler mustache

By The Associated Press

WASHINGTON —An Army reservist charged with taking part in the attack on the U.S. Capitol was known as a Nazi sympathizer who wore a Hitler mustache, coworkers told federal investigators.

Timothy Hale-Cusanelli, 30, was employed as a security contractor at a Navy base when he was alleged to have breached the Capitol on Jan. 6, authorities said.

In court papers filed Friday, federal prosecutors in Washington said his coworkers at the Naval Weapons Station Earle in Colts Neck, New Jersey, told investigators that he held white supremacist views.

The filing included photos from Hale-Cusanelli's cellphone of him with a Hitler mustache, along with pro-Nazi cartoons.

One Navy seaman said that Hale-Cusanelli told him "he would kill all the Jews and eat them for breakfast, lunch, and dinner, and he wouldn't need to season them because the salt from their tears would make it flavorful enough."

Other coworkers recalled Hale-Cusanelli making derogatory remarks about women, Black people and other minorities.

Jonathan Zucker, Hale-Cusanelli's attorney, wrote in a filing that there was no evidence his client belongs to any white supremacist organizations.

Authorities said Hale-Cusanelli made videos of himself screaming at Capitol Police officers, climbing a scaffolding to enter the building through doors kicked open by rioters, and chanting "Stop the steal!" Some of those videos were posted to social media.

FEMA to help manage unaccompanied minors at US-Mexico border

By DARLENE SUPERVILLE
Associated Press

WILMINGTON, Del. — The Biden administration is turning to the Federal Emergency Management Agency for help managing and caring for record numbers of unaccompanied immigrant children who are streaming into the United States by illegally crossing the border with Mexico.

FEMA will support a governmentwide effort over the next three months to safely receive, shelter and transfer minor children who arrive alone at the U.S. southwest border, without a parent or other adult, Homeland Security Secretary Alejandro Mayorkas said Saturday.

Government figures show a growing crisis at the border as hundreds of children illegally enter the U.S. from Mexico daily and are taken into custody.

The Homeland Security Department is supposed to process and transfer unaccompanied minor children to the Department of Health and Human Services within three days so that they can be placed with a parent already living in the United States, or other suitable sponsor, until their immigration cases can be resolved.

But more children are being held longer at Border Patrol facilities that weren't designed with their care in mind because long-term shelters run by the Department of Health and Human Services have next to no capacity to accommodate them. Children are being apprehended daily at far higher rates than HHS can release them to parents or sponsors.

Mayorkas said FEMA is working with the Health and Human Services Department to "look at every available option to quickly expand physical capacity for appropriate lodging."

"Our goal is to ensure that unaccompanied children are transferred to HHS as quickly as possible, consistent with legal requirements and in the best interest of the children," Mayorkas said.

During an record influx of unaccompanied minors in 2014, the Obama administration also turned to FEMA for help coordinating the governmentwide response. During that crisis, FEMA helped stand up temporary shelters and processing stations on military bases.

President Joe Biden has ended the Trump-era practice of expelling immigrant children who cross the border alone, but maintained expulsions of immigrant families and single adults.

While his administration has tried to deter immigrants from entering the U.S., many believe they have a better chance now that Biden is president.

There have also been growing reports of parents sending their children across the border alone while they remain in Mexico or Central America.

> *"Our goal is to ensure that unaccompanied children are transfered to HHS as quickly as possible."*
>
> **Alejandro Mayorkas**
> Homeland Security secretary

Declutter Your Finances With a Spring Cleaning

By Wes Stripling, Community Bank President
First National Bank & Trust

With spring right around the corner, spring season also means spring cleaning. While sorting and tidying up around the house, it's also a good time to add financial organization to your spring cleaning to-do list. To help, here are some tips for organizing your financial house:

- **Review your budget.** A lot can change in a year. If you've been promoted, had a child, or become a new homeowner or renter, be sure to update your budget. Determine what expenses demand the most money and identify areas where you can realistically cut back. Develop a strategy for spending and saving – and stick to it.

- **Evaluate and pay down debt.** Take a look at how much you owe and what you are paying in interest. Begin paying off existing debt, whether that's by chipping away at loans with the highest interest rates or eliminating smaller debt first.

- **Set up automatic bill pay.** By signing up for automatic bill pay, you'll never have to worry about a missed payment impacting your credit score. You can set it so that money is withdrawn from your checking account on the same day each month.

- **Sign up for e-statements, paperless billing and text alerts.** Converting to paperless billing will help keep your house–physical and financial–more clean and organized, and will help protect you from fraud.

- **Shred old financial documents.** The IRS recommends keeping tax returns and other important documents for at least seven years after you file the return. Go through your tax files, shred older files and create a system that keeps your paperwork organized so it is easily accessible.

- **Check your credit report.** Every year, you are guaranteed one free credit report from each of the three credit bureaus. Take advantage of these free reports and check them for any possible errors. Mistakes can drag down your score and prevent you from getting a loan, or cause you to pay a higher than necessary interest rate.

- **Manage your money on the go.** Utilize a mobile banking app to check your balance, pay your bills, transfer funds, deposit a check and send money to friends from wherever you are.

Spring is the season of renewal and taking time to renew your financial focus will set you up for sunny financial days throughout the rest of the year.

AFFIDAVIT OF PUBLICATION

IN THE MATTER OF

Wisconsin Public Service

Integrated Resource Plan

STATE OF MICHIGAN

COUNTY OF HOUGHTON SS

YVONNE ROBILLARD

Being first duly sworn, says that he/she is the agent of the Publisher of The Daily Mining Gazette, a newspaper published in the English Language for the dissemination of local or transmitted news and intelligence of a general character and legal news, which is duly qualified newspaper, and that annexed hereto is a copy of a certain order taken from said newspaper in which order was published on the following dates:

March 15, 2021

Yvonne Robillard

Agent of the Publisher of The Daily Minir

Subscribed and sworn before me this 1

Day of March

Catherine O'Connell R

Notary Public, Houghton County, Michig

Acting in and for the County of Houghtor

CATHERINE O'CONNELL RICCI
Notary Public, State of Michigan
County of Houghton
My Commission Expires Aug. 10, 2024
Acting in the County of Houghton

DAILY GLOBE

Daily Globe, Inc.
118 E. McLeod Avenue ~ Ironwood, MI 49938
906-932-2211 Fax 906-932-5358

PROOF OF PUBLICATION
STATE OF MICHIGAN – COUNTY OF GOGEBIC

Katherine Lavinder

Katherine Lavinder being duly sworn says:
I am the Legal Advertising Representative of The Daily Globe, a newspaper published and circulated in Gogebic and Ontonagon Counties. The Annexed is a printed copy of a notice which was published in said paper on the following date(s):

UMERC

March 16, 2021

Subscribed and sworn to before me
This 16th day of March 2021

Jennifer Louise Kallas

Jennifer Louise Kallas
Gogebic County, Acting in Gogebic County

My commission expires 09-19-2027

JENNIFER LOUISE KALLAS
Notary Public, State of Michigan
County of Gogebic
My commission expires
September 19, 2027
Acting in the County of Gogebic

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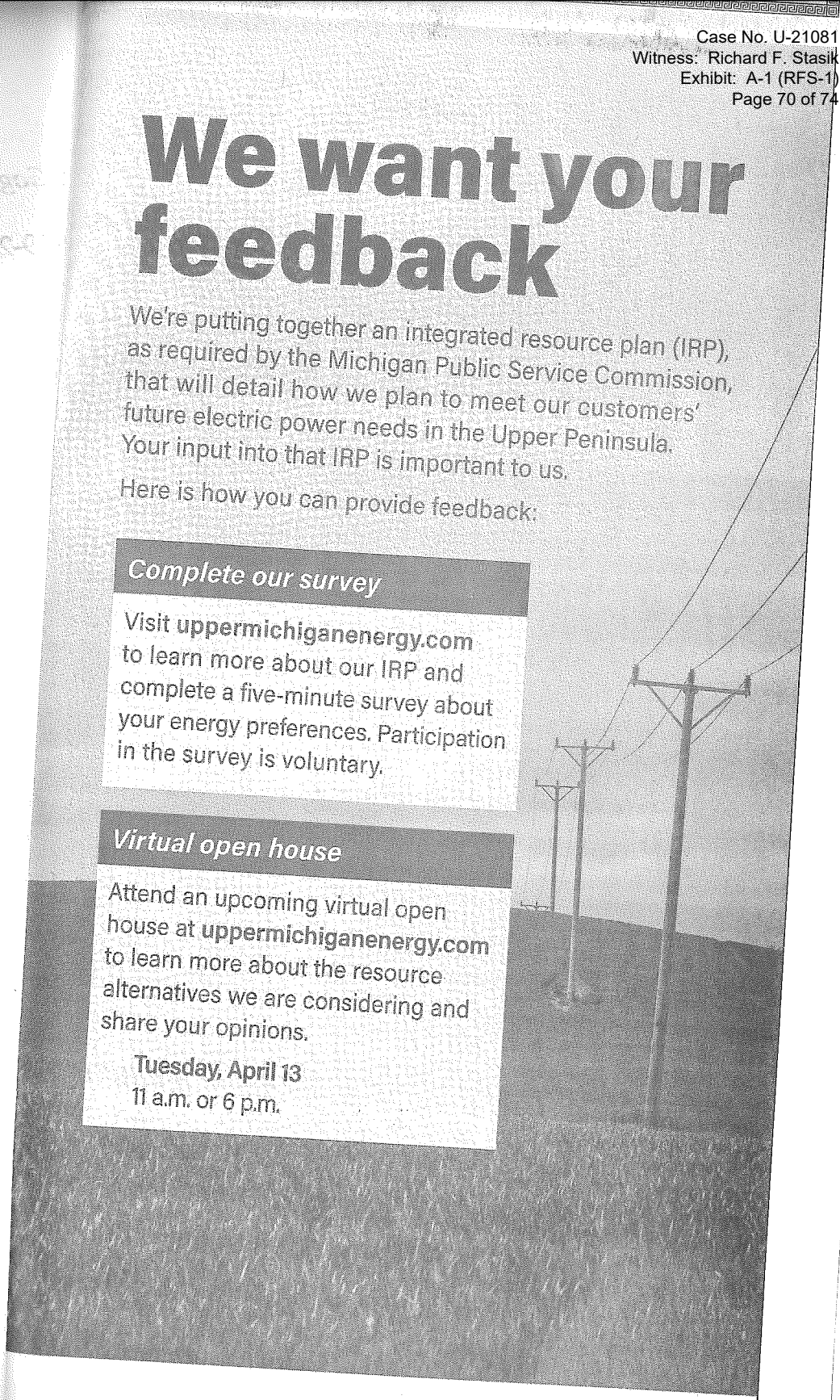
Tuesday, April 13
11 a.m. or 6 p.m.



UPPER MICHIGAN ENERGY RESOURCES

We value your feedback and participation. More information is available at **uppermichiganenergy.com.**

UMERC-WE-210046-03-IDG-GJ

The Mining Journal
Upper Michigan's Largest Daily Newspaper
249 W. Washington St., P.O. Box 430, Marquette, Michigan 49855. Phone (906)228-2500. Fax (906)228-3273.

AFFIDAVIT OF PUBLICATION

STATE OF MICHIGAN

AFFIDAVIT OF PUBLICATION

For the County of **MARQUETTE**

In the matter of: Wisconsin Public Service
Integrated Resource Plan

Size 3 x 10.5

Circulation 5,600

State of **MICHIGAN,** County of Marquette

ANN C. TROUTMAN

being duly sworn, says that she is

PUBLISHER

of **THE MINING JOURNAL**

a newspaper published and circulated in said county and otherwise qualified according to Supreme Court Rule; that annexed hereto is a printed copy of a notice which was published in said newspaper on the following date, or dates, to-wit

March 15, 2021

ANN C. TROUTMAN

Subscribed and sworn to before me this 15th day of March, 2021.

HOLLY GASMAN
Notary Public for MARQUETTE County, Michigan
Acting in the County of Marquette
My commission expires: May 25, 2025

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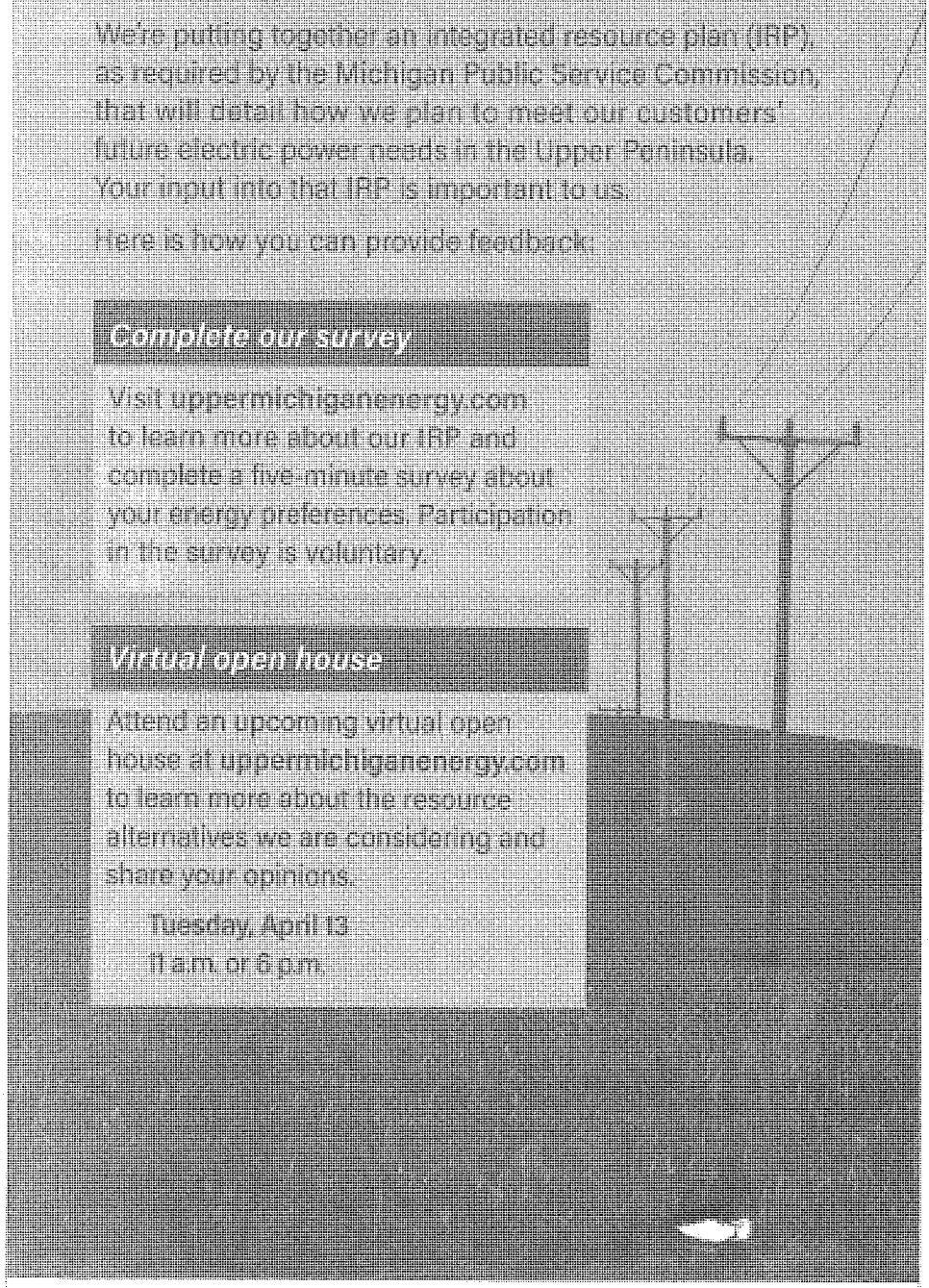

UPPER MICHIGAN ENERGY RESOURCES

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UMERC-WE-3100418-02-MB-G2

PROOF OF PUBLICATION
PUBLISHER S AFFIDAVIT

STATE OF MICHIGAN
County of Dickinson

Marge Petrick being duly sworn, deposes and says that he/she is clerk of THE DAILY NEWS, a newspaper printed, published, and circulated in the City of Iron Mountain and the County of Dickinson, State of Michigan; that the annexed printed notice has been duly published in said newspaper on the 15th day of March A.D. 2021, and the succeeding publications on the following dates:

Signed Marge Petrick

Subscribed and sworn to before me this 15th day of March A.D. 2021

JENNIFER L FLYNN
Notary Public, State of Michigan
County of Dickinson
My Commission Expires Mar. 29, 2026
Acting in the County of Dickinson

Signed Jennifer Flynn
Jennifer Flynn
Notary Public for Dickinson County, MI
Acting in Dickinson County, MI

My Commission expires March 29, 2026

ding vaccinations with
e AstraZeneca shot as a
ecaution for two weeks.

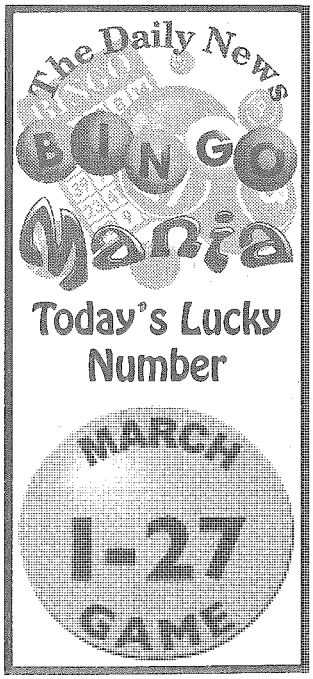
ondon police hief won't quit

LONDON (AP) — Lon-
n's police commissioner
Sunday defended her offi-
rs' actions and said she
dn't intend to resign, after
ming under heavy criti-
sm for the way police treat-
some protesters during a
gil for a woman whom one
the force's own officers is
cused of murdering.
Hundreds defied coron-
irus restrictions Saturday
protest violence against
omen and remember Sarah
verard, a 33-year-old Lon-
n resident whose disap-
arance and killing prompt-
a national outcry. But the
gil ended with clashes
tween police and those
tending, and many ques-
ned whether the police
rce was too heavy-handed.
Home Secretary Priti
tel said scenes from the
gil in south London were
psetting." The capital's
ayor, Sadiq Khan, said the
lice response was "at
nes neither appropriate
r proportionate."

Cuomo adviser riticized for calls

NEW YORK (AP) A
ngtime adviser to New
ork Gov. Andrew Cuomo
ading the state's COVID-
vaccine rollout has been
lling county executives to
uge their loyalty to the
emocratic governor amid
sexual harassment investi-
tion, according to reports
The Washington Post
d The New York Times.
One unnamed Democratic
unty executive was so dis-
bed by the call from vac-
ne "czar" Larry Schwartz
executive filed notice of
impending ethics com-
aint with the public integri-
unit of the state attorney
neral's office Friday, the
wspapers reported.
The executive feared the
unty's vaccine supply
uld suffer if the executive
d not indicate support for
omo, the Post reported.

Fearless" and "1989."
Beyoncé earned her 28th Grammy, surpassing Alison Krauss to become the most decorated female act in Grammy history.
A partial list of Grammy winners Sunday:
— **Record of the year:** "Everything I Wanted," Billie Eilish
— **Album of the year:** "folklore," Taylor Swift
— **Best R&B performance:** "Black Parade," Beyonce
— **Best pop vocal album:** "Future Nostalgia," Dua Lipa
— **Best rap song:** "Savage," Megan Thee Stallion, featuring Beyonce
— **Song of the year (songwriter's award):** "I Can't Breathe," H.E.R., Dernst Emile II and Tiara Thomas
— **Best pop solo performance:** "Watermelon Sugar," Harry Styles
— **Best country album:** "Wildcard," Miranda Lambert
— **Best new artist:** Megan Thee Stallion
— **Best traditional pop vocal album:** "American Standard," James Taylor
— **Best dance/electronic album:** "Bubba," Kaytranada
— **Best rock album:** "The New Abnormal," the Strokes.
— **Best alternative music album:** "Fetch the Bolt Cutters," Fiona Apple
— **Best progressive R&B album:** "It Is What It Is," Thundercat.
— **Best R&B album:** "Bigger Love," John Legend
— **Best rap album:** "King's Disease," Nas
— **Best jazz vocal album:** "Secrets Are the Best Stories," Kurt Elling featuring Danilo Perez
— **Best jazz instrumental album:** "Trilogy 2," Chick Corea, Christian McBride and Brian Blade
— **Best gospel album:**

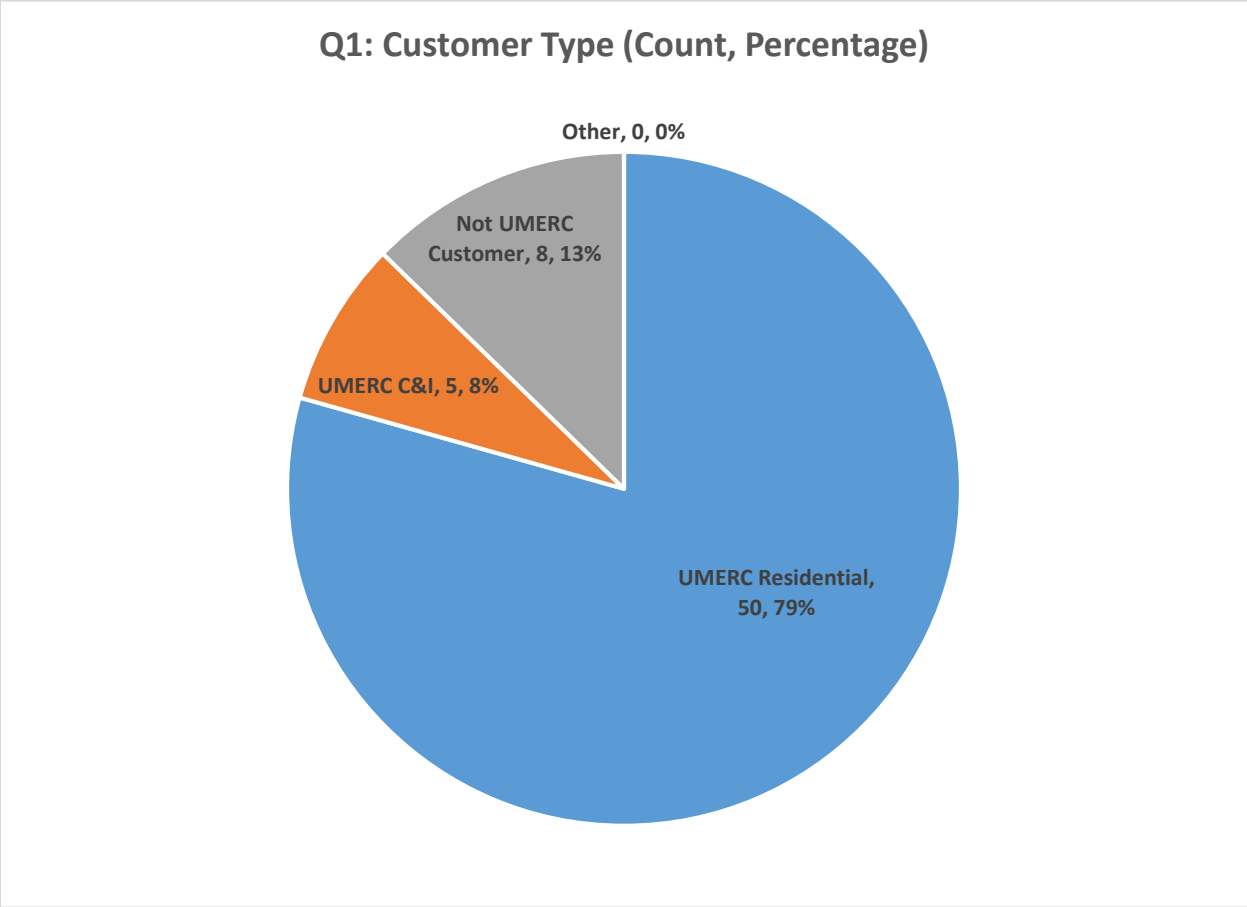


Destructive Industry on Earth," Voice," Linda Ronstadt

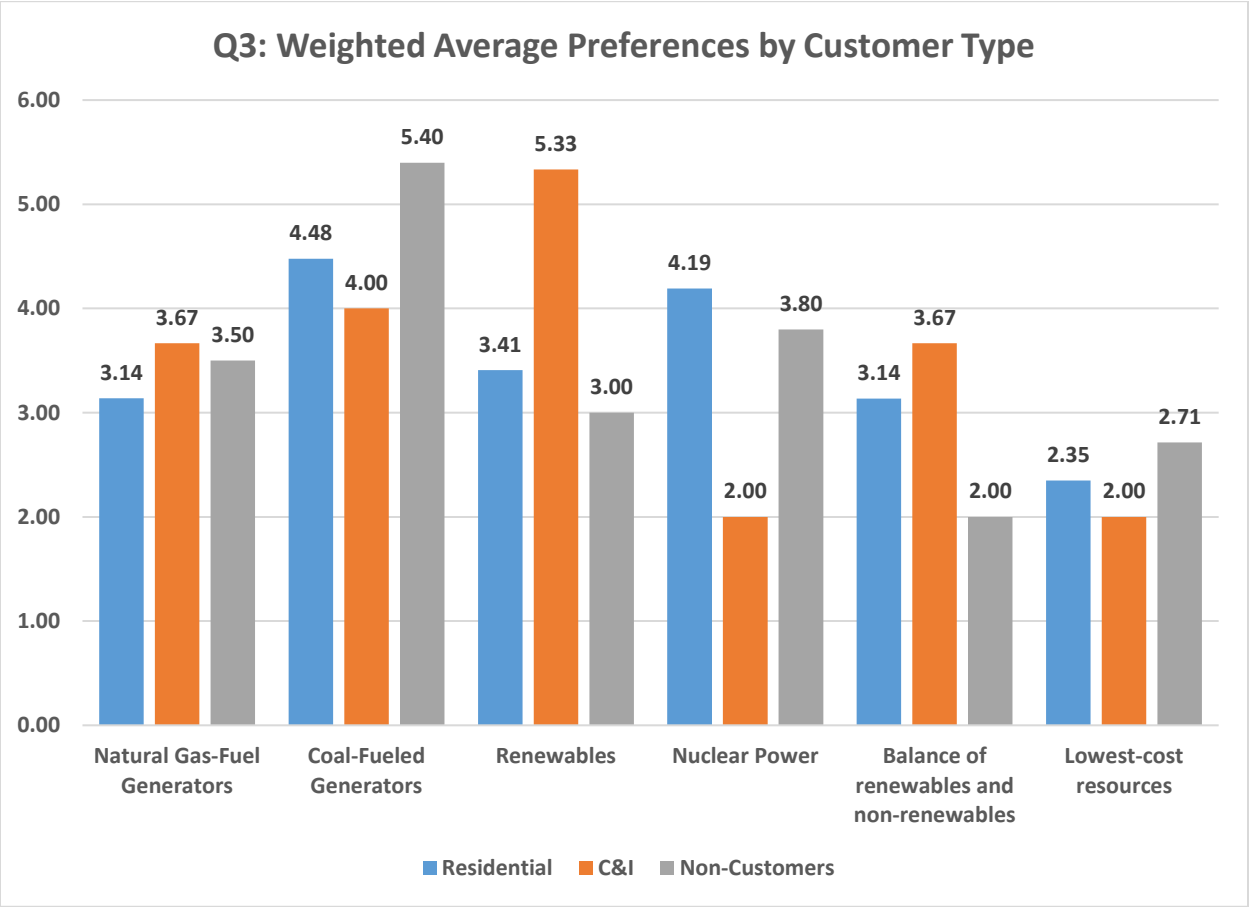
unionized jobs and address-

SURVEY RESPONSES

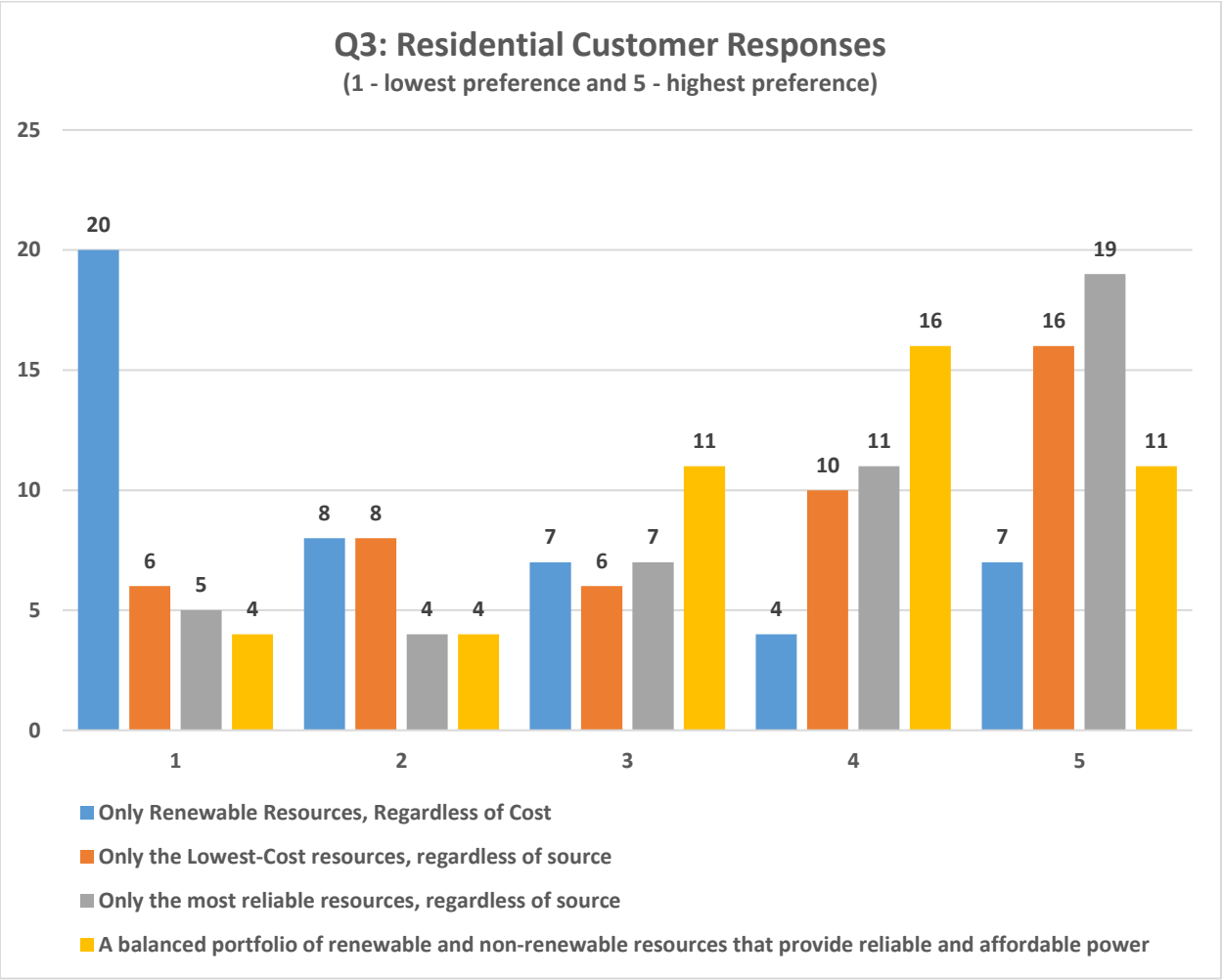
Question 1: Which type of customer are you?

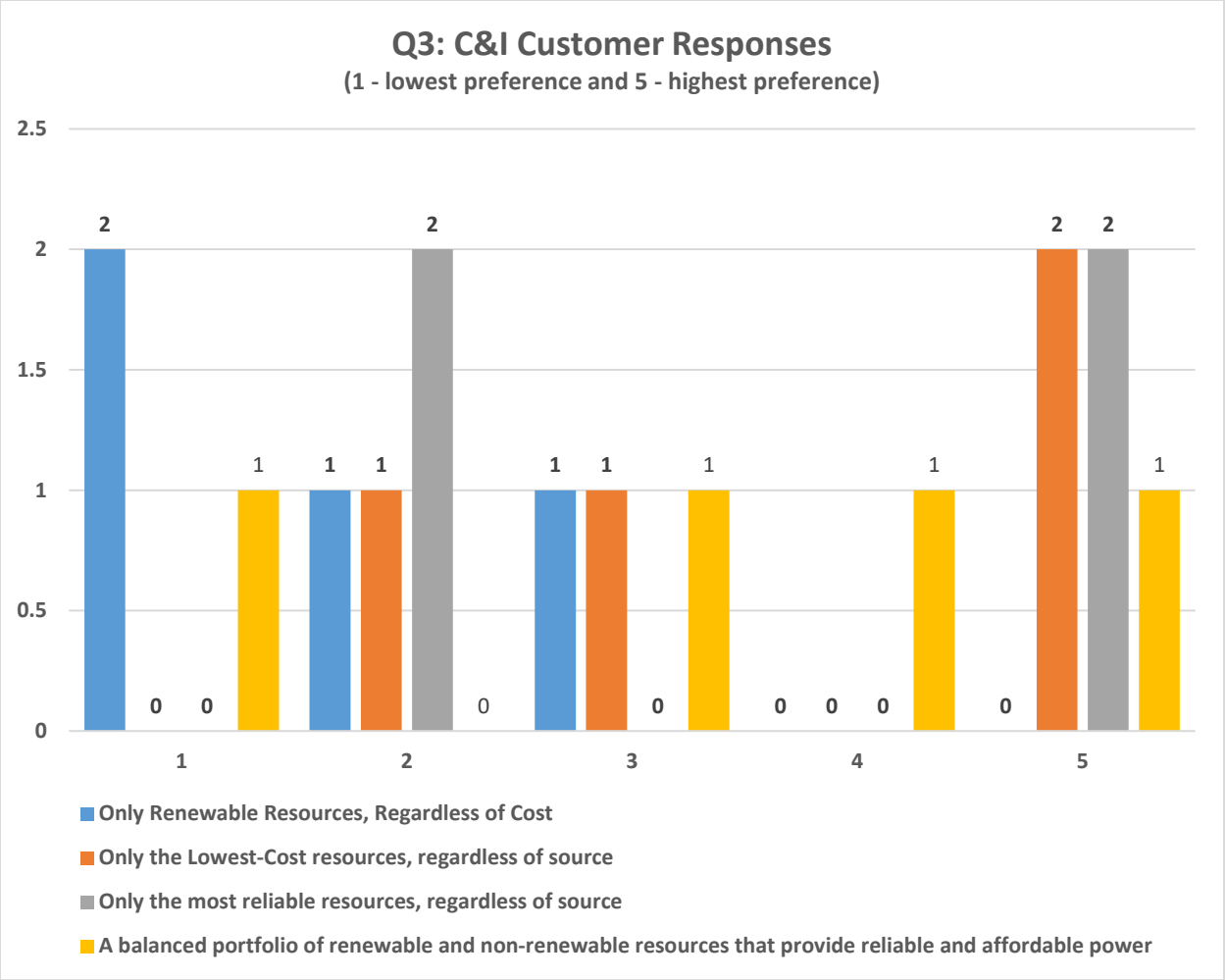


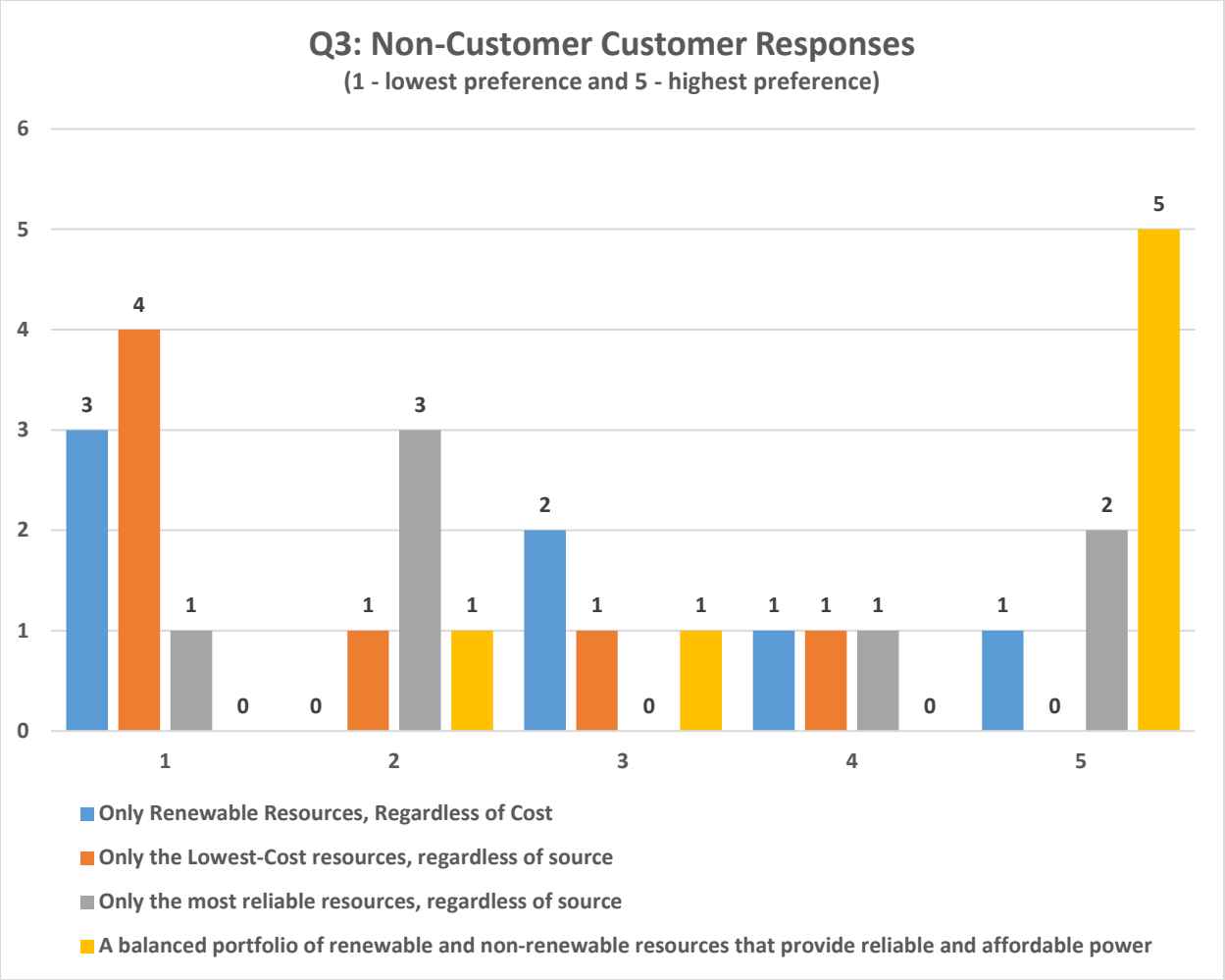
Question 2: Thinking about where your energy should come from in the future, please rank from numbers 1-6 the following energy sources from your highest (1) to lowest (6) reference. If you have no preference regarding the source of energy, then leave the boxes below unnumbered and proceed to the next question.



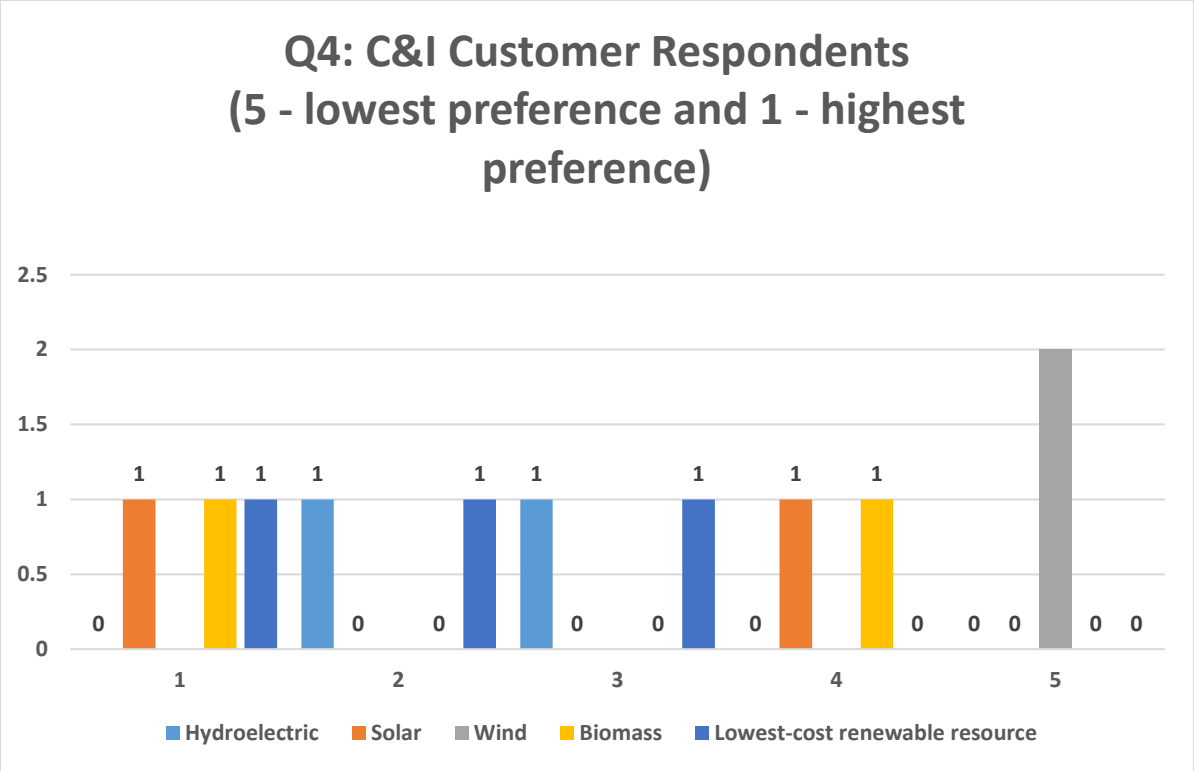
Question 3: Thinking about the possible mix of resources in the UMERC integrated resource plan (IRP), please rate how important it is to reflect each of the following in the IRP, in your opinion.

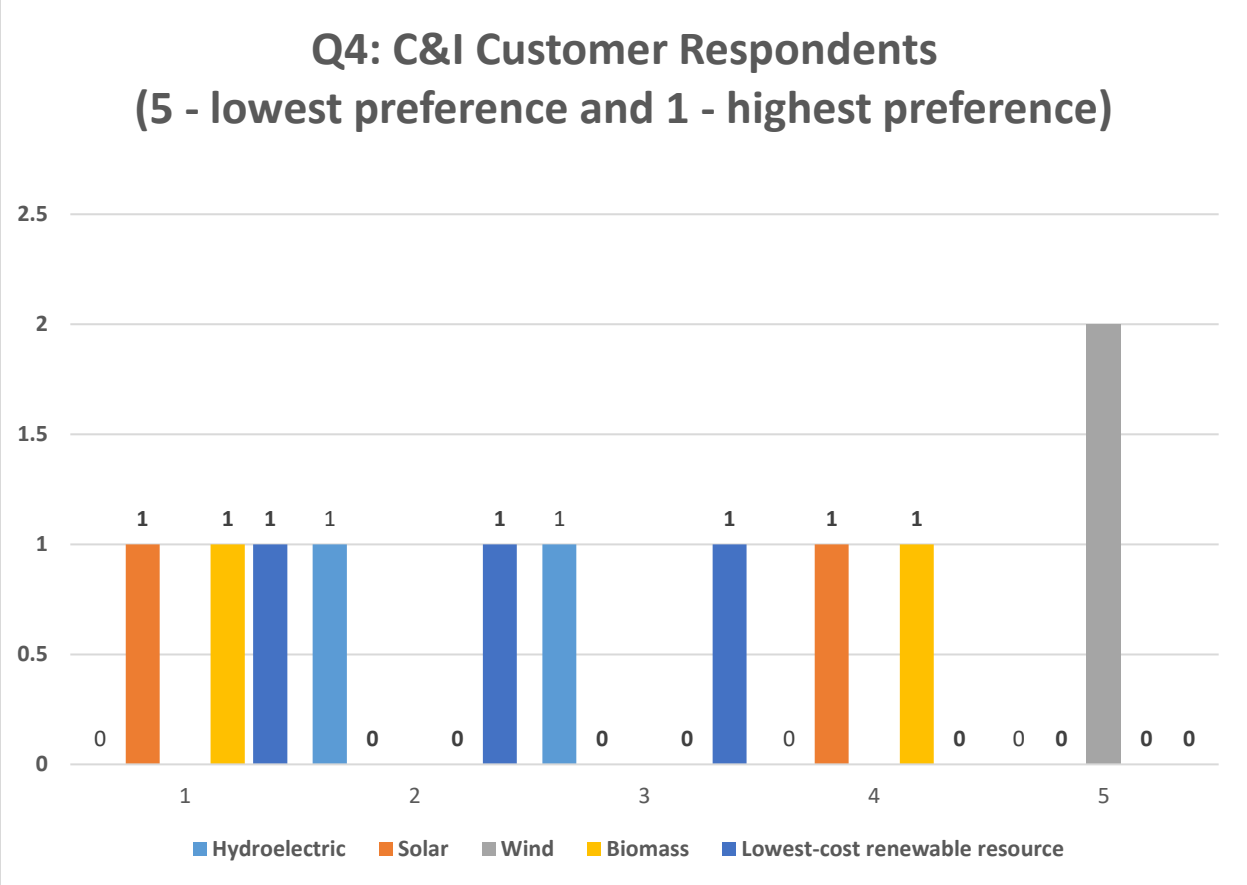



Q3: C&I Customer Responses
(1 - lowest preference and 5 - highest preference)
2.5
2
1.5
1
0.5
0
2
0
0
1
1
1
2
0
1
1
0
1
0
0
0
1
0
2
2
1
1
2
3
4
5
Only Renewable Resources, Regardless of Cost
Only the Lowest-Cost resources, regardless of source
Only the most reliable resources, regardless of source
A balanced portfolio of renewable and non-renewable resources that provide reliable and affordable power

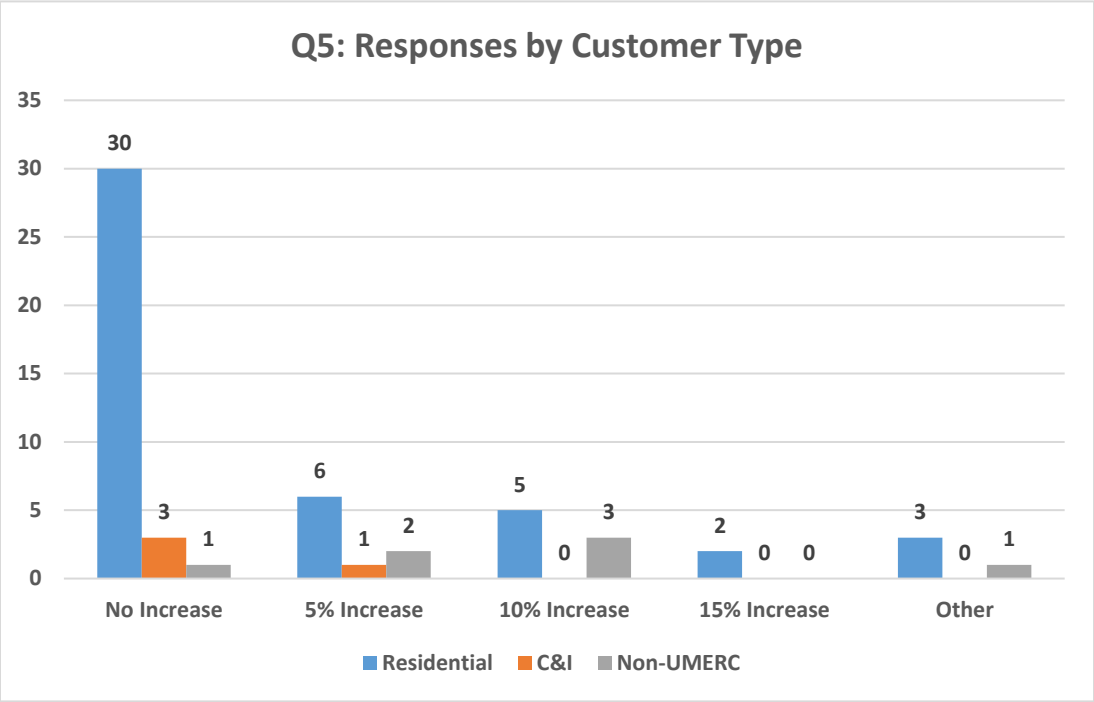


Question 4: Please rank from numbers 1-5 the following renewable resources from your highest (1) to lowest (5) preference. If you have no preference, leave the boxes unnumbered and proceed to the next question.

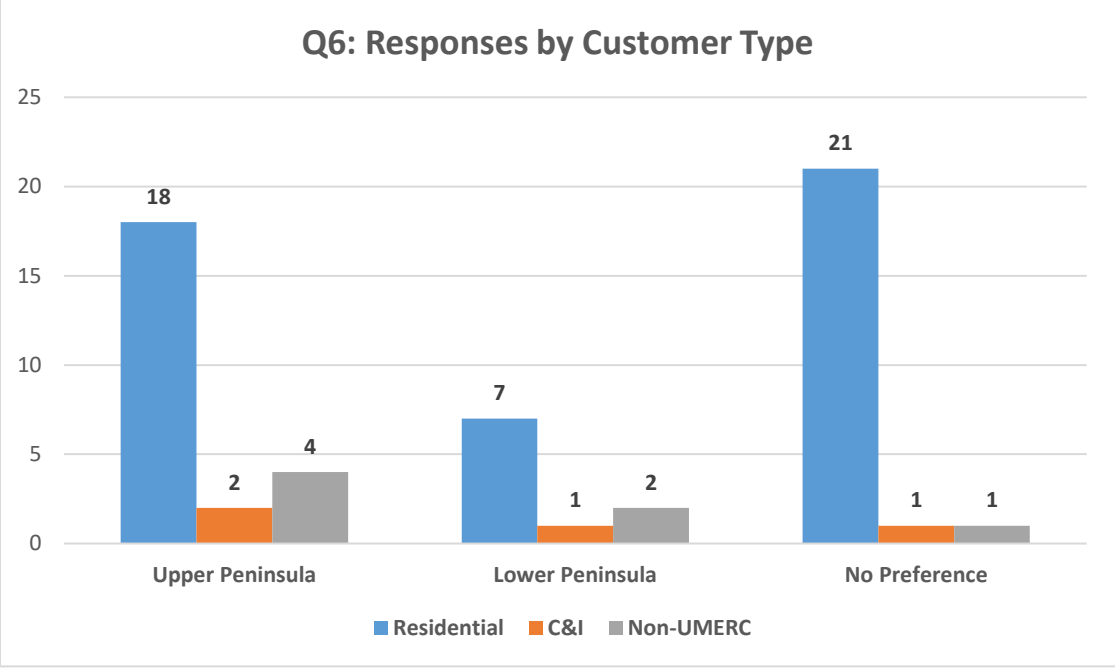

Q4: C&I Customer Respondents
(5 - lowest preference and 1 - highest preference)
2.5
2
1.5
1
0.5
0
1
2
3
4
5
Hydroelectric
Solar
Wind
Biomass
Lowest-cost renewable resource


Q4: C&I Customer Respondents
(5 - lowest preference and 1 - highest preference)
2.5
2
1.5
1
0.5
0
1
2
3
4
5
Hydroelectric
Solar
Wind
Biomass
Lowest-cost renewable resource

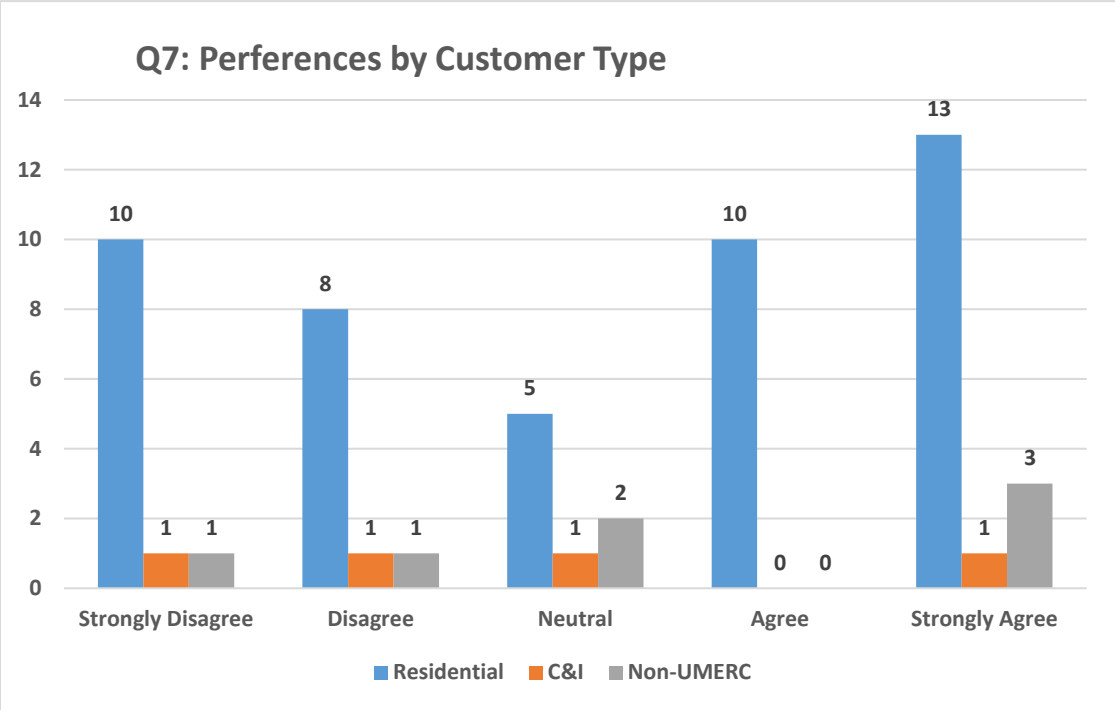
Question 5: Compared to your current energy costs, how much extra on average would you be willing to pay to have renewable resources included in UMERC's energy portfolio?



Question 6: Now think about where UMERC's renewable energy could be generated. Please pick your first choice. If you have no preference, pick the No preference option.



Question 7: The state of Michigan's renewable portfolio standard requires that 15% of the electricity sold to retail customers come from renewable energy sources in 2021. How strongly do you disagree or agree that UMERC should exceed the state mandate of 15%?



SURVEY COMMENTS RECEIVED

- What protective measures are in place, and will be in place, to fortify the power grid from probable cyber and/or EMP (ElectroMagnetic Pulse) attacks?
  5/1/2021 12:09 AM

- Thank you very much for giving your customers the opportunity to express their values to you, it is very appreciated!
  4/16/2021 3:58 PM

- Use most efficient resource possible.
  4/12/2021 9:02 AM

- Mandate costs are passed to consumers and they pay the bill. We have plenty of inexpensive fuel sources to generate electricity.. Let the market dictate electrical energy resources. Government mandates can only lead to higher, much higher prices that disproportionately hurt the poor.
  4/3/2021 6:40 PM

- Conserve also
  4/2/2021 11:57 AM

- You should not charge the customer extra money for your company to do the right thing for the good of the planet!
  4/1/2021 7:19 PM

- Solar energy for the UP is out because of persistent cloud and snow cover. Every time I cross the bridge, I never see the wind turbines turning and MAY have seen one turning further down state. The generation is unreliable or apparently not useable when available. Biomass makes sense as this will consume O2 and generate CO2 whether you burn it or leave it to rot/decompose on the forest floor. Besides CO2 is good for trees and the more trees you grow the more CO2 they will consume (if that is truly something some people are worried about.) Natural gas should be reserved for residential and small commercial customers and reduce distribution energy demands. Larger customers should be incentivised to consume coal when possible. (God knows the EPA has enouch regulations that a person could practically live in the exhaust stack, but I digress.) Pipelines are the safest and most costeffective means of transporting fossil fuels unless you are rich enough to convince less well-informed people that driving trucks and trains of fammables through their towns is safer. Follow the money when someone gives you an answer to solve your problem.
  3/31/2021 4:09 PM

- NONE
  3/31/2021 11:00 AM

- Change does need to take place to protect the environment.
  3/30/2021 3:43 PM

- Tell Whitmer hands off the Line 5 propane and keep her away from your IRP planning.
  3/29/2021 8:38 PM

- Electric is too expensive now. Utilities should figure out ways to cut costs to reduce total rate paid by users. Or at least hold the line.
  3/29/2021 2:38 PM

- I believe in the power of markets. Politicians should not dictate how to develop reliable energy sources. They can use taxes to influence cost and hence influence markets
  3/26/2021 10:28 AM

- This global warming save the planet crap is just that, crap. We need to keep people working give the boiler makers pipe fitters laborers & all others working in the field working & stop shutting down places. Focus on how this country is literally falling apart fast. Considering everyone is broke why even consider raising our rates there is no way I can afford an increase
  3/25/2021 1:38 PM

- Wind, solar and biomass are not renewable, reliable or cost effective. Energy efficiency is more practical and cost effective.

3/23/2021 7:46 PM

- NA
  3/22/2021 2:25 PM

- As far as the climate is concerned fossil fuels are no longer sustainable. Nuclear power as presently utilized does not provide a safe power source.
  3/21/2021 3:55 PM

- No one wants to pay higher utility bills, but we all live in an environment that is adversely affected by the burning of fossil fuels. It's time all people and companies become environmentally responsible.
  3/20/2021 9:00 PM

- I think renewable energy is very important and look forward to more sustainable options to keep Michigan pure.
  3/17/2021 4:35 PM

- Like to see plan on power outages
  3/15/2021 1:10 PM

- Renewable resource goal should be to continue to seek higher percentages for the future in the portfolio and with continuous improvement, costs should decrease over time.
  3/14/2021 8:20 AM

- Line 5 is important to Michigan because of the strain closing it could have on the electric grid. Wind power is not at all cost effective or inefficient!
  3/12/2021 7:37 PM

- The main concern I have, which we've experienced several times in the past few years, is related to electric costs during extremely cold periods causing the gas market to become extremely tight. We are an interruptible customer that is subject to market pricing during on-peak hours. It seems that we are subject to more market pricing during the very cold times compared to years past. I'm sure it's related to natural gas being used on the generation side but as a customer, it puts us in a very difficult situation when we're under constraints for gas usage and paying elevated market pricing for electrical.
  3/9/2021 8:25 AM

Origin of Requirement	Filing, Testimony, Exhibits, and Workpaper Requirements	
	General Filing Requirements	
MPSC Case No. U-18461	Filing Announcement - Required if a utility intends to file an IRP on a date other than its scheduled filing date, shall file a filing announcement and includes: 1) Estimated date of filing; 2) Information related to any stakeholder engagement meetings that have already taken place or are scheduled to take place; 3) Information related to any stakeholder engagement meetings that have already taken place or are scheduled to take place; and 4) Information related to any Certificate of Necessity application that would be filed with the utility's IRP.	Filing on Required date of October 10, 2021 - Not applicable
	The Company will file an IRP by October 15th of 2021	
MPSC Case No. U-18461	Pre-filing Request for Proposals - Each electric utility whose rates are regulated by the Commission shall issue a request for proposals (RFP) to provide any new supply-side capacity resources needed to serve the utility's reasonably projected electric load, applicable planning reserve margin, and local clearing requirement for its customers in this state, as well as customers located in other states but served by the utility, during the initial three-year planning period to be considered in each IRP to be filed, as outlined in MCL 460.6t.	In process - Company will provide with cost update within 150 days of filing.
MPSC Case No. U-18461	IRP Report and Documentation - The utility's IRP filing shall demonstrate compliance with MCL 460.6t and include the following items: a) Letter of Transmittal expressing commitment to the approved preferred resource plan and resource acquisition strategy and signed by an officer of the utility having the authority to commit the utility to the resource acquisition strategy, acknowledging that the utility reserves the right to make changes to its resource acquisition strategies as appropriate due to changing circumstances;) Technical volume(s) that fully describe and document the utility's analysis and decisions in selecting its preferred resource plan and resource acquisition strategy; c) The data and information requested in the Commission's IRP filing requirements included herein; d) Any other information deemed relevant by the utility.	
	Testimony, Exhibits, and Workpaper Requirements	**Witness**
MPSC Case No. U-18461	Informative non-technical description of the preferred resource plan and resource acquisition strategy.	Stasik-Direct-9
	Overview of Witness Testimony in the case.	Stasik-Direct-6
	Overview of statutory framework and requirements.	Stasik-Direct-3-4
MPSC Case No. U-18461	An overview of the planning period examined in the IRP analysis and application	Stasik-Direct-7
MPSC Case No. U-18461	A brief introduction describing the utility, its existing facilities, existing purchase power arrangements, existing demand-side programs, existing demand-side rates, and the goal to be achieved by its proposed course of action and implementation strategy	Keller-Direct-4-5
MPSC Case No. U-18461	Describe resource plans to satisfy at least the objectives and priorities identified in MCL 460.6t. The utility may identify and/or describe additional planning objectives that the resource plan will be designed to meet. The utility shall describe and document its additional planning objectives and its guiding principles to design alternative resource plans that satisfy consider the planning objectives and priorities.	Stasik-Direct-4
	Company Vision, Strategy, Principles, Goals and Objectives	Stasik - Direct - 4
	Describe benefits to the local communities and Michigan	Exhibit A-14 (RAG-1)
MPSC Case No. U-18461	General description of the utility's existing energy system, including:	
MPSC Case No. U-18461	i) Net present value of utility revenue requirements with and without any financial performance incentives for demand-side resources	Exhibit A-6 (KMK-1)
MPSC Case No. U-18461	ii) Revenue requirement of existing generation and power purchase agreements	Exhibit A-6 (KMK-1)
MPSC Case No. U-18461	iii) Summary of existing generation and power purchase agreements by fuel type	Keller-Direct-4-5
MPSC Case No. U-18461	iv) Utility's existing capacity resource mix	Keller-Direct-4-5
MPSC Case No. U-18461	v) Utility's service territory and breakdown of customers class composition	Keller-Direct-11
MPSC Case No. U-18461	vi) Description of planning period analyzed	Stasik-Direct-4
MPSC Case No. U-18461	2) Statement of power need	Keller-Direct-11
MPSC Case No. U-18461	3) Identify and explain the basis for the forecasted price of energy, capacity, and fuels, and of peak demand and energy requirements, for each year of the analysis used in each scenario and sensitivity evaluated by the utility as part of the IRP process	Exhibit A-6 (KMK-1)
MPSC Case No. U-18461	4) Market and regulatory environment influencing resource planning decisions;	
MPSC Case No. U-18461	i) Regional transmission organization (RTO) market and state regulation structure if a multi-state utility	Keller-Direct-16
MPSC Case No. U-18461	ii) Potential Changes to RTO Capacity Market	Keller-Direct-16
MPSC Case No. U-18461	iii) Electric Customer Choice	Keller-Direct-12
MPSC Case No. U-18461	iv) Transmission Expansion	Keller-Direct-13-14
MPSC Case No. U-18461	v) Environmental	Exhibit A-6 (KMK-1)
MPSC Case No. U-18461	vi) Renewable Portfolio Standards	Keller-Direct-15

MPSC Case No. U-18461	vii) Other	N/A
MPSC Case No. U-18461	5) IRP Planning Process	Stasik-Direct-13
MPSC Case No. U-18461	6) Stakeholder Report	Stasik-Direct-13
	Stakeholder Engagement	**Witness**
MPSC Case No. U-18461	Documentation demonstrating the public outreach process undertaken by the utility	Exhibit A-1 (RFS-1) Exhibit A-2 (RFS-2)
	Analytical Approach	**Witness**
MPSC Case No. U-18461	Describe the modeling process, including the duration of the study	Exhibit A-6 (KMK-1)
MPSC Case No. U-18461	Describe and provide a justification for the risk analysis approach adopted from the Risk Assessment Methodology section:	
MPSC Case No. U-18461	a) The utility shall describe and document its quantification of the risk that affects the evaluation of the various preferred resource plan options, The utility shall provide a tabulation of the key quantitative results of that analysis and a discussion of how those findings affected its decision on a resource plan.	Keller-Direct-17-20
MPSC Case No. U-18461	The utility shall describe and document the identification of risk variables and/or combinations of risk variables selected; their ranges, probabilities, ranking, and/or weighting that defines the risk quantification which the various preferred resource plan options were judged. Also describing how these risk variables were judged to be appropriate and explain how these were determined. Describe the modeling tools and data sources employed during the capacity expansion, and other modeling processes.	Keller-Direct-17-20
	IRP Scenario and Sensitivities	**Witness**
MPSC Case No. U-18461	Include a detailed description of all scenarios and sensitivities.	Exhibit A-6 (KMK-1)
MPSC Case No. U-18461 MPSC Case No. U-18418	In addition to each electric utility's own scenarios and assumptions, the inclusion of the scenarios and sensitives established modeling scenarios and assumptions in accordance with Commission Order in U-18418, or subsequent Commission Orders related to IRP modeling parameters and requirements.	Exhibit A-6 (KMK-1)
	Existing Supply-Side (Generation) Resources	**Witness**
MPSC Case No. U-18461	Detailed account of projected energy and capacity purchased or produced by the electric utility's owned and contracted resources, including cogeneration resources. Include data regarding the utility's current generation portfolio, including the age, capacity factor, licensing status, and remaining estimated time of operation for each facility in the portfolio.	
MPSC Case No. U-18461	1) Overview	Keller - Scenario - Workpapers
MPSC Case No. U-18461	2) Fossil-Fueled Generating Units	Keller Direct - 6
MPSC Case No. U-18461	3) Nuclear Generating Units	N/A
MPSC Case No. U-18461	4) Hydroelectric Generating Units	N/A
MPSC Case No. U-18461	5) Renewable Generating Units	N/A
MPSC Case No. U-18461	6) Energy Storage Facilities	N/A
MPSC Case No. U-18461	7) Power Purchase Agreements: energy and capacity purchased or produced by the electric utility from a contracted resource, including any cogeneration resource	N/A
MPSC Case No. U-18461	8) RTO Capacity Credits and Modeling of Existing Units (such as capacity factor, heat rate, outage rate, in service and retirement dates, operating costs, etc.)	Keller-Direct-5
MPSC Case No. U-18461	9) Spot Market Purchases and Off-System Sales	Keller Direct- 16
	Demand-Side Resources	**Witness**
MPSC Case No. U-18461	Describe the existing demand response and load management programs for the IRP study horizon.	Keller-Direct-9
MPSC Case No. U-18461	Historical and projected load management and demand response programs for the electric utility in terms of megawatts and MISO Zonal Resource Credits (ZRCs) and the projected costs for those programs.	Keller-Direct-9
MPSC Case No. U-18461	Provide data on projected enrolled capacity and demand response events for each existing program.	
MPSC Case No. U-18461	i) Describe the amount of load reductions and the expected hours of interruption per day, month, and year for each existing program.	Keller-Direct 10
MPSC Case No. U-18461	ii) Describe the utility's method for determining whether to purchase energy rather than relying on demand response.	Keller-Direct 10
MPSC Case No. U-18461	iii) A description of any other programs the utility is considering that could potentially expand demand response resources.	Keller-Direct 10
MPSC Case No. U-18461	iv) Describe details regarding the utility's plan to eliminate energy waste, including the total amount of energy waste reduction expected to be achieved annually, and the cost of the plan.	Keller-Direct 10
	Renewable and Renewable Portfolio Standard Goals	**Witness**
MPSC Case No. U-18461	Projected energy purchased or produced by the electric utility from a renewable energy resource.	Keller - Scenario - Workpapers

MPSC Case No. U-18461	Describe how the electric provider will meet existing renewable energy standards. If the level of renewable energy purchased or produced is projected to drop over the planning periods, the electric utility must demonstrate why the reduction is in the best interest of ratepayers.	Keller Direct -
MPSC Case No. U-18461	Specify whether the number of megawatt hours of electricity used in the calculation of the renewable energy credit portfolio will be the previous twelve-month period of weather-normalized retail sales or based on the average number of megawatt hours of electricity sold by the electric provider annually during the previous three years to retail customers in this state.	Keller Direct - 12
MPSC Case No. U-18461	Include the expected incremental cost of compliance with existing renewable energy standards for the required compliance period	Keller Direct - 12
MPSC Case No. U-18461	A description of how the electric provider's plan is consistent with the renewable energy goals required by the Michigan Legislature (e.g. 35% combined renewable energy and energy waste reduction goal by 2025)	Stasik Direct - 23
MPSC Case No. U-18461	Describe the options for customer-initiated renewable energy that will be offered by the electric provider and forecast sales of customer-initiated renewable energy.	Keller - Direct - 10
MPSC Case No. U-18461	Describe how the electric provider will meet the demand for customer-initiated renewable energy.	Keller - Direct - 10
	Peak Demand and Energy Forecasts	**Witness**
MPSC Case No. U-18461	A long-term forecast of the electric utility's sales and peak demand under various reasonable scenarios. Include details regarding the utility's plan to eliminate energy waste, including the total amount of energy waste reduction expected to be achieved annually, and the cost of the plan.	
MPSC Case No. U-18461	a) A forecast of the utility's peak demand and details regarding the amount of peak demand reduction the utility expects to achieve and the actions the utility proposes to take in order to achieve that peak demand reduction	Peccarelli-Direct-2
MPSC Case No. U-18461	i) Key variables used to develop forecast	Peccarelli - Direct - 3
MPSC Case No. U-18461	ii) Long-term forecasting methodology	Peccarelli - Direct - 3
MPSC Case No. U-18461	iii) Forecasting uncertainty and risks	Peccarelli- Direct-4
MPSC Case No. U-18461	iv) Historical growth in electric sales for the previous five years, including a record of its previous load forecasts (can be supplied in work papers)	Peccarelli- Direct-10
MPSC Case No. U-18461	v) Business as usual deliveries and demand forecast	Peccarelli-Direct-5
MPSC Case No. U-18461	vi) Alternative forecast scenarios and sensitivities in accordance with the Commission's final order in Case No. U-18418, or subsequent Commission orders relating to IRP modeling parameters and requirements	Peccarelli-Direct-9
	Capacity and Reliability Requirements	**Witness**
MPSC Case No. U-18461	The utility shall indicate how it complies, and will comply, with all applicable state, federal, ISO, RTO capacity and reliability regulations, laws, rules and requirements, (such as planning reserve margins, system reliability and ancillary service requirements) including the projected costs/revenues of complying with those regulations, laws, and rules.	
MPSC Case No. U-18461	a) Planning Reserve Margin Requirements	Keller-Direct-7-8
MPSC Case No. U-18461	b) System Reliability Requirements	Keller-Direct-19
MPSC Case No. U-18461	c) Ancillary Services Requirements	N/A
MPSC Case No. U-18461	The utility shall include data regarding the utility's current generation portfolio, including the age, capacity factor, licensing status, and remaining estimated time of operation for each facility in the portfolio.	Keller-Direct-4 Exhibit A-6 (KMK-1)
	Transmission Analysis	**Witness**
MPSC Case No. U-18461	In with MCL 460.6t(5)(h), the utility shall include an analysis of potential new or upgraded electric transmission options for the electric utility. The utility's analysis shall include the following information:	Keller-Direct-13-14
MPSC Case No. U-18461	a) The utility shall assess the need to construct new, or modify existing transmission facilities to interconnect any new generation and shall reflect the estimated costs of those transmission facilities in the analyses of the resource options.	Keller-Direct-13-14
MPSC Case No. U-18461	b) A detailed description of the utility's efforts to engage local transmission owners in the utility's IRP process in effort to inform the IRP process and assumptions, including a summary of meetings that have taken place.	Keller-Direct-13-14
MPSC Case No. U-18461	c) Current transmission system import and export limits as most recently documented by the RTO and any local area constraints or congestion concerns.	Keller-Direct-13-14
MPSC Case No. U-18461	d) Any information provided by the transmission owner(s) indicating the anticipated effects of fleet changes proposed in the IRP on the transmission system, including both generation retirements and new generation, subject to confidentiality provisions	Keller-Direct-13-14
MPSC Case No. U-18461	e) Any information provided by the transmission owner(s), including cost and timing, indicating potential transmission options that could impact the utility's IRP by:	Keller-Direct-13-14
MPSC Case No. U-18461	1) increasing import or export capability;	Keller-Direct-13-14
MPSC Case No. U-18461	2) facilitating power purchase agreements or sales of energy and capacity both within or outside the planning zone or from neighboring RTOs	Keller-Direct-13-14
MPSC Case No. U-18461	3) transmission upgrades resulting in increasing system efficiency and reducing line loss allowing for greater energy delivery and reduced capacity need	Keller-Direct-13-14
MPSC Case No. U-18461	4) advanced transmission and distribution network technologies affecting supply-side resources or demand-side resources.	Keller-Direct-13-14
	Fuel	**Witness**

MPSC Case No. U-18461	a) Overview	Exhibit A-6 (KMK-1)
MPSC Case No. U-18461	b) Natural gas price forecasts under the various scenarios	Exhibit A-6 (KMK-1)
MPSC Case No. U-18461	c) Oil price forecasts under the various scenarios	N/A
MPSC Case No. U-18461	d) Coal price forecasts under the various scenarios	N/A
MPSC Case No. U-18461	e) Delivered natural gas prices to existing and new utility owned generating plants	Exhibit A-6 (KMK-1)
MPSC Case No. U-18461	f) Delivered oil prices to existing and new utility owned generating plants	N/A
MPSC Case No. U-18461	g) Delivered coal prices to existing and new utility owned generating plants	N/A
MPSC Case No. U-18461	h) Projected annual fuel costs under the various scenarios	Keller - Scenario - Workpapers
MPSC Case No. U-18461	i) The projected long-term firm gas transportation contracts or natural gas storage the electric utility will hold to provide an adequate supply of natural gas to any new and existing generation facility.	Exhibit A-6 (KMK-1)
	Resource Screen	**Witness**
MPSC Case No. U-18461	Describe the utility's options of resources, including combinations of resources, to serve future electric load such as utilizing existing and planned generation resources, build a new facility, purchasing capacity from the market on a short-term basis, and purchasing capacity through a power purchase agreement. The following sections shall discuss each option in detail and options shall be considered in combination to serve future electric load. As described below, work papers with information on the costs of each resource option and combination of resource options shall be provided with the utility's filing.	Exhibit A-6 (KMK-1)
MPSC Case No. U-18461	a) Existing and Planned Generation	Keller - Direct - 4 Exhibit A-6 (KMK-1)
MPSC Case No. U-18461	b) New Build	Exhibit A-6 (KMK-1)
MPSC Case No. U-18461	i) New generation technology and operating assumptions	Exhibit A-6 (KMK-1)
MPSC Case No. U-18461	ii) New generation development costs	Exhibit A-6 (KMK-1)
MPSC Case No. U-18461	iii) New energy integration of storage technology and operating assumptions	Exhibit A-6 (KMK-1)
MPSC Case No. U-18461	iv) New energy storage development costs	Exhibit A-6 (KMK-1)
MPSC Case No. U-18461	c) Distributed Generation	Keller Direct - 10
MPSC Case No. U-18461	i) Solar Photovoltaic (including solar plus storage)	Keller Direct - 10
MPSC Case No. U-18461	ii) Biogas	Keller Direct - 10
MPSC Case No. U-18461	iii) Energy Storage	Keller Direct - 10
MPSC Case No. U-18461	iv) Other Distributed Generation	Keller Direct - 10
MPSC Case No. U-18461	d) Market Capacity Purchases	
MPSC Case No. U-18461	i) Regional Market Supply Outlook	Keller Direct - 14
MPSC Case No. U-18461	ii) Availability of Market Capacity	Keller Direct - 14

MPSC Case No. U-18461	iii) Market Capacity Price Assumptions	Exhibit A-6 (KMK-1)
MPSC Case No. U-18461	e) Long-Term Power Purchase Agreements	Keller Direct - 8
MPSC Case No. U-18461	f) Transmission Resources	
MPSC Case No. U-18461	i) Overview	Keller Direct - 14-16
MPSC Case No. U-18461	ii) Existing Import and Export Capability	Keller Direct - 14-16
MPSC Case No. U-18461	iii) Transmission Network Upgrade Assumptions for IRP	Keller Direct - 14-16
MPSC Case No. U-18461	iv) Import and Export Impact on Resource Strategy	Keller Direct - 14-16
	Modeling Results	**Witness**
MPSC Case No. U-18461	An analysis of the capital costs, energy production, energy production costs, fuel costs, energy served, capacity factor, emissions (levels and costs), and viability of all reasonable options available to meet projected energy and capacity needs, including, but not limited to, existing electric generation facilities in this state. The following suggest several elements that address the specific items to be included. They are not necessarily exhaustive.	
MPSC Case No. U-18461	a) Description of IRP portfolio design strategy (portfolio optimized for least cost, value maximization, reliability, risk minimization, environmental specification etc., or a particular combination)	Keller-Direct-7
MPSC Case No. U-18461	b) Scenario and sensitivity results, including, revenue requirement and financial impacts (NPV), portfolio capacity including additions and retirements. Include monthly and annual energy pricing, and resource capacity and load factors;	Exhibit A-6 (KMK-1)
MPSC Case No. U-18461	c) Business as usual/reference case portfolios options to be selected from	Exhibit A-6 (KMK-1)
MPSC Case No. U-18461	d) Analysis of IRP results	Exhibit A-6 (KMK-1)
MPSC Case No. U-18461	e) Risk assessment of each scenario	Add to Keller - Direct 15
MPSC Case No. U-20633	Prior to the update to the Michigan Integrated Resource Planning Parameters and Integrated Resource Plan filing requirements in 2022, a Michigan rate-regulated utility or multistate utility with resources serving Michigan load that is filing an integrated resource plan pursuant to Section 6t of Public Act 341 of 2016, MCL 460.6t, may include the modeling of its sensitivities as workpapers, rather than exhibits, so long as the workpapers are provided to the Commission Staff and available to the Michigan Department of Environment, Great Lakes, and Energy.	Keller - Scenario work papers
MPSC Case No. U-20633	A Carbon Reduction Scenario that uses the existing EP scenario assumptions but with a base load forecast that is 1.5% the Company's base outlook for load. The scenario is to include all new proposed resources included in the company's PCA. Utilities should run the Carbon Reduction scenario first with a hard cap on carbon emissions at 28% by 2025 and second with hard cap on carbon emissions at 32% by 2025.	Keller - Scenario work papers
MPSC Case No. U-20633	The Carbon Reduction scenario shall calculate the carbon emissions attributable to energy to serve customers' load plus internal use and losses. This includes carbon emission estimates from owned generation units, power purchase agreements, and carbon emissions attributable to market purchases and sales. For the purpose of assigning a carbon value to Midcontinent Independent System Operator, Inc. and PJM Interconnection LLC market purchases, utilities should use the Midcontinent Independent System Operator, Inc. or PJM Interconnection LLC annual average.	Keller - work papers
MPSC Case No. U-20633	Modeling data of its sensitivities be included as workpapers including annual projected emissions for CO2, SOx, NOx, mercury, and PPM over the 15-year planning horizon for the preferred plan and each scenario optimized plan including any additional scenarios developed by the utility.	Exhibit A-14 (RAG+E156:F164-1) Trinity Workpapers
	Risk Assessment Methodology	**Witness**
MPSC Case No. U-18461	Each utility's IRP filing shall include a thorough risk analysis of the preferred plan and the optimal plans for each of the scenarios specified in MIRPP, as well as all additional scenarios and sensitivities filed with the IRP application. The plans should be feasible and differ in generation mix from the preferred plan and MIRPP plans.	
MPSC Case No. U-18461	1) Discussion of the methodology used for risk analysis	Keller - Direct 7
MPSC Case No. U-18461	2) Utility's justification for the chosen methodology over other alternatives. Acceptable forms include, but not limited to: scenario analysis, global sensitivity analysis, stochastic optimization, generating near-optimal solutions, agent-based stochastic optimization, mean-variance portfolio analysis, and Monte Carlo simulation.	Keller - Direct 7
	Proposed Course of Action	**Witness**
MPSC Case No. U-18461	a) The type of generation technology proposed for a generation facility contained in the plan and the proposed capacity of the generation facility, including projected fuel costs under various reasonable scenarios	Keller-Direct-17
MPSC Case No. U-18461	b) Plans for meeting current and future capacity needs with the cost estimates for all proposed construction and major investments, including any transmission or distribution infrastructure that would be required to support the proposed construction or investment, and power purchase agreements	Exhibit A-6 (KMK-1)
MPSC Case No. U-18461	c)The projected long-term firm gas transportation contracts or natural gas storage the electric utility will hold to provide an adequate supply of natural gas to any new generation facility	N/A
MPSC Case No. U-18461	d) How the filing utility will meet local, state, and federal laws, rules, and regulations under the proposed course of action	Keller - Direct -18

MPSC Case No. U-18461	The utility shall describe the process used to select the preferred resource plan, including the planning principles used by the utility to judge the appropriate tradeoffs between competing planning objectives and between expected performance and risk. The utility shall describe how its preferred resource plan satisfies the following:	Keller - Direct -18
MPSC Case No. U-18461	a) Strike an appropriate balance between the various planning objectives specified	Keller- Direct 21-22
MPSC Case No. U-18461	b) Utilize renewable and demand-side resources to comply with existing laws and goals and, in the judgment of the utility, are consistent with the public interest and achieve state energy policies	Direct - Stasik 22-23
MPSC Case No. U-18461	c) In the judgment of the utility, the preferred plan, in conjunction with the deployment of demand response measures, has sufficient resources to serve load forecasted for the implementation period	Keller- Direct 10-11
MPSC Case No. U-18461	The utility shall develop an implementation plan that specifies the major tasks, schedules, and milestones necessary to implement the preferred resource plan over the implementation period. The utility shall describe and document its implementation plan, which shall contain:	
MPSC Case No. U-18461	a) A schedule to report the status of an approved plan in accordance with MCL 460.6t(14)	Keller - Direct -18
MPSC Case No. U-18461	b) A schedule and description of actions to implement ongoing and planned demand-side programs and demand-side rates	Keller - Direct -18
MPSC Case No. U-18461	c) A schedule and description of relevant supply-side resource research, engineering, retirement, acquisition, and construction	Keller - Direct -18
MPSC Case No. U-18461	d) A net present value revenue requirement comparison of its proposal and reasonable alternatives over the planning period utilized in the analysis. It shall also include the calculation and comparison of the net present value revenue requirement of the utility's proposed plan and alternative resource plans including the alternative resource plans resulting from the Commission-approved modeling scenarios. In addition, the utility shall provide support for its chosen discount rate and discuss how the results of its analysis would change with different discount rate assumptions	Exhibit A-6 (KMK-1) Keller Scenario Workpapers
	Rate Impact	**Witness**
MPSC Case No. U-18461	Projected year-on-year impact of the proposed course of action (and other feasible options) for the periods covered by the plan, covering the following accounts:	
MPSC Case No. U-18461	a) Revenue Requirement	Keller Scenario - Workpapers
MPSC Case No. U-18461	b) Rate Base	Keller Scenario - Workpapers
MPSC Case No. U-18461	c) Plant-in-service capital accounts	Keller Scenario - Workpapers
MPSC Case No. U-18461	d) Non-fuel, fixed operations and maintenance accounts	Keller Scenario - Workpapers
MPSC Case No. U-18461	e) Non-fuel, variable operations and maintenance accounts	Keller Scenario - Workpapers
MPSC Case No. U-18461	f) Fuel accounts	Keller Scenario - Workpapers
MPSC Case No. U-18461	g) Emissions cost	Keller Scenario - Workpapers
MPSC Case No. U-18461	h) Effluent additive costs	Keller Scenario - Workpapers
MPSC Case No. U-18461	j) Projected change in generation plant-in-service	Keller Scenario - Workpapers
MPSC Case No. U-18461	The utility shall describe the financial assumptions and models used in the plan. The plan shall include, at a minimum, the following financial information, together with supporting documentation and justification:	
MPSC Case No. U-18461	a)The general rate of inflation	Exhibit A-6 (KMK-1)
MPSC Case No. U-18461	b)The allowance for funds used during construction rates used in the plan	Keller Scenario - Workpapers
MPSC Case No. U-18461	c) The cost of capital rates used in the plan (debt, equity, and weighted) and the assumed capital structure	Keller Scenario - Workpapers
MPSC Case No. U-18461	d) The discount rates used in the calculations to determine present worth	Exhibit A-6 (KMK-1)
MPSC Case No. U-18461	e) The tax rates used in the plan	Keller Scenario - Workpapers
MPSC Case No. U-18461	f) Net present value of revenue requirements for the plan	Exhibit A-5 (ALN-2)
MPSC Case No. U-18461	g) Nominal revenue requirements by year	Exhibit A-5 (ALN-2)
MPSC Case No. U-18461	h) Average system rates per kWh by year	Exhibit A-5 (ALN-2)
MPSC Case No. U-18095 et al	Upper Michigan Energy Resources Corporation shall file for a biennial review of its avoided costs on December 21, 2020, and shall include in its application any relevant information and data regarding quantifying other avoided costs, including line losses, environmental costs, and hedging value as well as potential methods for calculating technology-specific avoided costs.	Nelson Direct - 3-6 Exhibit A-4 (ALN-1)
	Environmental	**Witness**

MPSC Case No. U-18461	Describe how the utility's proposed IRP will comply with all applicable local, state and federal environmental regulations, laws, and rules.	
MPSC Case No. U-18461	a) Include a list of all applicable environmental regulations that are applicable to the utility fleet. Identify which regulations apply to which resources	Greco Direct - 2-4
MPSC Case No. U-18461	b) Include all capital costs for compliance with new and reasonably expected environmental regulations for existing fleet assets in the utility IRP	Greco Direct - 4
MPSC Case No. U-18461	c) Provide an annual projection of the following emissions for the first five years of the IRP study period differentiating between existing and new resources within the proposed IRP	
MPSC Case No. U-18461	i) Tons of sulfur oxides	Exhibit A-14 (RAG-1)
MPSC Case No. U-18461	ii) Tons of oxides of nitrogen	Exhibit A-14 (RAG-1)
MPSC Case No. U-18461	iii) Tons of carbon dioxide	Exhibit A-14 (RAG-1)
MPSC Case No. U-18461	iv) Tons of particulate matter	Exhibit A-14 (RAG-1)
MPSC Case No. U-18461	v) Pounds of mercury	Exhibit A-14 (RAG-1)
MPSC Case No. U-18461	d) Provide the total projected emissions of the items listed below through the study period for the utility's proposed plan, as well as the scenarios identified in the MIRPP as approved in Case No. U-18418, or modified by Commission order:	
MPSC Case No. U-18461	i) Tons of sulfur oxides	Exhibit A-14 (RAG-1)
MPSC Case No. U-18461	ii) Tons of oxides of nitrogen	Exhibit A-14 (RAG-1)
MPSC Case No. U-18461	iii) Tons of carbon dioxide	Exhibit A-14 (RAG-1)
MPSC Case No. U-18461	iv) Tons of particulate matter	Exhibit A-14 (RAG-1)
MPSC Case No. U-18461	v) Pounds of mercury	Exhibit A-14 (RAG-1)
	Approval of Costs	**Witness**
MPSC Case No. U-18461	For the Commission to specify the costs to be approved for the construction of or significant investment in supply or demand-side facilities, or contractual agreements, excluding short-term market capacity purchases to meet SRM capacity requirements, in accordance with MCL 60.6t(11)-(12), the following information, data, and documents shall be provided:	
MPSC Case No. U-18461	1) <u>For specific supply-side resources</u> (inclusive of storage technologies such as battery storage) of less than 225 MW (nameplate capacity of a project) that are planned to go into service within three years following the approval of the IRP, the following evidence (covering the lifespan of the project) shall be provided:	
MPSC Case No. U-18461	a) A description of the plant size, type, and summary engineering/design specifications. The description shall also include the following:	Keller - Direct -18 Exhibit A-6 (KMK-1)
MPSC Case No. U-18461	i) Description of fuel use, both primary and back-up, and provisions for transporting and storing fuel	N/A
MPSC Case No. U-18461	ii) Projected annual costs, in accordance with the breakdown specified in the Federal Energy Regulatory Commission Uniform System of Accounts	Keller - Direct -18
MPSC Case No. U-18461	iii) Annual depreciation on the capital investment	Keller - Direct -18 Genaric Units explained in Keller BAU Workpapers

MPSC Case No. U-18461	b) Projected annual return and income taxes on capital investment	Keller - Direct -18 Genaric Units explained in Keller BAU Workpapers
MPSC Case No. U-18461	c) Projected property taxes	Keller - Direct -18 Genaric Units explained in Keller BAU Workpapers
MPSC Case No. U-18461	d) The operation and maintenance (O&M) costs over the life of the facility described as costs which are variable, in current dollars per kWh, with expenses for fuel and non-fuel items indicated separately; and costs which are fixed, in current dollars per kW	N/A
MPSC Case No. U-18461	e) The rates of escalation of cost, including:	
MPSC Case No. U-18461	i) Capital costs	Keller - Direct -18 Genaric Units Exhibit A-6 (KMK-1)
MPSC Case No. U-18461	ii) O&M costs which are fixed	Keller - Direct -18 Genaric Units Exhibit A-6 (KMK-1)
MPSC Case No. U-18461	iii) O&M costs which are variable and unrelated to fuel	Keller - Direct -18 Genaric Units Exhibit A-6 (KMK-1)
MPSC Case No. U-18461	iv) O&M costs which are fixed	Keller - Direct -18 Genaric Units Exhibit A-6 (KMK-1)
MPSC Case No. U-18461	f) The total annual average cost per kWh at projected loads in current dollars for each year of the plan for the proposed facility	Keller - Direct -18 Genaric Units Exhibit A-6 (KMK-1)
MPSC Case No. U-18461	g) Equivalent availability factors, including both scheduled and forced outage rates	Keller - Direct -18 Genaric Units Exhibit A-6 (KMK-1)
MPSC Case No. U-18461	h) Capacity factors for each year in the planning period	Keller - Direct -18 Genaric Units Exhibit A-6 (KMK-1)
MPSC Case No. U-18461	i) Operations cycle (i.e. baseload, intermediate, or peaking), identifying expected hours per year of operation, number of starts per year , and cycling conditions for each year in the planning period	Keller - Direct -18 Genaric Units Exhibit A-6 (KMK-1)
MPSC Case No. U-18461	j) Heat rates (efficiency) for various levels of operation	N/A
MPSC Case No. U-18461	k) Unit lifetime, both for accounting book purposes and engineering design purposes, with explanations of differences	Keller - Direct -18 Exhibit A-6 (KMK-1)
MPSC Case No. U-18461	l) Lead time, separately identifying the estimated time required for engineering, permitting and licensing, design, construction and pre-commercial operation date testing	Keller - Direct -18
MPSC Case No. U-18461	m) Potential socioeconomic impacts, such as employment, for the local region of the proposed supply-side resource, construction of or significant investment in an electric generation facility, or the purchase of an existing electric generation facility.	Exhibit A-14 (RAG-1)
MPSC Case No. U-18461	II) Renewable Resources: The utility shall file data consistent with its renewable energy plan. (For incremental renewable energy beyond the 15% requirement in 2021 and any renewable energy to be constructed or purchased after the conclusion of the 20-year renewable planning period ending in 2029, the utility shall file as set forth below.) Revenue requirement and incremental costs of compliance shall be calculated to include the following:	
MPSC Case No. U-18461	a) Capital, operating and maintenance costs for renewable energy systems (including property taxes and insurances for renewable energy systems)	Keller - Direct -18
MPSC Case No. U-18461	b) Financing costs	Keller - Direct -18
MPSC Case No. U-18461	c) Costs that are not otherwise recoverable in base rates including interconnection and substation costs	Keller - Direct -18
MPSC Case No. U-18461	d) Ancillary service costs	Keller - Direct -18
MPSC Case No. U-18461	e) Cost of purchased renewable energy credits (RECs) other than those purchased for non-compliance	Keller - Direct -18 Genaric Units Exhibit A-6
MPSC Case No. U-18461	f) Cost of contracts	Keller - Direct -18
MPSC Case No. U-18461	g) Expenses incurred as a result of governmental action including changes in tax or other laws	N/A
MPSC Case No. U-18461	h) Subtract revenues (i.e., transfer price, environmental attributes, interest on regulatory liability, etc.) through 2029	Keller - Direct -18
MPSC Case No. U-18461	i) Recovery to include the authorized rate of return on equity, which will remain fixed at the rate of return and debt to equity ratio that was in effect in base rates when the renewable plan was approved (only through 2029).	Keller - Direct -18

MPSC Case No. U-18461	j) Provide the following information in relation to renewable resource cost recovery.	
MPSC Case No. U-18461	i) Forecast through the end of the renewable plan period of the non-volumetric surcharge	Keller - Direct -18
MPSC Case No. U-18461	ii) Forecast through the end of the renewable plan period of the regulatory liability balance.	Keller - Direct -18
MPSC Case No. U-18461	III) Demand Response and Energy Waste Reduction: The utility shall provide the following information in relation to demand response programs, energy waste reduction programs, and distributed generation programs cost approval and recovery. For each individual program or group of programs, provide:	N/A - No Change
MPSC Case No. U-18461	a) Total annual cost including:	N/A - No Change
MPSC Case No. U-18461	i) Annual O&M cost for each individual portfolio of energy waste reduction, demand response, and distributed generation programs	N/A - No Change
MPSC Case No. U-18461	ii) Annual capital cost for each individual portfolio of energy waste reduction, demand response, and distributed generation programs	N/A - No Change
MPSC Case No. U-18461	iii) Expected cost-sharing or financial incentive granted to the utility by the Commission	N/A - No Change
MPSC Case No. U-18461	b) Total demand reduction potential (MW), including the amount of load reduction and the expected hours of interruption per day, month, and year for each program, if applicable.	N/A - No Change
MPSC Case No. U-18461	c) Maximum single event demand reduction	N/A - No Change
MPSC Case No. U-18461	d) Total resource capacity (MW) and type (load modifying resource, emergency demand response, etc.) reported to the applicable RTO/ISO	N/A - No Change
MPSC Case No. U-18461	e) Total energy reduction achieved (MWh)	N/A - No Change
MPSC Case No. U-18461	f) Description of program, including customer enrollment, technology used, and marketing plan.	N/A - No Change
	Exhibits and Workpapers	**Witness**
MPSC Case No. U-18461	The filing shall include exhibits and work papers as outlined below, subject to any license or other confidentiality restrictions that are unable to be resolved by issuance of a protective order.	
MPSC Case No. U-18461	a) Any work papers used in developing the application, supporting testimony, and IRP. Such work papers shall, when possible, be provided in electronic format with formulas intact.	Keller Scenario Workpapers
MPSC Case No. U-18461	b) Any modeling input and output files used in developing the application, supporting testimony, and IRP. Such modeling input and output files shall, when possible, be provided in electronic format with formulas intact. The utility shall also identify each modeling program used, and provide information for how interested parties can obtain access to such modeling program. Modeling inputs and outputs in the model-dependent binary format should be made available to parties that obtain a license	Exhibit A-11 (KMK-6) Keller Scenario Workpapers
MPSC Case No. U-18461	c) Cost data and estimates that were used in the resource screening process to evaluate each electric resource that was considered either individually or in combination with other resources, including renewable alternatives, such as solar, wind, or solar plus battery storage.	Exhibit A-6 (KMK-1) Keller Scenario Workpapers
MPSC Case No. U-18461	d) A description, including estimated costs, of each alternative proposal received by the utility	Exhibit A-6 (KMK-1) Keller Scenario Workpapers

MPSC Case No. U-18461	e) A discussion of any differences between its short term fuel price forecasts and the short term capacity price curve in its last Power Supply Cost Recovery proceeding.	Exhibit A-6 (KMK-1) Keller Scenario Workpapers
MPSC Case No. U-18461	f) Identification and justification of the forecasted price of energy, capacity, and fuels, and of peak demand and energy requirements used in the IRP. The utility shall identify its base case forecasts and a range of sensitivities for each such factor, and explain how those sensitivities were identified. If the base case forecast(s) differs from recent previous forecasts submitted by the utility to the Commission in other cases, the utility shall provide an explanation for such differences.	Exhibit A-6 (KMK-1) Keller Scenario Workpapers
MPSC Case No. U-18461	g) In developing its IRP, a utility shall present an environmental compliance strategy which demonstrates how the utility will comply with all applicable federal and state environmental regulations, laws and rules. Included with this information, the utility shall analyze the cost of compliance on its existing generation fleet going forward, including existing projects being undertaken on the utilities generation fleet.	Greco Direct - 4-5
MPSC Case No. U-18461	h) Estimated annual emissions of carbon dioxide and greenhouse gases, particulates, sulfur dioxides, oxides of nitrogen, and mercury per year and over the life of the facilities included in their IRP	Exhibit A-14 (RAG-1)
MPSC Case No. U-18461	i) A comparison of total projected carbon emissions under each scenario and sensitivity analyzed, including quantifying the carbon emissions projected in each sensitivity as a percentage of the carbon emissions presented in the business as usual case.	Exhibit A-14 (RAG-1)
MPSC Case No. U-18461	j) The assumed retirement dates of the facilities included in the IRP, with justification provided for the assumed retirement dates	Exhibit A-6 (KMK-6) Keller Scenario Workpapers
MPSC Case No. U-18461	k) An analysis that contains an individualized cost estimate for electric resources that were considered, including renewable alternatives, such as solar, wind, or solar plus battery storage, and such cost estimates for all alternative proposals, solicited or unsolicited, received by the utility.	Exhibit A-6 (KMK-1) Keller Scenario Workpapers
MPSC Case No. U-18461	l) Electricity market forecasts utilized	Exhibit A-9 (KMK-4) Exhibit A-10 (KMK-5)
MPSC Case No. U-18461	m) Other documents and data underlying the IRP Analysis	N/A

STATE OF MICHIGAN

BEFORE THE MICHIGAN PUBLIC SERVICE COMMISSION

*** * * * ***

In the matter of the application of **UPPER MICHIGAN ENERGY RESOURCES CORPORATION** for approval of its integrated resource plan pursuant to MCL 460.6t and for other relief.	))))	Case No. U-21081

DIRECT TESTIMONY AND EXHIBITS OF

AARON L. NELSON

FOR

UPPER MICHIGAN ENERGY RESOURCES CORPORATION

Q. Please state your name, business address, and position.

A. My name is Aaron Nelson. My business address is 231 W. Michigan Street, Milwaukee, Wisconsin 53203. I am employed by WEC Business Services, LLC ("WBS"), serving all of the WEC Energy Group, Inc. ("WEC") utilities, including Upper Michigan Energy Resources Corporation ("UMERC" or the "Company"). WBS and UMERC are wholly-owned subsidiaries of WEC.

Q. For whom are you providing testimony?

A. I am providing testimony on behalf of UMERC.

Q. Please describe briefly your educational, professional, and utility background.

A. In 2011, I completed a Bachelor of Business Administration degree, with specializations in management and information systems, from the University of Wisconsin–Eau Claire. In

2016, I completed a Master of Science in Management degree, with specialization in financial analysis, from the University of Wisconsin-Milwaukee. I have completed training courses in public utility regulation at the Michigan State University Institute of Public Utilities and the New Mexico State University Center for Public Utilities.

In 2011, I was hired by Wisconsin Electric d/b/a We Energies and worked in various roles in several areas prior to my current role. In 2016, I began working as a Project Specialist in State Regulatory Affairs with WBS. Today, my primary responsibilities include class cost of service and regulatory compliance for all WEC utilities, including UMERC. In addition, I perform and am otherwise involved with rate development and service and tariff administration for each of WEC's electric and steam utilities.

Q. Have you previously testified before any regulatory agency?

A Yes. I provided testimony to the Public Service Commission of Wisconsin ("PSCW") relating to electric, natural gas, and steam class cost of service. I have also provided testimony in proceedings concerning natural gas class cost of service before the Illinois Commerce Commission, the Michigan Public Service Commission ("MPSC" or the "Commission"), and the Minnesota Public Utilities Commission.

Q. What is the purpose of your direct testimony?

A. The purpose of my testimony is to present UMERC's analysis and discussion regarding (i) the Public Utility Regulatory Policies Act, 16 USC. §2601 et seq. ("PURPA") avoided cost review and (ii) the retail rate impacts of UMERC's Preferred Course of Action as described by Company Witnesses Stasik and Keller.

Q. Are you sponsoring any exhibits in this proceeding?

A. Yes, I am sponsoring the following Exhibits:

Exhibit A-4 (ALN-1) – Proposed Tariff Modifications Redline

Exhibit A-5 (ALN-2) – Cost Per kWh of Preferred Course of Action

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

A. Yes, they were.

PURPA Avoided Cost Review

Q. Why is UMERC addressing the issue of PURPA avoided costs in its IRP filing?

A. Pursuant to the Order issued on October 29, 2020, in Case No. U-18095, UMERC was scheduled to file its next PURPA review application by April 5, 2021. UMERC filed a motion to extend the filing deadline for its PURPA review to accommodate its inclusion in this required IRP filing. The Commission approved UMERC's motion in its Order on February 18, 2021 in Case No. U-20470.

Q. Please describe UMERC's parallel generation tariffs.

A. UMERC has three parallel generation tariffs available for customers desiring to sell electrical energy to the Company:

PG-2M: Standard Offer for generation facilities of 550 kW or less. Energy is credited at a fixed rate for the initial five years of service. Thereafter, energy is credited at the previous year's Day Ahead Locational Marginal Prices ("DA LMP") for the most recently completed November 1 to October 31 period. Capacity is credited based on Midcontinent Independent System Operator ("MISO") capacity market values.

PG-3M: Available for generation facilities of 5 MW or less. Energy is credited at a fixed rate for the initial five years of service. Thereafter, energy is credited

at the DA LMP for each hour. Capacity is credited based on MISO capacity market values.

PG-4M: Available for generation facilities of 20 MW or less. Energy and capacity are credited based on negotiated rates.

These three parallel generation tariffs are consistent across UMERC's two rate zones. My testimony will focus on PG-2M and PG-3M.

Q. What is the definition of "avoided cost" in the context of PURPA?

A. PURPA Regulations (18 CFR 292.101(b)(6)) define avoided costs as:

> "Avoided costs means the incremental costs to an electric utility of electric energy or capacity or both which, but for the purchase from the qualifying facility or qualifying facilities, such utility would generate itself or purchase from another source."

Q. Based on this definition of avoided costs, how should the Commission determine UMERC's avoided costs?

A. As a result of the Commission's approval of the Mihms and Kuester Generating Stationsin Case No. U-18224, UMERC will not have a need for capacity during the 5-year planning horizon beginning 2022. Therefore, UMERC's avoided capacity cost should be based on the MISO Planning Resource Auction ("PRA") clearing price. This is consistent with UMERC's current tariffs and the MPSC's Order in Case U-18095 directing UMERC to adopt an avoided capacity cost based on MISO capacity market values. For energy payments, UMERC's avoided energy cost should be based on the MISO DA LMP for UMERC's load. This calculation is the most efficient means to derive the true cost of the incremental energy and capacity that UMERC would look to purchase to satisfy its total

requirements, until such time that the Company's capacity resource portfolio becomes substantially different than it is today. Since the Federal Energy Regulatory Commission ("FERC") acknowledges that the avoided costs can be based on the utility's costs to self-generate with incremental resources, or purchase from another source, it is appropriate to align the avoided cost set in this proceeding with the expected cost of the incremental energy and capacity that would be purchased by UMERC, but for the purchase from the qualifying facility ("QF").

Q. Please describe the Company's current avoided capacity cost calculation methodology.

A. UMERC's current avoided capacity cost rate is based on the results of the MISO PRA for the relevant Local Resource Zone, and is updated each June 1. Since UMERC is expected to have generation capacity in excess of its expected demand through at least 2027, the MISO PRA results continue to be a reasonable basis for determining UMERC's avoided capacity cost. The most recent MISO PRA results for Zone 2 of Planning Year 2021/2022 was $5 MW/Day or $1,825 MW/Year. Table 1 presents UMERC's net capacity position based on Witness Keller's Business As Usual case, as she describes in her direct testimony. Based on this modeling, UMERC is expected to have excess capacity through 2027, even before including the potential new solar investments.

Table 1. System Capacity vs Native System Firm Peak Demand (MW) excl. Mines				
Year	Capacity	Demand	Reserve (9.4%)	Excess/Deficient
2022	186.8	110.3	10.4	66.1
2023	186.8	110.0	10.3	66.5
2024	211.8	109.6	10.3	91.9
2025	211.8	109.4	10.3	92.1
2026	211.8	109.2	10.3	92.3
2027	211.8	108.9	10.2	92.7

Q. Please describe the Company's current avoided energy cost calculation methodology.

A. Per the Commission's Order in Case Nos. U-18095 and U-18096 dated December 20, 2018, the base avoided energy cost for the first 5-years commencing in 2019 shall be the forecasted market values for energy used in the Certificate of Necessity ("CON") proceeding for the Mihms and Kuester Generating Stations, after which time it shall shift to a variable rate (page 13, paragraph 2). Consistent with UMERC's existing tariff language, customers receive a fixed energy credit for their initial five years (60 months) of service. For the WPSC and WEPCo Rate Zones Pg-2M tariffs, thereafter, the energy credit shall equal the average of the on-peak DA LMP at the MIUP.UMERC load zone node for the WEPCo Rate Zone and the WPS.UMERC load zone node for the WPSC Rate Zone. The rates shall be reset annually on January 1 of each year based on the hourly average on-peak DA LMP at the MUP.UMERC load zone node for the WEPCo Rate Zone and the WPS.UMERC load zone node for the WPSC Rate Zone of the most recently completed November 1 to October 31 period. For the WPSC and WEPCo Rate Zones Pg-3M tariffs, after the initial 60 months of service, the energy credit is calculated at the DA LMP at MUP.UMERC load zone node for the WEPCo Rate Zone and the WPS.UMERC load zone node expressed in $/kWh for every hour.

Q. Is the avoided capacity and energy payment methodology proposed by UMERC in this proceeding a change to its current practice?

A. No.

Q. Does UMERC consider line losses in the aforementioned avoided cost rates?

A. Yes. UMERC's existing parallel generation tariffs account for line losses in the rates paid for energy and capacity. In evaluating the value of avoided line losses, UMERC utilizes the primary (low & med voltage) distribution line loss factors as the base delivery level since the energy received from a QF at that voltage level would tend to avoid the distribution losses associated with delivering energy from the transmission system. For energy received at a lower voltage, the losses from the lower voltage to the primary (low & med voltage) level needs to be accounted for resulting in a lower price than what would be paid at the primary (low & med voltage) level. This is consistent with the current methodology for the WPSC Rate Zone, but is a deviation from the current methodology for the WEPCo Rate Zone where distribution losses at the lower voltage levels were incorrectly added to the distribution losses at the primary (low & med voltage) level. The line loss factor applies to both the base avoided energy and capacity costs. In addition, applying the MISO determined local balancing authority ("LBA") transmission loss factor to the base avoided capacity cost is appropriate as this factor applies to distribution interconnected generation in the MISO PRA. Because the base avoided energy cost is based on MISO LMPs, which already include the cost of transmission losses, no price adjustment is made to account for transmission losses.

For the energy distribution loss factors, the primary voltage calculation accounts for the benefit of avoiding the distribution losses at the higher distribution voltage while

the secondary and residential voltage calculation accounts for the distribution losses incurred by moving from the lower voltage level to the higher primary voltage level. For the capacity price multiplier, the proposed calculation uses the MIUP transmission loss factor of 2.6% for the WEPCo Rate Zone and the WPSC Rate Zone uses a transmission loss factor of 2.2%.

Q. What are the recommended distribution loss factors for the WEPCo and WPSC Rate Zones?

A. The distribution loss factors for the WEPCo and WPSC Rate Zones are presented in the Table 2 and Table 3 below:

Table 2.
WEPCo Zone Distribution Loss Factors

Residential:	0.9781
Secondary:	0.9858
Primary (less than 69 kV):	1.0203
Transmission:	1.0000

Table 3.
WPSC Zone Distribution Loss Factors

Secondary:	0.9885
Primary (less than 50 kV):	1.0096
Transmission:	1.0000

Q. Do the recommended distribution loss factors reflect a modification from those included in the WEPCo and WPSC Rate Zones current PG-2M and PG-3M tariffs, respectively?

A. The recommended distribution loss factors for the WPSC Rate Zone do not reflect a change from the existing tariffs. The recommended WEPCo Rate Zone distribution loss factors are modified to match the same methodology utilized in calculating the WPSC Rate Zone distribution loss factors.

Q. How does UMERC evaluate environmental costs with regard to its avoided cost rates?

A. Avoided environmental costs are evaluated based on the cost of a Michigan Renewable Energy Credit ("MREC"), if MRECs are transferred to the Company. The most recent MREC purchases by UMERC included $168,000 for 2021, $173,250 for 2022, and $192,500 for 2023. Consistent with UMERC's existing tariffs, at UMERC's sole discretion, a premium, on a per kWh basis, may be applied to generators that generate an MREC that is transferred to UMERC. Customers have the right to retain MRECs. Premiums are to be set when the contract is signed and will not change during the contract period based on the prevailing MREC value at the time of execution. This is consistent with UMERC's current practice.

Q. Is a hedging value considered in UMERC's avoided cost rates?

A. No. Including a hedging value would assume a possible benefit from the energy rates being fixed at the beginning of the year. Should realized energy prices be lower than the fixed price provided to the QF at the beginning of each year, this would result in UMERC's customers paying higher prices than if the energy had been purchased from the MISO market to the benefit of the QF. Given that avoided cost energy rates are updated annually, changes in the MISO energy prices will be incorporated into the QF's energy credits each year. With the current evolution of MISO's generation fleet to a larger proportion of renewable generation resources, it would be speculative to apply a hedging value to the annual rate adjustment mechanism currently employed by UMERC.

Q. What is UMERC's position on potential methods for calculating technology-specific avoided costs?

A. The MISO Energy and Ancillary Services market provides access to a wide range of generation resources and allows for different technologies to be compared on a non-discriminatory basis based on the differing capabilities of the resources. UMERC (i) does not expect a need for new capacity resources, (ii) has access to the MISO market, and (iii) has the ability to procure MRECs at a reasonable cost. Accordingly, there is no benefit to UMERC's customers from calculating technology-specific avoided costs at this time. Should UMERC determine a future need for additional capacity, an analysis will be performed to determine how best to serve UMERC's load based upon the resource technology available at that time to ensure a balance between environmental, economic, and reliability needs.

Q. Are you proposing any tariff changes based on UMERC's proposed avoided cost rates as discussed above?

A. Yes, Exhibit A-4 (ALN-1) reflects the modified distribution loss factors for the WEPCo Rate Zone to align the methodology with the WPSC Rate Zone as previously discussed.

Q. Are there any other tariff changes that you are recommending?

A. Yes, an energy credit rate for the year 2027 was added to the PG-2M and PG-3M tariffs from UMERC's forecast of MISO market energy in Case No. U-18095.

Q. Does this proposed tariff meet the FERC's requirements to comply with the PURPA?

A. Yes. The Parallel Generation-Purchase Tariff allows a QF to sell energy and capacity to UMERC at non-discriminatory rates that are set through a competitive bidding process, to interconnect with UMERC and operate in parallel with established standards and other generating resources. The applicable PG-2M tariffs for the WEPCO and WPS Corp. rate

zones provide the standard offer tariff avoided cost rates at which UMERC would pay the QF for delivered energy and capacity.

Customer Rate Impacts of the Company's Preferred Course of Action ("PCA")

Q. Briefly describe UMERC's IRP PCA.

A. As described by Company Witness Keller, UMERC's modeling supports the Business as Usual ("BAU") scenario with additional investment in renewables to mitigate market risk, improve reliability, and reduce carbon emissions as the economic path forward.

Q. Describe the financial modeling assumptions used in the development of UMERC's PCA.

A. For an explanation and analysis of the planning assumptions see Exhibit A-6 (KMK-1).

Q. Please describe Exhibit A-5 (ALN-2).

A. Exhibit A-5 (ALN-2) presents the customer rate impacts resulting from the incremental revenue requirement of the PCA for years 2022 through 2041. Line 1 is the incremental revenue requirement for the PCA. Line 2 is applicable customer level annual energy sales in MWh. Line 3 is the incremental customer bill impact, stated in cents per kWh. Line 4 is the net present value of the incremental revenue requirements through 2041. Line 5 is the weighted average cost of capital used to calculate the net present value revenue requirement for UMERC's PCA.

Q. How was the incremental revenue requirement calculated?

A. The incremental revenue requirement on line 1 of Exhibit A-5 (ALN-2) is the annual net cost / (savings) resulting from the new solar investments by UMERC for years 2022 through 2041. More specifically, the incremental revenue requirement is comprised of the following: 1) new solar capital revenue requirements; 2) new solar fixed operations &

maintenance ("O&M"); 3) new solar net energy market sales revenue; 4) new solar net capacity market sales revenue; and 5) anticipated savings from avoiding the purchases of MRECs in the market.

Q. What are the financial ramifications of UMERC's PCA for the Company's customers?

A. The net present value of the incremental revenue requirements for UMERC's PCA is $25.5 million. This achieves UMERC's goal of providing its customers with a balanced generation portfolio approach while increasing the customers utilization of renewable resources and reducing the risk of volatile energy prices in the future while maintiaining reliablity. See Exhibit A-5 (ALN-2) for the nominal incremental revenue requirement by year and customer rate impacts under UMERC's PCA.

Q. Does this conclude your direct testimony at this time?

A. Yes, it does

M.P.S.C. No. 1 – Electric
Upper Michigan Energy Resources Corporation

WEPCo Rate Zone

Original Sheet No. D-60.01

PARALLEL GENERATION-PURCHASE PG-2M-STANDARD OFFER

AVAILABILITY

To customers contracting for electric service who satisfy the requirements of "qualifying facility" status under Part 292 of the Federal Energy Regulatory Commission's regulations under the Public Utility Regulatory Policies Act of 1978, generating electrical energy with total customer owned generating capacity of 550 KW or less, and desiring to sell electrical energy to the Company. Customers are not required to take electric service deliveries from the Company. Customers shall enter into a five, ten, fifteen or twenty year service agreement with the Company. Customers with generation capacity of 150 KW or less have the option of selling energy to the Company under this PG-2M tariff, or the CGS Category 1 tariff or the CGS Category 2 tariff.

MONTHLY RATES

Facilities Charge

Residential, Non-Demand Secondary customers, and customers not taking electric service deliveries from the Company with customer owned generation capacity of less than 100 kW: Cg1 single or three phase facilities charge
Demand Customers and customers not taking electric service deliveries from the Company with customer owned generation capacity equal to or greater than 100 kW: Cg3 facilities charge

Charges for Deliveries from Company

Deliveries from the Company to the customer shall be billed in accordance with the standard applicable rate schedules of the Company.

Energy Credit Deliveries to Company

On-peak Energy Credit

January 1, 2019 through December 31, 2019: $.02612 per kWh on-peak
January 1, 2020 through December 31, 2020: $.02664 per kWh on-peak
January 1, 2021 through December 31, 2021: $.02718 per kWh on-peak
January 1, 2022 through December 31, 2022: $.02772 per kWh on-peak
January 1, 2023 through December 31, 2023: $.02827 per kWh on-peak
January 1, 2024 through December 31, 2024: $.02884 per kWh on-peak
January 1, 2025 through December 31, 2025: $.02942 per kWh on-peak
January 1, 2026 through December 31, 2026: $.03000 per kWh on-peak
January 1, 2027 through December 31, 2027: $.03060 per kWh on-peak

Customers shall receive the applicable on-peak energy credit shown above for their initial five years (60 months) of service under this tariff, thereafter, the on-peak energy credit shall equal the average of the on-peak Day Ahead Locational Marginal Prices ("DA LMP") at the MIUP.WEPM load zone node. The rates shall be reset annually on January 1 of each year based on the hourly average on-peak DA LMP at the MIUP.WEPM load zone node of the most recently completed November 1 to October 31 period.

Off-peak Energy Credit

January 1, 2019 through December 31, 2019: $.02612 per kWh off-peak
January 1, 2020 through December 31, 2020: $.02664 per kWh off-peak
January 1, 2021 through December 31, 2021: $.02718 per kWh off-peak
January 1, 2022 through December 31, 2022: $.02772 per kWh off-peak
January 1, 2023 through December 31, 2023: $.02827 per kWh off-peak
January 1, 2024 through December 31, 2024: $.02884 per kWh off-peak
January 1, 2025 through December 31, 2025: $.02942 per kWh off-peak
January 1, 2026 through December 31, 2026: $.03000 per kWh off-peak
January 1, 2027 through December 31, 2027: $.03060 per kWh off-peak

(Continued on Sheet No. D-60.02)

Issued January 2, 2019
T. T. Eidukas
Vice-President,
Milwaukee, Wisconsin

Effective for service rendered on and after January 1, 2019

Issued under authority of the Michigan Public Service Commission
Dated December 20, 2018
in Case Nos. U-18095 and 18096

PARALLEL GENERATION-PURCHASE PG-2M-STANDARD OFFER
(Continued from Sheet No. D-60.01)

MONTHLY RATES (cont.)

Off-peak Energy Credit (cont.)

Customers shall receive the applicable off-peak energy credit shown above for their initial five years (60 months) of service under this tariff, thereafter, the off-peak energy credit shall equal the average of the off-peak DA LMP at the MIUP.WEPM load zone node. The rates shall be reset annually on January 1 of each year based on the hourly average off-peak DA LMP at the MIUP.WEPM load zone node of the most recently completed November 1 to October 31 period.

Capacity Payment

A capacity credit shall be paid reflecting the most recent Midcontinent Independent System Operator ("MISO") capacity auction market result in the relevant Local Resource Zone if the customer generation capacity can be counted as capacity in the MISO Capacity Auction (Resource Adequacy) market. The capacity price will be updated each June 1 to reflect the most recent year-round auction clearing price in MISO. The current on-peak rate until May 31, 2022 will be $.00059/kWh. If the MISO capacity auction deviates from its current annual format, the applicable capacity price will be calculated from the most recently cleared capacity seasons spanning a 12 month period.

Renewable Premium

At the Company's sole discretion, a premium to be paid on a per kWh basis may be applied to generators that generate a renewable credit that is transferred to the Company. Customers retain the right to refuse a renewable premium and keep the renewable credits or tags. Premiums are to be set when the contract is signed and will not change during the contract period.

Distribution Loss Factors

The following factors shall be applied to the on-peak and off-peak energy factors and capacity payments to reflect system losses~~. *The energy and capacity values will be divided by these adjustment factors*~~*:*

Customers served on a residential rate schedule
~~1.06343~~*0.9781*

Customers served on a secondary rate schedule
~~1.05529~~*0.9858*

Customers served on a primary rate (low & med voltage) schedule	1.02031
Customers served on a primary rate schedule or special contract (high voltage)	1.00000

Generator only customers metered at a secondary voltage less than 4,160 volts
~~1.05529~~*0.958*

Generator only customers metered at a primary voltage less than or equal to 4,160 volts	1.02031
Generator only customers metered at a primary voltage greater than 4,160 volts and less than 69,000 volts	1.02031
Generator only customers metered at a primary voltage greater than or equal to 69,000 volts	1.00000

Line loss savings will be evaluated on a case by case basis.

ON-PEAK and OFF-PEAK HOURS

The on-peak and off-peak time periods will correspond to the tariffed rate schedule under which the customer purchases energy from the Company. Customers not purchasing energy from the Company will be assigned a peak period of 8 am to 8 pm.

HOLIDAYS

The days of the year which are considered holidays are: New Year's Day, Memorial Day, Independence Day, Labor Day, Thanksgiving Day, and Christmas Day.

MINIMUM CHARGE

The monthly minimum charge shall be the facilities charge.

(Continued on Sheet No. D-60.03)

PARALLEL GENERATION-PURCHASE PG-3M

AVAILABILITY

To customers contracting for electric service who satisfy the requirements of "qualifying facility" status under Part 292 of the Federal Energy Regulatory Commission's regulations under the Public Utility Regulatory Policies Act of 1978, generating electrical energy with total customer owned generating capacity of 5,000 KW or less, and desiring to sell electrical energy to the Company. Customers are not required to take electric service deliveries from the Company. Customers shall enter into a five, ten, fifteen or twenty year service agreement with the Company. Customers with generation capacity of 550 kW or less have the option of selling energy to the Company under this PG-3M tariff or PG-2M tariff.

MONTHLY RATES

Facilities Charge

Residential, Non-Demand Secondary customers, and customers not taking electric service deliveries from the Company with customer owned generation capacity of less than 100 kW: Cg1 single or three phase facilities charge
Demand Customers and customers not taking electric service deliveries from the Company with customer owned generation capacity equal to or greater than 100 kW: Cg3 facilities charge

Energy Credit

January 1, 2019 through December 31, 2019: $.02612 per all kWhs
January 1, 2020 through December 31, 2020: $.02664 per all kWhs
January 1, 2021 through December 31, 2021: $.02718 per all kWhs
January 1, 2022 through December 31, 2022: $.02772 per all kWhs
January 1, 2023 through December 31, 2023: $.02827 per all kWhs
January 1, 2024 through December 31, 2024: $.02884 per all kWhs
January 1, 2025 through December 31, 2025: $.02942 per all kWhs
January 1, 2026 through December 31, 2026: $.03000 per all kWhs
January 1, 2027 through December 31, 2027: $.03060 per all kWhs

Customers shall receive the applicable energy credit shown above for their initial five years (60 months) of service under this tariff, thereafter, the Customer will be compensated at the Day Ahead LMP at MIUP.WEPM load zone node expressed in $/kWh for every hour.

Capacity Payment

A capacity credit shall be paid reflecting the most recent Midcontinent Independent System Operator ("MISO") capacity auction market result in the relevant Local Resource Zone if the customer generation capacity can be counted as capacity in the MISO Capacity Auction (Resource Adequacy) market. The capacity price will be updated each June 1 to reflect the most recent year-round auction clearing price in MISO. The current all kWhs rate until May 31, 2022 will be $.00021/kWh. If the MISO capacity auction deviates from its current annual format, the applicable capacity price will be calculated from the most recently cleared capacity seasons spanning a 12 month period.

Renewable Premium

At the Company's sole discretion, a premium to be paid on a per kWh basis may be applied to generators that generate a renewable credit that is transferred to the Company. Customers retain the right to refuse a renewable premium and keep the renewable credits or tags. Premiums are to be set when the contract is signed and will not change during the contract period.

Distribution Loss Factors

The following factors shall be applied to the energy factors and capacity payments to reflect system losses~~***. The energy and capacity values will be divided by these adjustment factors***~~***:***

Customers served on a residential rate schedule	~~1.06343~~***0.9781***
Customers served on a secondary rate schedule	~~1.05529~~***0.9858***

(Continued on Sheet No. D-60.05)

PARALLEL GENERATION-PURCHASE PG-3M
(Continued from Sheet No. D-60.04)

Distribution Loss Factors (cont.)

Customers served on a primary rate (low & med voltage) schedule	1.02031
Customers served on a primary rate schedule or special contract (high voltage)	1.00000
Generator only customers metered at a secondary voltage less than 4,160 volts	~~*1.05529*~~*0.9858*
Generator only customers metered at a primary voltage less than or equal to 4,160 volts	1.02031
Generator only customers metered at a primary voltage greater than 4,160 volts and less than 69,000 volts	1.02031
Generator only customers metered at a primary voltage greater than or equal to 69,000 volts	1.00000

Line loss savings will be evaluated on a case by case basis.

MINIMUM CHARGE

The monthly minimum charge shall be the facilities charge.

PRO-RATION OF DEMAND COST FOR AUTHORIZED MAINTENANCE

For customers billed on rates with demand charges, the demand charges other than "Customer Demand" shall be prorated if the maintenance schedule of the customer owned generation facility has been approved in advance in writing by the Company. Said pro-ration shall be based on the number of authorized days of scheduled maintenance. The customer shall pay the demand rate for the higher than normal demands due to the generation outage only for the days of authorized maintenance.

SPECIAL RULES

1. The Company shall install appropriate metering facilities to record all flows of energy necessary to bill the customer in accordance with the charges and credits of this rate schedule.

2. The customer shall furnish, install, and wire the necessary service entrance equipment, meter sockets, meter enclosure cabinets, or meter connection cabinets that may be required by the Company to properly meter usage and sales to the Company.

3. The requirements for interconnecting a generator with the Company's facilities are contained in the Michigan Public Service Commission's Electric Interconnection Standards Rules (R460.481- 460.489) and the Company's Michigan Utility Generator Interconnection Requirements, copies of which will be provided to customers upon request. All requirements must be met prior to commencing service.

PARALLEL GENERATION RULES

See Schedule PGXM.

D9. PARALLEL GENERATION-PURCHASE BY WPSC-STANDARD OFFER PG-2M

EFFECTIVE IN: All territory served.

AVAILABILITY

To customers contracting for electric service who satisfy the requirements of "qualifying facility" status under Part 292 of the Federal Energy Regulatory Commission's regulations under the Public Utility Regulatory Policies Act of 1978, generating electrical energy with total customer owned generating capacity of 550 KW or less, and desiring to sell electrical energy to the Company. Customers are not required to take electric service deliveries from the Company. Customers shall enter into a five, ten, fifteen or twenty year service agreement with the Company. Customers with generation capacity of 30 KW or less have the option of selling energy to the Company under this PG-2M tariff or the PG-1M tariff.

MONTHLY RATES

Customer Charge: $12.00/Month $0.3945/Day

Charges for Deliveries from Company

Deliveries from the Company to the customer shall be billed in accordance with the standard applicable rate schedules of the Company.

Energy Credit Deliveries to Company

On-peak Energy Credit

January 1, 2019 through December 31, 2019: $.02612 per kWh on-peak
January 1, 2020 through December 31, 2020: $.02664 per kWh on-peak
January 1, 2021 through December 31, 2021: $.02718 per kWh on-peak
January 1, 2022 through December 31, 2022: $.02772 per kWh on-peak
January 1, 2023 through December 31, 2023: $.02827 per kWh on-peak
January 1, 2024 through December 31, 2024: $.02884 per kWh on-peak
January 1, 2025 through December 31, 2025: $.02942 per kWh on-peak
January 1, 2026 through December 31, 2026: $.03000 per kWh on-peak
January 1, 2027 through December 31, 2027: $.03060 per kWh on-peak

Customers shall receive the applicable on-peak energy credit shown above for their initial five years (60 months) of service under this tariff, thereafter, the on-peak energy credit shall equal the average of the on-peak Day Ahead Locational Marginal Prices ("DA LMP")at the WPS.WPSM load zone node. The rates shall be reset annually on January 1 of each year based on the hourly average on-peak DA LMP at the WPS.WPSM load zone node of the most recently completed November 1 to October 31 period.

Off-peak Energy Credit

January 1, 2019 through December 31, 2019: $.02612 per kWh off-peak
January 1, 2020 through December 31, 2020: $.02664 per kWh off-peak
January 1, 2021 through December 31, 2021: $.02718 per kWh off-peak
January 1, 2022 through December 31, 2022: $.02772 per kWh off-peak
January 1, 2023 through December 31, 2023: $.02827 per kWh off-peak
January 1, 2024 through December 31, 2024: $.02884 per kWh off-peak
January 1, 2025 through December 31, 2025: $.02942 per kWh off-peak
January 1, 2026 through December 31, 2026: $.03000 per kWh off-peak
January 1, 2027 through December 31, 2027: $.03060 per kWh on-peak

Customers shall receive the applicable off-peak energy credit shown above for their initial five years (60 months) of service under this tariff, thereafter, the off-peak energy credit shall equal the average of the off-peak DA LMP at the WPS.WPSM load zone node. The rates shall be reset annually on January 1 of each year based on the hourly average off-peak DA LMP at the WPS.WPSM load zone node of the most recently completed November 1 to October 31 period.

(Continued on Sheet No. D-144.00)

D9. PARALLEL GENERATION-PURCHASE BY WPSC PG-3M

EFFECTIVE IN: All territory served.

AVAILABILITY

To customers contracting for electric service who satisfy the requirements of "qualifying facility" status under Part 292 of the Federal Energy Regulatory Commission's regulations under the Public Utility Regulatory Policies Act of 1978, generating electrical energy with total customer owned generating capacity of 5,000 KW or less, and desiring to sell electrical energy to the Company. Customers are not required to take electric service deliveries from the Company. Customers shall enter into a five, ten, fifteen or twenty year service agreement with the Company. Customers with generation capacity of 550 kW or less have the option of selling energy to the Company under this PG-3M tariff or PG-2M tariff.

MONTHLY RATES

Customer Charge: $12.00/Month $0.3945/Day

Energy Credit

January 1, 2019 through December 31, 2019: $.02612 per all kWhs
January 1, 2020 through December 31, 2020: $.02664 per all kWhs
January 1, 2021 through December 31, 2021: $.02718 per all kWhs
January 1, 2022 through December 31, 2022: $.02772 per all kWhs
January 1, 2023 through December 31, 2023: $.02827 per all kWhs
January 1, 2024 through December 31, 2024: $.02884 per all kWhs
January 1, 2025 through December 31, 2025: $.02942 per all kWhs
January 1, 2026 through December 31, 2026: $.03000 per all kWhs
January 1, 2027 through December 31, 2027: $.03060 per all kWhs

Customers shall receive the applicable energy credit shown above for their initial five years (60 months) of service under this tariff, thereafter, the Customer will be compensated at the Day Ahead LMP at WPS.WPSM load zone node expressed in $/kWh for every hour.

Capacity Payment

A capacity credit shall be paid reflecting the most recent Midcontinent Independent System Operator (“MISO”) capacity auction market result in the relevant Local Resource Zone if the customer generation capacity can be counted as capacity in the MISO Capacity Auction (Resource Adequacy) market. The capacity price will be updated each June 1 to reflect the most recent year-round auction clearing price in MISO. The current all kWhs rate until May 31, ***2022*** will be $.00021/kWh. If the MISO capacity auction deviates from its current annual format, the applicable capacity price will be calculated from the most recently cleared capacity seasons spanning a 12 month period.

Renewable Premium

At the Company's sole discretion, a premium to be paid on a per kWh basis may be applied to generators that generate a renewable credit that is transferred to the Company. Customers retain the right to refuse a renewable premium and keep the renewable credits or tags. Premiums are to be set when the contract is signed and will not change during the contract period.

Distribution Loss Factors

The following factors shall be applied to the energy factors and capacity payments to reflect system losses:

Customers metered at a transmission voltage of 50,000 volts or higher:	1.0000
Customers metered at a primary voltage of 4,160 volts - 50,000 volts:	1.0096
Customers metered at a secondary voltage of less than 4,160 volts:	0.9885

Line loss savings will be evaluated on a case by case basis.

(Continued on Sheet No. D-146.00)

UMERC Proposed Course of Action
Customer Rate Impacts

Millions of dollars

Line No.	Description	2022	2023	2024	2025	2026	2027	2028	2029	2030	2031	2032	2033	2034	2035	2036	2037	2038	2039	2040	2041
1	Incremental Revenue Requirement	$0.0	$0.0	$0.0	($0.2)	$6.2	$5.2	$4.6	$4.1	$3.5	$3.1	$3.1	$3.1	$3.0	$3.0	$3.0	$2.9	$2.8	$2.6	$2.4	$2.5
2	Retail Energy Sales (MWh)	613,824	613,427	613,000	612,553	612,120	611,695	611,276	610,865	610,461	610,065	609,675	609,293	608,918	608,550	608,188	607,834	607,487	607,146	606,812	606,485
3	Incremental Unit Cost (Cents/kWh)	-	-	-	(0.038)	1.009	0.850	0.751	0.663	0.569	0.513	0.504	0.513	0.496	0.491	0.487	0.472	0.457	0.423	0.390	0.408
4	Net present value of incremental revenue requirement	$25.5																			
5	Weighted Average Cost of Capital: (from KMK BAU)	7.45%																			

Source of Cost Information: WP-A-5
Source kWh by Year: JPP-2, excluding transmission and distribution losses

STATE OF MICHIGAN

BEFORE THE MICHIGAN PUBLIC SERVICE COMMISSION

* * * * *

In the matter of the application of UPPER MICHIGAN ENERGY RESOURCES CORPORATION for approval of its integrated resource plan pursuant to MCL 460.6t and for other relief.	))))	Case No. U-21081

DIRECT TESTIMONY AND EXHIBITS OF

KIM M. KELLER

FOR

UPPER MICHIGAN ENERGY RESOURCES CORPORATION

Q. Please state your name, business address and position.

A. My name is Kim M. Keller. My business address is 333 West Everett Street, Milwaukee, Wisconsin 53203. I am the Manager of Planning for Wisconsin Electric Power Company ("Wisconsin Electric"), Wisconsin Public Service Corporation ("WPS Corp"), and Upper Michigan Energy Resources Corporation ("UMERC" or the "Company").

Q. For whom are you providing testimony?

A. I am providing testimony on behalf of UMERC, which is a subsidiary of WEC Energy Group, Inc. ("WEC").

Q. Please describe briefly your educational, professional, and utility background.

A. I received a Bachelor of Science Degree with a major in Finance from the University of Wisconsin – Madison in 1989. I have been employed by Wisconsin Electric for 20 years,

working in a number of positions in Finance (Closing, Consolidations, External Reporting and Accounting Research, and Finance - Power Generation) before joining Wholesale Energy and Fuels. For several years, I was an Accounting Manager for the External Reporting and Accounting Research Group. I became the Manager of Fuel Cost Planning in May 2018. In this position I am responsible for supporting all of Wisconsin Electric's, WPS Corp's and UMERC's fuel cost recovery filings in the Wisconsin and Michigan jurisdictions.

Q. Have you previously testified before any regulatory agency?

A. Yes. As Manager – Planning, I have submitted testimony in support of UMERC's Integrated Resource Plan ("IRP") (Case No. U-20470) as well as testimony on behalf of Wisconsin Electric in proceedings before the Michigan Public Service Commission (including Case No. U-20231, which was Wisconsin Electric's Power Supply Cost Recovery Plan for 2019). In addition, I have submitted testimony in Wisconsin Electric's and WPS Corp's 2020 rate cases (Dockets 05-UR-109 and 6690-UR-126) and 2019 fuel cost plans (Dockets 6630-ER-104 and 6690-ER-104).

Q. What is the purpose of your pre-filed direct testimony?

A. The purpose of my direct testimony is to support UMERC's IRP Application filed in this case. Specifically, I will provide/address:

- An overview of the IRP and its results;
- An overview of various assumptions contained in the IRP, including the following:
    - The Company's available generation resources;
    - The Company's assumptions regarding the amount of service to be provided to electric retail access service ("RAS") customers;

- The Company's assumption regarding future requirements to supply a portion of its retail sales with renewable resources, and how these resources will receive credit under the Michigan Renewable Portfolio Standard ("RPS");

- An overview of the results of the IRP analysis including a summary of results;
  - Supply alternatives including the Company's preliminary evaluation of opportunities to contract for supply;
- The proposed course of action identified as the most reasonable and prudent means of meeting UMERC's projected need.

Q. Are you sponsoring any exhibits in this proceeding?

A. Yes, I am sponsoring the following exhibits:

- Exhibit A-6 (KMK-1) – Economic Evaluation (CONFIDENTIAL)
- Exhibit A-7 (KMK-2) – Summary Inputs and Outputs (CONFIDENTIAL)
- Exhibit A-8 (KMK-3) – Net Run Costs (CONFIDENTIAL)
- Exhibit A-9 (KMK-4) – LMP Forecast (CONFIDENTIAL)
- Exhibit A-10 (KMK-5) – Market Price Forecast
- Exhibit A-11 (KMK-6) – IRP Builds

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

A. Yes, they were.

Q. Please describe UMERC.

A. UMERC is a Michigan jurisdictional regulated utility authorized to serve the former Michigan electric customers of Wisconsin Electric and WPS Corp and the former Michigan natural gas customers of WPS Corp. UMERC is engaged as a public utility in the business of generating, purchasing, distributing, and selling electric energy to approximately 36,900

full requirements customers, as well as any distribution-only customers who qualify for RAS. UMERC also provides retail natural gas service to approximately 5,300 full requirements customers and natural gas transportation service to approximately 16 transportation customers.

IRP Modeling Process

Q. Please provide an introduction and overview of UMERC's IRP.

A. An IRP explains how an electric utility company plans on meeting the projected peak demand, energy requirements and, more recently, environmental goals on behalf of the customers it serves. By Michigan statute, UMERC is required to provide an IRP that encompasses a 20-year forecast period (2022-2042). The Company's primary planning objective was to create and develop a well-diversified and balanced IRP, with a focus on providing value to customers through price stability over the long-term, ensuring reliability, resiliency, and environmental responsibility.

Q. Discuss the methodology for completing the analysis UMERC completed for this proceeding.

A. UMERC ran various scenarios required by Michigan's IRP process, which included Business as Usual ("BAU"), Emerging Technology ("ET"), Environmental Policy, and High Market Prices. In addition, a sensitivity analysis was performed in each scenario, which determines how independent variables, i.e. planning assumptions, affect the economic value of the IRP compared to the status quo.

Q. Please provide a summary of UMERC's existing Generation fleet.

A. UMERC currently owns two newly-constructed reciprocating internal combustion engine ("RICE") natural gas fired generating facilities which entered service in 2019. These units

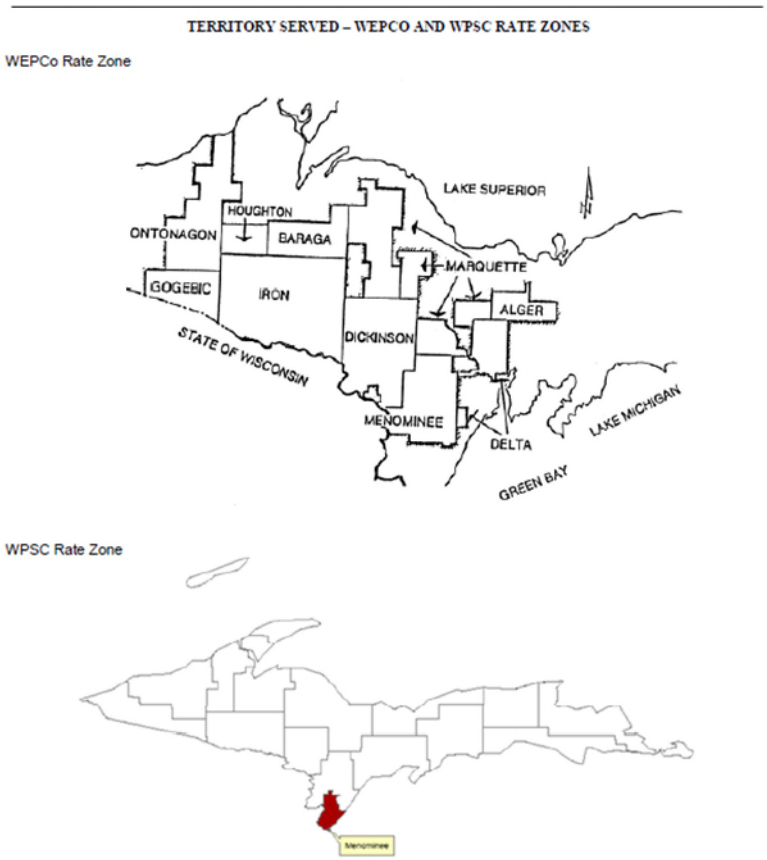
currently receive a combined capacity credit from Midcontinent Independent System Operator, Inc. ("MISO") of 179.3 MW. Each facility's total capacity is provided below:

- Kuester Generating Station: 125.6 MW
- Mihm Generating Station: 53.7 MW

Q. Please describe UMERC's service territory.

A. The UMERC service territory is divided into two distinct geographic areas. As authorized in Case No. U-18061, the Company provides, among other things, electric service to all retail customers within the former public utility service territories of Wisconsin Electric and WPS Corp in the state of Michigan. See Figure 1 below for a graphic presentation of the service territory.

Figure 1. Service Territory



Q. Please explain how UMERC developed its modeling process to comply with Michigan's IRP Requirements.

A. The state of Michigan requires analyses of the following three scenarios: (1) BAU assuming status quo conditions continue throughout the planning period; (2) emerging technology analyzing the potential impact from reduced costs for emerging technologies that include demand response, waste reduction programs, and large and small-scale storage and solar energy; and (3) high energy market prices evaluating the impact of significantly higher than expected natural gas prices and energy market prices.

Q. Are there any other required scenarios from other Michigan orders?

A. Yes. In the order in Case No. U-20633 et al., related to new environmental policy in Michigan, a rate regulated utility in Michigan that files an IRP prior to the update in 2022, shall perform two model runs. This is in addition to the utility's own scenarios and assumptions and those required by the Commission's Michigan IRP Planning Parameters, that are based on the existing Environmental Policy scenario with the high load growth sensitivity of 1.5%, thereby creating a new scenario, that: (1) demonstrates a reduction in carbon emissions by at least 28% of the utility's 2005 amounts by 2025, accomplished by modeling a hard cap on carbon emissions in 2025; and (2) demonstrates a reduction in carbon emissions by at least 32% of the utility's 2005 amounts by 2025, accomplished by modeling a hard cap on carbon emissions in 2025.

Q. Provide a summary of the 20 Year Resource Plan.

A. The 20 Year Resource Plan to meet customers' energy needs through 2042 incorporates anticipated changes facing UMERC, the utility industry, and the state of Michigan over the 20 year planning period. UMERC must plan for sufficient supplies of electricity while

also maintaining reasonable and fair prices and achieving safety, environmental, operational, and reliability goals. The IRP scenarios based on the load forecast developed by UMERC were designed to meet the UMERC load requirements and other planning objectives stated herein.

Energy Exemplar's ("EE") PLEXOS market simulation software ("PLEXOS") was used to simulate long-term resource expansion analysis utilizing detailed operating characsterisitics and cost, with customizable constraints on system planning requirements and/or system operation Using constraints for system planning reserve margin, target levels of renewable energy, and input data such as UMERC's load forecast for energy and peak demand, UMERC has sufficient generating capacity to meet its firm load obligation through the planning period and a business as usual existing system scenario would also be adequate to meet Michigan's renewable generation and environmental mandates through 2030. However, UMERC's current energy procurement strategy is dependent on buying renewable energy credits ("RECs") to increase renewables by 2030. As a result, expansion plan scenarios that increase the percentage of UMERC's owned generation, while continuing to optimize UMERC's portfolio, have been evaluated. The planning reserve margin, renewable portfolio standard, and incremental energy efficiency as a percentage of energy demand, must meet or exceed the minimum requirements in order for any potential scenario to be viable. Run Net Cost and Net Present Value were aggregated into a table and compared across all scenarios in Exhibit A-8 (KMK-3) – Net Run Costs.

Q. Please explain what model UMERC utilized in its modeling process.

A. UMERC utilitzed PLEXOS to evaluate its optimal long-term expansion plan. PLEXOS is a comprehensive production cost model with regional databases for conducting capacity

expansion planning. The model provides the capability to solve the capacity expansion problem simultaneously with commitment and dispatch. PLEXOS also accounts for all types of generation and storage resource options during generation capacity expansion. This allows PLEXOS to build balanced portfolios of conventional, renewable, and storage resources, which accounts for the delivery curves of price taking wind and solar generators. PLEXOS allows UMERC to forecast future generation portfolios using locational marginal price cases across the MISO territory; identify low-cost resource options to meet UMERC's future system needs; and simulate the dispatch, costs, and revenues of the portfolio as part of the MISO market.

Q. Please explain how UMERC developed its modeling process to comply with Michigan's IRP Requirements.

A. In order for a scenario to be viable, UMERC's IRP planning reserve margin ("PRM") must be at least 9.4 percent and its RPS must be 15 percent from 2022 onwards.

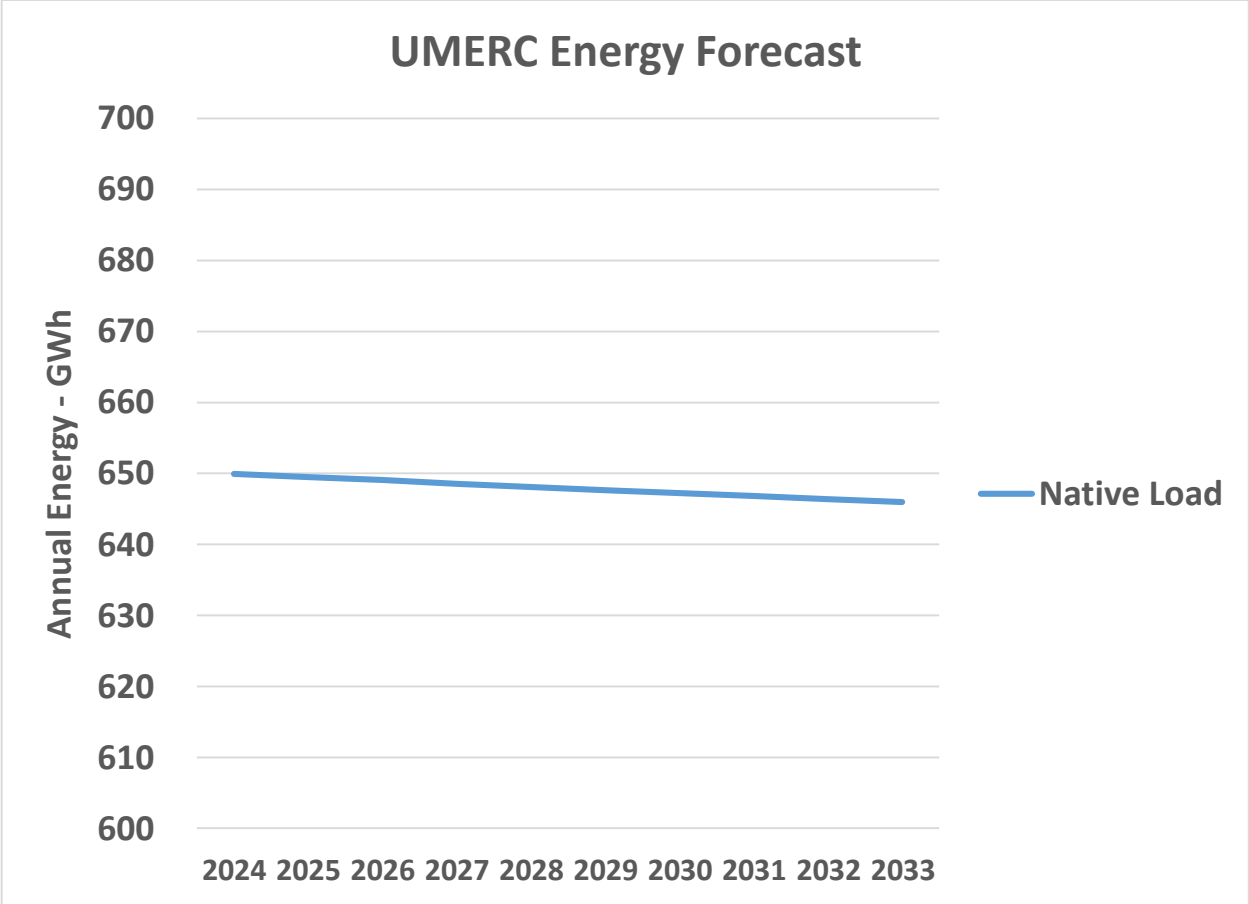
Q. Did UMERC utilize any Purchase Power Agreements ("PPAs") to meet its capacity or energy requirements?

A No. UMERC does not currently use PPAs to meet its capacity or energy requirements.

Q. Explain UMERC's Energy Forecast.

A. UMERC is only responsible for meeting its own native load on a firm, uninterruptable basis. UMERC's native load, and the MISO-required 9.4% PRM requirement, as well as the peak demand of the full load expected to be served by UMERC during the planning period is shown in Figure 2. For detail on how the energy and demand forecast was developed see Company Witness Peccarelli's direct testimony.

Figure 2. UMERC Energy Forecast



Q. Describe the options for customer-initiated renewable energy forecast of sales of customer-initiated renewable energy.

A. UMERC currently has very little historical or forecast load data for customer-initiated renewable energy, so it is not explicitly incorporated into our energy and demand models. Implicitly, our models and forecasts assume that the unobserved historical trend in customer-initiated renewable energy will continue into the future. Currently there are 36 residential customers and one commercial / industrial customer with approximately 250 kW in the WEPCo rate zone and 6 residential customers with 32 kW in the WPSC rate zone.

Q. Describe UMERC's demand response ("DR") resources.

A. UMERC has a significant amount of electric non-firm load on its system, with the mines contract (Case No. U-17682) and a firm load obligation of approximately 110 MW, the Company has more interruptible load than firm load. UMERC offers several retail electric non-firm tariffs which are open to both new customers to the UMERC system as well as existing customers currently taking firm service and desiring to take non-firm service. Due to the amount of existing non-firm load and the fact that UMERC has excess capacity, the Company has not pursued additional DR efforts in the near term.

Q. Please detail the DR electric non-firm load options for UMERC.

A. Below are descriptions of the various electric non-firm load options for UMERC. These programs are subject to interruption when the Company, the Transmission Operator or the Reliability Authority feel the distribution, transmission equipment, or supply to firm customers is in jeopardy.

WEPCO RATE ZONE

Tilden Special Contract: As of April 1, 2019, Tilden takes electric service from UMERC under a special contract approved by the Commission in Case No. U-18224. This special contract includes interruptible service and at this time the entire electric load of Tilden is being served as non-firm. UMERC utilizes this as a Load Modifying Resource ("LMR" with MISO).

General Primary Full Requirements and Retail Access Service – Large Curtailable Contract Rate – CpLC: This service is reflected on tariff sheet Nos. D-40.00-D43.00 and is available to customers taking service at 13.8 kilovolts or higher with a minimum of 50 megawatts of curtailable load. No customers are currently taking service under this rate schedule.

General Primary Full Service Requirements Service Interruptible Rate Cp2: This service is reflected on tariff sheet Nos. D-27.00 – D28.00 and is available to customers taking service at 2,400 volts or higher with at least 1,000 kilowatts of interruptible load. No customers are currently taking non-firm service under this rate schedule.

General Primary Full Requirements Service – Curtailable Contract Rate – Cp3: This service is reflected on tariff sheet Nos. D-29.00-D32.00 and is available to customers taking service at 2,400 volts or higher with a minimum of 500 kilowatts of curtailable load. Two customers are currently taking non-firm service under this rate schedule UMERC utilizes this as an LMR with MISO.

Special Contract: A customer takes electric service from UMERC under a special contract approved by the Commission in Case No. U-10959. This special contract includes interruptible service. UMERC utilizes this as a LMR with MISO.

WPSC RATE ZONE

CPI: This service is reflected on rate sheet Nos. D-122.00 - D130.00 and is available to customers taking service on the Cp-1M rate schedule with a minimum of 200 kilowatts of interruptible load. Two customers are currently taking non-firm service under this rate schedule UMERC utilizes this as a LMR with MISO.

Q. What are the projected MISO zonal resource credits ("ZRC") values for UMERC's DR programs?

A. The ZRC values for PY2021/2022 are 195.8 MW for the DR programs described above.

Q. How does UMERC meet Energy Waste Reduction ("EWR")?

A. UMERC intends to meet its EWR obligations under 2008 PA 295 pursuant to Section 91 by making payments to an independent EWR administrator selected by the Commission.

UMERC has no plans at this time to change this. Being a small utility, it is not currently cost effective to meet EWR through other means. UMERC filed its most recent EWR plan in Case No. U-20880. The EWR surcharges in place for UMERC collect an amount equal to 2% of UMERC 2021 retail electric revenues.

Q. Please describe how UMERC is impacted by Electric Customer Choice.

A. Michigan has a Electric Customer Choice ("ECC") program which permits customers to shop for power supply from a diverse market of licensed alternative electric suppliers ("AES"). ECC allows customers to purchase electricity at prices determined by them and an unregulated AES or to continue to buy from the utility at prices regulated by the Michigan Public Service Commission. However, under state law, no more than 10 percent of an electric utility's average weather-adjusted retail sales for the preceeding calendar year may take service from an AES at any time. UMERC is currently fully subscribed. Therefore, UMERC modeled its current ECC program.

Q. Provide a brief description of the demonstrated needs incorporated into UMERC's IRP analysis.

A. The demand load forecast allows a comparison of energy and capacity requirements with UMERC's existing and additional near-term resources. The results are a determination of the adequacy of existing and near-term resources to meet UMERC's needs and renewable energy requirements during the planning period. The state of Michigan's renewable portfolio standard ("RPS") requires 15% of the electricity produced come from renewable energy sources in 2021. UMERC's current strategy includes a portfolio of banked RECs and third-party REC-only purchases exposing the Company's customers to market risk.

Q. Please describe how UMERC determines its RECs needed to meet the RPS.

A. UMERC calculates the RECs based on the average number of megawatt hours of electricity sold annually during the previous three years to retail customers in the state minus the Mines.

Q. Explain UMERC's proposed additions to its generating fleet.

A. With the Mine's contract (Case No. U-17682) and a firm load obligation of approximately 110 MW, the existing fleet adequately covers the needs of customers for the next 15 years. In addition, UMERC has already reduced CO2 emissions from its 2005 base by approximately 87% with the April 2019 commercial in service date of the RICE units and the simultaneous retirement of the Presque Isle Power Plant, which was the only coal-fueled source of electric generation that served UMERC's customers. As a result, this IRP proposes to add renewable generation by 2025 to self generate RECs to satisfy the RPS requirements, improve local reliability and reduce carbon emissions further.

Q. Provide a description of the bulk transmission system and distribution system constraints included in the Company's modeling.

A. The Upper Penninsula ("UP") of Michigan is a load pocket unless or until transmission infrastructure is built to allow imports to fully serve the UP load including Tilden. Without new transmission, local loads must be supplied to a large extent from local generation. In addition, because it is a load pocket, the UP load requires highly redundant and reliable generators. The UMERC RICE generating fleet was designed and built with reliability in mind. Even in the unlikely event that two units are completely unavailable at the same time, the Company is still capable of meeting its demand obligations with planning reserves for the entire planning period.

Q. Why is the UP a load pocket?

A. As a peninsula, the UP has historically had to rely on local generation. It is interconnected to Wisconsin and, more recently, the lower peninsula of Michigan, but the transmission import capability from these interconnections remains limited.

Q. Have you analyzed new transmission in this IRP?

A. No, since UMERC has not identified a need for capacity within its IRP and subsequently has not identified a need for any related new or upgraded electrical transmission infrastructure. However, despite UMERC's lack of need for new generation capcity, ATC continuously performs analysis of the transmission system to ensure it is reliable under a range of system conditions.

Q. How often does ATC analyze the transmission system?

A. ATC annually performs a 10-year assessment of the transmission system within the UP and the northern portion of Wisconsin. For example, ATC has identified the need for asset-renewal projects, such as the rebuild of the underwatrer 138 kV transmission line within the Straights of Mackinac and Winona – Atlantic 69 kV line, which add incremental capability to the transmission system and strengthen the ability to import and export power.

Q. Describe how the import and export capabilities are determined.

A. UMERC is within MISO's Local Resource Zone 2 ("LRZ2"), which encompasses the entire ATC footprint within eastern Wisconsin and most of Michigan's UP. Import and export capabilities into LRZ2 are determined annually, through the MISO Resource Adequacy process. Many new transmission facilities have been built in the last 20 years. Nonetheless, the UP is still not able to fully rely on energy imports to meet UP load.

Q. Describe the Company's BAU scenario analysis and results.

A. The economic analysis evaluates the BAU operation of UMERC's fleet over the planning period using the PLEXOS model populated with the detailed unit characteristics to economically dispatch the UMERC units for status quo alternative scenarios. The BAU base case assumes BAU operations, in addition to pursuing renewable sources of energy and capacity to replace purchased RECs, as well as base case best estimate assumptions for variables such as load and gas prices. Cases for difference courses of action are subsequently compared to revised BAU cases, which each consider changed variables. The BAU scenario is one of the least cost alternatives as UMERC has a firm load obligation of approximately 110MW, which the existing fleet adequately covers the needs of customers for the next 15 years. See Exhibit A-6 (KMK-1) – Economic Evaluation for detailed results.

Q. Describe the Company's Emerging Technologies ("ET") scenario analysis and results.

A. For the ET scenarios UMERC utilizied the PLEXOS model to economically dispatch its units, energy waste reduction programs, and economically select new "Generic Units" (i.e. solar, wind and small-scale storage) to meet future capacity needs for alternative scenarios. See Exhibit A-6 (KMK-1) Economic Evaluation for detailed results.

Q. Describe the Company's High Market Price scenario analysis and results.

A. The high market price scenario evaluates the impact of significantly higher than expected natural gas prices and energy market prices for alternative scenarios. See Exhibit A-6 (KMK-1) – Economic Evaluation for detailed results.

Q. Describe the Company's New Environmental Policy scenario analysis and results.

A. UMERC performed model runs, in addition to it's own scenarios and assumptions with the high load growth sensitivity of 1.5%, demonstrating a reduction in carbon emissions of at least 28% of the Company's 2005 amounts by 2025, accomplished by modeling a hard cap on carbon emissions in 2025; and another demonstrating a reduction in carbon emissions of at least 32% of the Company's 2005 amounts by 2025, accomplished by modeling a hard cap on carbon emissions in 2025. See Exhibit A-6 (KMK-1) – Economic Evaluation for detailed results.

Q. Please describe the planning assumptions.

A. For an explanation and analysis of the planning assumptions including supply side resource costs modeled see Exhibit A-6 (KMK-1) – Economic Evaluation.

Q. What recommendations did the Company's IRP modeling provide.

A. In virtually every sensitivity run except for the high load growth which includes the return of the Empire Mine and the 25% renewable scenario, UMERC's modeling supports the BAU with additional renewables to mitigate market risk, improve reliability, and reduce carbon emissions as the economic path forward. See Exhibit A-6 (KMK-1) – Economic Evaluation for detailed results.

Q. Did the Company complete a sensitivity analysis for its preferred course of action ("PCA")?

A. Yes. UMERC's results are included in Exhibit A-6 (KMK-1) – Economic Evaluation and Exhibit A-8 (KMK-3) – Net Run Costs.

Q. Please describe Net Run Costs.

A. The Net Run Costs are annualized build costs which are included in the Fixed Costs calculated by PLEXOS.

Q. Are there any fundamental changes to the Company's current resource portfolio that are reflected in this IRP submittal?

A. Yes. Effective in the Company's 2020 IRP in Case No. U-20470, UMERC has replaced the Presque Isle Power Plant capacity and energy from its now-retired coal-fired power plant with capacity and energy from the Company's new natural gas-fired RICE units. UMERC is looking to optimize the assets that it currently owns to maximize customer benefit with the addition of solar generation units to mitigate market risk for future REC purchases, improve reliability and further reduce carbon emissions.

Q. On average, what percentage of total energy requirements are provided by Company-owned generation facilities.

A. Output from the Company's RICE units comprises approximately 60% of the energy that is ultimately delivered to retail customers, inclusive of sales to the Mine and other interruptable customers. However, UMERC generation is sufficient to cover 100% of the native firm load, which excludes the Mine and other interruptable customers.

Q. How does the Company currently procure the remaining 40% of its total energy requirements?

A. The Company currently procures the remaining energy that it ultimately delivers to its retail customers through purchases from the MISO day-ahead and real-time energy markets.

Q. Please describe the impact of the proposed solar investments on UMERC's generation portfolio?

A. The proposed solar investments will provide additional energy to UMERC's generation portfolio. By locating this renewable generation in the same load zone as UMERC's load,

the transmission losses for this energy and the price of energy are reduced providing higher value to UMERC. The new solar generation will provide UMERC future RECs to meet the Michigan RPS, in addition to providing system voltage support improving local reliability and even further reduce carbon emissions.

Q. Please describe the impact of the proposed solar investments on fuel prices for UMERC?

A. Solar investments provide energy with no fuel costs. Fuel price forecasts affect both the cost of energy produced from the gas-fueled supply options and also the price of energy (Locational Marginal Prices or "LMP") in MISO and the UP. Locating renewable generation near the UMERC load reduces LMPs which benefits all UMERC customers, and, in fact, all customers in the UP.

Q. Why are proposed solar investments reasonable and prudent?

A. These investments are reasonable and prudent as they reduce fuel cost and mitigate market risk related to higher market prices for natural gas and/or coal used as fuel for generation. In addition, under the RPS, Michigan requires an increasing amount of RECs generated in the state which may not be available at current prices or quantities in future years.

Q. Does UMERC expect this increase in its company-owned generation portfolio to reduce its reliance on MISO market purchases to reduce price risk associated with such purchases?

A. Yes, UMERC will need fewer MISO market purchases with this increase in company-owned generation. Adding generation serves as a prudent hedge against market volatility and reduces UMERC's customers exposure to market energy price volatility.

Q. What factors could cause MISO market prices to increase significantly?

A. With relatively low natural gas prices, gas-fired power generation continues to be setting the marginal dispatching price of generation in the U.S. With 200 MW of generation over capacity in MISO Zone 2, UMERC has had low capacity and energy prices. There are no assurances that the market will be able to continue to deliver low energy and capacity prices into the future. Suppliers to the MISO market could experience higher market prices for natural gas and/or coal used as fuel for generation, which could cause the market prices for power to be significantly higher than forecasted. Planned or unplanned outages of low-cost generation, generating unit retirements, or transmission outages in the MISO market could also significantly increase market prices for power.

Q. Please provide a breakdown of the average market hedge value provided by each of the Company's current sources of electric energy, as a percentage of total non-Mine related energy requirements.

A. Company-owned RICE generation plus the proposed solar investments constitute 60% of UMERC's total energy requirements, based on 2025. UMERC typically plans to purchase 40%, leaving that 40% of the Company's total energy requirement exposed to the day-ahead and real-time MISO energy markets.

Q. What level of market exposure do UMERC customers bear for market capacity purchases?

A. Due to the requirements inherent within the State Reliability Mechanism ("SRM"), Michigan utilities are required to demonstrate that they own or have contractual rights to sufficient capacity resources to meet their need four years into the future. UMERC-owned generation comprises 100% of its capacity, which is sufficient capacity resources.

Q. What factors could cause volatility in the capacity market?

A. Several factors can influence the price obtained for future capacity contracts, aside from normal market fluctuations. zonal resource adequacy projections, such as the annual OMS-MISO Resource Adequacy survey can often provide an outlook on the relative scarcity of capacity resources that could be available in a given year. If a particular zone is expected to be deficient in relation to its zonal PRMR or its Local Clearing Requirement ("LCR"), then one could expect to pay a premium for any capacity contract. The potential for a locational requirement that is tied to the SRM requirements of a particular zone would likely yield a premium to be paid for any capacity contract, due to an increased demand for a discrete amount of resources, at least until such time that additional generating resources can be built.

Q. What is the resource adequacy outlook for LRZ2, as published in the 2021 OMS-MISO Survey?

A. For planning year 2022, the survey results indicate that LRZ2 is expected to have 200 MW (UCAP) of surplus capacity in excess of the amount needed to satisfy its 1 day in 10-year loss of load expectation requirements. In planning year 2022, LRZ2 is expected to be between 200 MW short and 1600 MW long on its capacity requirements, depending on whether currently planned resource additions come to fruition as scheduled, which means that LRZ2 could be upto 200 MW short.

Q. Please describe the Company's PCA.

A. UMERC looks to hedge its customers against future market volatility by making solar investments while further reducing the air emissions from its generation portfolio. The RPS requires RECs generated from renewables in Michigan which may not be available for purchase at reasonable prices in the future. UMERC's balanced resource portfolio

approach will deliver reliable, low-cost energy for its customers that is adequately hedged against future market price volatility while exceeding all current goals for reductions in emissions.

Q. Please generally describe the benefits of the solar generating facilities, in terms of economic benefit in relation to the Company's current avoided cost, and market risk mitigation.

A: Although the Company does not have a capacity need due to the structure of the Special Contract with Tilden Mining Company L.C., the Company purchases nearly 40% of its total energy needs from the MISO market with the balance being provided by the Mihm and Kuester RICE generating plants. The benefits of solar generating facilities would be to mitigate the Company's exposure to volatile market prices and the potential for reduced output from the Mihm and Kuester RICE plants as a result of future CO2 emission reduction efforts. In addition, solar will improve local reliability in the UP through system voltage support.

Q. What other benefit do these solar investments provide UMERC, other than future price certainty?

A. Adding solar generating facilities reduces risks associated with the purchases of future RECs required in the RPS. The RPS requires renewables located in Michigan to supply the RECs to meet the standard and there is no guarantee that qualifying RECs will be available at reasonable prices in the future. In addition, solar generating facitlities reduce fuel costs providing low-cost energy hedged against fuel commodity market price volatility. For further discussion of other benefits renewable investments provide see the testimony of Company Witness Greco on environmental justice modeling and outcomes.

Q. Are there any other benefits to the proposed future solar investments?

A. Yes. The proposed solar investments will postion the Company to potentially better utilize energy storage in the future. Over time, and as energy storage technology becomes more prevalent and economic at the utilityscale, this technology provides significant additional benefit to a large solar application. UMERC sees its PCA in this IRP as expandable, whereby in future proceedings the Company will look to closely evaluate the economics of storage and other emerging technologies, in an effort to further leverage the many benefits of solar energy generation.

Q. Do UMERC's existing RICE units offer any market hedge value to UMERC customers?

A. Yes. As stated previously, natural gas pricing and market energy pricing are generally thought to be highly correlated. Therefore, any natural gas-fired generating unit will not provide a complete hedge against energy market pricing. However, as evidenced by recent approvals to build new natural gas-fired, dispatchable generating resources in the MISO footprint, these resources provide necessary complementary capacity to the growing volume of renewable energy generating facilities in MISO. The hedge value provided by RICE, or other natural gas-fired dispatchable resources, is a hedge against the factors that cause market price volatility other than natural gas prices.

The characteristics of a natural gas-fired RICE unit complement a resource portfolio that is increasingly populated with renewable generation. Dispatchable units with expedient start-up times and quick ramping rates allow system operators to closely match the total system demand to the amount of resources available – in particular, intermittent

renewable resources – to meet this demand, thereby reducing the potential for large variability in LMP pricing.

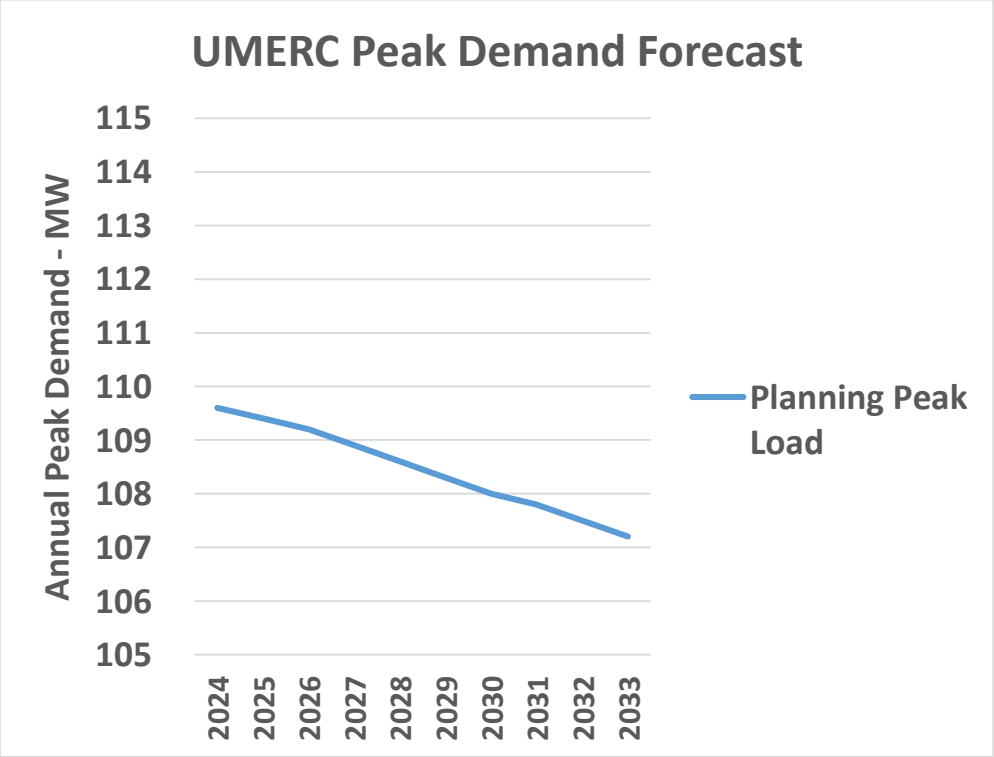
Table 1: System Capacity versus Demand

System Capacity vs Native System Firm Peak Demand (MW) excl. Mines				
Year	Capacity	Demand	Reserve (9.4%)	Excess/Deficient
2021	186.8	110.3	10.4	66.1
2022	186.8	110.3	10.4	66.1
2023	186.8	110.0	10.3	66.5
2024	211.8	109.6	10.3	91.9
2025	211.8	109.4	10.3	92.1
2026	211.8	109.2	10.3	92.3
2027	211.8	108.9	10.2	92.7
2028	211.8	108.6	10.2	93.0
2029	211.8	108.3	10.2	93.3
2030	211.8	108.0	10.2	93.6
2031	211.8	107.8	10.1	93.9
2032	211.8	107.5	10.1	94.2
2033	211.8	107.2	10.1	94.5
2034	211.8	106.9	10.0	94.8
2035	211.8	106.7	10.0	95.0
2036	211.8	106.4	10.0	95.4
2037	211.8	105.9	10.0	95.9
2038	211.8	105.6	9.9	96.2
2039	211.8	105.4	9.9	96.5
2040	211.8	105.1	9.9	96.8

Q. As illustrated in Table 1, why does UMERC plan to maintain a capacity surplus throughout the timeframe evaluated by this IRP?

A. The reason for this is a product of the disparity between UMERC's energy and capacity market exposure. Due to the large amount of the Company's peak demand requirements that are satisfied through DR resources, UMERC's overall capacity deficit is significantly less than its energy deficit. Moreover, due to the competitive pricing that resulted from the

Company's project evaluation during the development of this IRP, UMERC is proposing to provide a long-term, low cost hedge against energy and capacity market volatility to the benefit of its PSCR customers. In order to take advantage of the significant amount of economic energy market hedge presented by the solar projects, UMERC finds itself with an outlook including a capacity surplus. In any given year, excess capacity can be sold through contract or offered into the MISO Planning Resource Auction, providing additional benefit to UMERC's PSCR customers.



Q. Please provide a description of the project evaluation process that is being employed to determine UMERC's preferred solar project and development partner for a solar generating facility for an EPC build.

A. UMERC has performed preliminary evaluations of potential projects that are expected to be available in 2025 (when UMERC's need will exist) and is of a size that would fit its needs. Specifically, these projects included those currently available in the MISO queue

or with existing interconnect agreements. UMERC will be performing a competitive procurement process to make a final selection and expects to be able to update the financial information included in this IRP within 150 days of filing the application.

LMP Forecast

Q. Has UMERC submitted a 20-year forecast of LMPs to use as a basis for the avoided energy cost?

A. Yes. Please see Exhibit A-9 (KMK-4) LMP Forecast.

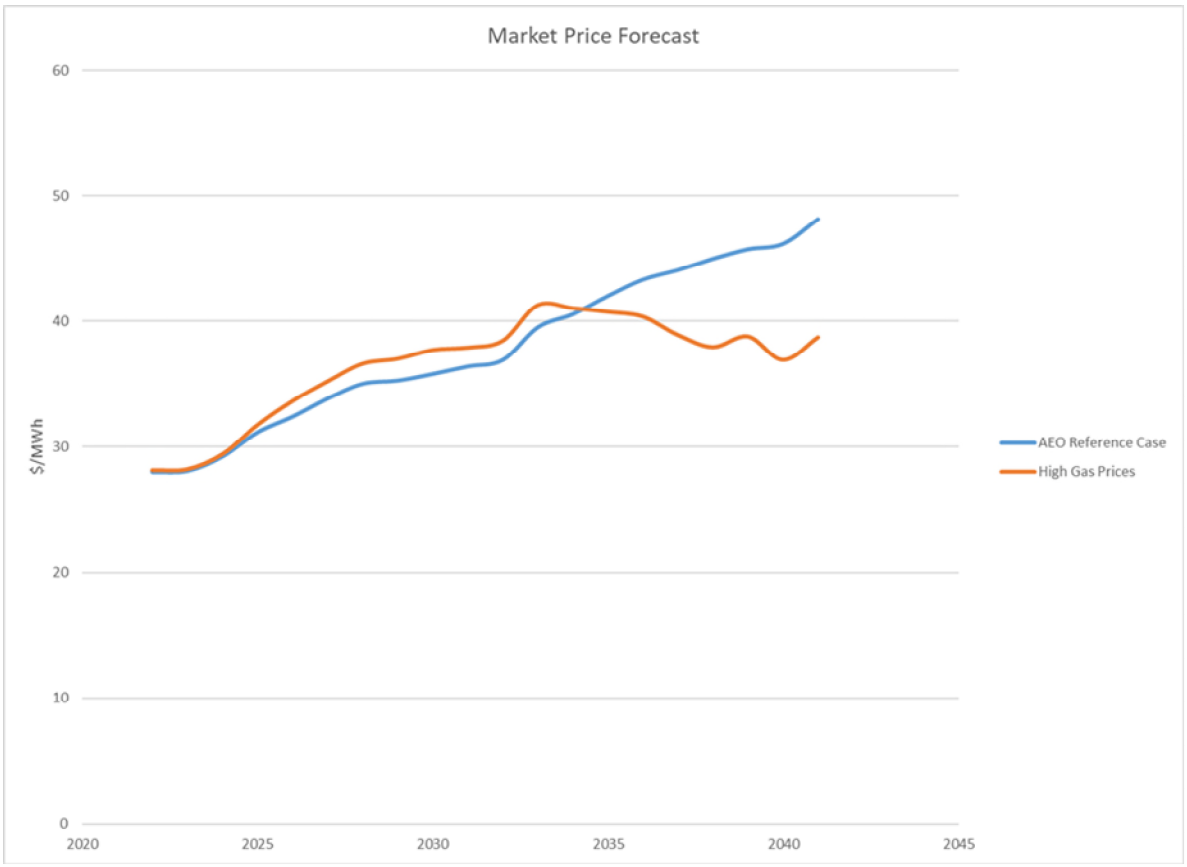
Q. Is this LMP Forecast equal to the base assumptions utilized in the capacity expansion modeling efforts?

A. Yes.

Q. How was this LMP Forecast derived?

A. The LMP Forecast was developed utilizing the Aurora cost model. As part of the process, UMERC contracted with EE and Siemens to model long-term expansion and the resulting market pries of the Eastern Interconnect and specifically MISO Load Resource Zones. Market price forecasts generated were then incorporated into PLEXOS to appropriately represent the market while optimizing the Company's IRP for 2022-2042. Figure 3 shows the market price forecast based on the natural gas price forecasts utilized in the evaluation.

Figure 3



Q. Does the LMP Forecast provided here constitute a reasonable expectation of future average LMP prices?

A. Yes.

Q. Does this conclude your direct testimony at this time?

A. Yes, it does.

Economic Analysis

The following sections provide and identify the detailed planning assumptions and results of the UMERC economic analysis focusing on the quantifiable components. The economic analysis is a comprehensive evaluation that tests and validates the Preferred Course of Action ("PCA"). In addition to the base assumptions, the economic analysis includes sensitivity analysis, which determines how independent variables, *i.e.* planning assumptions, affect the economic value the PCA provides assessing multiple potential and varied outcomes.

The PLEXOS model runs capture the annual dispatch costs and revenues for UMERC's existing generation along with any new generation picked including generator and load LMPs and energy production or consumption in MWh on an hourly basis. The model is also used to evaluate the gas price and market price and their relative effect on UMERC for each alternative. Other variables such as financing costs, (depreciation, return, taxes, investment tax credits, etc.) were incorporated into the Net Run Costs spreadsheets to determine total revenue requirements.

The PCA is to build renewable generation to meet RPS requirements, mitigate market risk related to higher market prices, improve local reliability and reduce carbon dioxide emissions. The PCA is supported by the outputs from the planning scenarios detailed in our workpapers, Exhibit A-8 (KMK-3) – Net Run Costs and Exhibit A-11 (KMK-6) – IRP Builds.

1.0 Generation Resource Modeling

1.1 Long-Term Capacity Expansion Model - PLEXOS

UMERC utilized Energy Exemplar's ("EE") PLEXOS market simulation software ("PLEXOS") to evaluate it's optimal long-term expansion plan. The PLEXOS model provides the most robust model functionality and is a proven power market simulation tool that is a leader in modeling flexibility, efficiency, simulation alternatives and advanced analysis.

PLEXOS is a comprehensive production cost model with regional databases for conducting capacity expansion planning and is used by over 280 customers with utilities being the largest customer base.[1] The model provides the capability to solve the capacity expansion problem simultaneously with commitment and dispatch based on input generator performance data, monthly fuel cost forecasts and

[1] Notable customers includes AEP, Xcel Energy, Dominion, Southern California Edison, MISO, PJM, and California ISO

other UMERC specific energy market components (FTRs, make whole payments, ancillary services, etc.). PLEXOS also accounts for all types of generation and storage resource options during generation capacity expansion. This allows PLEXOS to build balanced portfolios of conventional, renewable and storage resources, which accounts for the delivery curves of price taking wind and solar generators.

PLEXOS allows UMERC to forecast future generation portfolios and locational marginal prices across MISO; identify low cost resource options to meet the Company's future system needs; and simulate the dispatch, costs, and revenues of those portfolios as part of the Midcontinent Independent System Operator, Inc. ("MISO") market included in Exhibits A-8, A-9 and A-10. The full results and input data are available in Exhibit A-7.

1.2 Economic Modeling Approach

As described above, the economic analysis evaluates the overall PCA against continued operation of UMERC's respective existing generation portfolios over the planning period. UMERC utilized the PLEXOS model to economically dispatch the Company's portfolio, optimize CO_2 emissions, economically select new "Generic Units" to meet future capacity needs, meet energy waste reduction programs, and evaluate high market price comparative scenarios.

In the various scenarios, the PLEXOS model was populated with UMERC detailed unit characteristics, as well as the generic unit characteristics. In the BAU Alternative, the purchased renewable energy credits ("RECs") are replaced with generic units to meet the renewable portfolio standard ("RPS") throughout the study period. The following provides a breakdown of how economic analysis was developed utilizing the PLEXOS model and specific internal financial calculations for each of these scenarios. A detailed breakdown of these variables is provided in the confidential attachment Exhibit A-7 (KMK-2) – Summary Inputs and Outputs.

- Fuel Costs – Determined by PLEXOS
- Variable Costs – Determined by PLEXOS
- Market Energy Purchases and Sales – Determined by PLEXOS
- Market Capacity Purchases – Determined by PLEXOS

- Status Quo/Generic Unit Specific Unit Capital Recovery – Internal calculation using utility specific financial parameters to more accurately calculate return on and of investment and correctly incorporate investment tax credits ("ITC") when applicable
- Status Quo/Generic Unit Specific Unit Annual Fixed Costs – Internal calculation
- Future Generic Unit Expansion Optimization – Determined by PLEXOS
- Generic Unit Capital Recovery/Fixed operations and maintenance ("O&M") – Fixed O&M and unit build costs were provided as inputs to the PLEXOS model based on internal calculations.

The cost information developed above was used to provide economic comparisons between the BAU, Emerging Technologies and High Market Price Alternatives.

2.0 Planning Assumptions

2.1 Discount Rate

The discount rate used in determining the net present value ("NPV") of the annual cost streams for the Project and the Alternatives is equal to UMERC's average weighted average cost of capital ("WACC"). The WACC used in the evaluation is 7.45. The NPV values in the economic evaluation are expressed in 2021 dollars.

2.2 Study Period

The estimated life of the UMERC RICE units is 30 years from their in service date in 2019. The study period focuses on a 20-year time period from 2022 to 2042. The economic analysis assumes the RICE units continue to run and that the terms of the Mine Contract are renewed for the study period.

2.3 Escalation Rate

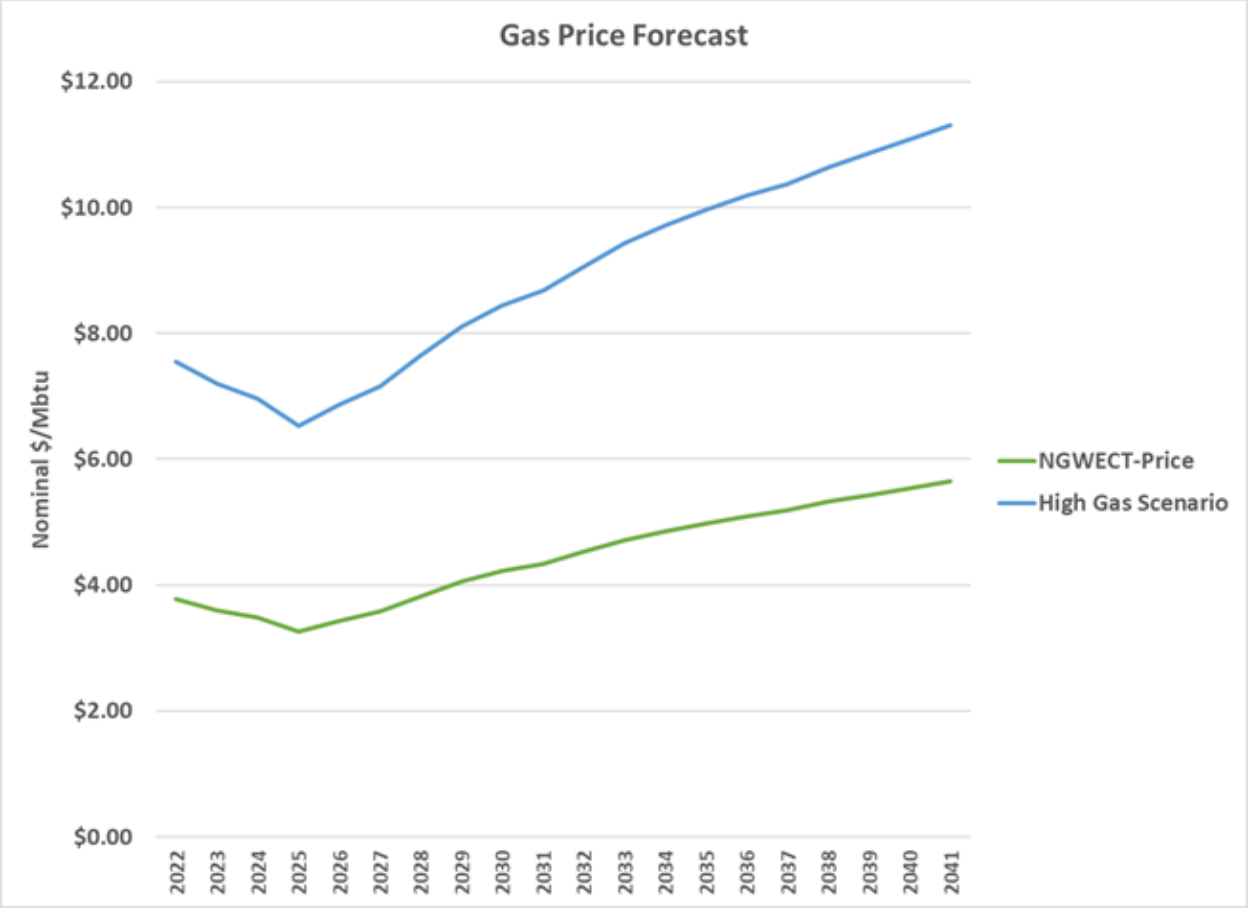
The base escalation rate assumption utilized in the economic analysis to account for increases in costs due to nominal and real inflation was [redacted] This rate was applied to fixed and variable O&M, and market capacity prices.

2.4 Natural Gas Price Forecast

The RICE units are gas-fueled so the cost of producing electricity depends on the price of natural gas. Gas price forecasts have generally been unreliable in the past. For this IRP, the base natural gas price forecast used in the economic evaluation was developed and provided in EIA's 2020

Annual Energy Outlook ("AEO") – Reference Case. Two natural gas price sensitivities were performed to test the overall impact natural gas prices would have on the overall economics of the IRP. A base natural gas price forecast. The other forecast was a high natural gas price forecast developed by calculating and adding one standard deviation to the Reference Case forecast. These natural gas prices were then used to develop the market price forecasts for MISO's LRZ2 area that was used in the capacity expansion model. **Figure 2-1** below includes the natural gas price forecast assumptions used in the evaluation.

Figure 2-1

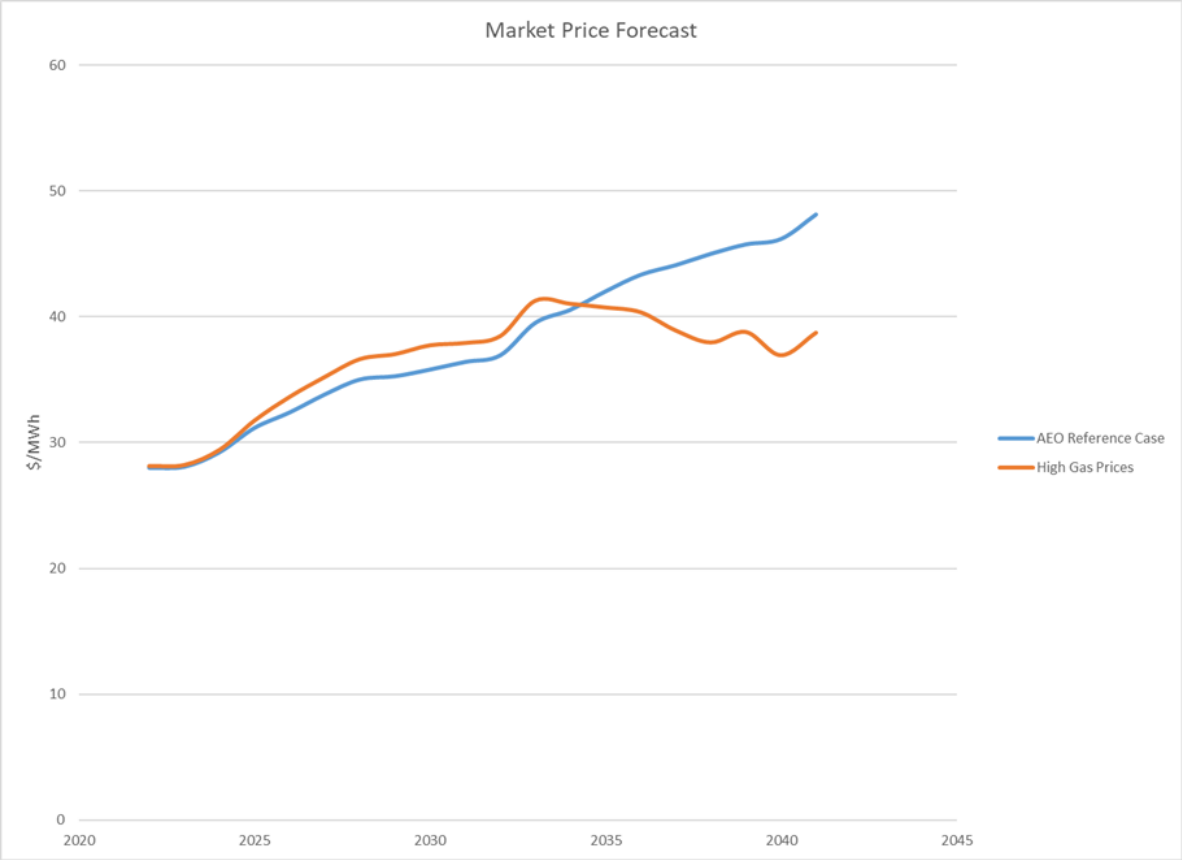


2.5 Market Energy Prices

As part of the overall process, WEC Energy Group contracted with Energy Exemplar and Siemens to model long-term expansion and the resulting market prices of the Eastern

Interconnect and specifically MISO Load Resource Zone 2 ("LRZ2")[2]. Market price forecasts generated were then incorporated into PLEXOS to appropriately represent the market while optimizing each individual utility's integrated resource plan for 2022-2042. **Figure 2-3** shows the electricity market price forecast based on the natural gas price forecasts utilized in the evaluation.

Figure 2-3



2.6 Planning Reserve Margin

The planning reserve margin requirement used in the economic evaluation was the MISO Loss of Load Expectation of 9.4%.

2.7 Demand and Energy Forecast

[2] Energy Exemplar's Aurora model was used to produce the market prices for the Eastern Interconnect and MISO LRZ2.

The annual peak demand and energy forecasts are provided in Exhibit A-12 (JJP-1) – Annual Energy and Peak Demand Forecasts.

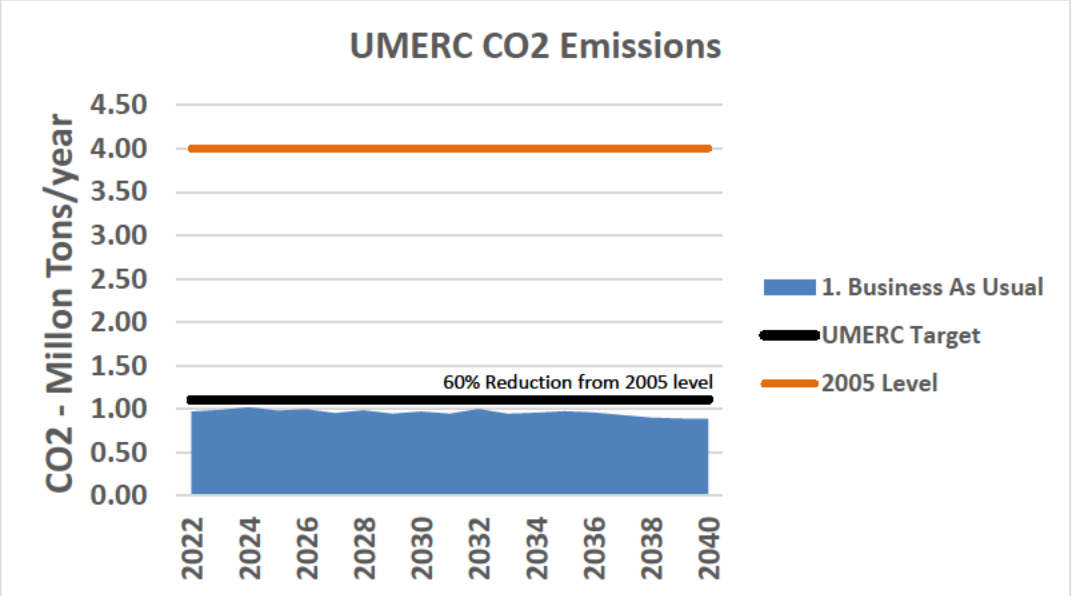
2.8 Non – Firm Load

The entirety of the MINE load is non-firm because it can be curtailed to zero MW in an emergency. UMERC customers have had the opportunity to become curtailable or interruptible customers under WE and WPS rate tariffs for many years. For planning purposes, the IRP assumes no change in non-firm load.

2.9 CO2 Reduction Levels

In its New Environmental Policy scenarios UMERC performed model runs demonstrating a reduction in carbon emissions of at least 28% of the Company's 2005 amounts by 2025, and another demonstrating a reduction in carbon emissions of at least 32% of the Company's 2005 amounts by 2025. **Table 2-2** reflects the CO_2 reduction targets for each utility by 2025 and 2030.

Table 2-2



2.10 Market Energy CO Content

The average CO_2 content per MWh used in the evaluation assumes [redacted].

2.11 Market Capacity Price Forecast

Cost of New Entry (CONE) is the standard long-term price of capacity in resource planning. The reason for this assumption is that over time, any current excess capacity in the system will be utilized or removed (retirements or economic shutdown) and as such, the cost of any newly needed capacity will be the cost of building a unit. The most recent value of CONE in our area, MISO LRZ 2, is $90,940/MW-yr[3]. This long-term cost planning assumption is understandably too high to be utilized in the immediate future so the assumption is gradually increase up the value of CONE. This means that [redacted]

2.12 Generic Units

Generic units are utilized in the capacity expansion model to optimize the balance of UMERC's portfolio with future decisions on additional generation when there is a capacity need in the future. UMERC forecasts modest load growth from 2022 to 2042. Load growth is not a significant driver of capacity need.

The generic units that were modeled in PLEXOS to meet future capacity needs [redacted] are provided below in **Table 2-3**. In addition to the generic units identified below, the model also has the option to select market capacity as a capacity source, [redacted] to meet capacity need [redacted].

Table 2-3: Generic Units

	Capacity	*Capacity Factor*	*Capital Cost*	*Eligible ITC*	*Equivalent Capital Cost*	*Fixed O&M*	*First Year Available*
	MW	*%*	*$/kW*	*%*	*$/kW*	*$/kW-year*	
Solar A	**100**	**24%**	1,500	26%	**1,368**	**20.0**	**2025**
Solar B	**25**	**21%**	1,300	26%	**1,186**	**25.0**	**2025**
Wind	**50**	**30%**	1,550	0%	**1,550**	**35.0**	**2027**

[3] Sourced from MISO Annual CONE Filing:
https://cdn.misoenergy.org/Final%20Annual%20CONE%20Filing%20(2020)480413.pdf

2.13 Existing and Projected Long-Term Gas Transportation Contracts

UMERC has long-term firm transportation contracts through [redacted] to serve its existing RICE units. The IRP models these contracts through the 20 study period.

2.14 Fixed O&M Forecast

The fixed operating and maintenance ("O&M") costs forecasted for the Generic units is outlined in Table 2-3 with [redacted] escalation rate applied for the subsequent years.

2.15 Capital Expenditures

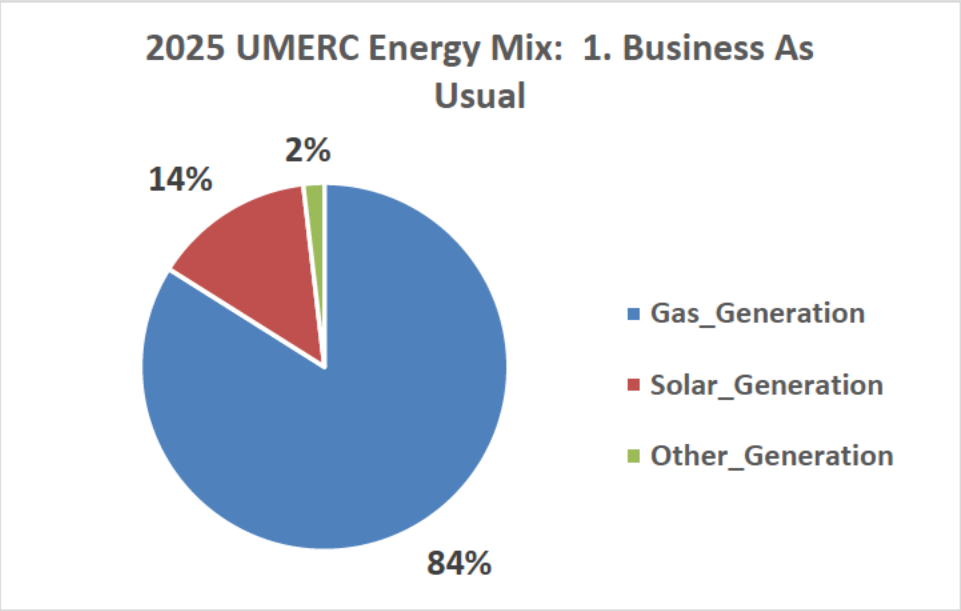
In addition to the annual O&M expenditures, the Generic units will also incur capital expenditures. However, in the economic model these costs were treated as expenses for modeling purposes only. The capital expenditures include inverter replacements in year 15 to extend the life of the Solar.

3.0 Business As Usual Alternative

This Alternative included in the economic evaluation is a continuation of UMERC's existing portfolio, with one small exception for meeting the RPS. Estimates for continued fixed O&M, capital expenditures, and capital overhauls were considered and included for continued operation of UMERC's existing generation. The RPS is met in this alternative with owned resources replacing the purchased REC's as well as base case best estimate assumptions for variables such as load and gas prices.

Sensitivities for natural gas price projections, load projections, retail choice load, EWR savings, only natural gas simple CTs, renewable energy projections, grid defection projections and carbon reduction projections were completed.

Table 2-4: BAU Energy Mix



4.0 Emerging Technologies Alternatives

This alternative analyzes the potential impact that could result from reduced costs for emerging technologies that include demand response, energy waste reduction programs, large and small-scale storage, as well as solar energy. Sensitivities for natural gas price projections, load projections, EWR savings, and 25% renewables by 2030 were completed.

5.0 Environmental Alternatives

This alternative evaluates two model runs that are based on the existing Environmental Policy scenario with the high load growth sensitivity of 1.5%, thereby creating a new scenario, that: (1) demonstrate a reduction in carbon emissions by at least 28% of the utility's 2005 amounts by 2025, accomplished by modeling a hard cap on carbon emissions in 2025; and (2) demonstrate a reduction in carbon emissions by at least 32% of the utility's 2005 amounts by 2025, accomplished by modeling a hard cap on carbon emissions in 2025. Sensitivities for natural gas price projections, load projections, and EWR savings were completed.

6.0 High Market Price Alternatives

This alternative evaluates the impact of significantly higher than expected natural gas prices and energy market prices. Sensitivities for natural gas price projections, load projections, retail choice load, EWR savings, and Grid defection projection were completed.

7.0 Economic Evaluation

UMERC undertook a robust evaluation of the quantitative benefits the PCA provides the UMERC customers. As part of the evaluation it is important to test primary assumptions to understand the overall impact it has on the results. This type of evaluation determines how different values of an independent variable, *i.e.* planning assumptions, affect the economic value a project – or, in this case, an interrelated series of projects -- provides compared to alternatives. The planning assumptions identified and incorporated in the sensitivity analysis are shown in **Figure 5-1** and resulting revenue requirements are shown in **Figure 5-2**.

/Figure 5-1: Sensitivity Assumptions

Scenario	*Base*	*High Gas*	*Low Gas*	*High Load Growth*	*Retail Choice Return*	*50% CO2 Reduction*	*EWR*	*25% by 2030 Renewables*	*Grid Defection*	*CT Only*
BAU	x	x		x	x		x			x
ET	x	x		x			x	x		
Environmental	x	x		x		x	x			
High Mkt Price	x	x	x	x	x		x		x	

Figure 5-2: Revenue Requirements in millions (NPV)

Scenario	Base	High Gas	Low Gas	High Load Growth	Retail Choice Return	50% CO2 Reduction	EWR	25% by 2030 Renewables	Grid Defection	CT only
BAU	729.8	856.7		806.1	794.0		729.3			729.8
ET	693.3	821.5		765.1			688.9	702.7		
Environ	693.3	822.0		765.1		693.3	688.9			
High Mkt Price	803.0	852.8	611.1	888.8	875.3		800.0		794.7	

UMERC completed an analysis of levelized cost (Net Run Costs) and revenue requirements over the 20 year period for the 6 BAU, 5 ET, 5 Environmental Policy and 7 High Market Price scenarios for a total of 23 unique scenarios. The scenarios evaluated were selected in order to comply with the state of Michigan IRP requirements, renewable portfolio standards, and environmental policy in Michigan or to sensitize different energy procurement strategies to technology and market changes, but do not represent a selectable IRP scenario to UMERC (e.g. UMERC cannot choose higher or lower MISO market costs, and these scenarios should only be compared to their respective base scenarios.) The economic analysis forecasts the net cost to UMERC of operating and maintaining the Rice units, building and operating solar investments and buying or selling energy to meet its customer's energy requirements. The NPV analysis is in the IRP Exhibit A-8 (KMK-3) – Net Run Costs. Investing in renewable energy technology provides energy savings over their useful life compared to traditional fossil-fueled generation and reduced carbon emissions but also can mean a sizable capital investment to realize those savings.

The sensitivity analysis indicates the costs of the PCA over a wide range of planning assumptions with a minimum combined NPV cost of **$693.3 million** and a maximum combined NPV cost of **$794.0 million**.

class	GUID	name	category	description
Generator	1e6f4c93-9c38-4e7e-b953-5d580ddb169e	Capacity Sale		
Generator	06ad8330-ca63-48b4-a49f-a2a01add1f34	Capacity Purchase		
Generator	d282b55b-8c18-4141-a255-150f566e2cb7	Kuester 1		
Generator	8888df32-09cb-4b59-a6fb-678440ae499e	Kuester 2		
Generator	3192aadd-e542-422e-a7a9-2344208ba42b	Kuester 3		
Generator	e67a2ecc-994f-4ac2-ba3f-75d48e1f8236	Kuester 4		
Generator	a7110ccb-147f-4597-891b-169edb275292	Kuester 5		
Generator	dfd83bda-635e-4054-94d7-49dc5ed031c8	Kuester 6		
Generator	8c1e5e5a-2eca-4e15-8aff-63dd5ca98f14	Kuester 7		
Generator	187dcf95-20e7-44f4-a3fd-beac781c4afb	Mihm 1		
Generator	fdf68438-f2ca-41e7-8842-28c19cda2115	Mihm 2		
Generator	83b2e070-48bc-4a82-9a02-c93e7f881139	Mihm 3		
Generator	ea5d184a-7e59-4db4-8a6d-0a96502b3ff0	10% RPS Solar Unit		
Generator	f1a09c14-bbf1-4f18-ae88-5701878859de	UMERC LMR	DSM	
Generator	02c99e22-7ef9-4adc-b0f3-4cc831e856c7	EWR Savings	DSM	
Generator	da3f5d5c-bdd4-49bc-9b71-8e890f316fb4	New SolarA	Expansion Generic	
Generator	5d8076a4-0f38-4278-b4fb-446405b61068	New SolarStorage	Expansion Generic	
Generator	9b20e8d7-8ba4-465e-830f-46db337d6661	New Wind	Expansion Generic	
Generator	b0ba19ee-185e-464b-b423-2f94d0fc419e	New WindStorage	Expansion Generic	
Generator	9165ed6d-93e0-4ca8-9443-e1d6f6868cfb	New CC430	Expansion Generic	
Generator	a7e145cb-6d40-4180-ac3b-88cbf2993ac6	New CT100	Expansion Generic	
Generator	35baa2d3-850c-4500-8926-d66b741b4025	New RICE	Expansion Generic	
Generator	965d2f26-8112-40e9-9319-01297be92184	New SolarB	Expansion Generic	
Fuel	79125ea3-39f9-41dd-92a7-4e1c35031312	NG Wisconsin		
Fuel	363652bf-d253-42fc-9cd7-b0526f202f7d	NGWECT		
Emission	d6bc904e-1fa7-4f53-9674-0f4feb1ea284	CO2		
Emission	94d07f10-3206-4c8d-97ac-7a6a450a9a4b	NOX		
Emission	700c9221-34b4-4b49-86d9-cff3cf3d773a	SO2		
Battery	dd8756e2-1784-4d29-98d6-f0ad4ffd1cae	New Battery	Expansion Generic	
Battery	4f3ba5d1-1d42-4103-9053-baf94342f97f	New StorageSolar	Expansion Generic	
Battery	0a3d7c22-5862-4544-a8a2-775a74b4378f	New StorageWind	Expansion Generic	
Region	54dcd595-0b24-4794-891c-28977108a282	UMERC		
Node	3d8e10e6-2917-4efa-ba52-eb2a8903ea3a	UMERC		
Market	95ba7a2e-f40a-4de3-8cde-14d7a14144b4	LRZ2		
Constraint	a8ecb033-ec35-4365-9ea7-53e8f0f6ce32	CO2 Total Const		
Constraint	06f960ae-7c8d-4bc7-a43b-e47b4ac66fbc	SolarStorage		
Constraint	dd150c12-f9b7-484c-959a-14e7aed60db5	WindStorage		
Constraint	7ad72462-e8f0-49ef-b598-317ccfc0f54e	25% Renewables 2030		
Constraint	f1746adf-4eb3-4fcd-a165-5266d99d1aa9	10% RPS 2025		
Data File	4b0bac56-8f36-410c-ba02-0aedfaf14caa	UMERC Load		
Data File	b4b945b3-e8dc-4ccb-a84a-89a46254310a	UMERC Load - High Load Growth		
Data File	9504d1a3-6384-488f-9c8d-7912971e7060	EWR		
Data File	afce7e96-a356-4e76-90b6-67d01ddc9913	UMERC Load - Retail Return		
Data File	8185d023-234c-4f20-995f-8bbb90968912	UMERC Load - Low Load Grid Defection		
Variable	f5aede4e-52a2-421d-8483-289180e049c0	CONE		
Variable	a334f122-15d4-4c4e-95d6-3a2de0db03a3	MISO_LRZ_2		
Variable	554b33ba-0a59-470f-817b-3759840de54c	Market CO2 Ratio		
Variable	1b640038-9d3d-45f6-9ade-d04d4d3866ef	Market CO2 Rate		
Variable	27a15cb3-6f33-410a-8272-9bc57e8c1865	Henry Hub	Gas Prices	
Variable	cff155a3-80b3-41ce-9884-0455e9618472	Chicago	Gas Prices	
Variable	26298348-f76b-4889-a8d4-e4e288b45a60	NGWisconsin	Gas Prices	
Variable	aea9fddc-7630-4015-9070-3f4c4d8bbfc7	NGWECT	Gas Prices	
Variable	e74e1b98-5d95-43dd-9f5f-76db39c4567e	Generic Esc 2021	Escalations	
Variable	42056595-20a1-4f48-9f85-30fbb9d1c298	Solar Esc 2021	Escalations	
Variable	0336cdc7-ce1c-4dad-b2f9-542ad060216b	Emerging Tech Escalation 2021	Escalations	
Variable	ceb91707-040c-41f9-99c3-26b73ac2e461	Generic Solar Accredidation	Capacity Accredidation	
Variable	56ddc937-8029-4663-b2ed-699d0b76551f	Generic Wind Accredidation	Capacity Accredidation	
Scenario	6dc559d9-f6cc-4a0f-97e1-2498f50584ea	Market 2 - High Gas		
Scenario	da81a34c-8261-4405-87f0-5494ddc50b33	Market 3 - CO2		
Scenario	88bac3cf-6d18-43be-b732-5bfc4804ab89	CT Only		
Scenario	451e628e-caf1-467e-8ff6-661b58f354b8	EWR Savings		
Scenario	88ede576-c6bb-4729-abc4-7be582884f1f	Grid Defection		
Scenario	8b23e1a2-5793-477a-9117-84d6d99e902e	High Gas		
Scenario	eba8ec90-b031-4054-b974-a8c53e23fb53	Low Gas		
Scenario	30b28a51-be6b-4b20-b2a0-f6dadf04516e	High Load Growth		
Scenario	102d8e88-ad78-417b-93ad-e24cfae6be1a	50% Retail Choice Return		
Scenario	27b7748c-263e-4e0c-aa12-626bb2b70ce7	Low Load - Grid Defection		
Scenario	ec9f625b-abec-49d9-9865-7f183e5d8b1f	10% RPS 2025 - constraint		
Scenario	3a586a44-d478-4874-99e4-ee7a8f1d2eec	10% RPS 2025 - unit		
Scenario	460a096c-4e58-4b04-b4ca-65003ea25603	Low Oil and Gas	Scenario 4	
Scenario	73dc6957-3392-4ec4-a700-51f0d66a723e	Renewable 25%	Scenario 2	
Scenario	1df2844a-a45b-4b8a-94c1-713e8858f054	Emerging Tech Cost	Scenario 2	
Scenario	d4f858d6-2498-4b07-8f91-e1689614a82e	CO2 Total Const	Scenario 3	
Scenario	e97b40e3-6df4-454f-b1c3-0529aaf5d781	30% CO2 Reduction	Scenario 3	
Scenario	ba67a867-cec2-4e38-b9ef-af39b0e79f3d	50% CO2 Reduction	Scenario 3	
Model	6598a1a4-67ad-4289-9573-9d0a3d281cd0	1. Business As Usual	1. Business As Usual	
Model	12520336-9d7a-4aa1-a147-488673c65c7b	1.1a. High Gas	1. Business As Usual	
Model	9d5343f8-8736-4dd5-9dc1-aac454d4f5ff	1.2a. High Load	1. Business As Usual	
Model	8c6d671e-a342-4577-abf2-31fd8d8aa0a3	1.2b. Retail Choice Return	1. Business As Usual	
Model	3ec6879c-73f5-4900-8d18-b3f852a727b6	1.3. EWR Savings Increase	1. Business As Usual	
Model	bc6ad236-b83a-4c9b-a713-b5308381ddc4	1.4. CT Only	1. Business As Usual	
Model	3c2908af-1da7-426a-9e32-9c710accb1b7	1.4. CT Only - no 10% RPS	1. Business As Usual	
Model	4b74e0e2-20fe-4913-af8d-a14bc7d300b9	2. Emerging Technology Base Scenario	2. Emerging Technology	
Model	c27d50d4-078d-4e8a-95d5-4ee734e6f0b3	2.4. 25% Renewables 2030	2. Emerging Technology	
Model	98dd079c-8ec9-4fce-aa74-6e2f94f0e092	2.1a. Emerging Technology High Gas	2. Emerging Technology	
Model	e00f3368-5c78-4e76-8064-0c9801a9fdab	2.3. Emerging Technology EWR	2. Emerging Technology	
Model	2740aeb8-ea09-45ff-8c3c-81b4bad4c57e	2.2a. Emerging Technology High Load Growth	2. Emerging Technology	
Model	e50589cf-a46f-4359-9727-0675fdb5c782	3. Environmental Base Case	3. Environmental/Additional	

Model	51543960-38bd-41b6-bc0d-a66aae4bf1dd	3.1a. Environmental High Gas	3. Environmental/Additional	
Model	2dc705bb-f696-40a4-8551-ad5bf8e682e7	3.2a. Environmental High Load Growth	3. Environmental/Additional	
Model	af8670d4-9fba-45a1-808d-dac5fa4efd76	3.3. Environmental 50% CO2 Reduction	3. Environmental/Additional	
Model	31393b88-e01f-4f5a-b951-78f00c5fe544	3.4. Environmental EWR	3. Environmental/Additional	
Model	1d3cd57a-3e43-47b9-ad98-9e1985374ab5	4. High Market Price	4. High Market Price	
Model	3861aaa1-450b-403a-a862-f69c698e0642	4.1a. High Market High Gas Price	4. High Market Price	
Model	61555276-e922-40ef-a155-a3e196c625c1	4.1b. High Market Low Gas Price	4. High Market Price	
Model	9cd3be55-2b42-4583-81a7-8464d7180c23	4.2a. High Market High Load Growth	4. High Market Price	
Model	ba97220a-ce5d-4699-bb05-e1dd3bbe2e7a	4.2b. High Market Retail Choice Return	4. High Market Price	
Model	1573b5ae-3c33-4fa0-93c6-b8b7a373720f	4.4. High Market EWR Savings	4. High Market Price	
Model	e856961c-40b1-4db4-b9c7-e334549dfd75	4.3. High Market Grid Defection	4. High Market Price	
Horizon	972d8de0-2c98-4f7f-a871-29f27a74392f	2021-2050		
Horizon	532fc05e-4b64-41ff-8ad0-940f44f0c7b7	2022-2042		
Report	25c05693-a366-467f-b376-ee1c105fe8f6	Base		
LT Plan	e5f00b0f-6dbb-407e-b5e5-6dc8c70eaca8	12_m		
PASA	6f828c49-75ed-4f35-9a34-1723150bb43c	Regional		PASA for maintenance scheduling
MT Schedule	079b83a9-651b-4c8c-a666-076333413ff6	Regional		MT Schedule for constraint decomposition in regional mode
ST Schedule	a84b4393-8a6f-4520-bbcd-07b317e5282b	Regional		ST Schedule chronological simulation in regional mode
ST Schedule	12df141d-39a0-4b04-af7b-9b623bcb112a	Nodal		ST Schedule chronological simulation in nodal mode
Transmission	462a8d88-0599-4b49-bef4-c1e71ee59520	Base		
Production	37322bbf-1559-431a-b462-c07b2ac3c648	MIP		
Stochastic	326bf64b-232e-4e6f-a4f1-ab952281c562	Monte Carlo s=20		Monte Carlo simulation with a sample size of 20
Performance	59fbaf4e-6ce7-4932-ac6c-044f004a8b3b	CPLEX .001		
Performance	30d26fce-901c-4c8d-967e-927660cbbbb3	Gurobi .001		
Diagnostic	f7223d45-2eaf-41f8-9c9f-67205cae1924	Defaults 7.5 w/LTNPV		

REDACTED

category_id	class	category	rank	class_id	name
77	Generator	DSM	1	2	
78	Generator	Expansion Candidates	2	2	
79	Generator	Expansion Generic	3	2	
80	Battery	Expansion Generic	1	13	
75	Variable	Gas Prices	1	55	
81	Variable	Escalations	2	55	
82	Variable	Capacity Accredidation	3	55	
83	Scenario	Scenario 4	1	58	
88	Scenario	Scenario 2	2	58	
89	Scenario	Scenario 3	3	58	
84	Model	1. Business As Usual	1	60	
85	Model	2. Emerging Technology	2	60	
86	Model	3. Environmental/Additional	3	60	
87	Model	4. High Market Price	4	60	

parent_class	child_class	collection	parent_object	child_object
Generator	Fuel	Fuels	Kuester 1	NGWECT
Generator	Fuel	Fuels	Kuester 2	NGWECT
Generator	Fuel	Fuels	Kuester 3	NGWECT
Generator	Fuel	Fuels	Kuester 4	NGWECT
Generator	Fuel	Fuels	Kuester 5	NGWECT
Generator	Fuel	Fuels	Kuester 6	NGWECT
Generator	Fuel	Fuels	Kuester 7	NGWECT
Generator	Fuel	Fuels	Mihm 1	NGWECT
Generator	Fuel	Fuels	Mihm 2	NGWECT
Generator	Fuel	Fuels	Mihm 3	NGWECT
Generator	Fuel	Fuels	New CC430	NGWECT
Generator	Fuel	Fuels	New CT100	NGWECT
Generator	Fuel	Fuels	New RICE	NGWECT
Generator	Node	Nodes	Kuester 1	UMERC
Generator	Node	Nodes	Kuester 2	UMERC
Generator	Node	Nodes	Kuester 3	UMERC
Generator	Node	Nodes	Kuester 4	UMERC
Generator	Node	Nodes	Kuester 5	UMERC
Generator	Node	Nodes	Kuester 6	UMERC
Generator	Node	Nodes	Kuester 7	UMERC
Generator	Node	Nodes	Mihm 1	UMERC
Generator	Node	Nodes	Mihm 2	UMERC
Generator	Node	Nodes	Mihm 3	UMERC
Generator	Node	Nodes	New WindStorage	UMERC
Generator	Node	Nodes	New Wind	UMERC
Generator	Node	Nodes	New SolarStorage	UMERC
Generator	Node	Nodes	New SolarA	UMERC
Generator	Node	Nodes	New CC430	UMERC
Generator	Node	Nodes	New CT100	UMERC
Generator	Node	Nodes	New RICE	UMERC
Generator	Node	Nodes	Capacity Sale	UMERC
Generator	Node	Nodes	Capacity Purchase	UMERC
Generator	Node	Nodes	UMERC LMR	UMERC
Generator	Node	Nodes	EWR Savings	UMERC
Generator	Node	Nodes	10% RPS Solar Unit	UMERC
Generator	Node	Nodes	New SolarB	UMERC
Emission	Generator	Generators	CO2	Kuester 1
Emission	Generator	Generators	CO2	Kuester 2
Emission	Generator	Generators	NOX	Kuester 1
Emission	Generator	Generators	NOX	Kuester 2
Emission	Generator	Generators	SO2	Kuester 1
Emission	Generator	Generators	SO2	Kuester 2
Emission	Generator	Generators	CO2	Kuester 3
Emission	Generator	Generators	NOX	Kuester 3
Emission	Generator	Generators	SO2	Kuester 3
Emission	Generator	Generators	CO2	Kuester 4
Emission	Generator	Generators	NOX	Kuester 4
Emission	Generator	Generators	SO2	Kuester 4
Emission	Generator	Generators	CO2	Kuester 5
Emission	Generator	Generators	NOX	Kuester 5
Emission	Generator	Generators	SO2	Kuester 5

Emission	Generator	Generators	CO2	Kuester 6
Emission	Generator	Generators	NOX	Kuester 6
Emission	Generator	Generators	SO2	Kuester 6
Emission	Generator	Generators	CO2	Kuester 7
Emission	Generator	Generators	NOX	Kuester 7
Emission	Generator	Generators	SO2	Kuester 7
Emission	Generator	Generators	CO2	Mihm 1
Emission	Generator	Generators	NOX	Mihm 1
Emission	Generator	Generators	SO2	Mihm 1
Emission	Generator	Generators	CO2	Mihm 2
Emission	Generator	Generators	NOX	Mihm 2
Emission	Generator	Generators	SO2	Mihm 2
Emission	Generator	Generators	CO2	Mihm 3
Emission	Generator	Generators	NOX	Mihm 3
Emission	Generator	Generators	SO2	Mihm 3
Emission	Generator	Generators	CO2	New CC430
Emission	Generator	Generators	NOX	New CC430
Emission	Generator	Generators	SO2	New CC430
Emission	Generator	Generators	SO2	New CT100
Emission	Generator	Generators	NOX	New CT100
Emission	Generator	Generators	CO2	New CT100
Emission	Generator	Generators	CO2	New RICE
Emission	Generator	Generators	NOX	New RICE
Emission	Generator	Generators	SO2	New RICE
Battery	Node	Node	New StorageWind	UMERC
Battery	Node	Node	New StorageSolar	UMERC
Battery	Node	Node	New Battery	UMERC
Node	Region	Region	UMERC	UMERC
Market	Node	Nodes	LRZ2	UMERC
Constraint	Generator	Generators	SolarStorage	New SolarStorage
Constraint	Generator	Generators	WindStorage	New WindStorage
Constraint	Generator	Generators	25% Renewables 2030	New SolarA
Constraint	Generator	Generators	25% Renewables 2030	New SolarStorage
Constraint	Generator	Generators	25% Renewables 2030	New Wind
Constraint	Generator	Generators	25% Renewables 2030	New WindStorage
Constraint	Generator	Generators	10% RPS 2025	New SolarA
Constraint	Generator	Generators	10% RPS 2025	New SolarStorage
Constraint	Generator	Generators	10% RPS 2025	New Wind
Constraint	Generator	Generators	10% RPS 2025	New WindStorage
Constraint	Generator	Generators	25% Renewables 2030	New SolarB
Constraint	Generator	Generators	10% RPS 2025	New SolarB
Constraint	Emission	Emissions	CO2 Total Const	CO2
Constraint	Battery	Batteries	SolarStorage	New StorageSolar
Constraint	Battery	Batteries	WindStorage	New StorageWind
Constraint	Battery	Batteries	25% Renewables 2030	New Battery
Constraint	Battery	Batteries	25% Renewables 2030	New StorageSolar
Constraint	Battery	Batteries	25% Renewables 2030	New StorageWind
Constraint	Battery	Batteries	10% RPS 2025	New Battery
Constraint	Battery	Batteries	10% RPS 2025	New StorageSolar
Constraint	Battery	Batteries	10% RPS 2025	New StorageWind
Constraint	Region	Regions	25% Renewables 2030	UMERC
Constraint	Region	Regions	10% RPS 2025	UMERC
Constraint	Market	Markets	CO2 Total Const	LRZ2
Model	Scenario	Scenarios	1.1a. High Gas	High Gas

Model	Scenario	Scenarios	1.2a. High Load	High Load Growth
Model	Scenario	Scenarios	1.3. EWR Savings Increase	EWR Savings
Model	Scenario	Scenarios	1.4. CT Only	CT Only
Model	Scenario	Scenarios	2.4. 25% Renewables 2030	Renewable 25%
Model	Scenario	Scenarios	2. Emerging Technology Base Scenario	Emerging Tech Cost
Model	Scenario	Scenarios	2.4. 25% Renewables 2030	Emerging Tech Cost
Model	Scenario	Scenarios	2.1a. Emerging Technology High Gas	Emerging Tech Cost
Model	Scenario	Scenarios	2.1a. Emerging Technology High Gas	High Gas
Model	Scenario	Scenarios	2.3. Emerging Technology EWR	Emerging Tech Cost
Model	Scenario	Scenarios	2.3. Emerging Technology EWR	EWR Savings
Model	Scenario	Scenarios	2.2a. Emerging Technology High Load Growth	Emerging Tech Cost
Model	Scenario	Scenarios	2.2a. Emerging Technology High Load Growth	High Load Growth
Model	Scenario	Scenarios	1.2b. Retail Choice Return	50% Retail Choice Return
Model	Scenario	Scenarios	3. Environmental Base Case	CO2 Total Const
Model	Scenario	Scenarios	3. Environmental Base Case	30% CO2 Reduction
Model	Scenario	Scenarios	3. Environmental Base Case	Emerging Tech Cost
Model	Scenario	Scenarios	3.1a. Environmental High Gas	CO2 Total Const
Model	Scenario	Scenarios	3.1a. Environmental High Gas	30% CO2 Reduction
Model	Scenario	Scenarios	3.1a. Environmental High Gas	Emerging Tech Cost
Model	Scenario	Scenarios	3.1a. Environmental High Gas	High Gas
Model	Scenario	Scenarios	3.2a. Environmental High Load Growth	CO2 Total Const
Model	Scenario	Scenarios	3.2a. Environmental High Load Growth	30% CO2 Reduction
Model	Scenario	Scenarios	3.2a. Environmental High Load Growth	Emerging Tech Cost
Model	Scenario	Scenarios	3.2a. Environmental High Load Growth	High Load Growth
Model	Scenario	Scenarios	3.3. Environmental 50% CO2 Reduction	CO2 Total Const
Model	Scenario	Scenarios	3.3. Environmental 50% CO2 Reduction	Emerging Tech Cost
Model	Scenario	Scenarios	3.3. Environmental 50% CO2 Reduction	50% CO2 Reduction
Model	Scenario	Scenarios	3.4. Environmental EWR	CO2 Total Const
Model	Scenario	Scenarios	3.4. Environmental EWR	30% CO2 Reduction
Model	Scenario	Scenarios	3.4. Environmental EWR	Emerging Tech Cost
Model	Scenario	Scenarios	3.4. Environmental EWR	EWR Savings
Model	Scenario	Scenarios	4. High Market Price	Market 2 - High Gas
Model	Scenario	Scenarios	4.1a. High Market High Gas Price	Market 2 - High Gas
Model	Scenario	Scenarios	4.1a. High Market High Gas Price	High Gas
Model	Scenario	Scenarios	4.1b. High Market Low Gas Price	Low Gas
Model	Scenario	Scenarios	4.2a. High Market High Load Growth	Market 2 - High Gas
Model	Scenario	Scenarios	4.2a. High Market High Load Growth	High Load Growth
Model	Scenario	Scenarios	4.2b. High Market Retail Choice Return	Market 2 - High Gas
Model	Scenario	Scenarios	4.2b. High Market Retail Choice Return	50% Retail Choice Return
Model	Scenario	Scenarios	4.4. High Market EWR Savings	Market 2 - High Gas
Model	Scenario	Scenarios	4.4. High Market EWR Savings	EWR Savings
Model	Scenario	Scenarios	4.3. High Market Grid Defection	Market 2 - High Gas
Model	Scenario	Scenarios	4.3. High Market Grid Defection	Low Load - Grid Defection
Model	Scenario	Scenarios	4. High Market Price	Low Oil and Gas
Model	Scenario	Scenarios	4.1a. High Market High Gas Price	Low Oil and Gas
Model	Scenario	Scenarios	4.1b. High Market Low Gas Price	Low Oil and Gas
Model	Scenario	Scenarios	4.2a. High Market High Load Growth	Low Oil and Gas
Model	Scenario	Scenarios	4.2b. High Market Retail Choice Return	Low Oil and Gas
Model	Scenario	Scenarios	4.3. High Market Grid Defection	Low Oil and Gas
Model	Scenario	Scenarios	4.4. High Market EWR Savings	Low Oil and Gas
Model	Scenario	Scenarios	4.1b. High Market Low Gas Price	Market 2 - High Gas
Model	Scenario	Scenarios	1. Business As Usual	CO2 Total Const
Model	Scenario	Scenarios	1.1a. High Gas	CO2 Total Const
Model	Scenario	Scenarios	1.2a. High Load	CO2 Total Const

Model	Scenario	Scenarios	1.2b. Retail Choice Return	CO2 Total Const
Model	Scenario	Scenarios	1.3. EWR Savings Increase	CO2 Total Const
Model	Scenario	Scenarios	1.4. CT Only	CO2 Total Const
Model	Scenario	Scenarios	2. Emerging Technology Base Scenario	CO2 Total Const
Model	Scenario	Scenarios	2.1a. Emerging Technology High Gas	CO2 Total Const
Model	Scenario	Scenarios	2.2a. Emerging Technology High Load Growth	CO2 Total Const
Model	Scenario	Scenarios	2.3. Emerging Technology EWR	CO2 Total Const
Model	Scenario	Scenarios	2.4. 25% Renewables 2030	CO2 Total Const
Model	Scenario	Scenarios	4. High Market Price	CO2 Total Const
Model	Scenario	Scenarios	4.1a. High Market High Gas Price	CO2 Total Const
Model	Scenario	Scenarios	4.1b. High Market Low Gas Price	CO2 Total Const
Model	Scenario	Scenarios	4.2a. High Market High Load Growth	CO2 Total Const
Model	Scenario	Scenarios	4.2b. High Market Retail Choice Return	CO2 Total Const
Model	Scenario	Scenarios	4.3. High Market Grid Defection	CO2 Total Const
Model	Scenario	Scenarios	4.4. High Market EWR Savings	CO2 Total Const
Model	Scenario	Scenarios	1.4. CT Only - no 10% RPS	CT Only
Model	Scenario	Scenarios	1.4. CT Only - no 10% RPS	CO2 Total Const
Model	Scenario	Scenarios	1. Business As Usual	10% RPS 2025 - constraint
Model	Scenario	Scenarios	1.1a. High Gas	10% RPS 2025 - constraint
Model	Scenario	Scenarios	1.2a. High Load	10% RPS 2025 - constraint
Model	Scenario	Scenarios	1.2b. Retail Choice Return	10% RPS 2025 - constraint
Model	Scenario	Scenarios	1.3. EWR Savings Increase	10% RPS 2025 - constraint
Model	Scenario	Scenarios	2. Emerging Technology Base Scenario	10% RPS 2025 - constraint
Model	Scenario	Scenarios	2.2a. Emerging Technology High Load Growth	10% RPS 2025 - constraint
Model	Scenario	Scenarios	2.3. Emerging Technology EWR	10% RPS 2025 - constraint
Model	Scenario	Scenarios	2.4. 25% Renewables 2030	10% RPS 2025 - constraint
Model	Scenario	Scenarios	3. Environmental Base Case	10% RPS 2025 - constraint
Model	Scenario	Scenarios	3.2a. Environmental High Load Growth	10% RPS 2025 - constraint
Model	Scenario	Scenarios	3.3. Environmental 50% CO2 Reduction	10% RPS 2025 - constraint
Model	Scenario	Scenarios	3.4. Environmental EWR	10% RPS 2025 - constraint
Model	Scenario	Scenarios	4. High Market Price	10% RPS 2025 - constraint
Model	Scenario	Scenarios	4.1a. High Market High Gas Price	10% RPS 2025 - constraint
Model	Scenario	Scenarios	4.1b. High Market Low Gas Price	10% RPS 2025 - constraint
Model	Scenario	Scenarios	4.2a. High Market High Load Growth	10% RPS 2025 - constraint
Model	Scenario	Scenarios	4.2b. High Market Retail Choice Return	10% RPS 2025 - constraint
Model	Scenario	Scenarios	4.3. High Market Grid Defection	10% RPS 2025 - constraint
Model	Scenario	Scenarios	4.4. High Market EWR Savings	10% RPS 2025 - constraint
Model	Scenario	Scenarios	1.4. CT Only	10% RPS 2025 - constraint
Model	Horizon	Horizon	1. Business As Usual	2022-2042
Model	Horizon	Horizon	1.1a. High Gas	2022-2042
Model	Horizon	Horizon	1.2a. High Load	2022-2042
Model	Horizon	Horizon	1.2b. Retail Choice Return	2022-2042
Model	Horizon	Horizon	1.3. EWR Savings Increase	2022-2042
Model	Horizon	Horizon	1.4. CT Only	2022-2042
Model	Horizon	Horizon	2. Emerging Technology Base Scenario	2022-2042
Model	Horizon	Horizon	2.4. 25% Renewables 2030	2022-2042
Model	Horizon	Horizon	2.1a. Emerging Technology High Gas	2022-2042
Model	Horizon	Horizon	2.3. Emerging Technology EWR	2022-2042
Model	Horizon	Horizon	2.2a. Emerging Technology High Load Growth	2022-2042
Model	Horizon	Horizon	3. Environmental Base Case	2022-2042
Model	Horizon	Horizon	3.1a. Environmental High Gas	2022-2042
Model	Horizon	Horizon	3.2a. Environmental High Load Growth	2022-2042
Model	Horizon	Horizon	3.3. Environmental 50% CO2 Reduction	2022-2042
Model	Horizon	Horizon	3.4. Environmental EWR	2022-2042

Model	Horizon	Horizon	4. High Market Price	2022-2042
Model	Horizon	Horizon	4.1a. High Market High Gas Price	2022-2042
Model	Horizon	Horizon	4.1b. High Market Low Gas Price	2022-2042
Model	Horizon	Horizon	4.2a. High Market High Load Growth	2022-2042
Model	Horizon	Horizon	4.2b. High Market Retail Choice Return	2022-2042
Model	Horizon	Horizon	4.4. High Market EWR Savings	2022-2042
Model	Horizon	Horizon	4.3. High Market Grid Defection	2022-2042
Model	Horizon	Horizon	1.4. CT Only - no 10% RPS	2022-2042
Model	Report	Report	1. Business As Usual	Base
Model	Report	Report	1.1a. High Gas	Base
Model	Report	Report	1.2a. High Load	Base
Model	Report	Report	1.2b. Retail Choice Return	Base
Model	Report	Report	1.3. EWR Savings Increase	Base
Model	Report	Report	1.4. CT Only	Base
Model	Report	Report	2. Emerging Technology Base Scenario	Base
Model	Report	Report	2.4. 25% Renewables 2030	Base
Model	Report	Report	2.1a. Emerging Technology High Gas	Base
Model	Report	Report	2.3. Emerging Technology EWR	Base
Model	Report	Report	2.2a. Emerging Technology High Load Growth	Base
Model	Report	Report	3. Environmental Base Case	Base
Model	Report	Report	3.1a. Environmental High Gas	Base
Model	Report	Report	3.2a. Environmental High Load Growth	Base
Model	Report	Report	3.3. Environmental 50% CO2 Reduction	Base
Model	Report	Report	3.4. Environmental EWR	Base
Model	Report	Report	4. High Market Price	Base
Model	Report	Report	4.1a. High Market High Gas Price	Base
Model	Report	Report	4.1b. High Market Low Gas Price	Base
Model	Report	Report	4.2a. High Market High Load Growth	Base
Model	Report	Report	4.2b. High Market Retail Choice Return	Base
Model	Report	Report	4.4. High Market EWR Savings	Base
Model	Report	Report	4.3. High Market Grid Defection	Base
Model	Report	Report	1.4. CT Only - no 10% RPS	Base
Model	LT Plan	LT Plan	1. Business As Usual	12_m
Model	LT Plan	LT Plan	1.1a. High Gas	12_m
Model	LT Plan	LT Plan	1.2a. High Load	12_m
Model	LT Plan	LT Plan	1.2b. Retail Choice Return	12_m
Model	LT Plan	LT Plan	1.3. EWR Savings Increase	12_m
Model	LT Plan	LT Plan	1.4. CT Only	12_m
Model	LT Plan	LT Plan	2. Emerging Technology Base Scenario	12_m
Model	LT Plan	LT Plan	2.4. 25% Renewables 2030	12_m
Model	LT Plan	LT Plan	2.1a. Emerging Technology High Gas	12_m
Model	LT Plan	LT Plan	2.3. Emerging Technology EWR	12_m
Model	LT Plan	LT Plan	2.2a. Emerging Technology High Load Growth	12_m
Model	LT Plan	LT Plan	3. Environmental Base Case	12_m
Model	LT Plan	LT Plan	3.1a. Environmental High Gas	12_m
Model	LT Plan	LT Plan	3.2a. Environmental High Load Growth	12_m
Model	LT Plan	LT Plan	3.3. Environmental 50% CO2 Reduction	12_m
Model	LT Plan	LT Plan	3.4. Environmental EWR	12_m
Model	LT Plan	LT Plan	4. High Market Price	12_m
Model	LT Plan	LT Plan	4.1a. High Market High Gas Price	12_m
Model	LT Plan	LT Plan	4.1b. High Market Low Gas Price	12_m
Model	LT Plan	LT Plan	4.2a. High Market High Load Growth	12_m
Model	LT Plan	LT Plan	4.2b. High Market Retail Choice Return	12_m
Model	LT Plan	LT Plan	4.4. High Market EWR Savings	12_m

Model	LT Plan	LT Plan	4.3. High Market Grid Defection	12_m
Model	LT Plan	LT Plan	1.4. CT Only - no 10% RPS	12_m
Model	Transmission	Transmission	1. Business As Usual	Base
Model	Transmission	Transmission	1.1a. High Gas	Base
Model	Transmission	Transmission	1.2a. High Load	Base
Model	Transmission	Transmission	1.2b. Retail Choice Return	Base
Model	Transmission	Transmission	1.3. EWR Savings Increase	Base
Model	Transmission	Transmission	1.4. CT Only	Base
Model	Transmission	Transmission	2. Emerging Technology Base Scenario	Base
Model	Transmission	Transmission	2.4. 25% Renewables 2030	Base
Model	Transmission	Transmission	2.1a. Emerging Technology High Gas	Base
Model	Transmission	Transmission	2.3. Emerging Technology EWR	Base
Model	Transmission	Transmission	2.2a. Emerging Technology High Load Growth	Base
Model	Transmission	Transmission	3. Environmental Base Case	Base
Model	Transmission	Transmission	3.1a. Environmental High Gas	Base
Model	Transmission	Transmission	3.2a. Environmental High Load Growth	Base
Model	Transmission	Transmission	3.3. Environmental 50% CO2 Reduction	Base
Model	Transmission	Transmission	3.4. Environmental EWR	Base
Model	Transmission	Transmission	4. High Market Price	Base
Model	Transmission	Transmission	4.1a. High Market High Gas Price	Base
Model	Transmission	Transmission	4.1b. High Market Low Gas Price	Base
Model	Transmission	Transmission	4.2a. High Market High Load Growth	Base
Model	Transmission	Transmission	4.2b. High Market Retail Choice Return	Base
Model	Transmission	Transmission	4.4. High Market EWR Savings	Base
Model	Transmission	Transmission	4.3. High Market Grid Defection	Base
Model	Transmission	Transmission	1.4. CT Only - no 10% RPS	Base
Model	Production	Production	1. Business As Usual	MIP
Model	Production	Production	1.1a. High Gas	MIP
Model	Production	Production	1.2a. High Load	MIP
Model	Production	Production	1.2b. Retail Choice Return	MIP
Model	Production	Production	1.3. EWR Savings Increase	MIP
Model	Production	Production	1.4. CT Only	MIP
Model	Production	Production	2. Emerging Technology Base Scenario	MIP
Model	Production	Production	2.4. 25% Renewables 2030	MIP
Model	Production	Production	2.1a. Emerging Technology High Gas	MIP
Model	Production	Production	2.3. Emerging Technology EWR	MIP
Model	Production	Production	2.2a. Emerging Technology High Load Growth	MIP
Model	Production	Production	3. Environmental Base Case	MIP
Model	Production	Production	3.1a. Environmental High Gas	MIP
Model	Production	Production	3.2a. Environmental High Load Growth	MIP
Model	Production	Production	3.3. Environmental 50% CO2 Reduction	MIP
Model	Production	Production	3.4. Environmental EWR	MIP
Model	Production	Production	4. High Market Price	MIP
Model	Production	Production	4.1a. High Market High Gas Price	MIP
Model	Production	Production	4.1b. High Market Low Gas Price	MIP
Model	Production	Production	4.2a. High Market High Load Growth	MIP
Model	Production	Production	4.2b. High Market Retail Choice Return	MIP
Model	Production	Production	4.4. High Market EWR Savings	MIP
Model	Production	Production	4.3. High Market Grid Defection	MIP
Model	Production	Production	1.4. CT Only - no 10% RPS	MIP
Model	Performance	Performance	1. Business As Usual	Gurobi .001
Model	Performance	Performance	1.1a. High Gas	Gurobi .001
Model	Performance	Performance	1.2a. High Load	Gurobi .001
Model	Performance	Performance	1.2b. Retail Choice Return	Gurobi .001

Model	Performance	Performance	1.3. EWR Savings Increase	Gurobi .001
Model	Performance	Performance	1.4. CT Only	Gurobi .001
Model	Performance	Performance	2. Emerging Technology Base Scenario	Gurobi .001
Model	Performance	Performance	2.4. 25% Renewables 2030	Gurobi .001
Model	Performance	Performance	2.1a. Emerging Technology High Gas	Gurobi .001
Model	Performance	Performance	2.3. Emerging Technology EWR	Gurobi .001
Model	Performance	Performance	2.2a. Emerging Technology High Load Growth	Gurobi .001
Model	Performance	Performance	3. Environmental Base Case	Gurobi .001
Model	Performance	Performance	3.1a. Environmental High Gas	Gurobi .001
Model	Performance	Performance	3.2a. Environmental High Load Growth	Gurobi .001
Model	Performance	Performance	3.3. Environmental 50% CO2 Reduction	Gurobi .001
Model	Performance	Performance	3.4. Environmental EWR	Gurobi .001
Model	Performance	Performance	4. High Market Price	Gurobi .001
Model	Performance	Performance	4.1a. High Market High Gas Price	Gurobi .001
Model	Performance	Performance	4.1b. High Market Low Gas Price	Gurobi .001
Model	Performance	Performance	4.2a. High Market High Load Growth	Gurobi .001
Model	Performance	Performance	4.2b. High Market Retail Choice Return	Gurobi .001
Model	Performance	Performance	4.4. High Market EWR Savings	Gurobi .001
Model	Performance	Performance	4.3. High Market Grid Defection	Gurobi .001
Model	Performance	Performance	1.4. CT Only - no 10% RPS	Gurobi .001
Model	Diagnostic	Diagnostic	1. Business As Usual	Defaults 7.5 w/LTNPV
Model	Diagnostic	Diagnostic	1.1a. High Gas	Defaults 7.5 w/LTNPV
Model	Diagnostic	Diagnostic	1.2a. High Load	Defaults 7.5 w/LTNPV
Model	Diagnostic	Diagnostic	1.2b. Retail Choice Return	Defaults 7.5 w/LTNPV
Model	Diagnostic	Diagnostic	1.3. EWR Savings Increase	Defaults 7.5 w/LTNPV
Model	Diagnostic	Diagnostic	1.4. CT Only	Defaults 7.5 w/LTNPV
Model	Diagnostic	Diagnostic	2. Emerging Technology Base Scenario	Defaults 7.5 w/LTNPV
Model	Diagnostic	Diagnostic	2.4. 25% Renewables 2030	Defaults 7.5 w/LTNPV
Model	Diagnostic	Diagnostic	2.1a. Emerging Technology High Gas	Defaults 7.5 w/LTNPV
Model	Diagnostic	Diagnostic	2.3. Emerging Technology EWR	Defaults 7.5 w/LTNPV
Model	Diagnostic	Diagnostic	2.2a. Emerging Technology High Load Growth	Defaults 7.5 w/LTNPV
Model	Diagnostic	Diagnostic	3. Environmental Base Case	Defaults 7.5 w/LTNPV
Model	Diagnostic	Diagnostic	3.1a. Environmental High Gas	Defaults 7.5 w/LTNPV
Model	Diagnostic	Diagnostic	3.2a. Environmental High Load Growth	Defaults 7.5 w/LTNPV
Model	Diagnostic	Diagnostic	3.3. Environmental 50% CO2 Reduction	Defaults 7.5 w/LTNPV
Model	Diagnostic	Diagnostic	3.4. Environmental EWR	Defaults 7.5 w/LTNPV
Model	Diagnostic	Diagnostic	4. High Market Price	Defaults 7.5 w/LTNPV
Model	Diagnostic	Diagnostic	4.1a. High Market High Gas Price	Defaults 7.5 w/LTNPV
Model	Diagnostic	Diagnostic	4.1b. High Market Low Gas Price	Defaults 7.5 w/LTNPV
Model	Diagnostic	Diagnostic	4.2a. High Market High Load Growth	Defaults 7.5 w/LTNPV
Model	Diagnostic	Diagnostic	4.2b. High Market Retail Choice Return	Defaults 7.5 w/LTNPV
Model	Diagnostic	Diagnostic	4.4. High Market EWR Savings	Defaults 7.5 w/LTNPV
Model	Diagnostic	Diagnostic	4.3. High Market Grid Defection	Defaults 7.5 w/LTNPV
Model	Diagnostic	Diagnostic	1.4. CT Only - no 10% RPS	Defaults 7.5 w/LTNPV

REDACTED

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name	class	attribute	value
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CPLEX .001	Performance		
CPLEX .001	Performance		
2021-2050	Horizon		
2021-2050	Horizon		
2021-2050	Horizon		
2021-2050	Horizon		
2021-2050	Horizon		
Base	Report		
Base	Report		
Generic Esc 2021	Variable		
Generic Esc 2021	Variable		
UMERC Load	Data File		
UMERC Load	Data File		
Market 2 - High Gas	Scenario		
Market 3 - CO2	Scenario		
1. Business As Usual	Model		
12_m	LT Plan		
MIP	Production		
MIP	Production		
Base	Transmission		
Base	Transmission		
Base	Transmission		
Base	Transmission		
Defaults 7.5 w/LTNPV	Diagnostic		
Defaults 7.5 w/LTNPV	Diagnostic		
Defaults 7.5 w/LTNPV	Diagnostic		
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Defaults 7.5 w/LTNPV	Diagnostic		
Solar Esc 2021	Variable		
Solar Esc 2021	Variable		
CT Only	Scenario	Read Order	2
EWR Savings	Scenario	Read Order	2
Grid Defection	Scenario	Read Order	2
High Gas	Scenario	Read Order	1
Low Gas	Scenario	Read Order	1
Renewable 25%	Scenario	Read Order	2
Low Oil and Gas	Scenario	Read Order	1
1.1a. High Gas	Model	Enabled	-1
Gurobi .001	Performance	SOLVER	4
Gurobi .001	Performance	Small MIP Relative Gap	0.00001
Gurobi .001	Performance	MIP Relative Gap	0.00001

High Load Growth	Scenario	Read Order	2
1.2a. High Load	Model	Enabled	-1
1.2b. Retail Choice Return	Model	Enabled	-1
1.3. EWR Savings Increase	Model	Enabled	-1
1.4. CT Only	Model	Enabled	-1
UMERC Load - High Load Growth	Data File	Growth Period	3
UMERC Load - High Load Growth	Data File	Enabled	-1
2022-2042	Horizon	Date From	44562
2022-2042	Horizon	Chrono Date From	44562
2022-2042	Horizon	Step Count	20
2022-2042	Horizon	Step Type	4
2022-2042	Horizon	Chrono Step Count	7305
Emerging Tech Cost	Scenario	Read Order	1
Emerging Tech Escalation 2021	Variable	Compound Start Date	44562
2. Emerging Technology Base Scenario	Model	Enabled	-1
2.4. 25% Renewables 2030	Model	Enabled	-1
2.1a. Emerging Technology High Gas	Model	Enabled	-1
2.3. Emerging Technology EWR	Model	Enabled	-1
2.2a. Emerging Technology High Load Growth	Model	Enabled	-1
50% Retail Choice Return	Scenario	Read Order	2
UMERC Load - Retail Return	Data File	Growth Period	3
UMERC Load - Retail Return	Data File	Enabled	0
CO2 Total Const	Scenario	Read Order	2
30% CO2 Reduction	Scenario	Read Order	3
50% CO2 Reduction	Scenario	Read Order	3
3. Environmental Base Case	Model	Enabled	-1
3.1a. Environmental High Gas	Model	Enabled	-1
3.2a. Environmental High Load Growth	Model	Enabled	-1
3.3. Environmental 50% CO2 Reduction	Model	Enabled	-1
3.4. Environmental EWR	Model	Enabled	-1
4. High Market Price	Model	Enabled	-1
4.1a. High Market High Gas Price	Model	Enabled	-1
4.1b. High Market Low Gas Price	Model	Enabled	-1
4.2a. High Market High Load Growth	Model	Enabled	-1
4.2b. High Market Retail Choice Return	Model	Enabled	-1
4.4. High Market EWR Savings	Model	Enabled	-1
Low Load - Grid Defection	Scenario	Read Order	3
UMERC Load - Low Load Grid Defection	Data File	Growth Period	3
UMERC Load - Low Load Grid Defection	Data File	Enabled	0
4.3. High Market Grid Defection	Model	Enabled	-1
10% RPS 2025 - constraint	Scenario	Read Order	1
10% RPS 2025 - unit	Scenario	Read Order	1
1.4. CT Only - no 10% RPS	Model	Enabled	-1

REDACTED

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System	Generator	Generators	System	UMERC LMR				0
System	Generator	Generators	System	UMERC LMR				0
System	Generator	Generators	System	UMERC LMR				0
System	Generator	Generators	System	UMERC LMR				0
Emission	Generator	Generators	CO2	Mihm 1				0
Emission	Generator	Generators	NOX	Mihm 1				0
Emission	Generator	Generators	CO2	Mihm 2				0
Emission	Generator	Generators	NOX	Mihm 2				0
Emission	Generator	Generators	CO2	Mihm 3				0
Emission	Generator	Generators	NOX	Mihm 3				0
Emission	Generator	Generators	CO2	Kuester 1				0
Emission	Generator	Generators	CO2	Kuester 2				0
Emission	Generator	Generators	CO2	Kuester 3				0
Emission	Generator	Generators	CO2	Kuester 4				0
Emission	Generator	Generators	CO2	Kuester 5				0
Emission	Generator	Generators	CO2	Kuester 6				0
Emission	Generator	Generators	CO2	Kuester 7				0
Emission	Generator	Generators	NOX	Kuester 1				0
Emission	Generator	Generators	NOX	Kuester 2				0
Emission	Generator	Generators	NOX	Kuester 3				0
Emission	Generator	Generators	NOX	Kuester 4				0
Emission	Generator	Generators	NOX	Kuester 5				0
Emission	Generator	Generators	NOX	Kuester 6				0
Emission	Generator	Generators	NOX	Kuester 7				0
Emission	Generator	Generators	CO2	New CC430				0
Emission	Generator	Generators	NOX	New CC430				0
Emission	Generator	Generators	CO2	New CT100				0
Emission	Generator	Generators	NOX	New CT100				0
Emission	Generator	Generators	CO2	New RICE				0
Emission	Generator	Generators	NOX	New RICE				0
System	Generator	Generators	System	New CC430		{Object}CT Only		0
System	Generator	Generators	System	New RICE		{Object}CT Only		0
System	Generator	Generators	System	New SolarA		{Object}CT Only		0
System	Generator	Generators	System	New SolarStorage		{Object}CT Only		0
System	Generator	Generators	System	New Wind		{Object}CT Only		0
System	Generator	Generators	System	New WindStorage		{Object}CT Only		0
System	Variable	Variables	System	NGWECT	TimeSeries\Monthly\Fuel Prices.csv			0
System	Fuel	Fuels	System	NGWECT				0
System	Fuel	Fuels	System	NGWECT		{Object}High Gas		0
System	Fuel	Fuels	System	NGWECT		{Object}Low Gas		0
System	Variable	Variables	System	Henry Hub	TimeSeries\Annual\Henry Hub Reference Case.csv			0
System	Data File	Data Files	System	UMERC Load - High L	TimeSeries\Load Forecasts\WECNProfile.csv			0
System	Data File	Data Files	System	UMERC Load - High L	TimeSeries\Load Forecasts\UMERCLoad2021_2050 - High Gr	{Object}High Load Growth		0
System	Data File	Data Files	System	UMERC Load - High L	TimeSeries\Load Forecasts\UMERC_Energy - High Load Grow	{Object}High Load Growth		0
System	Data File	Data Files	System	UMERC Load - High L	TimeSeries\Load Forecasts\UMERC_Demand - High Load Gro	{Object}High Load Growth		0
System	Region	Regions	System	UMERC	{Object}UMERC Load - High Load Growth	{Object}High Load Growth		0
System	Battery	Batteries	System	New Battery				0
System	Battery	Batteries	System	New Battery				0
System	Battery	Batteries	System	New Battery				0

System	Battery	Batteries	System	New Battery			0
System	Battery	Batteries	System	New Battery			0
System	Battery	Batteries	System	New Battery			0
System	Battery	Batteries	System	New Battery			0
System	Battery	Batteries	System	New Battery			0
System	Battery	Batteries	System	New Battery			0
System	Battery	Batteries	System	New Battery			0
System	Battery	Batteries	System	New Battery			0
System	Battery	Batteries	System	New Battery			0
System	Battery	Batteries	System	New Battery			0
System	Battery	Batteries	System	New Battery			0
System	Battery	Batteries	System	New Battery			1
System	Battery	Batteries	System	New StorageSolar			0
System	Battery	Batteries	System	New StorageSolar			0
System	Battery	Batteries	System	New StorageSolar			0
System	Battery	Batteries	System	New StorageSolar			0
System	Battery	Batteries	System	New StorageSolar			0
System	Battery	Batteries	System	New StorageSolar			0
System	Battery	Batteries	System	New StorageSolar			0
System	Battery	Batteries	System	New StorageSolar			1
System	Battery	Batteries	System	New StorageSolar			0
System	Battery	Batteries	System	New StorageSolar			0
System	Battery	Batteries	System	New StorageSolar			0
System	Battery	Batteries	System	New StorageSolar			0
System	Battery	Batteries	System	New StorageSolar			0
System	Battery	Batteries	System	New StorageSolar			0
System	Battery	Batteries	System	New StorageWind			0
System	Battery	Batteries	System	New StorageWind			0
System	Battery	Batteries	System	New StorageWind			0
System	Battery	Batteries	System	New StorageWind			0
System	Battery	Batteries	System	New StorageWind			0
System	Battery	Batteries	System	New StorageWind			0
System	Battery	Batteries	System	New StorageWind			0
System	Battery	Batteries	System	New StorageWind			0
System	Battery	Batteries	System	New StorageWind			1
System	Battery	Batteries	System	New StorageWind			0
System	Battery	Batteries	System	New StorageWind			0
System	Battery	Batteries	System	New StorageWind			0
System	Battery	Batteries	System	New StorageWind			0
System	Battery	Batteries	System	New StorageWind			0
System	Battery	Batteries	System	New StorageWind			0
System	Battery	Batteries	System	New StorageWind			0
System	Battery	Batteries	System	New StorageWind			0
System	Generator	Generators	System	EWR Savings			0
System	Generator	Generators	System	EWR Savings			0
System	Generator	Generators	System	EWR Savings	{Object}EWR		0
System	Generator	Generators	System	EWR Savings			0
System	Data File	Data Files	System	EWR	TimeSeries/Monthly/EWR - Base Case.csv		0
System	Data File	Data Files	System	EWR	TimeSeries/Monthly/EWR - High Savings.csv	{Object}EWR Savings	0
System	Generator	Generators	System	EWR Savings			4
System	Variable	Variables	System	Emerging Tech Escalat			0
System	Variable	Variables	System	Emerging Tech Escalat			4
System	Constraint	Constraints	System	25% Renewables 203		{Object}Renewable 25%	0
System	Constraint	Constraints	System	25% Renewables 203		{Object}Renewable 25%	4
Constraint	Region	Regions	25% Renewables 2	UMERC		{Object}Renewable 25%	0
Constraint	Generator	Generators	25% Renewables 2	New SolarA		{Object}Renewable 25%	0
Constraint	Generator	Generators	25% Renewables 2	New SolarStorage		{Object}Renewable 25%	0
Constraint	Generator	Generators	25% Renewables 2	New Wind		{Object}Renewable 25%	0
Constraint	Generator	Generators	25% Renewables 2	New WindStorage		{Object}Renewable 25%	0
System	Generator	Generators	System	EWR Savings		{Object}Emerging Tech Cost	0
System	Generator	Generators	System	New SolarA		{Object}Emerging Tech Cost	0
System	Generator	Generators	System	New SolarStorage		{Object}Emerging Tech Cost	0
System	Generator	Generators	System	New Wind		{Object}Emerging Tech Cost	0
System	Generator	Generators	System	New WindStorage		{Object}Emerging Tech Cost	0
System	Battery	Batteries	System	New Battery		{Object}Emerging Tech Cost	0
System	Battery	Batteries	System	New StorageSolar		{Object}Emerging Tech Cost	0
System	Battery	Batteries	System	New StorageWind		{Object}Emerging Tech Cost	0
Constraint	Battery	Batteries	25% Renewables 2	New Battery		{Object}Renewable 25%	0
Constraint	Battery	Batteries	25% Renewables 2	New StorageSolar		{Object}Renewable 25%	0
Constraint	Battery	Batteries	25% Renewables 2	New StorageWind		{Object}Renewable 25%	0
System	Region	Regions	System	UMERC	{Object}UMERC Load - Retail Return	{Object}50% Retail Choice Return	0
System	Data File	Data Files	System	UMERC Load - Retail	TimeSeries\Load Forecasts\UMERCLoad2021_2050 - Retail R	{Object}50% Retail Choice Return	0
System	Data File	Data Files	System	UMERC Load - Retail	TimeSeries\Load Forecasts\UMERC_Energy - Retail Return.cs	{Object}50% Retail Choice Return	0
System	Data File	Data Files	System	UMERC Load - Retail	TimeSeries\Load Forecasts\UMERC_Demand - Retail Return.c	{Object}50% Retail Choice Return	0
System	Data File	Data Files	System	UMERC Load - Retail	TimeSeries\Load Forecasts\WECNProfile.csv		0
Constraint	Market	Markets	CO2 Total Const	LRZ2		{Object}CO2 Total Const	0
Constraint	Emission	Emissions	CO2 Total Const	CO2			0
System	Constraint	Constraints	System	CO2 Total Const			0

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System	Constraint	Constraints	System	CO2 Total Const	[redacted]			4
System	Constraint	Constraints	System	CO2 Total Const	[redacted]		{Object}30% CO2 Reduction	4
System	Variable	Variables	System	Market CO2 Ratio	[redacted]		{Object}CO2 Total Const	0
System	Variable	Variables	System	Market CO2 Rate	[redacted]		{Object}CO2 Total Const	0
System	Constraint	Constraints	System	CO2 Total Const	[redacted]		{Object}50% CO2 Reduction	4
System	Constraint	Constraints	System	CO2 Total Const	[redacted]		{Object}CO2 Total Const	0
System	Data File	Data Files	System	UMERC Load - Low Lo	[redacted]	TimeSeries\Load Forecasts\UMERCLoad2021_2050 - Grid De	{Object}Low Load - Grid Defection	0
System	Data File	Data Files	System	UMERC Load - Low Lo	[redacted]	TimeSeries\Load Forecasts\WECNProfile.csv		0
System	Data File	Data Files	System	UMERC Load - Low Lo	[redacted]	TimeSeries\Load Forecasts\UMERC_Energy - Grid Defection.c	{Object}Low Load - Grid Defection	0
System	Data File	Data Files	System	UMERC Load - Low Lo	[redacted]	TimeSeries\Load Forecasts\UMERC_Demand - Grid Defection	{Object}Low Load - Grid Defection	0
System	Region	Regions	System	UMERC	[redacted]	{Object}UMERC Load - Low Load Grid Defection	{Object}Low Load - Grid Defection	0
System	Constraint	Constraints	System	10% RPS 2025	[redacted]		{Object}10% RPS 2025 - constraint	0
System	Constraint	Constraints	System	10% RPS 2025	[redacted]		{Object}10% RPS 2025 - constraint	4
Constraint	Generator	Generators	10% RPS 2025	New SolarA	[redacted]		{Object}10% RPS 2025 - constraint	0
Constraint	Generator	Generators	10% RPS 2025	New SolarStorage	[redacted]		{Object}10% RPS 2025 - constraint	0
Constraint	Generator	Generators	10% RPS 2025	New Wind	[redacted]		{Object}10% RPS 2025 - constraint	0
Constraint	Generator	Generators	10% RPS 2025	New WindStorage	[redacted]		{Object}10% RPS 2025 - constraint	0
Constraint	Battery	Batteries	10% RPS 2025	New Battery	[redacted]		{Object}10% RPS 2025 - constraint	0
Constraint	Battery	Batteries	10% RPS 2025	New StorageSolar	[redacted]		{Object}10% RPS 2025 - constraint	0
Constraint	Battery	Batteries	10% RPS 2025	New StorageWind	[redacted]		{Object}10% RPS 2025 - constraint	0
Constraint	Region	Regions	10% RPS 2025	UMERC	[redacted]		{Object}10% RPS 2025 - constraint	0
Constraint	Battery	Batteries	25% Renewables :	New Battery	[redacted]		{Object}Renewable 25%	0
Constraint	Battery	Batteries	25% Renewables :	New StorageSolar	[redacted]		{Object}Renewable 25%	0
Constraint	Battery	Batteries	25% Renewables :	New StorageWind	[redacted]		{Object}Renewable 25%	0
Constraint	Region	Regions	25% Renewables :	UMERC	[redacted]		{Object}Renewable 25%	0
Constraint	Battery	Batteries	25% Renewables :	New Battery	[redacted]		{Object}Renewable 25%	0
Constraint	Battery	Batteries	25% Renewables :	New StorageSolar	[redacted]		{Object}Renewable 25%	0
Constraint	Battery	Batteries	25% Renewables :	New StorageWind	[redacted]		{Object}Renewable 25%	0
Constraint	Region	Regions	25% Renewables :	UMERC	[redacted]		{Object}Renewable 25%	0
Constraint	Battery	Batteries	25% Renewables :	New Battery	[redacted]		{Object}Renewable 25%	0
Constraint	Battery	Batteries	25% Renewables :	New StorageSolar	[redacted]		{Object}Renewable 25%	0
Constraint	Battery	Batteries	25% Renewables :	New StorageWind	[redacted]		{Object}Renewable 25%	0
Constraint	Region	Regions	25% Renewables :	UMERC	[redacted]		{Object}Renewable 25%	0
Constraint	Battery	Batteries	25% Renewables :	New Battery	[redacted]		{Object}Renewable 25%	0
Constraint	Battery	Batteries	25% Renewables :	New StorageSolar	[redacted]		{Object}Renewable 25%	0
Constraint	Battery	Batteries	25% Renewables :	New StorageWind	[redacted]		{Object}Renewable 25%	0
Constraint	Region	Regions	25% Renewables :	UMERC	[redacted]		{Object}Renewable 25%	0
System	Generator	Generators	System	UMERC LMR	[redacted]		{Object}Market 2 - High Gas	0
System	Generator	Generators	System	UMERC LMR	[redacted]		{Object}High Load Growth	0
System	Generator	Generators	System	UMERC LMR	[redacted]		{Object}High Load Growth	0
System	Generator	Generators	System	UMERC LMR	[redacted]		{Object}High Load Growth	0
System	Generator	Generators	System	UMERC LMR	[redacted]		{Object}High Load Growth	0
System	Generator	Generators	System	UMERC LMR	[redacted]		{Object}High Load Growth	0
System	Generator	Generators	System	UMERC LMR	[redacted]		{Object}High Load Growth	0
System	Generator	Generators	System	UMERC LMR	[redacted]		{Object}High Load Growth	0
System	Generator	Generators	System	10% RPS Solar Unit	[redacted]		{Object}10% RPS 2025 - unit	0
System	Generator	Generators	System	10% RPS Solar Unit	[redacted]		{Object}10% RPS 2025 - unit	0
System	Generator	Generators	System	10% RPS Solar Unit	[redacted]	TimeSeries\Hourly\NewSolarProfile.csv	{Object}10% RPS 2025 - unit	0
System	Generator	Generators	System	10% RPS Solar Unit	[redacted]		{Object}10% RPS 2025 - unit	4
System	Generator	Generators	System	10% RPS Solar Unit	[redacted]		{Object}10% RPS 2025 - unit	4
System	Generator	Generators	System	10% RPS Solar Unit	[redacted]		{Object}10% RPS 2025 - unit	0
System	Generator	Generators	System	10% RPS Solar Unit	[redacted]	edidation	{Object}10% RPS 2025 - unit	0
System	Generator	Generators	System	10% RPS Solar Unit	[redacted]		{Object}10% RPS 2025 - unit	0
System	Generator	Generators	System	10% RPS Solar Unit	[redacted]			0
System	Generator	Generators	System	10% RPS Solar Unit	[redacted]		{Object}Emerging Tech Cost	0
System	Generator	Generators	System	New SolarB	[redacted]			0
System	Generator	Generators	System	New SolarB	[redacted]			0
System	Generator	Generators	System	New SolarB	[redacted]	TimeSeries\Hourly\NewSolarBProfile.csv		0
System	Generator	Generators	System	New SolarB	[redacted]			0
System	Generator	Generators	System	New SolarB	[redacted]	edidation		0
System	Generator	Generators	System	New SolarB	[redacted]			0
System	Generator	Generators	System	New SolarB	[redacted]			0
System	Generator	Generators	System	New SolarB	[redacted]			0
System	Generator	Generators	System	New SolarB	[redacted]			4
System	Generator	Generators	System	New SolarB	[redacted]			4
System	Generator	Generators	System	New SolarB	[redacted]		{Object}CT Only	0
System	Generator	Generators	System	New SolarB	[redacted]		{Object}Emerging Tech Cost	0
Constraint	Generator	Generators	25% Renewables :	New SolarB	[redacted]		{Object}Renewable 25%	0
Constraint	Generator	Generators	10% RPS 2025	New SolarB	[redacted]		{Object}10% RPS 2025 - constraint	0

object	parent_class	child_class	collection	property	phase_id	report_period	report_summary	report_statistics	report_samples
Base	System	Generator	Generators	Generation	1	TRUE	TRUE	FALSE	FALSE
Base	System	Generator	Generators	Min Generation	1	FALSE	TRUE	FALSE	FALSE
Base	System	Generator	Generators	Max Generation	1	FALSE	TRUE	FALSE	FALSE
Base	System	Generator	Generators	Operating Hours	1	TRUE	TRUE	FALSE	FALSE
Base	System	Generator	Generators	Capacity Factor	1	TRUE	TRUE	FALSE	FALSE
Base	System	Generator	Generators	Fuel Cost	1	TRUE	TRUE	FALSE	FALSE
Base	System	Generator	Generators	VO&M Charge	1	TRUE	TRUE	FALSE	FALSE
Base	System	Generator	Generators	VO&M Cost	1	TRUE	TRUE	FALSE	FALSE
Base	System	Generator	Generators	Generation Cost	1	TRUE	TRUE	FALSE	FALSE
Base	System	Generator	Generators	Start & Shutdown Cost	1	TRUE	TRUE	FALSE	FALSE
Base	System	Generator	Generators	Start & Shutdown Penalty Cost	1	TRUE	TRUE	FALSE	FALSE
Base	System	Generator	Generators	Start Fuel Cost	1	TRUE	TRUE	FALSE	FALSE
Base	System	Generator	Generators	Emissions Cost	1	TRUE	TRUE	FALSE	FALSE
Base	System	Generator	Generators	Abatement Cost	1	TRUE	TRUE	FALSE	FALSE
Base	System	Generator	Generators	Total Generation Cost	1	TRUE	TRUE	FALSE	FALSE
Base	System	Generator	Generators	Total System Cost	1	TRUE	TRUE	FALSE	FALSE
Base	System	Generator	Generators	FO&M Cost	1	TRUE	TRUE	FALSE	FALSE
Base	System	Generator	Generators	Fixed Costs	1	TRUE	TRUE	FALSE	FALSE
Base	System	Generator	Generators	Heat Rate	1	TRUE	TRUE	FALSE	FALSE
Base	System	Generator	Generators	Marginal Heat Rate	1	TRUE	TRUE	FALSE	FALSE
Base	System	Generator	Generators	Average Heat Rate	1	TRUE	TRUE	FALSE	FALSE
Base	System	Generator	Generators	SRMC	1	TRUE	TRUE	FALSE	FALSE
Base	System	Generator	Generators	Average Cost	1	TRUE	TRUE	FALSE	FALSE
Base	System	Generator	Generators	Mark-up	1	TRUE	TRUE	FALSE	FALSE
Base	System	Generator	Generators	Price Received	1	TRUE	TRUE	FALSE	FALSE
Base	System	Generator	Generators	Pool Revenue	1	TRUE	TRUE	FALSE	FALSE
Base	System	Generator	Generators	Net Revenue	1	TRUE	TRUE	FALSE	FALSE
Base	System	Generator	Generators	Net Profit	1	TRUE	TRUE	FALSE	FALSE
Base	System	Generator	Generators	Units	1	TRUE	TRUE	FALSE	FALSE
Base	System	Generator	Generators	Max Capacity	1	TRUE	TRUE	FALSE	FALSE
Base	System	Generator	Generators	Installed Capacity	1	TRUE	TRUE	FALSE	FALSE
Base	System	Generator	Generators	Firm Capacity	1	TRUE	TRUE	FALSE	FALSE
Base	System	Generator	Generators	Maintenance	1	TRUE	TRUE	FALSE	FALSE
Base	System	Generator	Generators	Maintenance Hours	1	TRUE	TRUE	FALSE	FALSE
Base	System	Generator	Generators	Maintenance Rate	1	TRUE	TRUE	FALSE	FALSE
Base	System	Generator	Generators	Forced Outage	1	TRUE	TRUE	FALSE	FALSE

Base	System	Generator	Generators	Forced Outage Hours	1	TRUE	TRUE	FALSE	FALSE
Base	System	Generator	Generators	Forced Outage Rate	1	TRUE	TRUE	FALSE	FALSE
Base	System	Generator	Generators	Service Factor	1	TRUE	TRUE	FALSE	FALSE
Base	System	Generator	Generators	Units Built	1	TRUE	TRUE	FALSE	FALSE
Base	System	Generator	Generators	Capacity Built	1	TRUE	TRUE	FALSE	FALSE
Base	System	Generator	Generators	Build Cost	1	TRUE	TRUE	FALSE	FALSE
Base	System	Generator	Generators	Total Cost	1	TRUE	TRUE	FALSE	FALSE
Base	System	Emission	Emissions	Production	1	TRUE	TRUE	FALSE	FALSE
Base	System	Battery	Batteries	Units Built	1	TRUE	TRUE	FALSE	FALSE
Base	System	Battery	Batteries	Build Cost	1	TRUE	TRUE	FALSE	FALSE
Base	System	Region	Regions	Load	1	TRUE	TRUE	FALSE	FALSE
Base	System	Region	Regions	Native Load	1	TRUE	TRUE	FALSE	FALSE
Base	System	Region	Regions	Price	1	TRUE	TRUE	FALSE	FALSE
Base	System	Region	Regions	Net Market Profit	1	TRUE	TRUE	FALSE	FALSE
Base	System	Region	Regions	Peak Load	1	TRUE	TRUE	FALSE	FALSE
Base	System	Region	Regions	Capacity Reserve Margin	1	TRUE	TRUE	FALSE	FALSE
Base	System	Region	Regions	Planning Peak Load	1	TRUE	TRUE	FALSE	FALSE
Base	System	Region	Regions	Total Cost	1	TRUE	TRUE	FALSE	FALSE
Base	System	Market	Markets	Sales	1	TRUE	TRUE	FALSE	FALSE
Base	System	Market	Markets	Purchases	1	TRUE	TRUE	FALSE	FALSE
Base	System	Market	Markets	Net Sales	1	TRUE	TRUE	FALSE	FALSE
Base	System	Market	Markets	Net Purchases	1	TRUE	TRUE	FALSE	FALSE
Base	System	Market	Markets	Price	1	TRUE	TRUE	FALSE	FALSE
Base	System	Market	Markets	Revenue	1	TRUE	TRUE	FALSE	FALSE
Base	System	Market	Markets	Cost	1	TRUE	TRUE	FALSE	FALSE
Base	System	Market	Markets	Net Revenue	1	TRUE	TRUE	FALSE	FALSE
Base	System	Market	Markets	Net Cost	1	TRUE	TRUE	FALSE	FALSE
Base	System	Market	Markets	Total Cost	1	TRUE	TRUE	FALSE	FALSE
Base	System	Constraint	Constraints	Activity	1	TRUE	TRUE	FALSE	FALSE
Base	System	Constraint	Constraints	RHS	1	TRUE	TRUE	FALSE	FALSE
Base	System	Constraint	Constraints	Price	1	TRUE	TRUE	FALSE	FALSE
Base	System	Constraint	Constraints	Penalty Cost	1	TRUE	TRUE	FALSE	FALSE
Base	System	Variable	Variables	Value	1	TRUE	TRUE	FALSE	FALSE
Base	Generator	Fuel	Fuels	Offtake	1	TRUE	TRUE	FALSE	FALSE
Base	Generator	Fuel	Fuels	Price	1	TRUE	TRUE	FALSE	FALSE

Name	Value
SystemName	System
Version	8.2

UMERC IRP System Costs

PLEXOS results internal levelized capital recovery

Plexos v1.48

9/28/2021

	Business as Usual						*Emerging Technology*					*Environmental*					*High Market Price*						
Year	*Case 1.0 Base Case*	*Case 1.1a High Gas*	*Case 1.2a High Load*	*Case 1.2b Retail Choice Return*	*Case 1.3 EWR*	*Case 1.4 CT Only*	*Case 2.0 Base Case*	*Case 2.1a High Gas*	*Case 2.2a High Load Growth*	*Case 2.3 EWR*	*Case 2.4 25% RPS by 2030*	*Case 3.0 Base Case*	*Case 3.1a High Gas*	*Case 3.2a High Load Growth*	*Case 3.3 50% CO2 Reduction*	*Case 3.4 EWR*	*Case 4.0 Base Case*	*Case 4.1a High Gas*	*Case 4.1b Low Gas*	*Case 4.2a High Load Growth*	*Case 4.2b Retail Choice Return*	*Case 4.3 Grid Defection*	*Case 4.4 EWR Savings*
202	[redacted]																						
202																							
202																							
202																							
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203																							
204																							
204																							
Total	**1,503.6**	**1,739.0**	**1,742.1**	**1,642.1**	**1,502.2**	**1,503.6**	**1,424.1**	**1,658.8**	**1,649.4**	**1,413.8**	**1,442.5**	**1,424.1**	**1,659.5**	**1,649.4**	**1,424.1**	**1,413.8**	**1,630.3**	**1,702.4**	**1,266.4**	**1,895.9**	**1,785.0**	**1,608.6**	**1,623.1**
Difference from Base		**235.4**	**238.5**	**138.6**	**(1.4)**	**0.0**	**(79.4)**	**155.2**	**145.9**	**(89.8)**	**(61.1)**	**(79.4)**	**155.9**	**145.9**	**(79.4)**	**(89.8)**	**126.7**	**198.8**	**(237.2)**	**392.3**	**281.5**	**105.1**	**119.5**
NPV	**728.0**	**854.9**	**802.3**	**791.8**	**727.5**	**728.0**	**692.2**	**819.2**	**762.6**	**687.7**	**699.4**	**692.2**	**819.6**	**762.6**	**692.2**	**687.7**	**801.2**	**851.0**	**609.3**	**885.0**	**873.1**	**792.9**	**798.2**
Difference from Base		**126.9**	**74.3**	**63.8**	**(0.5)**	**0.0**	**(35.9)**	**91.1**	**34.6**	**(40.3)**	**(28.7)**	**(35.9)**	**91.6**	**34.6**	**(35.9)**	**(40.3)**	**73.2**	**122.9**	**(118.7)**	**157.0**	**145.1**	**64.9**	**70.2**

UMERC IRP System Costs

PLEXOS results with utility financing for capital expenditures

Plexos v1.48

9/28/2021

	Business as Usual						*Emerging Technology*					*Environmental*					*High Market Price*						
Year	*Case 1.0 Base Case*	*Case 1.1a High Gas*	*Case 1.2a High Load*	*Case 1.2b Retail Choice Return*	*Case 1.3 EWR*	*Case 1.4 CT Only*	*Case 2.0 Base Case*	*Case 2.1a High Gas*	*Case 2.2a High Load Growth*	*Case 2.3 EWR*	*Case 2.4 25% RPS by 2030*	*Case 3.0 Base Case*	*Case 3.1a High Gas*	*Case 3.2a High Load Growth*	*Case 3.3 50% CO2 Reduction*	*Case 3.4 EWR*	*Case 4.0 Base Case*	*Case 4.1a High Gas*	*Case 4.1b Low Gas*	*Case 4.2a High Load Growth*	*Case 4.2b Retail Choice Return*	*Case 4.3 Grid Defection*	*Case 4.4 EWR Savings*
2022	[redacted]																						
2023																							
2024																							
2025																							
2026																							
2027																							
2028																							
2029																							
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2035																							
2036																							
2037																							
2038																							
2039																							
2040																							
2041																							
Total	**1,497.7**	**1,733.1**	**1,743.0**	**1,635.0**	**1,496.3**	**1,497.7**	**1,420.3**	**1,651.1**	**1,650.0**	**1,409.9**	**1,443.3**	**1,420.3**	**1,651.8**	**1,650.0**	**1,420.3**	**1,409.9**	**1,624.4**	**1,696.5**	**1,260.5**	**1,896.8**	**1,777.9**	**1,602.7**	**1,617.2**
Difference from Base		**235.4**	**245.3**	**137.3**	**(1.4)**	**0.0**	**(77.4)**	**153.5**	**152.4**	**(87.7)**	**(54.4)**	**(77.4)**	**154.1**	**152.4**	**(77.4)**	**(87.7)**	**126.7**	**198.8**	**(237.2)**	**399.1**	**280.2**	**105.1**	**119.5**
NPV	**729.8**	**856.7**	**806.1**	**794.0**	**729.3**	**729.8**	**693.3**	**821.5**	**765.1**	**688.9**	**702.7**	**693.3**	**822.0**	**765.1**	**693.3**	**688.9**	**803.0**	**852.8**	**611.1**	**888.8**	**875.3**	**794.7**	**800.0**
Difference from Base		**126.9**	**76.3**	**64.2**	**(0.5)**	**0.0**	**(36.5)**	**91.7**	**35.2**	**(40.9)**	**(27.2)**	**(36.5)**	**92.1**	**35.2**	**(36.5)**	**(40.9)**	**73.2**	**122.9**	**(118.7)**	**159.0**	**145.5**	**64.9**	**70.2**

REDACTED

UMERC Forecasted LMPs

Month	Price ($/MWh)
Jan-22	[redacted]
Feb-22	
Mar-22	
Apr-22	
May-22	
Jun-22	
Jul-22	
Aug-22	
Sep-22	
Oct-22	
Nov-22	
Dec-22	
Jan-23	
Feb-23	
Mar-23	
Apr-23	
May-23	
Jun-23	
Jul-23	
Aug-23	
Sep-23	
Oct-23	
Nov-23	
Dec-23	
Jan-24	
Feb-24	
Mar-24	
Apr-24	
May-24	
Jun-24	
Jul-24	
Aug-24	
Sep-24	
Oct-24	
Nov-24	
Dec-24	
Jan-25	
Feb-25	
Mar-25	
Apr-25	
May-25	
Jun-25	
Jul-25	
Aug-25	
Sep-25	
Oct-25	
Nov-25	
Dec-25	
Jan-26	
Feb-26	
Mar-26	
Apr-26	
May-26	
Jun-26	
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Aug-26	
Sep-26	
Oct-26	
Nov-26	
Dec-26	
Jan-27	
Feb-27	
Mar-27	
Apr-27	
May-27	
Jun-27	
Jul-27	
Aug-27	
Sep-27	
Oct-27	
Nov-27	
Dec-27	
Jan-28	
Feb-28	
Mar-28	
Apr-28	
May-28	
Jun-28	

REDACTED

Jul-28	[redacted]
Aug-28	
Sep-28	
Oct-28	
Nov-28	
Dec-28	
Jan-29	
Feb-29	
Mar-29	
Apr-29	
May-29	
Jun-29	
Jul-29	
Aug-29	
Sep-29	
Oct-29	
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Oct-34	
Nov-34	
Dec-34	
Jan-35	
Feb-35	
Mar-35	

REDACTED

Apr-35	[redacted]
May-35	
Jun-35	
Jul-35	
Aug-35	
Sep-35	
Oct-35	
Nov-35	
Dec-35	
Jan-36	
Feb-36	
Mar-36	
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May-41	
Jun-41	
Jul-41	
Aug-41	
Sep-41	
Oct-41	
Nov-41	
Dec-41	

Market Price Forecast

Exhibit A-10 (KMK-5) – Market Price Forecast presents the PLEXOS generated hourly forecast of LMPs by load zone used in the model to calculate unit dispatch.

A Native Excel file containing this data was served upon Staff and Intervenors at the time of filing. The file is labeled as “Exhibit A-10 (KMK-5) – Market Price Forecast.xls”.

10% RPS hardwired in CT case, no RPS constraint in Scenario 2&3 High Gas cases, General Escalation on Solar

	Business As Usual Scenario						***Emerging Technology Base Scenario***					***Environmental Base Scenario***					***High Market Price Base Scenario***						
	Case 1	***Case 1.1a***	***Case 1.2a.***	***Case 1.2b.***	***Case 1.3.***	***Case 1.4***	***Case 2***	***Case 2.1a.***	***Case 2.2a.***	***Case 2.3***	***Case 2.4***	***Case 3***	***Case 3.1a.***	***Case 3.2a.***	***Case 3.3***	***Case 3.4***	***Case 4***	***Case 4.1a.***	***Case 4.1b.***	***Case 4.2a.***	***Case 4.2b.***	***Case 4.3***	***Case 4.4***
	Base	***High Gas***	***High Load Growth***	***Retail Choice Return***	***EWR***	***CT Only***	***Base***	***High Gas***	***High Load Growth***	***EWR***	***25% by 2030 Renewables***	***Base***	***High Gas***	***High Load Growth***	***50% CO2 Reduction***	***EWR***	***Base***	***High Gas***	***Low Gas***	***High Load Growth***	***Retail Choice Return***	***Grid Defection***	***EWR Savings***
2021																							
2022																							
2023																							
2024																							
2025	100 MW Solar	100 MW Solar	100 MW Solar	125 MW Solar	100 MW Solar	100 MW Solar	100 MW Solar	200 MW Solar	100 MW Solar	100 MW Solar	100 MW Solar	100 MW Solar	200 MW Solar	100 MW Solar	100 MW Solar	100 MW Solar	100 MW Solar	100 MW Solar	100 MW Solar	100 MW Solar	125 MW Solar	100 MW Solar	100 MW Solar
2026																							
2027																							
2028																							
2029											25 MW Solar												
2030											25 MW Solar												
2031																							
2032																							
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2034			25 MW Solar						25 MW Solar					25 MW Solar						25 MW Solar			
2035																							
2036																							
2037																							
2038																							
2039			25 MW Solar						25 MW Solar					25 MW Solar						25 MW Solar			
2040																							

STATE OF MICHIGAN

BEFORE THE MICHIGAN PUBLIC SERVICE COMMISSION

*** * * * ***

In the matter of the application of **UPPER MICHIGAN ENERGY RESOURCES CORPORATION** for approval of its integrated resource plan pursuant to MCL 460.6t and for other relief.	))))	Case No. U-21081

DIRECT TESTIMONY AND EXHIBITS OF

JARED J. PECCARELLI

FOR

UPPER MICHIGAN ENERGY RESOURCES CORPORATION

Q. Please state your name, business address and position.

A. My name is Jared Peccarelli and my business address is 231 West Michigan St., Milwaukee, WI 53203. I am employed by WEC Business Services, LLC ("WBS"), a subsidiary of WEC Energy Group, Inc. ("WEC"), as Manager Sales Forecasting.

Q. For whom are you providing testimony?

A. I am providing testimony on behalf of Upper Michigan Energy Resources Corporation ("UMERC" or the "Company"), which is a subsidiary of WEC.

Q. Please describe briefly your educational, professional, and utility background.

A. I received both a Bachelor of Science degree in Computer Science and a Master of Business Administration degree with a finance concentration from the University of Wisconsin – Milwaukee. In addition, I have completed all coursework required for a Master of Science degree in Applied Economics from Marquette University in Milwaukee, Wisconsin. I was

hired by We Energies (a subsidiary of WEC) in November 2002 and worked in various roles in several departments prior to my current position. I joined the Sales Forecasting team in Finance as a Principal Analyst in 2014 and have developed or assisted in the development of long-term electric and natural gas sales forecasts for multiple WEC utility subsidiaries since then. I am currently responsible for overseeing the development of the long-term sales forecasts for all of the electric, natural gas and steam utility subsidiaries of WEC, including UMERC.

Q. Have you previously testified before any regulatory agency?

A. Yes. I have submitted testimony concerning sales forecasting before the Michigan Public Service Commission on behalf of MGUC's general rate case proceeding in Case No. U-20718 and 2021-2022 GCR Plan in Case No. U-20818, and before the Public Service Commission of Wisconsin and the Illinois Commerce Commission in general rate case proceedings.

Q. What is the purpose of your direct testimony?

A. The purpose of my direct testimony is to provide an explanation of the methodology used to develop UMERC's sales and peak demand forecast for the 20-year forecast period (2022 – 2041) used in this required Integrated Resource Plan filing ("IRP").

Q. Are you sponsoring any exhibits in this proceeding?

A. Yes, I am sponsoring the following exhibits:

Exhibit A-12 (JJP-1) – Annual Energy and Peak Demand Forecasts

Exhibit A-13 (JJP-2) – Annual Sales Forecast by Customer Class

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

A. Yes, they were.

Q. Please explain how the Company's long-term sales forecast was developed for use in this IRP.

A. The Residential customer class forecast utilizes two regression models per rate zone[1], a monthly customer count model and a monthly use-per-customer model. Both models include seasonal customers and sales. The historical period utilized for the WPSC rate zone as a basis for the models is January 1, 2013 through June 1, 2021. The historical period utilized for WEPCO rate zone[2] as a basis for the use-per-customer projection is January 1, 2013 through January 1, 2020 and January 1, 2013 through June 1, 2021 for the customer count model. The customer count forecasts are based on regression models of the historical monthly trend in the number of residential customers. The use-per-customer forecast is based on a regression model, utilizing seasonal, weather related, and autoregressive variables to project average residential customer usage.

The Commercial customer class forecast utilizes two regression models per rate zone[3], a customer count model and a use-per-customer model. The use-per-customer models use historical data from January 1, 2017 through June 1, 2021, and exclude company use sales. The customer count models use historical data from January 1, 2013 through June 1, 2021. The customer count forecast is based on a regression analysis of the historical monthly trend in the number of commercial customers within the service territory, excluding those served by an Alternative Energy Supplier ("AES"). The use-per-

[1] The rate zones are the WEPCO rate zone and WPSC rate zone established when the Commission approved the formation of UMERC in case U-18061.
[2]The WEPCO rate zone was more heavily impacted by COVID-19 in regards to UPC while the customer counts remained stable.
[3] Issues in data from pre-formation of UMERC and addressed by beginning UPC regression on January 1, 2017. The customer count data was stable and was able to use a January 1, 2013 start date for the regression model.

customer model is based on a regression model, utilizing seasonal, weather-related, and autoregressive variables to project average commercial customer usage.

The Industrial customer class forecast for the WPSC rate zone utilizes a use-per-customer regression model, as well as individual forecasts for the two largest customers computed using adjusted, historical growth rates. The model uses historical data from January 1, 2013 through June 1, 2021. The customer count forecast is based on the historical trend in the number of industrial customers within the service territory, excluding those served by an AES. The use-per-customer model is based on a regression model, utilizing seasonal, weather-related, Producer Price Index, and autoregressive variables to project average industrial customer usage. The Industrial forecast for WEPCO rate zone utilizes individual forecasts for all customers within the class, computed using adjusted, historical growth rates. The model uses historical data from January 1, 2017 through June 1, 2021. Company Use is based on a regression model utilizing historical Company Use sales as a percentage of total sales.

The Lighting customer class forecast utilizes two regression models per zone, a monthly customer count model and a monthly use-per-customer model. The historical period utilized for the WPSC rate zone as a basis for the use-per-customer model is January 1, 2018 through June 1, 2021 and January 1, 2013 through June 1, 2021 for the customer count model. The historical period utilized for the WEPCO rate zone as a basis for the use-per-customer model is January 1, 2013 through June 1, 2021 and July 1, 2019 through June 1, 2021 for the customer count model. The customer count forecasts are based on regression models of the historical monthly trend in the number of lighting customers. The

use-per-customer forecasts are based on a regression model, utilizing seasonal, weather related, and autoregressive variables to project average lighting customer usage.

Q. Are there elements of risk or uncertainty when developing forecasts?

A. Yes. There are several areas of risk and uncertainty associated with the process employed to forecast sales and demand in this filing. The forecasts of average use-per-customer and number of customers were based on time series regression models that resulted in point estimates based on specific levels of confidence. In other words, the path these point estimates represent is one of the paths that the forecast could take based on the data utilized in the model. Another area of risk is due to the assumption of normal weather in the forecast horizon. Any variation between actual weather and normal weather presents a chance for differences between forecasted and actual volumes. Additionally, the trajectory of the COVID-19 pandemic recovery represents uncertainty in the forecasts that is difficult to model due to the unprecedented nature of the event and the magnitude of its impact on load.

Q. What were the results of the energy forecasts developed using the methodology you described earlier in your testimony?

A. The resulting class level energy forecasts are included in the following exhibit:

- Exhibit A-13 (JJP-2) – Annual Sales Forecast by Customer Class

Additionally, a summary of the resulting annual energy forecasts for the Base Case, High Load Growth Case and Grid Defection Case are included in the following exhibit:

- Exhibit A-12 (JJP-1) – Annual Energy and Peak Demand Forecasts

Q. What adjustments were made to the Base Case Energy Forecast to arrive at the High Load Growth Case and Grid Defection Case Energy Forecasts?

A. The High Load Growth Case forecast included the following adjustments to the Base Case:

- System Sales for the WEPCO and WPSC rate zones increasing by 1.5% annually starting in 2023.
- The addition of load from a restarted iron ore mine between 2035 and 2041.
- The return of 50% of Retail Choice load to System Sales in 2023.

The Grid Defection Case forecast included the following adjustment to the Base Case:

- System Sales demand for the WEPCO and WPSC rate zones decreasing by 0.1% annually starting in 2023.

Q. Please explain how the peak demand forecast was developed for the 2022 test year.

A. The peak demand forecast methodology consisted of estimating peak demand for each of the components and load zones required for the Midcontinent Independent System Operator ("MISO") resource adequacy process. The components include firm peak demand, non-firm peak demand and retail choice peak demand. The load zones included MIUP.UMRC, MIUP.TILDEN, MIUP.WPSE, WPS.UMRC, and WPS.WPSE. All of these load zones are owned by the UMERC-EDC asset owner. The MIUP.UMRC, MIUP.TILDEN, and MIUP.WPSE load zones are located in the MIUP local balancing authority ("LBA"). The WPS.UMRC and WPS.WPSE load zones are located in the WPS LBA.

MIUP.UMRC

The MIUP.UMRC load zone consists exclusively of system sales customers. Gross peak demand for the summer peak for MIUP.UMRC was forecasted using regression analysis with historical peak demand as the dependent variable and residential peak composite temperature-humidity index, historical monthly residential sales, historical total

retail sales and a weekend binary variable as the independent variables. Historical peak demand for the summer months, June through August, from June 2019 through June 2021 were used in the model. The weather variable was based on measurements recorded at the National Oceanic and Atmospheric Administration's ("NOAA") National Weather Service's ("NWS") weather station in Iron Mountain, Michigan. A monthly profile was applied to the summer peak to estimate peak demand for all twelve months. The non-firm peak demand was forecasted by estimating the historical demand available to be interrupted for the three non-firm customers located in this load zone. The average hourly load above firm nomination levels during the period 10:00 a.m. to 5:00 p.m. for June 2020 through September 2020 was used as the non-firm peak load for each of the customers. The non-firm peak demand for these customers was aggregated to estimate the non-firm peak demand for MIUP.UMRC. The firm peak demand for MIUP.UMRC was forecasted by subtracting the non-firm peak demand from the gross peak demand for each month.

MIUP.TILDEN

The firm and non-firm peak demand forecasts for MIUP.TILDEN were based on contractual obligations, as specified in U-18224. There is no firm demand associated with this customer or load zone. All of the load in the load zone is non-firm. The non-firm peak demand is based on historical load with input from wholesale market strategists employed by WEC and providing services to UMERC.

MIUP.WPSE

The MIUP.WPSE load consists exclusively of retail choice customers. The peak demand forecast for MIUP.WPSE was estimated by averaging historical peak demand for each month from the period April 2019 through June 2021.

WPS.UMRC

The WPS.UMRC load zone consists exclusively of system sales customers. Gross peak demand for the summer peak for WPS.UMRC was forecasted using regression analysis with historical peak demand as the dependent variable and residential peak composite temperature-humidity index, historical monthly residential sales, and historical commercial and industrial sales as the independent variables. Historical peak demand for the summer months, June through September, from June 2019 through June 2021 were used in the model. The weather variable was based on measurements recorded at the National Oceanic and Atmospheric Administration's ("NOAA") National Weather Service's ("NWS") weather station in Iron Mountain, Michigan. A monthly profile was applied to the summer peak to estimate peak demand for all twelve months. The non-firm peak demand was forecasted by estimating the historical demand available to be interrupted for the two non-firm customers located in this load zone. The average hourly load above firm nomination levels during the period 10:00 a.m. to 5:00 p.m. for each month from January 2018 through June 2021 was used for each of these two non-firm customers. The non-firm peak demand for these customers was aggregated to estimate the non-firm peak demand for WPS.UMRC. The firm peak demand for WPS.UMRC was forecasted by subtracting the non-firm peak demand from the gross peak demand for each month.

WPS.WPSE

The WPS.WPSE load consists exclusively of retail choice customers. Peak demand for the summer peak for WPS.WPSE was forecasted using regression analysis with historical peak demand as the dependent variable and historical monthly commercial and

industrial sales as the independent variable. A monthly profile was applied to the summer peak to estimate peak demand for all twelve months.

Q. What were the results of the energy forecasts developed using the methodology you described earlier in your testimony?

A. The resulting class level energy forecasts are included in the following exhibits:

- Exhibit A-13 (JJP-2) – Annual Sales Forecast by Customer Class

Additionally, a summary of the resulting annual peak demand forecasts for the Base Case, High Load Growth Case and Grid Defection Case are included in the following exhibit:

- Exhibit A-12 (JJP-1) – Annual Energy and Peak Demand Forecasts

Q. What adjustments were made to the Base Case Peak Demand Forecast to arrive at the High Load Growth Case and Grid Defection Case Peak Demand Forecasts?

A. The High Load Growth Case forecast included the following adjustments to the Base Case:

- System Sales demand for the WEPCO and WPSC rate zones increasing by 1.5% annually starting in 2023.
- The addition of load from a restarted iron ore mine between 2035 and 2041.
- The return of 50% of Retail Choice load to System Sales in 2023.

The Grid Defection Case forecast included the following adjustment to the Base Case:

- System Sales demand for the WEPCO and WPSC rate zones decreasing by 0.2% annually starting in 2023.

Q. What weather and temperature assumptions were made in the development of the Company's sales and peak demand projection?

A. UMERC used a 20-year average of actual monthly weather observations at Iron Mountain, Michigan, as reported by the NOAA NWS between the years of 2001 – 2020 as the basis

for assumed future weather characteristics utilized in the forecast, also known as "normal" weather.

Q. What were the actual and forecasted electric sales for the previous five years?

A. Figure 1 includes UMERC total sales by year from 2016 through 2020. The table includes forecasted, actual and weather-normalized sales and the weather-normalized sales variance from forecast. Due to the formation of UMERC on January 1, 2017, the actual and weather-normalized sales shown for 2016 represent the sum of actual retail load from customers located in Michigan for WEPCO and WPSC; including the large iron ore mine customer. The weather-normalized sales variance to forecast was -3.3% in 2020 due to the unexpected impact from the COVID-19 pandemic.

Figure 1, UMERC Total Sales

Year	Forecast, MWh	Actual, MWh	Weather-Normalized, MWh	Weather-Normalized vs. Forecast
2016*	2,624,614	2,410,301	2,410,301	-8.2%
2017	616,581	601,553	604,683	-1.9%
2018	612,412	623,138	614,936	0.4%
2019	612,138	617,502	619,886	1.3%
2020	615,638	595,937	595,555	-3.3%

Q. Does this conclude your direct testimony at this time?

A. Yes, it does.

Upper Michigan Energy Resources Corporation
Annual Energy and Peak Demand Forecasts

Year	Base Case		High Load Growth Case		Grid Defection Case	
	Energy Forecast (MWh, After EWR)	Peak Demand (MW)	Energy Forecast (MWh, After EWR)	Peak Demand (MW)	Energy Forecast (MWh, After EWR)	Peak Demand (MW)
2022	1,979,796	291.4	1,979,796	291.4	1,979,796	291.4
2023	1,979,372	291.1	2,133,308	316.4	1,977,393	290.8
2024	1,978,916	290.7	2,143,135	318.1	1,974,958	290.2
2025	1,978,438	290.5	2,153,197	319.8	1,972,503	289.7
2026	1,977,975	290.3	2,163,387	321.5	1,970,063	289.1
2027	1,977,520	290.0	2,173,738	323.3	1,967,632	288.5
2028	1,977,073	289.7	2,184,245	325.1	1,965,210	288.0
2029	1,976,633	289.4	2,194,912	326.9	1,962,797	287.4
2030	1,976,201	289.1	2,205,740	328.7	1,960,392	286.8
2031	1,975,777	288.9	2,216,732	330.6	1,957,995	286.3
2032	1,975,361	288.6	2,227,890	332.5	1,955,607	285.7
2033	1,974,952	288.3	2,239,217	334.4	1,953,227	285.1
2034	1,974,550	288.0	2,250,716	336.4	1,950,855	284.6
2035	1,974,156	287.8	2,332,906	349.1	1,948,492	284.0
2036	1,973,769	287.5	2,415,273	361.9	1,946,137	283.5
2037	1,973,390	287.2	2,533,078	380.1	1,943,789	282.9
2038	1,973,018	287.0	2,651,065	398.3	1,941,450	282.4
2039	1,972,654	286.7	2,769,236	416.5	1,939,118	281.8
2040	1,972,296	286.5	2,887,594	434.8	1,936,795	281.3
2041	1,971,946	286.2	3,041,402	458.5	1,934,479	280.8

Upper Michigan Energy Resources Corporation

Annual Sales Forecast By Class Level

Base Case (Generation Level)

Year	Residential	SC&I	LC&I (Excl. Mine)	Mine (WEPCO Only)	Street Lighting	Total (Excl. Company Use)	Company Use	Interdepartmental (WPSC)	Total
	Sales Forecast (MWh, After EWR)	Sales Forecast (MWh, After EWR)	Sales Forecast (MWh, After EWR)	Sales Forecast (MWh, After EWR)	Sales Forecast (MWh, After EWR)	Sales Forecast (MWh, After EWR)	Sales Forecast (MWh, After EWR)	Sales Forecast (MWh, After EWR)	Sales Forecast (MWh, After EWR)
2022	245,879	132,170	268,373	1,329,291	3,217	1,978,930	810	56	1,979,796
2023	246,038	131,630	268,373	1,329,291	3,174	1,978,507	810	56	1,979,372
2024	246,063	131,204	268,373	1,329,291	3,119	1,978,051	810	56	1,978,916
2025	246,024	130,823	268,373	1,329,291	3,062	1,977,573	810	56	1,978,438
2026	246,031	130,416	268,373	1,329,291	2,998	1,977,110	810	56	1,977,975
2027	246,040	130,015	268,373	1,329,291	2,936	1,976,655	810	56	1,977,520
2028	246,049	129,618	268,373	1,329,291	2,875	1,976,207	810	56	1,977,073
2029	246,060	129,227	268,373	1,329,291	2,817	1,975,768	810	56	1,976,633
2030	246,071	128,841	268,373	1,329,291	2,760	1,975,336	810	56	1,976,201
2031	246,083	128,460	268,373	1,329,291	2,704	1,974,912	810	56	1,975,777
2032	246,096	128,084	268,373	1,329,291	2,650	1,974,495	810	56	1,975,361
2033	246,110	127,714	268,373	1,329,291	2,598	1,974,086	810	56	1,974,952
2034	246,125	127,348	268,373	1,329,291	2,547	1,973,685	810	56	1,974,550
2035	246,141	126,987	268,373	1,329,291	2,498	1,973,291	810	56	1,974,156
2036	246,158	126,632	268,373	1,329,291	2,450	1,972,904	810	56	1,973,769
2037	246,175	126,282	268,373	1,329,291	2,403	1,972,525	810	56	1,973,390
2038	246,194	125,936	268,373	1,329,291	2,358	1,972,153	810	56	1,973,018
2039	246,214	125,596	268,373	1,329,291	2,314	1,971,788	810	56	1,972,654
2040	246,234	125,261	268,373	1,329,291	2,271	1,971,431	810	56	1,972,296
2041	246,256	124,931	268,373	1,329,291	2,230	1,971,080	810	56	1,971,946

Upper Michigan Energy Resources Corporation
Annual Sales Forecast By Class Level
High Load Growth (Generation Level)

Year	Residential	SC&I	LC&I (Excl. Mine)	Mine (WEPCO Only)	Street Lighting	Total (Excl. Company Use)	Company Use	Interdepartmental (WPSC)	Total
	Sales Forecast (MWh, After EWR)	Sales Forecast (MWh, After EWR)	Sales Forecast (MWh, After EWR)	Sales Forecast (MWh, After EWR)	Sales Forecast (MWh, After EWR)	Sales Forecast (MWh, After EWR)	Sales Forecast (MWh, After EWR)	Sales Forecast (MWh, After EWR)	Sales Forecast (MWh, After EWR)
2022	245,879	132,170	268,373	1,329,291	3,217	1,978,930	810	56	1,979,796
2023	303,903	163,360	331,706	1,329,291	3,977	2,132,238	1,001	69	2,133,308
2024	307,618	165,357	335,761	1,329,291	4,025	2,142,053	1,013	70	2,143,135
2025	311,421	167,402	339,912	1,329,291	4,075	2,152,101	1,025	71	2,153,197
2026	315,273	169,472	344,116	1,329,291	4,125	2,162,277	1,038	72	2,163,387
2027	319,185	171,575	348,386	1,329,291	4,177	2,172,614	1,051	73	2,173,738
2028	323,157	173,710	352,721	1,329,291	4,229	2,183,108	1,064	73	2,184,245
2029	327,189	175,877	357,122	1,329,291	4,281	2,193,760	1,077	74	2,194,912
2030	331,281	178,077	361,589	1,329,291	4,335	2,204,574	1,091	75	2,205,740
2031	335,436	180,311	366,124	1,329,291	4,389	2,215,551	1,104	76	2,216,732
2032	339,654	182,578	370,728	1,329,291	4,444	2,226,695	1,118	77	2,227,890
2033	343,935	184,879	375,401	1,329,291	4,500	2,238,007	1,132	78	2,239,217
2034	348,281	187,215	380,144	1,329,291	4,557	2,249,490	1,147	79	2,250,716
2035	379,348	203,915	414,053	1,329,291	4,964	2,331,571	1,249	86	2,332,906
2036	410,481	220,650	448,034	1,329,291	5,371	2,413,828	1,352	93	2,415,273
2037	455,009	244,586	496,636	1,329,291	5,954	2,531,476	1,498	103	2,533,078
2038	499,606	268,559	545,313	1,329,291	6,537	2,649,306	1,645	114	2,651,065
2039	544,272	292,569	594,066	1,329,291	7,122	2,767,320	1,792	124	2,769,236
2040	589,010	316,617	642,896	1,329,291	7,707	2,885,521	1,939	134	2,887,594
2041	647,146	347,867	706,351	1,329,291	8,468	3,039,124	2,131	147	3,041,402

Correct tie-outs	Tie-out excl. Mine	YOY Change
1,979,796	650,504	
2,133,308	804,016	23.599%
2,143,135	813,844	1.222%
2,153,197	823,906	1.236%
2,163,387	834,095	1.237%
2,173,738	844,446	1.241%
2,184,245	854,954	1.244%
2,194,912	865,621	1.248%
2,205,740	876,449	1.251%
2,216,732	887,441	1.254%
2,227,890	898,599	1.257%
2,239,217	909,926	1.261%
2,250,716	921,424	1.264%
2,332,906	1,003,615	8.920%
2,415,273	1,085,982	8.207%
2,533,078	1,203,787	10.848%
2,651,065	1,321,773	9.801%
2,769,236	1,439,944	8.940%
2,887,594	1,558,303	8.220%
3,041,402	1,712,110	9.870%

Upper Michigan Energy Resources Corporation
Annual Sales Forecast By Class Level
Grid Defection (Generation Level)

Year	Residential	SC&I	LC&I (Excl. Mine)	Mine (WEPCO Only)	Street Lighting	Total (Excl. Company Use)	Company Use	Interdepartmental (WPSC)	Total
	Sales Forecast (MWh, After EWR)	Sales Forecast (MWh, After EWR)	Sales Forecast (MWh, After EWR)	Sales Forecast (MWh, After EWR)	Sales Forecast (MWh, After EWR)	Sales Forecast (MWh, After EWR)	Sales Forecast (MWh, After EWR)	Sales Forecast (MWh, After EWR)	Sales Forecast (MWh, After EWR)
2022	245,879	132,170	268,373	1,329,291	3,217	1,978,930	810	56	1,979,796
2023	244,970	131,682	267,382	1,329,291	3,205	1,976,531	807	56	1,977,393
2024	244,050	131,187	266,377	1,329,291	3,193	1,974,099	804	55	1,974,958
2025	243,122	130,688	265,364	1,329,291	3,181	1,971,647	801	55	1,972,503
2026	242,200	130,192	264,358	1,329,291	3,169	1,969,211	797	55	1,970,063
2027	241,281	129,698	263,355	1,329,291	3,157	1,966,783	794	55	1,967,632
2028	240,366	129,206	262,356	1,329,291	3,145	1,964,364	791	55	1,965,210
2029	239,453	128,716	261,360	1,329,291	3,133	1,961,954	788	54	1,962,797
2030	238,544	128,227	260,368	1,329,291	3,121	1,959,552	785	54	1,960,392
2031	237,638	127,740	259,379	1,329,291	3,110	1,957,159	782	54	1,957,995
2032	236,736	127,255	258,394	1,329,291	3,098	1,954,774	779	54	1,955,607
2033	235,836	126,772	257,412	1,329,291	3,086	1,952,397	777	54	1,953,227
2034	234,940	126,290	256,434	1,329,291	3,074	1,950,029	774	53	1,950,855
2035	234,046	125,810	255,458	1,329,291	3,063	1,947,668	771	53	1,948,492
2036	233,156	125,331	254,487	1,329,291	3,051	1,945,316	768	53	1,946,137
2037	232,269	124,854	253,518	1,329,291	3,039	1,942,972	765	53	1,943,789
2038	231,385	124,379	252,553	1,329,291	3,028	1,940,635	762	53	1,941,450
2039	230,503	123,905	251,591	1,329,291	3,016	1,938,307	759	52	1,939,118
2040	229,625	123,433	250,633	1,329,291	3,005	1,935,986	756	52	1,936,795
2041	228,750	122,962	249,677	1,329,291	2,993	1,933,674	753	52	1,934,479

correct tie-outs	Tie-out excl. Mine	YOY Change
1,979,796	650,504	
1,977,393	648,102	-0.369%
1,974,958	645,667	-0.376%
1,972,503	643,212	-0.380%
1,970,063	640,772	-0.379%
1,967,632	638,341	-0.379%
1,965,210	635,919	-0.379%
1,962,797	633,505	-0.380%
1,960,392	631,100	-0.380%
1,957,995	628,704	-0.380%
1,955,607	626,316	-0.380%
1,953,227	623,936	-0.380%
1,950,855	621,564	-0.380%
1,948,492	619,201	-0.380%
1,946,137	616,845	-0.380%
1,943,789	614,498	-0.381%
1,941,450	612,159	-0.381%
1,939,118	609,827	-0.381%
1,936,795	607,503	-0.381%
1,934,479	605,188	-0.381%

STATE OF MICHIGAN

BEFORE THE MICHIGAN PUBLIC SERVICE COMMISSION

*** * * * ***

In the matter of the application of **UPPER MICHIGAN ENERGY RESOURCES** **CORPORATION** for approval of its integrated resource plan pursuant to MCL 460.6t and for other relief.	))))	Case No. U-21081

DIRECT TESTIMONY AND EXHIBIT OF

ROBERT A. GRECO

FOR

UPPER MICHIGAN ENERGY RESOURCES CORPORATION

Q. Please state your name, business address and position.

A. My name is Robert A. Greco. My business address is 231 West Michigan Street, Milwaukee, Wisconsin 53203. My current position is Director Air Quality & Projects, for WEC Business Services, LLC, a wholly owned subsidiary of WEC Energy Group, Inc. ("WEC").

Q. For whom are you providing testimony?

A. I am providing testimony on behalf of Upper Michigan Energy Resources Corporation ("UMERC" or the "Company"), which is a subsidiary of WEC.

Q. Please describe briefly your educational, professional, and utility background.

A. I received a Bachelor of Science in Mechanical Engineering from the University of Wisconsin – Milwaukee in 1986. In 2005, I received a Juris Doctor degree from Marquette University Law School. I have been employed by WEC Energy Group (or predecessor

companies) from 1986 to 1994 and 1999 to present in various engineering, project management and management positions.

Q. Have you previously testified before any regulatory agency?

A. Yes.

Q. What is the purpose of your direct testimony?

A. The purpose of my direct testimony is to introduce the Company's analysis regarding environmental justice and health impacts of UMERC's Integrated Resource Plan ("IRP") filing.

Q. Are you sponsoring any exhibits in this proceeding?

A. Yes, I am sponsoring Exhibit A-14 (RAG-1) – Emissions Data and Environmental Justice Discussion which was prepared by Trinity Consultants, Inc. ("Trinity") at my direction. This exhibit provides UMERC's annual emissions forecasts for the IRP planning period and a total emissions forecast for the entire IRP planning period. Furthermore, the exhibit contains five answers to environmental justice questions provided by staff of Michigan's Department of Environment, Great Lakes and Energy ("EGLE").

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

A. Yes, it was.

Q. Describe your role in preparing UMERC's IRP Filing.

A. I retained and directly oversaw Trinity to perform the analysis in Exhibit A-14 (RAG-1) and provided the information internally for inclusion in UMERC's IRP filing.

Q. What air quality regulations will be applicable to UMERC's A. J. Mihm and F. D. Kuester Generating Stations?

A. The RICE units are subject to the New Source Performance Standards ("NSPS") codified at 40 CFR Part 60 Subpart JJJJ and the National Emission Standards for Hazardous Air Pollutants ("NESHAP") for Stationary Reciprocating Internal Combustion Engines codified at 40 CFR Part 63 Subpart ZZZZ, also referred to as the "RICE MACT". Additionally, EGLE has issued Permits to Install No. 34-17B and 35-17B along with Renewable Operating Permit Nos. MI-ROP-P0796-2020 and MI-ROP-P0797-2020 for the A.J. Mihm and F.D. Kuester Generating Stations, respectively. These permits contain various other air emission limits, monitoring, recordkeeping, and reporting requirements, necessary for EGLE to ensure each facility operates in compliance with all air quality regulations and requirements applicable to each electric generating facility.

Q. Describe other federal permits and regulations applicable to UMERC's generating resources.

A. No additional environmental permits apply to the A.J. Mihms or F.D. Kuester Generating Stations. No air pollution requirements will apply to the proposed solar generation. Permits from the U.S. Army Corps of Engineers would be required if there will be impacts to wetlands or waterways under federal jurisdiction, and from the U.S. Fish and Wildlife Service if there will be impacts to federally-listed endangered or threatened species. The federal permit process also takes into account potential impacts to objects and/or sites in the National Register of Historic Places; this process may involve the Michigan State Historic Preservation Office.

Q. Describe other State of Michigan Permits and Regulations applicable to UMERC's generating resources.

No additional environmental permits apply to the A.J. Mihms or F.D. Kuester Generating Stations. No air pollution requirements will apply to the proposed solar generation. Permits from EGLE would be required if there will be wetland or wateeway impacts, floodplain impacts, construction activities which disturb one or more acres of land, or impacts associated with leaking underground storage tanks. Approvals from the Michigan Department of Natural Resources ("MDNR") would be required for impacts to state listed endangered or threatened species.

Q. Does UMERC's modeling include any expected capital costs for environmental compliance?

A. Not at this time.

Q. Describe UMERC's process to comply with all applicable federal and state environmental regulations, laws and rules.

A. The UMERC electric generating unit engines are equipped with state-of-the-art air quality control systems including selective catalytic reduction ("SCR") for nitrogen oxides ("NOx") control and oxidation catalyst systems for carbon monoxide ("CO"), volatile organic compound ("VOC"), and organic hazardous air pollutant ("HAP") control. To adhere to (Federal & State) requirements within the Title V Renewable Operating Permit ("ROP"), parameters such as SCR inlet temperature, pressure drop across the oxidation catalysts and reagent dosing are monitored to verify emission control equipment performance. Included with that is completing required maintenance and inspections according to the ROP and manufacture specifications. Required performance stack testing occurs every 8,760 operating hours for NOx, CO, and VOC's (40 CFR 60 subpart JJJJ) and annually to confirm formaldehyde limitations (RICE MACT, 40 CFR 63 subpart

ZZZZ). Performance testing for PM is completed every 5 years (40 CFR 52). Per the Title V ROP, requirements are verified every six months in the semiannual monitoring and RICE MACT (40 CFR 63 subpart ZZZZ) report along with being certified annually in the annual certification and annual RICE MACT report.

Projects related to compliance include required inspections, maintenance, replacements and overhauls of various RICE unit components and their respected emission control equipment components according to manufacture specifications.

Q. Are UMERC's A. J. Mihm and F. D. Kuester Generating Stations currently in compliance with all appliacable environmental requirements?

A. Yes.

Q. Are UMERC's A.J. Mihm and F.D. Kuester Generating Stations expected to remain compliant with the applicable environmental regulations under UMERC's Preferred Course of Action ("PCA")?

A. Yes.

Q. Describe the initiative issued by Governor Whitmer regarding environmental justice and health impacts of UMERC's IRP filing.

A. On September 23, 2020, Governor Whitmer issued her Executive Directive No. 2020-10, entitled Building a Carbon Neutral Michigan. In this Executive Directive, the Governor required EGLE to expand its environmental advisory opinion, issued consistent MCL 460.6t(7), "evaluate the potential impacts of proposed energy generation resources and alternatives to those resources, and also evaluate whether the IRPs filed by the utilities are consistent with the emission reduction goals included in this Directive." The Governor

further directed EGLE to include considerations of environmental justice and health impacts under the Michigan Environmental Protection Act."

Q. Does UMERC's IRP provide analyses consistent with Executive Directive No. 2020-10?

A. Yes.

Q. Who completed UMERC's analysis of environmental justice and health impacts for this IRP filing?

A. Trinity was engaged by WEC to perform this analysis at my direction and with my oversight. Trinity is a leading environmental consulting firm with expertise in many areas including air quality. Trinity has significant experience with providing support to its clients related to environmental justice, including planning and due diligence, risk and impact reviews, and screening assessments. Trinity routinely completes health risk assessments of impacts on disadvantaged communities as part of permitting that it completes for its clients.

Q. What data sources did UMERC and its consultant employ to analyze the environmental justice and health impacts of the IRP?

A. Trinity utilized the U.S. Environmental Protection Agency's ("EPA") Environmental Justice ("EJ") Screening tool and EPA's Technical Support Document entitled, "Estimating the Benefit per Ton of Reducing PM2.5 Precursors from 17 Sectors", dated February 2018.

Q. Does UMERC intend to hold a technical conference with MPSC and EGLE to discuss the environmental and emission related data included in the filing testimony, exhibits and work papers.

A. Yes. UMERC will work with MPSC and EGLE staff to schedule a technical conference within 30 days following submittal of this IRP.

Q. Can you summarize the comparison of the expected changes in criteria pollutant emissions of the PCA to the Business as Usual ("BAU") scenarios in UMERC's IRP?

A. UMERC's PCA includes continuing operation of the F.D. Kuester and A.J. Mihm Generating Stations ("Existing Facilities"). UMERC's PCA is very similar to the BAU with the notable exception of the proposed addition of 100 MW of solar generation. The proposed solar generation will not generate additional criteria pollutant emissions, so UMERC has conservatively assumed a slight reduction, or a worst-case scenario of zero change, in UMERC's overall criteria pollutant emissions levels.

During calendar years 2019 and 2020, the Existing Facilities generated average annual emissions as listed in the table below. In addition, market purchases are equal to approximately 1 percent of annual generation for a total of 7,043 MWh per year.

2019-2020 Average Annual Emissions[1] & Generation
A.J. Mihm and F.D. Kuester Generating Stations

Pollutant	CO (ton/yr)	NO_X (ton/yr)	PM_{10} (ton/yr)	$PM_{2.5}$ (ton/yr)	SO_2 (ton/yr)	VOC (ton/yr)	Generation (MWh)
A.J. Mihm	22.34	19.51	5.13	5.13	0.62	13.92	216,830
F.D. Kuester	57.10	48.81	12.49	12.63	1.31	32.90	487,472
MISO Purchases[2]	0.96	1.57	0.21	0.18	2.00	0.07	7,043

1. As reported to the Michigan Air Emissions Reporting System (MAERS)
2. EIA-923 data, NEI data & Environ. Sci. Technol. 2017, 51, 14445−14452

PCA emissions are expected to be very similar, if not slightly reduced, to these average actual emissions as reported to EGLE.

Q. Please summarize the analysis comparing the PCA to the optimal build plans from the BAU, Environmental Policy ("EP"), and Emerging Technologies ("ET") scenarios?

A. UMERC has evaluated various build plans (BAU, PCA, EP, and ET). All build plans are essentially the same as BAU with the PCA involving the continued operation of its Existing Michigan Facilities. The only difference among the various build plans is the possible addition of 100 MW of solar generation.

None of the various build plans evaluated will materially impact water quality, use, or discharges. UMERC's Existing Facilities do not have wastewater discharges beyond domestic use for its employees and stormwater management. The installation of the identified solar generation will also have minimal impact to water resources, as these facilities will also manage stormwater in compliance with all applicable requirements.

Air emission impacts due to the various build plans evaluated are also minimal as no changes from the current level of emissions are proposed. To the extent the identified solar generation offsets generation from the Existing Facilities, air emissions will proportionately decrease.

Likewise, the various plans evaluated do not generate negative impacts to public health, the climate, or vulnerable communities compared with the BAU scenario.

Q. Are any non-attainment areas located within UMERC's service territory?

A. No, there are not any nonattainment areas in UMERC's service territory. As such, no consideration of SO2, ozone, or their precursors (NOx, and PM 2.5) was provided in UMERC's analysis.

Q. Please summarize UMERC's qualitative analysis of PM2.5 impacts to areas identified as vulnerable by the EPA EJ Screening tool.

A. Using EPA's EJ Screening tool, the areas within a 3-mile radius of each of the UMERC Existing Facilities were assessed to identify any vulnerable areas. Results of this

assessment are presented in Exhibit A-14 (RAG-1) for UMERC's A.J. Mihm and F.D. Kuester Generating Stations, respectively.

Regarding PM2.5 impacts, there are no sensitive communities that are, or will be, impacted by either of the UMERC Existing Facilities under the proposed PCA. Also, both the A.J. Mihm and F.D. Kuester Generating Stations were permitted less than 2 years ago, so the air quality modeling associated with the permit applications for both facilities is still current. This modeling shows that the F.D. Kuester facility generates an insignificant PM2.5 impact and that the A.J. Mihm facility generates air impacts less than 12% of the National Ambient Air Quality Standards ("NAAQS") for PM2.5. Based on the EJ Screening assessment, both of facilities are located in areas that are not overburdened by PM2.5 pollution.

Q. Are there any other items related to UMERC's EJ analysis you would like to note?

A. Yes, Exhibit A-14 (RAG-1) Table 2 shows that the area surrounding the A.J. Mihm Generating Station is sensitive to wastewater discharges. However, the A.J. Mihm facility does not discharge wastewater and is not projected to discharge wastewater under any of the planning scenarios evaluated.

Q. Provide EPA metrics to quantify health benefits related to air emissions listed in Exhibit A-14 (RAG-1) and for UMERC's various planning scenarios.

A. As described above, air emissions are expected to remain constant under all of UMERC's planning scenarios. UMERC has conservatively assumed that the PCA will result in the same air emission ascurrent levels, under the BAU scenario. Nevertheless, the addition of 100 MW of solar to offset energy prices may replace some fossil fuel generation. Should

the addition of 100 MW of solar offset the use of natural gas, emissions are expected to decrease proportionately.

Q. Does this conclude your direct testimony at this time?

A. Yes, it does.

Emissions Data and Environmental Justice Discussion

Prepared by: Trinity Consulting

1. **Hold a technical conference with MPSC and EGLE staff within 30 days of the filing to discuss the environmental and emission related data included in the filing testimony, exhibits and workpapers.**

   UMERC will schedule a technical conference with MPSC and EGLE following submittal of its IRP.

2. **Identify, quantify, and provide testimony that compares the expected changes in criteria pollutant emissions of the Proposed Course of Action (PCA) to the Business as Usual (BAU) build plan in the BAU scenario. The company will use a proxy to determine the emissions from MISO purchases and will run the BAU scenario with two build plans: BAU base case build plan and PCA build plan.**

   UMERC's PCA plan includes continuing operation of its two Michigan facilities (F.D. Kuester and A.J. Mihm Generating Stations). UMERC's PCA is identical to its BAU with the possibility of adding wind and/or solar generation to offset natural gas generation at the two existing facilities. Because the extent of wind or solar additions are not yet known, a conservative environmental approach assumes no solar or wind will be added. Therefore, very small, if any, emissions changes are expected.

   During calendar years 2019 and 2020, the two facilities generated average annual emissions as listed in Table 1. In addition, MISO purchases are equal to approximately 1 percent of annual generation for a total of 7,043 MWh per year.

TABLE 1
2019-2020 Average Annual Emissions[1] & Generation
A.J. Mihm and F.D. Kuester Generating Stations

Pollutant	CO (ton/yr)	NO_X (ton/yr)	PM_{10} (ton/yr)	$PM_{2.5}$ (ton/yr)	SO_2 (ton/yr)	VOC (ton/yr)	Generation (MWh)
A.J. Mihm	22.34	19.51	5.13	5.13	0.62	13.92	216,830
F.D. Kuester	57.10	48.81	12.49	12.49	1.31	32.90	487,472
MISO Purchases[2]	0.96	1.57	0.21	0.18	2.00	0.07	7,043

1. As reported to the Michigan Air Emissions Reporting System (MAERS)
2. EIA-923 data, NEI data & Environ. Sci. Technol. 2017, 51, 14445−14452

PCA emissions are expected to be very similar to these average actual emissions as reported to EGLE. Annual emissions for all years of the projection period are presented in Table 2 below.

TABLE 2 Projected Annual Emissions A.J. Mihm and F.D. Kuester Generating Stations						
Pollutant	2022	2023	2024	2025	2026	2027
CO_2 (ton/yr)	713.38	713.38	713.38	713.38	713.38	713.38
NO_X (ton/yr)	69.89	69.89	69.89	69.89	69.89	69.89
PM_{10} (ton/yr)	17.83	17.83	17.83	17.83	17.83	17.83
$PM_{2.5}$ (ton/yr)	17.80	17.80	17.80	17.80	17.80	17.80
SO_2 (ton/yr)	3.92	3.92	3.92	3.92	3.92	3.92
Hg (lb/yr)	0.27	0.27	0.27	0.27	0.27	0.27

Pollutant	2028	2029	2030	2031	2032	2033
CO_2 (ton/yr)	713.38	713.38	713.38	713.38	713.38	713.38
NO_X (ton/yr)	69.89	69.89	69.89	69.89	69.89	69.89
PM_{10} (ton/yr)	17.83	17.83	17.83	17.83	17.83	17.83
$PM_{2.5}$ (ton/yr)	17.80	17.80	17.80	17.80	17.80	17.80
SO_2 (ton/yr)	3.92	3.92	3.92	3.92	3.92	3.92
Hg (lb/yr)	0.27	0.27	0.27	0.27	0.27	0.27

Pollutant	2034	2035	2036	2037	2038	2039
CO_2 (ton/yr)	713.38	713.38	713.38	713.38	713.38	713.38
NO_X (ton/yr)	69.89	69.89	69.89	69.89	69.89	69.89
PM_{10} (ton/yr)	17.83	17.83	17.83	17.83	17.83	17.83
$PM_{2.5}$ (ton/yr)	17.80	17.80	17.80	17.80	17.80	17.80
SO_2 (ton/yr)	3.92	3.92	3.92	3.92	3.92	3.92
Hg (lb/yr)	0.27	0.27	0.27	0.27	0.27	0.27

Pollutant	2040	2041	Total
CO_2 (ton/yr)	713.38	713.38	14,267.6
NO_X (ton/yr)	69.89	69.89	1,397.8
PM_{10} (ton/yr)	17.83	17.83	356.6
$PM_{2.5}$ (ton/yr)	17.80	17.80	356
SO_2 (ton/yr)	3.92	3.92	78.4
Hg (lb/yr)	0.27	0.27	5.4

3. Analyze multiple build plans, including the Proposed Course of Action (PCA) and the optimal build plans from the Business As Usual (BAU), Environmental Policy (EP), and Emerging Technologies (ET) scenario to identify and qualitatively assess the potential impacts to vulnerable communities. This assessment should address water quality, water use, water discharge, waste disposal, air emissions, public health, climate,

environmental justice, early retirement, and other considerations that were taken into account in the Company's decision.

UMERC has evaluated various build plans (BAU, PCA, EP, and ET). All build plans are essentially the same as BAU with the PCA involving the continued operation of its two existing Michigan facilities (F.D. Kuester and A.J. Mihm Generating Stations). The only difference among the various build plans is the possibility of adding wind and/or solar generation to offset natural gas generation at the two existing facilities. Because the extent of wind or solar additions are not yet known, a conservative environmental approach assumes no solar or wind will be added.

None of the various build plans evaluated will impact water quality, use, or discharges. UMERC does not impact water use or discharge beyond domestic use for its employees and stormwater management for its two existing facilities. Any solar or wind generation installed will also have minimal impact to water resources as these facilities will also manage stormwater in compliance with all applicable requirements.

Air emission impacts due to the various build plans evaluated are also minimal as no changes from the current level of emissions are proposed. To the extent solar or wind generation is added to offset generation at the existing facilities, air emissions will decrease.

Likewise, the various plans evaluated do not generate impacts to public health, the climate, or vulnerable communities compared with the BAU scenario as all plans are essentially the same as the BAU scenario.

4. **Identify and assess the impact of the Proposed Course of Action (PCA) to any non-attainment area within the electric utility service territory and qualitatively support in testimony. Impacts should consider SO2 and ozone, as well as their precursors NOx, and PM 2.5.**

   No nonattainment areas are impacted.

5. **Using the areas identified as vulnerable by the Michigan Environmental Justice Screening tool, or equivalent (see #3 above) complete a more comprehensive qualitative evaluation of PM2.5 impacts to these communities, describing expected air quality impacts, including the effect of an early retirement. This qualitative evaluation could consider stack height, meteorological data, dispersion factors and other inputs used to conduct typical dispersion modeling for a given pollutant.**

   Using EPA's EJ Screen tool, the areas within a 3-mile radius of each UMERC facility was assessed to identify any vulnerable areas. Results of this assessment are presented in Tables 3 and 4 below for UMERC's AJ Mihm and FD Kuester Generating Stations.

   Table 3 shows that the area surrounding the AJ Mihm Generating Station is sensitive to wastewater discharges. However, the AJ Mihm facility does not discharge wastewater and is not projected to discharge wastewater under any of the planning scenarios evaluated. Therefore, this parameter is not relevant to UMERC's PCA.

Regarding PM2.5 impacts, there are no sensitive communities that are, or will be, impacted by either of the UMERC facilities under the proposed PCA. Also, both the AJ Mihm and FD Kuester Generating Stations were permitted less than 2 years ago, the air quality modeling associated with the permit applications for both facilities is still current. This modeling shows that the FD Kuester facility generates an insignificant PM2.5 impact and that the AJ Mihm facility generates air impacts less than 12% of the National Ambient Air Quality Standards (NAAQS) for PM2.5. Based on the EJ Screen assessment, both of these facilities are located in areas that are not overburdened by PM2.5 pollution.

Table 3. AJ Mihm Generating Station - EJ Indices

EJ Index[1]	State Percentile[2]		Environmental Indicator	1 Mile		3 Miles	
	1 Mile	3 Miles		Value	Percentile in State	Value	Percentile in State
PM 2.5	52	52	$PM_{2.5}$ (PM 2.5 in µg/m^3)	5.10	0	5.10	0
Ozone	47	47	Ozone (ppb)	33.6	0	33.6	0
NATA Diesel PM	67	67	NATA Diesel PM (µg/m^3)	0.0423	0	0.0423	0
NATA Air Toxics Cancer Risk	52	52	NATA Air Toxics Cancer Risk (lifetime risk per million)	14	0	14	0
NATA Respiratory Hazard Index	54	55	NATA Respiratory Hazard Index	0.15	0	0.15	0
Traffic Proximity and Volume	55	55	Traffic Proximity and Volume (daily traffic count/distance to road)	15	17	16	18
Lead Paint Indicator	22	23	Lead Paint Indicator (% Pre-1960 Housing)	0.37	59	0.37	58
Superfund Proximity	61	61	Superfund Proximity (site count/km distance)	0.018	4	0.019	4
RMP Proximity	69	69	RMP Proximity (facility count/km distance)	0.018	1	0.019	1
Hazardous Waste Proximity	68	68	Hazardous Waste Proximity (facility count/km distance)	0.019	1	0.019	2
Wastewater Discharge Indicator	83	83	Wastewater Discharge Indicator (toxicity-weighted conc./m distance)	4.5E-10	34	5.5E-10	34

Table 4. FD Kuester Generating Station - EJ Indices

EJ Index[1]	State Percentile[2]		Environmental Indicator	1 Mile		3 Miles	
	1 Mile	3 Miles		Value	Percentile in State	Value	Percentile in State
PM 2.5	53	38	$PM_{2.5}$ (PM 2.5 in µg/m^3)	5.41	1	5.39	1
Ozone	50	33	Ozone (ppb)	34.1	1	34.1	1
NATA Diesel PM	66	60	NATA Diesel PM (µg/m^3)	0.0532	0	0.0534	0
NATA Air Toxics Cancer Risk	54	39	NATA Air Toxics Cancer Risk (lifetime risk per million)	15	0	15	1
NATA Respiratory Hazard Index	56	42	NATA Respiratory Hazard Index	0.16	0	0.16	0
Traffic Proximity and Volume	50	36	Traffic Proximity and Volume (daily traffic county/distance to road)	37	25	70	33
Lead Paint Indicator	37	25	Lead Paint Indicator (% Pre-1960 Housing)	0.26	45	0.23	40
Superfund Proximity	67	63	Superfund Proximity (site count/km distance)	0.010	1	0.010	1
RMP Proximity	70	69	RMP Proximity (facility count/km distance)	0.013	0	0.013	0
Hazardous Waste Proximity	52	36	Hazardous Waste Proximity (facility count/km distance)	0.140	25	0.250	36
Wastewater Discharge Indicator	25	11	Wastewater Discharge Indicator (toxicity-weighted conc./m distance)	6.1E-04	65	1.5E-02	83

[1]The 80th percentile is the level above which EPA typically suggests that additional review would be appropriate
[2]Data comes from EJSCREEN Standard Report generated using EJSCREEN

6. Include EPA metrics to quantify health benefits related to air emissions listed above. For guidance, consider the following EPA reports and tools: "Quantifying the Emissions and Health Benefits of Energy Efficiency and Renewable Energy", the "Co-Benefits Risk Assessment (COBRA) Health Impacts Screening and Mapping Tool", and/or "Environmental Benefits Mapping and Analysis Program- Community Edition (BenMAP-CE)".

Include EPA metrics to describe health benefits related to air emission reductions pending the scenarios listed above. For guidance, consider the following EPA reports and tools: "Quantifying the Emissions and Health Benefits of Energy Efficiency and Renewable Energy", the "Co-Benefits Risk Assessment (COBRA) Health Impacts Screening and Mapping Tool", or other appropriate health screening tools.

As described above, UMERC's PCA will not increase emissions above the BAU scenario. If solar or wind generation is added to offset the use of natural gas, emissions will decrease accordingly. The largest emissions change possible is the complete replacement of the AJ Mihm and FD Kuester facilities with a combination of solar and wind generation. This would be equivalent to the retirement of the two facilities.

Utilizing EPA's "Technical Support Document, Estimating the Benefit per Ton of Reducing PM2.5 Precursors from 17 Sectors", February 2018 (2018 TSD), UMERC evaluated the health benefits that would be associated with the elimination of both the AJ Mihm and FD Kuester Generating Stations. Table 5 identifies the benefits in terms of dollars associated with the elimination of all PM2.5 and PM2.5 precursor emissions from UMERC's two facilities. These monetary benefits are presented as a range of costs associated with different reference methods used within the 2018 TSD. Table 6 identifies the benefits in terms of incidence of avoided mortalities and morbidities associated with the elimination of all PM2.5 and PM2.5 precursor emissions from UMERC's two facilities.

Tables 5 and 6 are based on emissions from the AJ Mihm and FD Kuester Generating Stations only. Emissions associated with purchased power from MISO will not impact the same geographic areas as these two facilities.

Table 5

Dollar Value of PM2.5 & PM2.5 Precursor Emission Reductions from the Electric Generating Sector - 2020 Projection based on 2015$*

Pollutant	NO_X	SO_2	$PM_{2.5}$, primary	Total Benefit
Min ($/ton)	$ 5,600.00	$ 38,000.00	$ 140,000.00	$ 2,922,161.77
Max ($/ton)	$ 14,000.00	$ 96,000.00	$ 350,000.00	$ 7,307,334.14
Tons Reduced	68.32	1.93	17.62	

* 2018 TSD, Table 65

Dollar Value of PM2.5 & PM2.5 Precursor Emission Reductions from the Electric Generating Sector - 2025 Projection based on 2015$**

Pollutant	NO_X	SO_2	$PM_{2.5}$, primary	Total Benefit
Min ($/ton)	$ 6,000.00	$ 41,000.00	$ 150,000.00	$ 3,131,438.96
Max ($/ton)	$ 15,000.00	$ 100,000.00	$ 370,000.00	$ 7,735,693.42
Tons Reduced	68.32	1.93	17.62	

** 2018 TSD, Table 99

Dollar Value of PM2.5 & PM2.5 Precursor Emission Reductions from the Electric Generating Sector - 2030 Projection based on 2015$***

Pollutant	NO_X	SO_2	$PM_{2.5}$, primary	Total Benefit
Min ($/ton)	$ 6,500.00	$ 45,000.00	$ 160,000.00	$ 3,349,478.05
Max ($/ton)	$ 16,000.00	$ 110,000.00	$ 410,000.00	$ 8,527,949.70
Tons Reduced	68.32	1.93	17.62	

*** 2018 TSD, Table 133

Table 6

Health Endpoints Incidence (2020)*	NOx		SO_2		$PM_{2.5}$, primary		Total
	Per Ton	Total	Per Ton	Total	Per Ton	Total	
Premature Mortality (min)	0.00066	0.045	0.0045	0.009	0.016	0.284	0.338
Premature Mortality (max)	0.0015	0.102	0.01	0.019	0.037	0.657	0.779
Respiratory Emergency Room Visits	0.00032	0.022	0.0022	0.004	0.0091	0.160	0.186
Acute Bronchitis	0.00085	0.058	0.0055	0.011	0.021	0.370	0.439
Lower Respiratory Symptoms	0.011	0.752	0.07	0.135	0.27	4.756	5.643
Upper Respiratory Symptoms	0.016	1.093	0.1	0.193	0.39	6.870	8.156
Minor Restricted Activity Days	0.46	31.428	3	5.789	12	211.391	248.608
Work Loss Days	0.077	5.261	0.51	0.984	2	35.232	41.477
Asthma Exacerbation	0.018	1.230	0.12	0.232	0.46	8.103	9.565
Cardiovascular Hospital Admissions	0.00016	0.011	0.0011	0.002	0.004	0.070	0.084
Respiratory Hospital Admissions	0.00015	0.010	0.0011	0.002	0.0038	0.067	0.079
Non-fatal Heart Attacks (Peters)	0.00063	0.043	0.0045	0.009	0.016	0.282	0.334
Non-fatal Heart Attacks (All others)	0.000068	0.005	0.00049	0.001	0.0017	0.030	0.036
Health Endpoints Incidence (2025)*	**NOx**		**SO_2**		**$PM_{2.5}$, primary**		**Total**
	Per Ton	**Total**	**Per Ton**	**Total**	**Per Ton**	**Total**	
Premature Mortality (min)	0.0007	0.048	0.0048	0.009	0.017	0.299	0.357
Premature Mortality (max)	0.0016	0.109	0.011	0.021	0.039	0.687	0.818
Respiratory Emergency Room Visits	0.00033	0.023	0.0023	0.004	0.0094	0.166	0.193
Acute Bronchitis	0.00089	0.061	0.0057	0.011	0.022	0.388	0.459
Lower Respiratory Symptoms	0.011	0.752	0.073	0.141	0.29	5.109	6.001
Upper Respiratory Symptoms	0.016	1.093	0.1	0.193	0.41	7.223	8.509
Minor Restricted Activity Days	0.46	31.428	3	5.789	12	211.391	250.288248.608

Work Loss Days	0.077	5.261	0.52	1.003	2	35.232	41.496
Asthma Exacerbation	0.019	1.298	0.12	0.232	0.48	8.456	9.985
Cardiovascular Hospital Admissions	0.00017	0.012	0.0012	0.002	0.0044	0.078	0.091
Respiratory Hospital Admissions	0.00017	0.012	0.0012	0.002	0.0043	0.076	0.090
Non-fatal Heart Attacks (Peters)	0.00068	0.046	0.0049	0.009	0.018	0.317	0.373
Non-fatal Heart Attacks (All others)	0.000074	0.005	0.00054	0.001	0.0019	0.033	0.040
Health Endpoints Incidence (2030)*	**NOx**		**SO_2**		**$PM_{2.5}$, primary**		**Total**
	Per Ton	**Total**	**Per Ton**	**Total**	**Per Ton**	**Total**	
Premature Mortality (min)	0.00074	0.051	0.0051	0.010	0.018	0.317	0.377
Premature Mortality (max)	0.0017	0.116	0.011	0.021	0.042	0.740	0.877
Respiratory Emergency Room Visits	0.00034	0.023	0.0024	0.005	0.0098	0.173	0.200
Acute Bronchitis	0.00096	0.066	0.0062	0.012	0.024	0.423	0.500
Lower Respiratory Symptoms	0.012	0.820	0.079	0.152	0.31	5.461	6.433
Upper Respiratory Symptoms	0.017	1.161	0.11	0.212	0.44	7.751	9.125
Minor Restricted Activity Days	0.46	31.428	3.1	5.982	12	211.391	248.801
Work Loss Days	0.078	5.329	0.53	1.023	2.1	36.993	43.345
Asthma Exacerbation	0.02	1.366	0.13	0.251	0.51	8.984	10.601
Cardiovascular Hospital Admissions	0.00018	0.012	0.0014	0.003	0.0048	0.085	0.100
Respiratory Hospital Admissions	0.00018	0.012	0.0013	0.003	0.0047	0.083	0.098
Non-fatal Heart Attacks (Peters)	0.00074	0.051	0.0053	0.010	0.019	0.335	0.395
Non-fatal Heart Attacks (All others)	0.000079	0.005	0.00058	0.001	0.0021	0.037	0.044
* 2020 data from 2018 TSD Table 66; 2025 data from Table 100; 2030 data from Table 134							

MICHIGAN DEPARTMENT OF LICENSING AND REGULATORY AFFAIRS
PUBLIC SERVICE COMMISSION

ENTRY OF APPEARANCE IN AN ADMINISTRATIVE HEARING

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Please Note: *The Commission will provide* ***electronic*** *service of documents to all parties in this proceeding.*

THIS APPEARANCE TO BE ENTERED IN ASSOCIATION WITH THE ADMINISTRATIVE HEARING:

Case / Company Name: Upper Michigan Energy Resources Corporation Docket No. U-21081

Please enter my appearance in the above-entitled matter on behalf of:

1. (Name) Upper Michigan Energy Resources Corporation
2. (Name)
3. (Name)
4. (Name)
5. (Name)
6. (Name)
7. (Name)

Name Paul M. Collins

Address One Michigan Avenue, Ste. 900

City Lansing State MI

Zip 48933 Phone (517) 483-4954

Email collinsp@millercanfield.com

Date October 15, 2021

Signature: Paul M. Collins
Digitally signed by: Paul M. Collins
DN: CN = Paul M. Collins email = collinsp@millercanfield.com C = US O = Miller Canfield
Date: 2021.10.15 15:05:04 -04'00'

☐ I am not an attorney

☑ I am an attorney whose:

Michigan Bar # is P-69719

_____Bar # is: _____
(state)

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Please enter my appearance in the above-entitled matter on behalf of:

1. (Name) Upper Michigan Energy Resources Corporation
2. (Name)
3. (Name)
4. (Name)
5. (Name)
6. (Name)
7. (Name)

Name Sherri A. Wellman

Address One Michigan Avenue, Ste. 900

City Lansing State MI

Zip 48933 Phone (517) 483-4954

Email wellmans@millercanfield.com

Date October 15, 2021

Signature: Sherri Wellman

Digitally signed by: Sherri Wellman
DN: CN = Sherri Wellman email = wellmans@millercanfield.com C = US O = Miller Canfield
Date: 2021.10.15 15:05:51 -04'00'

☐ I am not an attorney

☑ I am an attorney whose:

Michigan Bar # is P-38989

_____Bar # is: _____
(state)

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