**STATE OF INDIANA**

**INDIANA UTILITY REGULATORY COMMISSION**

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|---|---|---|
| **VERIFIED PETITION OF INDIANA MICHIGAN POWER COMPANY (I&M) FOR APPROVAL OF RENEWABLE ENERGY PURCHASE AGREEMENTS WITH THE HOOSIER LINE SOLAR PROJECT AND THE MEADOW LAKE IV WIND PROJECT (CLEAN ENERGY PPA PROJECTS) AS CLEAN ENERGY PROJECTS AND ASSOCIATED ACCOUNTING AND RATEMAKING, INCLUDING TIMELY COST RECOVERY, UNDER IND. CODE § 8-1-8.8-11.** | **CAUSE NO.** | 46088 |

**SUBMISSION OF DIRECT TESTIMONY OF MARK A. BECKER**

Petitioner Indiana Michigan Power Company ("Petitioner" or "I&M"), by counsel, hereby submits the direct testimony and attachments of Mark A. Becker.

Respectfully submitted,

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## CERTIFICATE OF SERVICE

The undersigned hereby certifies that a copy of the foregoing was served this 20th day of June, 2024, by email transmission, hand delivery or United States Mail, first class, postage prepaid to:

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**INDIANA MICHIGAN POWER COMPANY**

# PRE-FILED VERIFIED DIRECT TESTIMONY

# OF

# MARK A. BECKER

## Contents

**DIRECT TESTIMONY OF MARK A. BECKER**
**ON BEHALF OF**
**INDIANA MICHIGAN POWER COMPANY**

## I. Introduction of Witness

**Q1. Please state your name and business address.**

My name is Mark A. Becker, and my business address is 212 East Sixth Street, Tulsa, Oklahoma.

**Q2. By whom are you employed and in what capacity?**

I am employed by American Electric Power Service Corporation (AEPSC) in the Integrated Resource Planning and Strategy group as a Managing Director of Resource Planning and Operational Analysis.

**Q3. What are your responsibilities as Managing Director of Resource Planning and Operational Analysis?**

I am responsible for the coordination and performance of long-term generation resource planning studies for Indiana Michigan Power Company (I&M or the Company) and the other regulated operating companies within American Electric Power Company, Inc. (AEP).

**Q4. Please briefly describe your educational background and business experience.**

I received a Bachelor of Science degree in Electrical Engineering from the University of Arkansas in 1983. I have over 40 years of experience working for investor-owned and municipal electric utilities and energy trading companies. The majority of my experience, approximately 35 years, has been related to performing a utility's resource planning and operational analysis functions using the proprietary long-term resource optimization software models known as

Strategist® and PLEXOS®. The PLEXOS® studies include the development of Integrated Resource Plans.

**Q5. Have you previously testified before this regulatory commission?**

Yes. I have previously testified before the Commission in Cause No. 45868, that sought the approval of purchase power agreements and ownership of solar energy resources. In addition, I also testified in Cause No. 45869 that sought the approval of a short-term capacity only purchase power agreement. I am also currently testifying in Cause No. 46083 that is seeking the approval of a short-term capacity only purchase power agreement. I have also provided testimony in regulatory proceedings on behalf of AEP regulated operating companies in Michigan, Arkansas, Texas, Louisiana, Oklahoma and Kentucky.

**Q6. Are you sponsoring any attachments in this proceeding?**

Yes, I am sponsoring the following attachments:

- Attachment MAB-1 IRP Report and Appendix 1
- Attachment MAB-2 IRP Appendix 2
- Attachment MAB-3 and 3C public and confidential versions of IRP Appendix 3
- Attachment MAB-4 IRP Appendix 4
- Attachment MAB-5 2021 IRP September 29, 2023 – IRP Update submitted to the Commission
- Attachment MAB-6 Confidential Highly Sensitive – CPCN POA Generic Unit Assumptions
- Attachment MAB-7 Confidential - CPCN POA Brattle Adjustments
- Attachment MAB-8 Confidential - CPCN REC Price Forecast

**Q7. Are you sponsoring any workpapers?**

Yes, I am sponsoring the following workpapers:

- WP-MAB-1 Confidential – CPCN POA Model Assumptions.docx
- WP-MAB-2 Confidential Highly Sensitive – Generic Resource Assumptions.xlsx
- WP-MAB-3 Confidential – CPCN POA Brattle Adjustments.xlsx
- WP-MAB-4 – CPCN POA Commodity Price Forecast.xlsx
- WP-MAB-5 Confidential Highly Sensitive – CPCN POA Model Results.xlsx
- WP-MAB-6 Confidential – CPCN POA REC Price Forecast.xlsx

**Q8. Were these attachments and workpapers prepared or assembled by you or under your direction?**

Yes.

## II. Purpose of Testimony

**Q9. What is the purpose of your testimony in this proceeding?**

The purpose of my testimony is to provide:

- An overview of I&M's 2021 Integrated Resource Plan (IRP) process;
- The 2021 IRP process' resulting Preferred Portfolio and Short-Term Action plan;
- The results of the Portfolio Optimization Analysis (POA) used to support the final selection of projects from the short-listed proposals from I&M's 2023 All Source Request for Proposals (RFP);

- The conclusions drawn of the POA's selection of the Hoosier Line PPA and Meadow Lake PPA (Clean Energy Projects); and
- Consideration of IRP resource alternatives.

These activities led to the execution of the Clean Energy Project PPAs being requested for approval by the Company in this docket.

## III. IRP Process

**Q10. What is the purpose of I&M's 2021 IRP?**

The purpose of the I&M 2021 IRP is to develop a set of supply- and demand-side resources that guides how I&M generates and supplies electricity to serve its customers' needs. The IRP is developed based on the best information available at the time of the modeling. The 2021 IRP includes a near-term plan, representing the resource changes during the period 2022 – 2028, and a long-term-indicative plan, representing resource changes during the period 2029 – 2041. Relative to the long-term indicative plan, the near-term plan is better informed with respect to new resource availability, costs and performance, existing resource availability and overall, Company load obligations. The IRP also provides a forum for I&M's customers and stakeholders to learn about and provide input to I&M's resource planning process.

**Q11. Please discuss I&M's experience with conducting IRPs.**

I&M has been conducting IRPs and submitting them in its Indiana jurisdiction for over twenty years. I&M conducted an IRP every two years through 2015, after which I&M and other Indiana utilities began conducting an IRP every three years.

**Q12. Did I&M prepare its IRP on a Total Company basis?**

Yes.

**Q13. How did the Company perform the 2021 IRP?**

In this IRP, I&M engaged Siemens PTI to provide its own unique expertise and perspective, facilitate the Stakeholder engagement process, and support the modeling and development of the IRP report. The AEPSC Integrated Resource Planning and Strategy group assisted the Company in overseeing the entire IRP process, provided Siemens PTI the necessary Company inputs to use in their modeling, and reviewed Siemens PTI results to ultimately determine a Preferred Portfolio and develop a Short-Term Action Plan that summarizes certain resource actions I&M expects to take prior to completion of its next IRP. Engaging Siemens PTI provided I&M with independent expertise and perspective in the development of the IRP. I&M also conducted an extensive and transparent stakeholder participation process, that allowed stakeholders an opportunity to participate and provide feedback continuously throughout the IRP process, this is discussed in more detail in Section 4 of the Company's IRP Report (Attachment MAB-1).

**Q14. What experience does Siemens PTI have in performing IRP modeling?**

Siemens PTI is an independent consulting organization within the larger Siemens company. Siemens PTI has extensive experience in the development of IRPs for a variety of electric utilities across the country, including utilities in Indiana and Michigan.

**Q15. Please briefly describe the process used to guide the 2021 IRP development.**

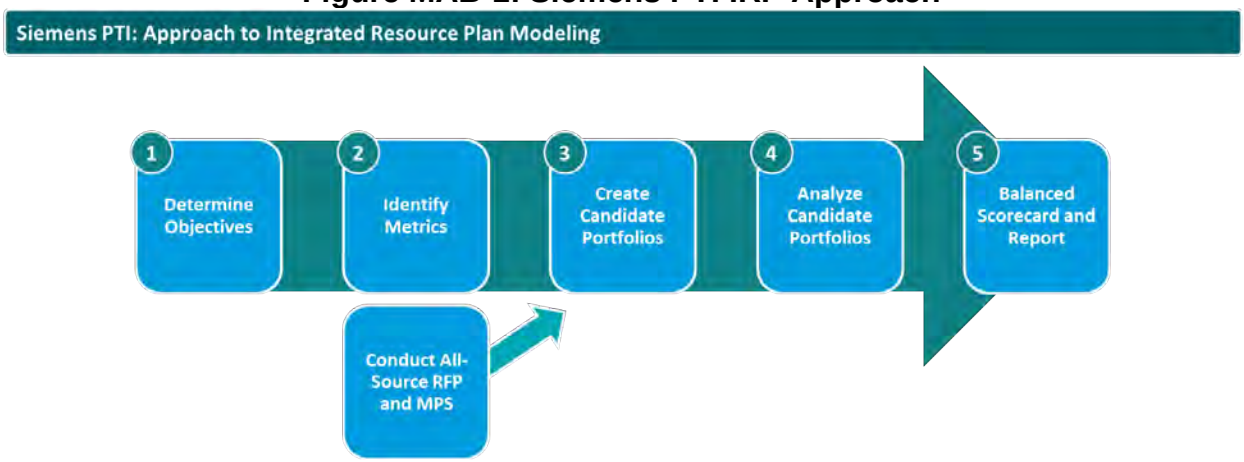
The 2021 IRP followed the 5-step structured and holistic approach, described below, to identify the Preferred Portfolio that best meets I&M's defined objectives over a wide range of potential future conditions. Several of the resource alternative assumptions made in the IRP process were informed through the inclusion of the 2020 Renewable RFP, an All-Source Informational RFP to capture market-based pricing, and the integration of a Market Potential

Study (MPS) to inform cost and performance characteristics for demand-side resources. This structured approach provided a comprehensive decision support tool to aid I&M in developing a near-term plan, 2022 – 2028, and a long-term-indicative plan, 2029 – 2041, based on the current generation portfolio, expected load growth, and the anticipated retirement of generation over the next twenty years.

**Q16. What are the 5-steps in the Siemens PTI IRP process?**

The 5-step structured approach to identify the Preferred Portfolio is: 1) Determine Objectives; 2) Identify Metrics; 3) Create Candidate Portfolios; 4) Analyze Candidate Portfolios; and 5) Balanced Scorecard and Reporting. The approach utilizes a phase gate process that allows the utility and Stakeholders to breakdown the overall IRP planning process into defined sequential steps to focus on key aspects of the process that ultimately build on one another to provide comprehensive IRP results. The 5-step process was first introduced to Stakeholders during the initial Stakeholder meeting and is provided in Figure MAB-1 below.

**Figure MAB-1: Siemens PTI IRP Approach**



A detailed description of the IRP methodology and process used in the 2021 IRP can be found in Section 2 of the IRP Report (Attachment MAB-1).

**Q17. Did I&M review Siemens PTI's IRP methodology and process?**

Yes. Prior to the IRP process beginning, I&M performed a thorough review of Siemens PTI's methodology and 5-step process for performing an IRP.

**Q18. Please describe your role in developing the 2021 IRP.**

As part of the AEP Integrated Resource Planning and Strategy group, I was involved in the pre-planning stages of the IRP, selection of Siemens PTI, through the end of the process where the Preferred Portfolio and Short-Term Action Plan were developed by the Company and the IRP Report was produced. During that time, I performed an accuracy and reasonableness review of model inputs that were provided to Siemens PTI by the Company, as well as outputs produced by Siemens PTI to ensure that they met the Company's IRP objectives.

**Q19. Is I&M's 2021 IRP available to the public?**

Yes. The IRP Report is available on I&M's website:

https://www.indianamichiganpower.com/community/improving-our-community/projects/irp/.

In particular, the following documents are available:

- IRP Public Summary
- IRP Report
- Volume 2 Appendix[1]
- Volume 3 Appendix (public redacted)

[1] Volume 2 includes corrected pages 1405 and 1406.

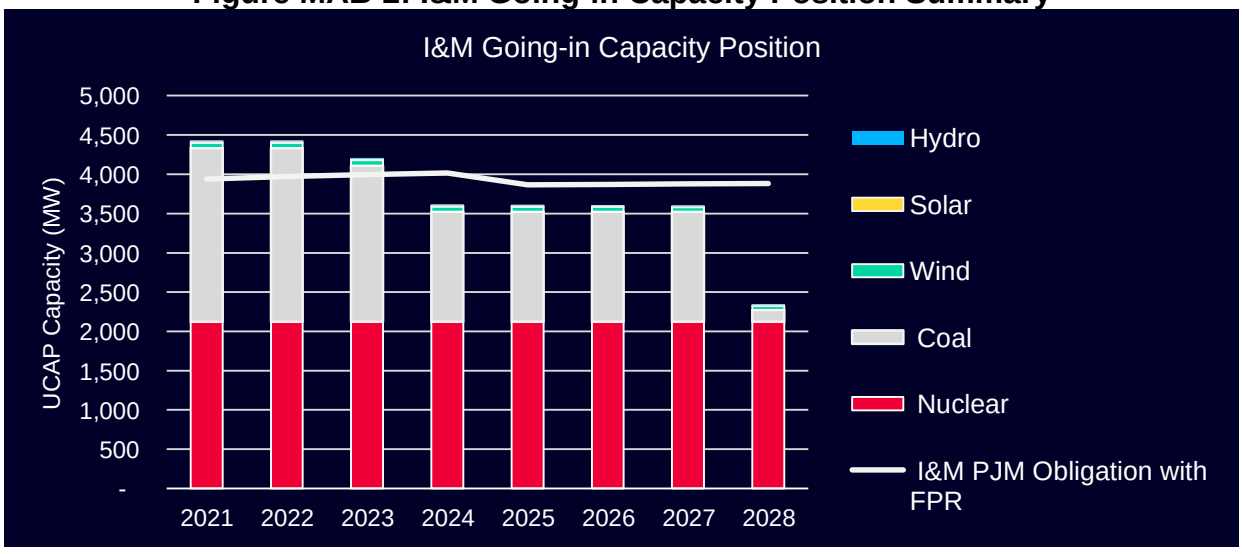
- Volume 4 Appendix

The Company also included six confidential exhibits with its IRP Report to comply with the Indiana IRP filing requirements. The confidential exhibits are contained in Attachment MAB-3C IRP Appendix Volume 3. A redacted, public version of Appendix Volume 3 is available on I&M's website and included with my testimony as Attachment MAB-3. The IRP Report and appendices can be found in Attachment MAB-1 through Attachment MAB-4. The Company's 2021 IRP Report and Appendix Vol 1 can also be found on the IURC website.[2]

**Q20. Did the 2021 IRP indicate that I&M has a need for additional capacity?**

Yes. As shown in Figure MAB-2, the 2021 IRP projected I&M to have a clear and significant need for capacity resulting from the retirement of Rockport Unit 1 and Unit 2 by 2028. Beginning in 2024, I&M's projected capacity shortfall is more than 300 MW as a result of Rockport Unit 2 no longer being an available capacity resource. By 2028, the capacity shortfall increases to approximately 1,500 MW due to the retirement of Rockport Unit 1.

**Figure MAB-2: I&M Going-in Capacity Position Summary**

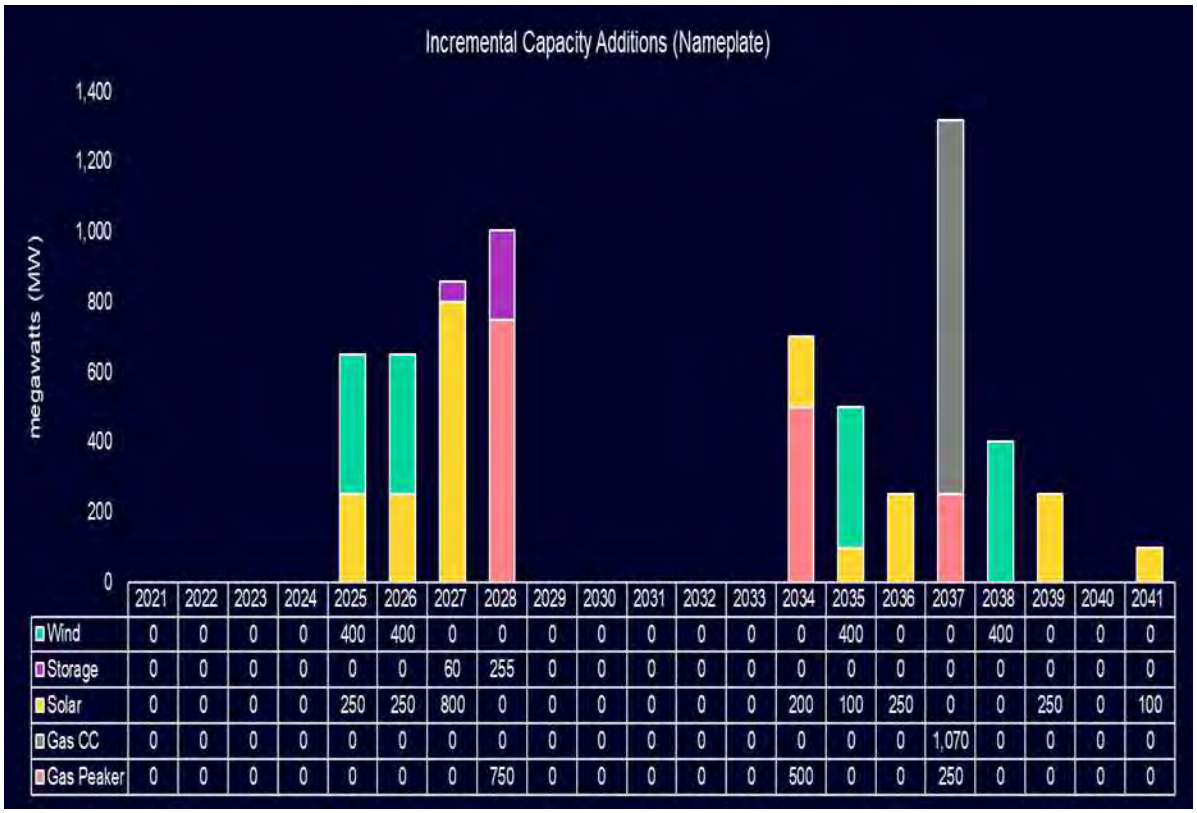



[2] https://www.in.gov/iurc/files/2021-I-and-M-IRP-Report-Revised.pdf

**Q21. Please describe the Company's Preferred Portfolio.**

In 2024, the Preferred Portfolio adds 314 MW of short-term purchases to meet I&M's projected capacity need. The Preferred Portfolio adds 800 MW of nameplate wind capacity and 500 MW of nameplate standalone solar capacity by 2026. In 2027, 500 MW of additional nameplate standalone solar capacity is added, along with 300 MW of nameplate solar coupled with 60 MW of nameplate storage. In 2028, 750 MW of simple-cycle combustion turbine capacity is added along with 255 MW of battery storage. Figure MAB-3 provides a graphical representation of the IRP resource additions.

**Figure MAB-3: Preferred Portfolio Resource Addition Summary**




| | 2021 | 2022 | 2023 | 2024 | 2025 | 2026 | 2027 | 2028 | 2029 | 2030 | 2031 | 2032 | 2033 | 2034 | 2035 | 2036 | 2037 | 2038 | 2039 | 2040 | 2041 |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| Wind | 0 | 0 | 0 | 0 | 400 | 400 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 400 | 0 | 0 | 400 | 0 | 0 | 0 |
| Storage | 0 | 0 | 0 | 0 | 0 | 0 | 60 | 255 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| Solar | 0 | 0 | 0 | 0 | 250 | 250 | 800 | 0 | 0 | 0 | 0 | 0 | 0 | 200 | 100 | 250 | 0 | 0 | 250 | 0 | 100 |
| Gas CC | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 1,070 | 0 | 0 | 0 | 0 |
| Gas Peaker | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 750 | 0 | 0 | 0 | 0 | 0 | 500 | 0 | 0 | 250 | 0 | 0 | 0 | 0 |

Please see Company witness Lucas' testimony for more discussion of the Company's Preferred Portfolio.

## IV. RFP Process

**Q22. What purpose does the IRP have in the RFP process?**

The IRP includes a near-term plan "resource plan", representing the resource changes during the period 2022 through 2028. This near-term resource plan provides a guideline for the type, timing and capacity of resources to be solicited through the RFP process that could potentially be added to I&M's system to meet the capacity needs of 2022 through 2028. The Commission's IRP rules require the IRP Short-Term Action Plan to include a workable strategy that can adapt to changing market condition, regulatory requirements, and other circumstances.[3] I&M's IRP near term action plan incorporated this flexibility.[4]

**Q23. Has the Commission's Director of Research Policy and Planning issued a Report on I&M's 2021 IRP?**

Yes. A report was issued February 12, 2024. The Director recognized the need to exercise judgment and flexibility in the planning process given extensive uncertainty. The Director's report (p. 3) stated:

> "IRPs are intended to be a systematic approach to better understand the complexities of an uncertain future, so utilities can maintain maximum flexibility to address resource requirements."
>
> ***
>
> "The resource portfolios emanating from the IRPs should not be regarded as being the definitive plan that a utility commits to undertake. Rather, IRPs should be regarded as illustrative or an ongoing effort that is based on the best information and judgment at the time the analysis is undertaken. The illustrative plan should provide off-ramps to give utilities maximum optionality to adjust to inevitable changing conditions (e.g., fuel prices, environmental regulations, public policy, technological changes that change the cost effectiveness of various resources, customer needs,

[3] See 170 IAC 4-7-8(10) and 170 IAC 4-7-9.

[4] See IRP p.7 ("Short-term capacity needs are subject to further adjustments prior to the PJM Delivery Year based on evolving load forecasts and unit performance."); p. 9. ("The I&M IRP is regularly reviewed as new information becomes available."): p. 9 (Short term action plan item 6 – "Adjust this action plan and future IRPs to reflect changing circumstances, as necessary.")

> etc.) and make appropriate and timely course corrections to alter their resource portfolios."[5]

The Company's application of judgment and flexibility in the execution of the Short-Term Action Plan is consistent with the opinions of the Director.[6] As the Director states the Company's use of "judgment is critical in an environment characterized by extensive uncertainty."[7]

**Q24. What types, timing and capacities of resources did the 2023 All Source RFP solicit?**

The 2023 All Source RFP sought approximately 800 MW of wind generation resources, approximately 850 MW of solar generation resources, approximately 315 MW of storage resources with consideration for 60 MW of acquired storage to be paired with up to 300 MW of the acquired solar resources and approximately 540 MW of gas generation resources and Supplemental Capacity Resources (e.g., Standalone Storage, Emerging Technologies, Thermal, and Other Capacity Resources) to meet overall capacity need.[8] As an alternate proposal for a standalone solar or wind energy resource, Bidders could include a proposal for a solar or wind energy resource with a co-located energy storage system (Storage Option). The RFP was designed to acquire capacity for PJM's 2028/2029 Planning Year (PY 28/29), consistent with the IRP and Short-Term Action Plan. Company witnesses Dehan and witness Koujak provide additional information about the RFP resources solicited.

**Q25. Is it reasonable for the RFP process to produce a mix of resources that differs from the resources identified in the IRP?**

Yes. I&M's IRP process is an important planning tool, based on the best information known at the time it is prepared. Market conditions, technology,

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[5] Director's Report for Indiana Michigan Power Company's 2021 Integrated Resource Plan, page 3.

[6] *Id.* at 15.

[7] Id at 15.

[8] The MW values are nameplate rated.

regulations and subsequently, Company needs, change over time. While the IRP is used to identify a preferred mix of resources for the RFP solicitation, the RFP results ultimately reflect the resources, and associated economics, available in the market and considers current market conditions (e.g., high inflation, supply-chain challenges, import tariffs, interconnection issues, etc.). Company witness Gaul provides additional information about the market challenges as the RFP process progressed.

**Q26. Please describe the types of proposals submitted in response to the RFP.**

In total, 90 proposals from 20 unique bidders were received, including solar, wind, standalone storage, solar plus storage, and Capacity Purchase Agreements. Company witness Dehan provides additional information about the proposals received in response to the RFP process.

**Q27. As part of the RFP proposal evaluation process, was an initial Eligibility and Threshold (E&T) Review, an Economic Analysis and a Non-Price Analysis conducted as part of the proposal Short-listing process?**

Yes. The Independent Monitor conducted the E&T Review on behalf of the Company to ensure all proposals conformed to the RFP requirements and that bidders were provided with a reasonable opportunity to provide all necessary information for further evaluation. Proposals that met the E&T Review requirements were further evaluated through the Company's Economic Analysis and a Non-Price Analysis process. The combination of the Economic and Non-Price Analyses yielded a Total Score for each proposal that was then used to rank the proposals to develop a Short-list of the highest-ranking proposals.

Company witness Dehan and witness Koujak provide additional information about the Economic and Non-Price Analyses and the Short-listing process.

**Q28. Please provide a summary of the Short-list proposals used in the POA.**

Figure MAB-4 provides a summary of the Short-list proposals used in the POA. Company Witnesses Dehan and Gaul provide additional information on the Short-list proposals, including projects that were removed prior to the POA, and on the executed Capacity Purchase Agreement presented to the Commission for approval.

**Figure MAB-4: Short-listed Proposals Used in the POA**

| Developer | Facility | Gen Type | Nameplate Capacity (MW) | Firm Capacity (MW) | Expected Planning Year Start | Contract Type |
|---|---|---|---|---|---|---|
| Lawrenceburg | Lawrenceburg | Gas CC | 840 | 840 | PY 28/29 | CPA (6 Yr) |
| Leeward | Hoosier Line | Solar | 180 | 25 | PY 27/28 | PPA (30 Yr) |
| EDPR | Meadow Lake IV | Wind | 100 | 20 | PY 26/27 | PPA (20 Yr) |
| [redacted] | | | | | | |
| | | TOTAL | 1,505 | 975 | | |

## V. Portfolio Optimization Analysis

**Q29. As part of the RFP proposal evaluation process, did the Company perform a POA of these proposals making up the Short-list?**

Yes. The proposals identified in Figure MAB-4 were part of the POA used in the final selection of projects.

**Q30. What was the purpose of the POA conducted by the Company?**

The purpose of the POA was to assess the 2021 IRP Preferred Portfolio using more current planning, resource cost, performance, and availability assumptions.

**Q31. Did the POA focus on a particular period of time?**

Yes. As further discussed below, the POA focused on the mix of proposal resources necessary to meet I&M's capacity and energy needs from the retirement of Rockport for the 2028-2029 PJM Planning Year.

**Q32. How was the POA conducted?**

The PLEXOS® resource planning software model was used to assess the optimal mix of resources from the RFP process and generic resources necessary to meet PJM's planning reserve margin requirement (PRM) and I&M customers' capacity and energy needs during PY 28/29 and beyond. In assessing the optimal mix of resources, the POA considered the amount of capacity and energy available from the short-listed RFP responses, generic resources, the Company's existing thermal and hydroelectric resources, Clean Energy Projects (except for the Sculpin Solar PPA) and the Montpelier CPA approved by the Commission in Cause Nos. 45868 and 45869, existing purchase power agreements, demand-side management, and demand response programs.

**Q33. Please describe the PLEXOS® software model.**

The PLEXOS® software model is widely used in the electric utility industry for resource planning and production costing analyses. For example, the Company used PLEXOS® to perform its 2018 I&M IRP analysis. The PLEXOS® long-term optimization model, also known as "LT Plan®," served as the basis for performing the POA. The PLEXOS LT Plan® is a Mixed Integer Linear Programming model which finds the optimal portfolio of future capacity and energy resources, including RFP proposals and generic resource alternatives, which minimizes the cumulative present worth (CPW) of a utility's generation-related variable and fixed costs over a long-term planning horizon. By minimizing this CPW, the model will support affordability for I&M's customers.

The LT Plan® model uses an objective function which seeks to minimize the aggregate of the following capital and production-related (energy) costs of the portfolio of resources:

- Fixed costs of proposal and generic capacity additions, *i.e.,* carrying charges on the capital cost of incremental capacity additions (based on a utility-specific, weighted average cost of capital), and fixed O&M;
- capacity and/or energy costs related to any purchase power agreements;
- fixed costs of any capacity purchases;
- variable costs associated with a utility's existing and new resource alternatives. This includes fuel, consumables, emission costs, and variable O&M costs;
- in addition to the energy produced by a utility's existing and new resources, the cost of market energy purchases needed to serve the utility's load requirements when economic to do so;
- a 'netting' of the RTO energy market sales revenue (negative cost) earned in the RTO power market from a utility's resources' energy sales *and* the cost to produce that energy.

The LT Plan® model executes the objective function described above while abiding by the following types of constraints:

- minimum reserve margins targets;
- a utility's energy requirements;
- resource addition limits (i.e., maximum units built annually and over the entire planning horizon);
- age and lifetime of power generation facilities;
- operational constraints of dispatchable resources such as ramp rates, minimum up/down times, capacity, heat rates, etc.;
- fuel burn minimum and maximums; and
- energy contract parameters such as energy and capacity.

The model inputs that comprise the objective function and constraints are considered in the development of an optimal resource plan that best fits a utility's capacity and energy needs. LT Plan® reasonably considers the relative load and generation variable and fixed costs that change from plan-to-plan. Likewise, transmission costs are included to the extent that they are associated with new generating capacity or are linked to specific supply alternatives.

**Q34. Was I&M's current capacity position (i.e., Going-In Capacity Position) considered when assessing the optimal mix of resources to meet the PJM PRM?**

Yes. I&M's existing thermal, hydroelectric and solar resources, the Commission approved 2022 Clean Energy Projects (except for Sculpin Solar PPA), Montpelier Capacity Purchase Agreement, existing purchase power agreements, demand response programs and demand-side management resources were considered in meeting the PJM PRM.

**Q35. How was the Cook Plant treated in the POA?**

Consistent with the 2021 IRP, the POA assumes the Cook Plant is not relicensed. This approach recognizes that a decision to relicense Cook and continue to operate the units has not been made. The Company's 2024 IRP will evaluate the economics of Cook relicensing and continued operation. Because the POA focused on optimizing recent proposals received as part of the Company's need to replace the retiring Rockport capacity and energy for the 2028-2029 PJM Planning Year, the assumption regarding the future of the Cook Plant maintains the optionality of the Cook relicense and does not impact the resource question addressed in the POA.

**Q36. Please describe the PJM PRM that was used in the POA.**

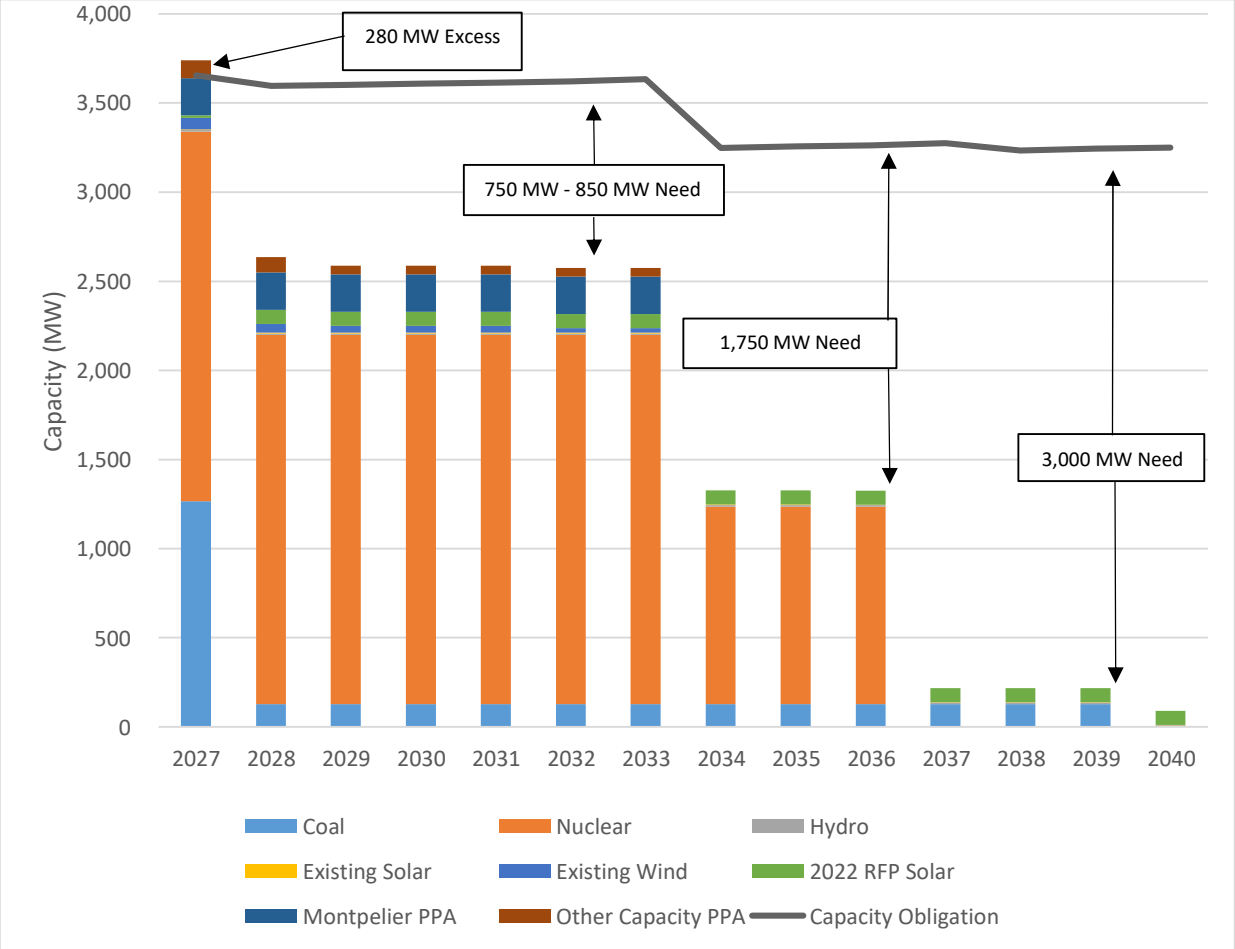
The PRM represents the amount of capacity above a utility's peak load that must be maintained to minimize the risk of a utility not being able to meet its peak load requirements. The PRM also considers the availability of various types of capacity during peak conditions when determining how much of a resource's nameplate capacity can contribute to meeting the PRM. The PJM PRM that was used in the POA was 11.7% for PY 24/25. Beginning in PY 25/26, the POA used a PRM of -6.13%, based on the FERC's order in Docket ER24-99 approving PJM's proposed changes to the PRM. Company witness Burkholder provides additional information on PJM's process used to revise the PJM PRM.

**Q37. Please describe I&M's Going-In Capacity Position that was used in the POA.**

Figure MAB-5 shows I&M's Going-In Capacity Position that was used in the POA. As shown in Figure MAB-5, I&M has 280 MW (UCAP) of excess capacity above its Capacity Obligation in PY 27/28. However, once Rockport 1 retires by PY 28/29, I&M will have a capacity deficit of between 750 MW and 850 MW (UCAP). The change in the capacity deficit in PY 34/35 and PY 37/38 reflects

the assumption that the Cook Plant will not be relicensed. While this assumption will be revisited in the 2024 IRP process, it does not impact the Company's need to develop resources to meet its capacity need due to the retirement of Rockport 1.

**Figure MAB-5: POA Going-In Capacity Position**




**Q38. Please describe the 2021 IRP planning assumptions that were updated for the POA.**

The Company included the following planning assumptions updates in the POA:

- I&M's peak and energy forecast.

- The PJM PRM and generating resource accredited capacity, as previously discussed, and in the testimony of Company witness Burkholder.
- Generic resource alternative assumptions (e.g., resource costs, timing, and quantities available).
- The forecast of Renewable Energy Certificate (REC) prices.

**Q39. Please describe how I&M's load forecast changed from the 2021 IRP to the POA.**

I&M's peak load used in the 2021 IRP was developed in June 2021. The load forecast used in the POA analysis was developed in September 2023. In general, I&M's peak load used in the POA was virtually the same (<1% change) from the 2021 IRP. I&M's energy forecast used in the POA was also similar to the forecast used in the 2021 IRP, changing by less than one percent. Please describe how the generic resource alternative assumptions were developed for POA.

The generic resource assumptions used in the POA were informed by the results of various recent RFP efforts and external sources (e.g., EIA, NREL, etc.).

- Generic Solar Resources – Generic Solar Purchase Power Agreement (PPA) alternatives and Purchase Sale Agreement (PSA) alternatives were developed based on the results of I&M's 2023 All Source RFP. The RFP price data determined the initial price of this generic resource. Future year prices were developed by applying the learning curves from the NREL 2023 Annual Technology Baseline report and inflation based on the Producer Price Index (PPI). Figure MAB-6 provides a summary of the POA assumptions for Generic Solar PPA and PSA alternatives.

**Figure MAB-6: Generic Solar Resource Alternatives**

| Agreement Type (PPA/PSA) | PPA Term/Asset Life (Years) | Installed Capacity Available (Entire 30 Yr Study Period) | Maximum Allowable Installed Capacity Additions Per Year | Planning Years Available | Pricing Source |
|---|---|---|---|---|---|
| PPA | 30 | 250 | 250 | 27/28 Only | 2023 I&M RFP Solar PPA average bid pricing for resources deemed available outside of specific bids modeled |
| PPA | 30 | 1,000 | 500 | 28/29 - 53/54 | 2023 I&M RFP Solar PPA average bid pricing. Inflation percentages and learning curves are utilized to forecast PPA prices. |
| PSA | 35 | 100 | 100 | 27/28 Only | 2023 I&M RFP Solar PSA average bid pricing for resources deemed available outside of specific bids modeled |
| PSA | 35 | 150 | 150 | 28/29 Only | Capital Cost is based on the cost of a PSA bid from the 2023 I&M RFP. |
| PSA | 35 | 1,000 | 500 | 29/30 - 53/54 | 2023 I&M RFP Solar PSA average bid pricing. Inflation percentages and learning curves are utilized to forecast Capital Costs. |

- Generic Wind Resources – Generic Wind PPA and PSA Resource pricing and availability was developed based on information from other AEP RFP efforts and market intelligence. Figure MAB-7 provides a summary of the POA assumptions for Generic Wind PPA and PSA alternatives.

**Figure MAB-7: Generic Wind Resource Alternatives**

| Agreement Type (PPA/PSA) | PPA Term/Asset Life (Years) | Installed Capacity Available (Entire 30 Yr Study Period) | Maximum Allowable Installed Capacity Additions Per Year | Planning Years Available | Pricing Source |
|---|---|---|---|---|---|
| PPA | 30 | 1,000 | 333 | 30/31 - 32/33 | Based on estimated PPA costs of wind made available via market intelligence |
| PSA | 30 | 1,000 | 150 | 33/34 - 53/54 | 2022 APCO RFP Wind PSA average bid pricing. Inflation percentages and learning curves are utilized to forecast Capital Costs. |

- Generic Battery Energy Storage System (BESS) Resources – Generic BESS (4-hour storage) cost and quantities were based on information received in the 2023 All-Source RFP. Generic 6-hour and 8-hour BESS pricing was based on the relationship between 4-, 6- and 8-hour BESS as developed by EIA. That EIA based pricing relationship was then applied to the 4-hour BESS alternative from the RFP to develop pricing for the 6-hour and 8-hour generic BESS alternatives. Figure MAB-8 provides a summary of the POA assumptions for Generic BESS alternatives.

**Figure MAB-8: Generic BESS Resource Alternatives**

| Agreement Type (PPA/PSA) | Storage Duration (Hours) | PPA Term/Asset Life (years) | Installed Capacity Available (Entire 30 Yr Study Period) | Maximum Allowable Installed Capacity Additions Per Year | Planning Years Available | Pricing Source |
|---|---|---|---|---|---|---|
| PSA | 4 | 20 | 500 | 250 | 28/29 - 53/54 | 2023 I&M RFP average 4-hour Storage PSA Pricing. Inflation percentages and learning curves are utilized to forecast Capital Costs. |
| PSA | 6 | 20 | 500 | 250 | 28/29 - 53/54 | Ratio of 6-hour to 4-hour Storage pricing (ratio based on EIA pricing) applied to 2023 I&M RFP average 4-hour Storage PSA Pricing. Inflation percentages and learning curves are utilized to forecast Capital Costs. |
| PSA | 8 | 20 | 500 | 250 | 28/29 - 53/54 | Ratio of 8-hour to 4-hour Storage pricing (ratio based on EIA pricing) applied to 2023 I&M RFP average 4-hour Storage PSA Pricing. Inflation percentages and learning curves are utilized to forecast Capital Costs. |

- Generic Gas Resources – Generic simple-cycle combustion turbine (CT) costs were based on recent proposal information. The aeroderivative and combined-cycle (CC) costs were developed using the recent market based CT cost information as a basis for their pricing. The aeroderivative and CC cost were developed by applying the CT, CC and aeroderivative cost relationships, as seen by the EIA, to the recent market-based CT cost. The POA assumed that any new generic gas resources would be

owned by I&M. Figure MAB-9 provides a summary of POA assumptions for Generic Gas Resource alternatives.

**Figure MAB-9: Generic Gas Resource Alternatives**

| Resource Name | Nameplate Capacity (MW) | Asset Life (Years) | Installed Capacity Available - Entire 30 Yr Study | Maximum Allowable Installed Capacity Additions Available Per Year | Planning Years Available | Pricing Source |
|---|---|---|---|---|---|---|
| Aeroderivative | 105 | 30 | 1,050 | 315 | 29/30 - 53/54 | Ratio of Aeroderivative to Frame CT pricing (ratio based on EIA pricing) applied to recent CT proposal pricing. Inflation percentages and learning curves are utilized to forecast Capital Costs. |
| Frame CT | 240 | 30 | 4,800 | 1,200 | 29/30 - 53/54 | Based on recent CT proposal pricing. Inflation percentages and learning curves are utilized to forecast Capital Costs. |
| 2x1 CC | 1,100 | 30 | 10,830 | 3,249 | 30/31 - 53/54 | Ratio of 2x1 CC to Frame CT pricing (ratio based on EIA pricing) applied to recent CT proposal pricing. Inflation percentages and learning curves are utilized to forecast Capital Costs. |
| 1x1 CC | 430 | 30 | 4,300 | 1,290 | 30/31 - 53/54 | Ratio of 1x1 CC to Frame CT pricing (ratio based on EIA pricing) applied to recent CT proposal pricing. Inflation percentages and learning curves are utilized to forecast Capital Costs. |

- Short-term (1-year) Market Capacity Only PPA – These purchases were limited to providing no more than 15% of I&M's peak load. The pricing for these PPAs was developed from recent capacity purchases and consummated transactions that AEP has experienced and AEP fundamental forecasts for short-term market capacity purchases. Figure MAB-10 provides a summary of POA assumptions for the Short-term (1-year) Market Capacity Only PPA assumptions.

**Figure MAB-10: Short-term (1-year) Market Capacity Only PPA Alternatives**

| Maximum Allowable Installed Capacity Additions Available Per Year | Planning Years Available | Pricing Source |
|---|---|---|
| 1,200 | 24/25 - 26/27 | Per Comm Ops, based on blend of recent offer/consummated transactions and the fundamental price curve. |
| 650 | 27/28 - 30/31 | Per Comm Ops, based on blend of recent offer/consummated transactions and the fundamental price curve. |
| 325 | 31/32 Only | Per Comm Ops, based on blend of recent offer/consummated transactions and the fundamental price curve. |
| 0 | 32/33 - 53/54 | Per Comm Ops, based on blend of recent offer/consummated transactions and the fundamental price curve. |

Confidential Highly Sensitive Attachment MAB-6 provides a summary of additional assumptions for the Generic Resource Alternatives used in the POA.

**Q40. Were there any adjustments made to the costs of the dispatchable (i.e., BESS, CT, and CC) alternatives?**

Yes. Based on analyses conducted by Brattle Consulting, the costs of the dispatchable alternatives were adjusted to reflect their operation and resulting revenues from day-ahead market volatility, real-time operations, and ancillary-service market revenues not otherwise captured in the POA. Confidential Attachment MAB-7 provides a summary of the Brattle Consulting adjustments used in the POA.

**Q41. Please describe the commodity price (i.e., natural gas price, PJM market capacity and energy price, etc.) forecast that was assumed in the POA.**

The POA used the same EIA based natural gas price forecast used in the 2021 IRP. AEP's Economic Forecasting group developed PJM market energy and capacity prices from that EIA gas price forecast using a long-term price forecasting model (i.e., Aurora). Figures MAB-11 to MAB-13 show the price forecasts for various commodities that were assumed in the POA.

**Figure MAB-11 – PJM Market Energy Price**

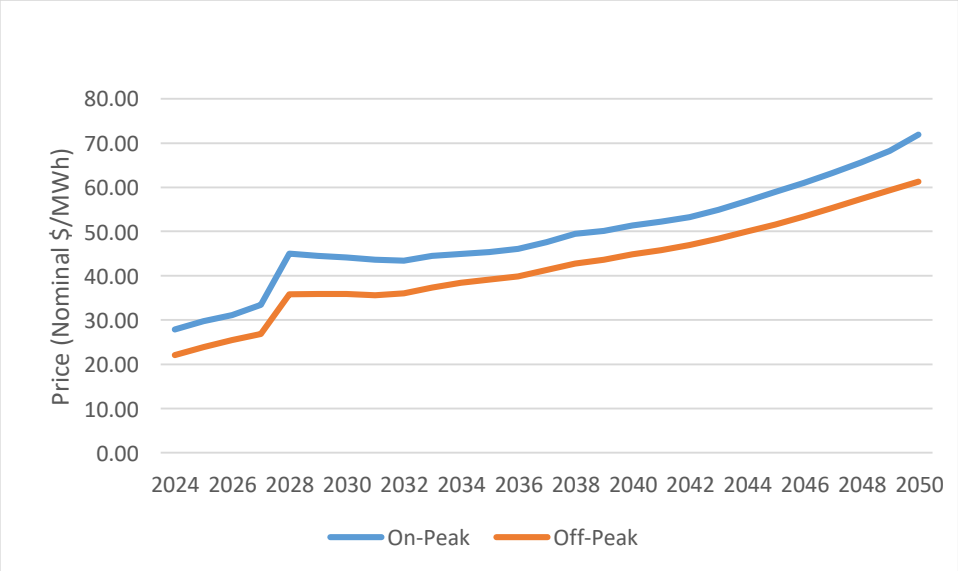


**Figure MAB-12 – Henry Hub Gas Price**

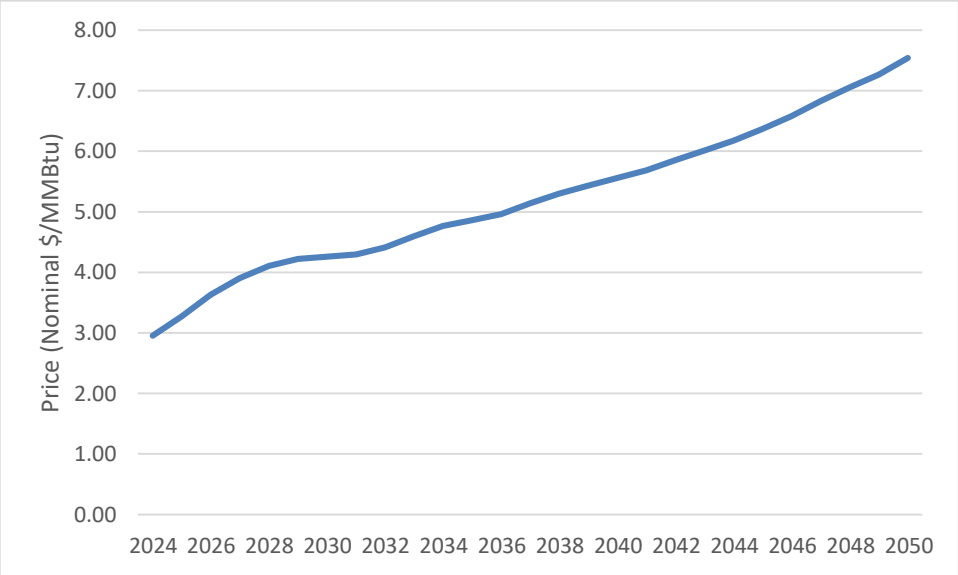
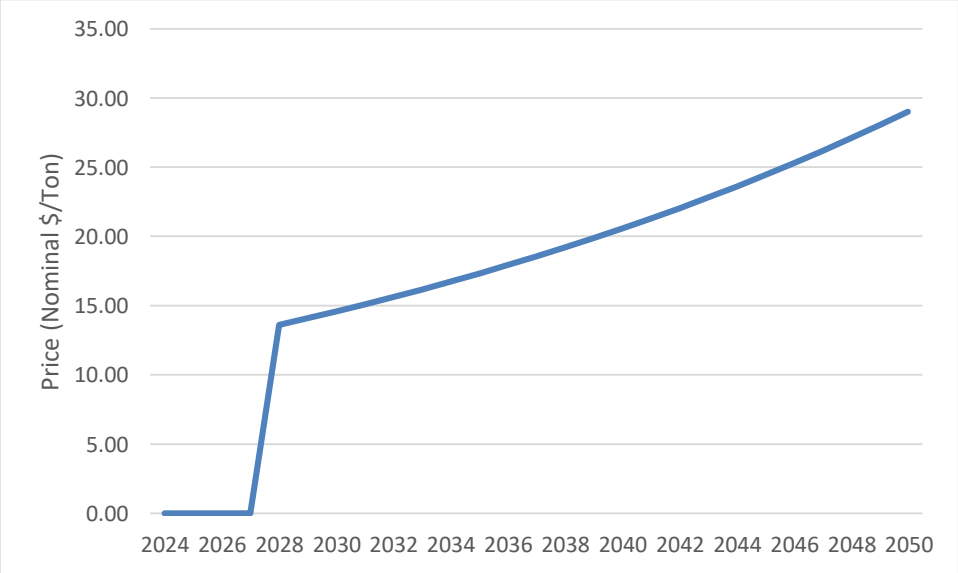



**Figure MAB-13 - CO2 Emission Price**




**Q42. Please describe the REC price forecast assumed in the POA.**

A REC price forecast was used in the POA to determine the revenues associated with the monetization of RECs from the proposal and generic renewable resources. Confidential Attachment MAB-8 provides a summary of the REC price forecast used in the POA.

**Q43. Please describe the results of the POA.**

The POA results are displayed in Figure MAB-14 below. In PY 27/28 and PY 28/29, the POA selects the 840 MW Lawrenceburg CPA (Indiana-specific contract is 697 MW)[9], the 180 MW Hoosier Line Solar PPA, the 100 MW Meadow Lake PPA and the [redacted] to meet I&M's capacity and energy needs due to the retirement of Rockport.

**Figure MAB-14 – POA Results**

| Year | Lawrenceburg CPA | Hoosier Line Solar PPA | Meadow Lake IV Wind PPA | [redacted] | Generic 1,110 MW CC | Generic 240 MW CT | Generic Solar PPA | Generic 4-Hour BESS | Short-Term Capacity Purchases |
|---|---|---|---|---|---|---|---|---|---|
| 2024 | 0 | 0 | 0 | | 0 | 0 | 0 | 0 | 100 |
| 2025 | 0 | 0 | 0 | | 0 | 0 | 0 | 0 | 0 |
| 2026 | 0 | 0 | 100 | | 0 | 0 | 0 | 0 | 0 |
| 2027 | 0 | 180 | 100 | | 0 | 0 | 0 | 0 | 0 |
| 2028 | 840 | 180 | 100 | | 0 | 0 | 0 | 0 | 0 |
| 2029 | 840 | 180 | 100 | | 0 | 0 | 0 | 0 | 0 |
| 2030 | 840 | 180 | 100 | | 0 | 0 | 0 | 0 | 0 |
| 2031 | 840 | 180 | 100 | | 0 | 0 | 0 | 0 | 0 |
| 2032 | 840 | 180 | 100 | | 0 | 0 | 0 | 0 | 0 |
| 2033 | 840 | 180 | 100 | | 0 | 0 | 0 | 0 | 0 |
| 2034 | 0 | 180 | 100 | | 1,083 | 1,200 | 449 | 0 | 0 |
| 2035 | 0 | 180 | 100 | | 1,083 | 1,200 | 696 | 0 | 0 |
| 2036 | 0 | 180 | 100 | | 1,083 | 1,200 | 693 | 0 | 0 |
| 2037 | 0 | 180 | 100 | | 2,166 | 1,680 | 689 | 0 | 0 |
| 2038 | 0 | 180 | 100 | | 2,166 | 1,680 | 686 | 0 | 0 |
| 2039 | 0 | 180 | 100 | | 2,166 | 1,680 | 682 | 0 | 0 |
| 2040 | 0 | 180 | 100 | | 2,166 | 1,680 | 878 | 50 | 0 |

**Q44. In addition to the Clean Energy PPAs, was there an additional short-listed renewable project selected in the POA?**

Yes. The [redacted] was selected in addition to the Clean Energy PPAs.

[9] The Company is requesting approval of the Lawrenceburg CPA in Cause No. 46083.

**Q45. Was the selection of the [redacted] resource sensitive to the assumptions made in the POA?**

Yes. The selection of the [redacted] was sensitive to the inclusion, or exclusion, of the REC price forecast assumption in the POA modeling. The [redacted] was the least economic of all the selected resources in the POA and was only selected in the POA resource plan when the REC price forecast was included in the POA modeling. If the REC price forecast was excluded in the modeling, the [redacted] was not selected in the POA resource plan.

**Q46. If the REC price forecast was excluded from the POA, were the Clean Energy PPAs selected in the POA resource plan?**

Yes. The Clean Energy PPAs continued to be selected in the POA resource plan even when the REC price forecast was excluded from the POA modeling. This indicates that the Clean Energy PPAs were an economic selection regardless of the potential benefits that REC monetization would provide.

## VI. POA Conclusions

**Q47. What conclusions can be drawn from the results of the POA?**

The POA concluded that the Clean Energy PPAs are an integral component in providing that diverse mix of resources to meet I&M's capacity and energy needs due to the retirement of Rockport.

**Q48. How does the Hoosier Line PPA's Levelized Cost of Energy (LCOE) compare to the LCOEs for the IRP solar resources selected in the 2021 I&M IRP?**

Figure MAB-15 provides a comparison of the LCOEs for the Hoosier Line PPA to the LCOEs of the solar alternatives assumed in the IRP. The IRP Tier 1 Solar pricing is based on the lowest bid received for solar resources from the All-Source Informational RFP conducted during the 2021 IRP effort and the 2020 Renewable RFP solar proposals. The IRP Tier 2 Solar pricing is based on the average of higher solar bids received as part of the All-Source RFP and the 2020 Renewable RFP solar proposals. Confidential Figure MAB-15 shows how the IRP Tier 1 Solar and Tier 2 Solar and the Hoosier Line PPA would compare. As can be seen in Confidential Figure MAB-3, the LCOE for the IRP Tier 1 Solar is approximately $74/MWh and IRP Tier 2 Solar is approximately $84/MWh. The LCOE for the Hoosier Line PPA is approximately [redacted] than the IRP Tier 1 Solar price, [redacted] the IRP Tier 2 Solar price.

**Figure MAB-15: LCOE Comparison of Hoosier Line PPA to 2021 IRP Solar Resource Assumptions**

**Q49. Is the Meadow Lake PPA consistent with the 2021 IRP?**

Yes. The Meadow Lake PPA is consistent with the resource type and timing in the 2021 IRP. The Meadow Lake PPA is also consistent with I&M's IRP

Objectives. While the Meadow Lake PPA LCOE is [redacted] and the LCOE for the 2021 IRP Wind was approximately $49/MWh, the POA determined that Meadow Lake PPA is an economic means of meeting I&M's capacity and energy needs as identified in the 2021 IRP. Please see the testimony of Company witness Gaul that indicates the cost of the Meadow Lake PPA is reasonable for wind currently available in the market.

**Q50. What are the energy benefits that come from the Meadow Lake PPA and the Hoosier Line PPA?**

The energy that is produced by the Meadow Lake PPA and the Hoosier Line PPA is utilized to serve I&M's load obligation and decreases its reliance on the PJM energy market. The annual average generation is estimated to be over 650 GWh during the forecast period for the Clean Energy Projects.

## VII. Consideration of Resource Alternatives

**Q51. Did I&M consider other resource options?**

Yes. That is the purpose of the IRP. The Company considered a number of options in the IRP process including conventional thermal generation, renewable energy, energy storage, several types of demand-side management including demand response, load management, conservation, conservation voltage reduction and cogeneration. These matters are discussed in Section 7.6 through 7.9 of the IRP Report (Attachment MAB-1).

The current PJM market is effectively utilizing the existing capacity resources in the region in meeting the overall energy requirements of the region, including I&M. However, I&M's membership in PJM does not eliminate its need to meet the capacity requirements of its customers, including adding new capacity

resources to address potential load growth and the retirement of the Rockport facilities.

I would also add that refurbishment or repowering of the Rockport facility is not a feasible option. In order to be compliant with the Fifth Joint Modification of the New Source Review (NSR) Consent Decree, Rockport Unit 1 is assumed to operate through its committed retirement date of December 31, 2028, and then retire. In complying with the NSR Consent Decree, refurbishment or repowering of Rockport Unit 1 is infeasible. As part of the Settlement Agreement in IURC Cause No. 45546, Rockport Unit 2 was assumed to be used as a capacity resource for I&M through the 2023/2024 Planning Year, allowing I&M to use up to 650 MW for its capacity obligation. Also, as part of the Settlement Agreement, beginning with the 2024/2025 Planning Year and through the remainder of its operating life, 100 percent of Rockport Unit 2 will be treated as a merchant generating unit and participate in the PJM markets as an RPM-only resource. Compliance with the Settlement Agreement made refurbishment or repowering of Rockport Unit 2 infeasible.

**Q52. Has the Company considered the State Utility Forecasting Group (SUFG) Electricity Projections?**

Yes. The Company reviewed the SUFG's most recent Indiana Electric Projections report from 2023.[10] In the Resource Needs section of the report (page 1-6), the SUFG indicates that the state has additional resource needs throughout the forecast period. The Aurora model used by the SUFG to conduct this analysis is adding more new resources than what is strictly necessary to meet the seasonal reserve requirements. This is because the model finds it economic to add additional wind and solar, especially to take advantage of tax credits when they are available. The forecast indicates a need for a mix of natural gas-fired combined-cycle capacity, with wind, solar and storage capacity.

[10] SUFG 2023 Indiana Electric Projections Report

The wind and natural gas combined-cycle resources are added first, with storage and solar being added in 2025 and 2029, respectively. The addition of the Clean Energy PPAs is consistent with the resources added in the SUFG Electricity Projections.

## VIII. Conclusions

**Q53. Please summarize your conclusions.**

The POA concluded that a diverse mix of resources including the Clean Energy PPAs is the preferred resource mix for replacing I&M's capacity and energy needs from the retirement of the Rockport facility.

**Q54. Does this conclude your pre-filed direct testimony?**

Yes.

**VERIFICATION**

I, Mark A. Becker, Managing Director of Resource Planning and Operational Analysis at American Electric Power Service Corporation, affirm under penalties of perjury that the foregoing representations are true and correct to the best of my knowledge, information, and belief.

Date 6/18/24

Mark A. Becker

**Attachment MAB-1**
**2021 I&M IRP Report Volume 1**

**[Bound Separately – Not Reproduced Herein]**

**Attachment MAB-1**
**2021 I&M IRP Report Volume 2**

**[Bound Separately – Not Reproduced Herein]**

**Attachment MAB-3**
**2021 I&M IRP Report Volume 3**

**[Bound Separately – Not Reproduced Herein]**

**Attachment MAB-4**
**2021 I&M IRP Report Volume 4**

**[Bound Separately – Not Reproduced Herein]**


# 2021 INTEGRATED RESOURCE PLAN UPDATE

to the:

Indiana Utility Regulatory Commission

Submitted Pursuant to:

Commission Rule 170 IAC 4-7-10

September 29, 2023

# Table of Contents

# I&M 2021 Integrated Resource Plan Update

## Executive Summary

Following the initial submission of Indiana Michigan Power Company's (I&M or Company) 2021 Integrated Resource Plan (IRP, Plan, or Report) on January 31, 2022, the Company is updating its 2021 IRP to reflect changes to its Preferred Portfolio (Modified Preferred Portfolio) and Short-Term Action Plan (Modified Short-Term Action Plan).

The Company's Modified Preferred Portfolio reduces I&M's natural gas peaker additions in its near-term plan and replaces the resource requirement with stand-alone storage resource additions. This modification supports further diversification of I&M's generation resources and sustainability benefits while maintaining similar affordability and reliability benefits for I&M's customers. Additionally, the Modified Preferred Portfolio is consistent with the 2021 IRP approved by the Michigan Public Service Commission (MPSC) in Case No. U-21189. Finally, the Modified Preferred Portfolio does not result in changes to resource additions beyond 2028 and the Modified Preferred Portfolio continues to maintain the optionality regarding the future operations of the Cook Nuclear Plant.

The Modified Preferred Portfolio reflects the following adjustments to the Preferred Portfolio:

- The gas peaker additions in 2028 were reduced from 1000 MW to 750 MW
- A series of 85 MW Stand-Alone Storage resources were added in 2026, 2027 and 2028 for a total of 255MW

The Modified Preferred Portfolio scorecard metrics were compared to the Preferred Portfolio scorecard metrics to estimate the impacts of the modifications and are shown in the updated Table 25R below. Table 25R is an update to Table 25 found on page 143 of the 2021 I&M IRP. Also of note is that the extended benefits from the Inflation Reduction Act (IRA) were not known at the time the 2021 IRP was conducted and therefore not reflected in the analysis. However, the addition of Stand-Alone Storage resources would be eligible for additional ITC credits which is expected to further benefit the Modified Preferred Portfolio cost and affordability metrics.

**Table 25R. Modified Preferred Portfolio Scorecard Metrics**

| Portfolio | 20-Year NPV CTSL | 10-Year NPV CTSL | 95th Percentile Value of NPV CTSL | Difference Btw. Mean & 95th Percentile | 5 Year Net Rate Increase CAGR (2025-2029) | Capital Investment Through (2028) | Percentage Reduction of CO2e (2005-2041) | Purchases as a % of Load (2021-2041) | Sales as a % of Load (2021-2041) | Surplus Reserve Margin (2041) | Number of Unique Generators (2041) |
|---|---|---|---|---|---|---|---|---|---|---|---|
| PP | 6.76 | 3.89 | 8.10 | 19.7% | 1.40% | 3.83 | 76.2% | 7.20% | 19.80% | 4.7% | 66 |
| PP w/Storage | 6.80 | 3.91 | 8.14 | 19.7% | 1.60% | 3.90 | 76.9% | 7.29% | 19.50% | 3.4% | 68 |

The following section updates, as itemized in Table 1, discuss the impacts to the Preferred Portfolio and the scorecard metrics of the Company's 2021 IRP.

**Table 1. 2021 IRP Section Updates Reference**

| 2021 IRP Section | 2021 IRP Update Section |
|---|---|
| Executive Summary | IRP Update Executive Summary |
| Section 9.4 | Section 1.2 |
| Section 9.5 | Section 1 |
| Section 9.6 | Section 1.1 |
| Section 9.7 | Section 1.2 |
| Section 9.8 | Section 1.3 |
| Section 9.9 | Section 1.4 |
| Section 9.10 | Section 1.5 |
| Section 10 | Section 2 |
| Section 10.1 | Section 2.1 |

Note: Section updates supplement discussions in the Company's 2021 IRP.

# 1 Description of the Modified Preferred Portfolio

Figure 54R illustrates I&M's UCAP capacity position for the Modified Preferred Portfolio that retains a similar level of capacity above the Company's minimum PJM capacity obligation in 2041. In addition to the existing resources, nameplate capacities of new supply-side resources in the Modified Preferred Portfolio include 1,600 MW of wind resources selected through 2038, 1,900 MW of stand-alone solar resources selected through 2041, the selection of hybrid paired solar + storage resources in 2027 of 60 MW storage / 300 MW Solar in 2027, 1,070 MW of Gas CC selected in 2037, 1,500 MW of Gas CT resources and 255 MW of Stand-Alone Storage resources through 2041. Demand Side Management (DSM) resources were not changed in the Modified Preferred Plan. Additionally, the Modified Preferred Portfolio only results in resource changes during the period 2026 through 2028 and continues to maintain the optionality regarding the future operations of the Cook Nuclear Plant.

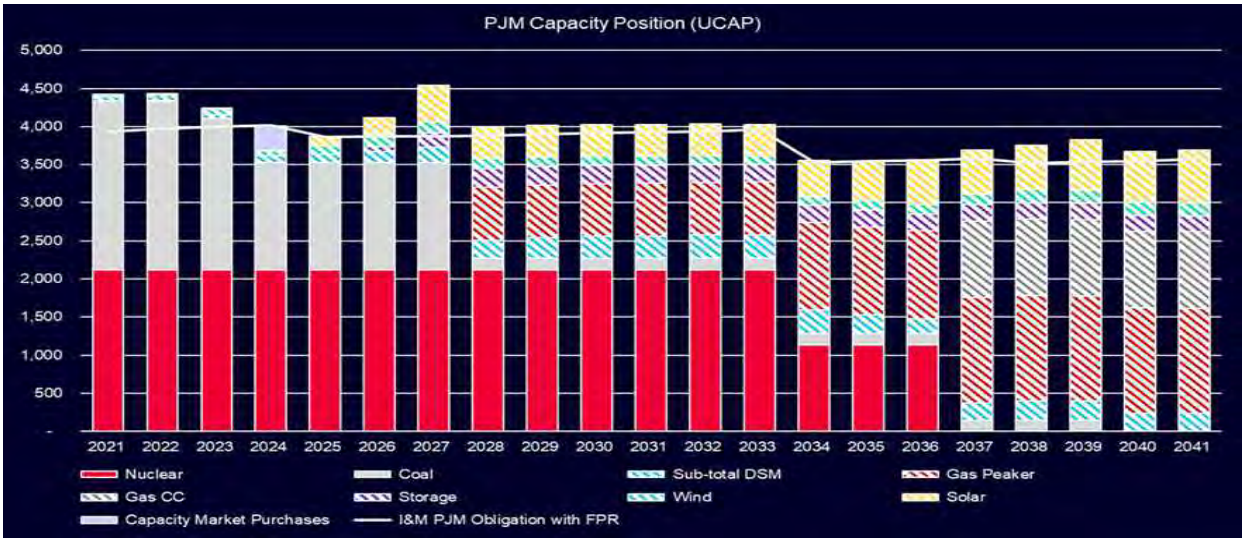



**Figure 54R: I&M's Modified Preferred Portfolio PJM Capacity Position (MW-UCAP) New and Existing Resources**

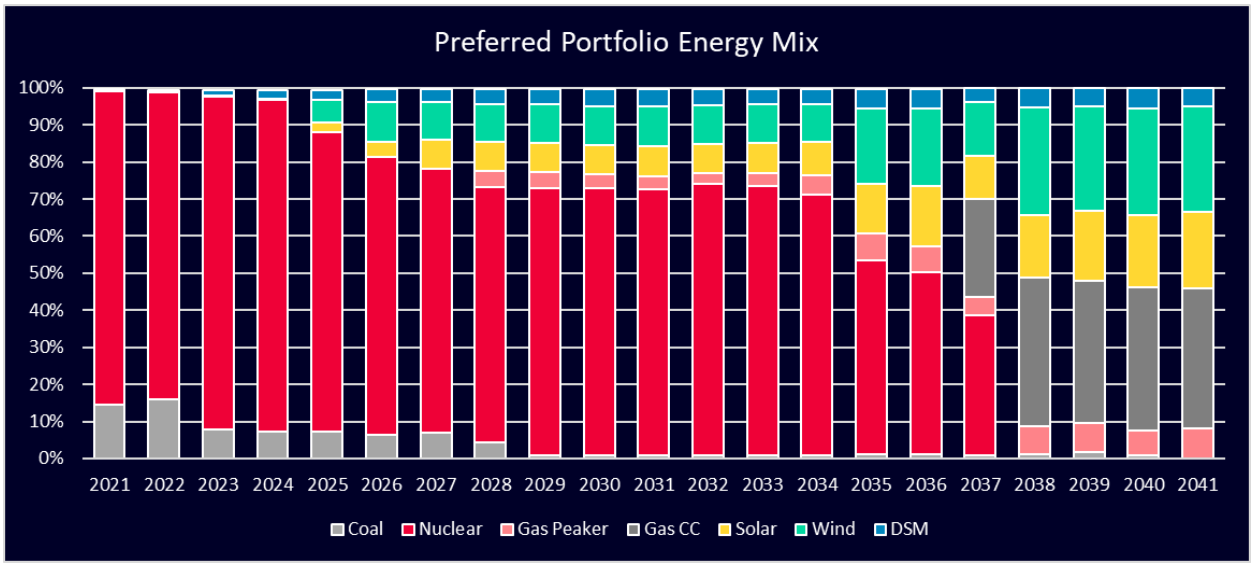



**Figure 55R: Modified Preferred Portfolio Energy Mix**

The forecasted energy mix by resource type contribution in the Modified Preferred Portfolio over the planning period is illustrated in Figure 55R. From an energy perspective, the reduction of the gas CT resource in 2028 results in a small reduction to the overall energy profile for the Company due to the limited amount of energy expected to be produced from this resource. The Modified Preferred Portfolio resources continue to include the addition of energy rich renewable resources and DSM resources that serve to mitigate future risks related to fuel price uncertainty and potential carbon emission prices. Additionally, the Modified Preferred Portfolio continues to include, with further resource diversification and sustainability benefits, incremental dispatchable generation resources to support resource adequacy and reliability during periods when renewable resources are not providing energy to meet the Company's load obligation.

The Modified Preferred Portfolio performs well across the range of metrics used in the Balanced Scorecard, retaining as well as enhancing the benefits I&M's resource plan is expected to bring to the Company's customers and Stakeholders, including:

## 1.1 Affordability

The Modified Preferred Portfolio remains as one of the least cost Portfolios with its Net Present Value Cost to Serve Load (NPVCTSL) being within 0.5% of the Preferred Portfolio and diversifies I&M's energy cost profile to support long-term customer affordability.

## 1.2 Rate Stability

The Modified Preferred Portfolio remains as one of the least cost Portfolios with the Capital Investment through 2028 increasing by less than 2% and the 5-year Compound Annual Growth Rate (CAGR) metric increasing by 0.2%. Additionally, the updates made to the Preferred Portfolio resulted in an upper boundary of cost risks (95$^{th}$ Percentile) to be within 0.5% of the Preferred Portfolio.

Table 26 in Section 9.4 on page 146 of the 2021 IRP has been updated to include the results of the Modified Preferred Plan. The updated results, provided in Table 26R, below show the forecasted impacts of each rate component on the metric in 2029. As shown on line 6, the Total Gross Revenue Requirement of the Modified Preferred Portfolio remains close to the Preferred Portfolio and significantly lower than the Reference' portfolio. The Modified Preferred Portfolio also continues to support managing the risk associated with higher levels of energy margins and market sales associated with the Reference' Portfolio. Additionally, the extended benefits from the Inflation Reduction Act (IRA) were not known at the time the 2021 IRP was conducted and therefore not reflected in this analysis. However, the addition of Stand-Alone Storage resources would be eligible for additional Investment Tax Credits (ITC) which is expected to further benefit the Modified Preferred Portfolio Net Cost of Service analysis.

**Table 26R: Retail Rate Impact Comparison**

| | | 2029 Single year Cost of Service Components and Net CAGR components | | |
|---|---|---|---|---|
| | | Preferred Portfolio | Reference' | Modified Pref Port. w/Storage |
| Line | | | | |
| | **Ratemaking Revenue Requirement - 100% owned** | | | |
| 1 | Pre-Tax Return on Rate Base | $249 | $354 | $250 |
| 2 | Depreciation Expense | $118 | $170 | $139 |
| 3 | Fixed O&M | $126 | $169 | $133 |
| 4 | Subtotal, prior to PTC/ITC | $493 | $693 | $523 |
| 5 | Less: Grossed Up PTC/ITC | ($72) | ($142) | ($72) |
| 6 | Total Gross Revenue Requirement | $421 | $552 | $451 |
| 7 | Less: Variable Energy Margin (Revenue-Fuel-VOM) | ($269) | ($409) | ($266) |
| 8 | Net Cost of Service Impact | $151 | $143 | $185 |
| 9 | | | | |
| 10 | Year over year Gross COS change | ($6) | ($11) | ($4) |
| 11 | Year over year Net COS change | ($12) | ($18) | ($10) |
| 12 | | | | |
| 13 | | **5 Year CAGR end year 2029** | | |
| 14 | | Net | Net | Net |
| 15 | 2020 Base Year Retail & FERC Revenues | $2,181 | $2,181 | $2,181 |
| 16 | 2029 Projection, New Resource Cost of Service | $151 | $143 | $185 |
| 17 | Total 2029 Net Cost of Service | $2,332 | $2,324 | $2,366 |
| 18 | | | | |
| 19 | Gross / Net % Cumulative Increase over 2020 Base ye | 6.9% | 6.6% | 8.5% |
| 20 | Net CAGR 2025-2029 | 1.40% | 1.30% | 1.60% |
| 21 | | | | |
| 22 | 2025-2028 Cumulative Capital Investment | 3.83 | 5.52 | 3.90 |

## 1.3 Sustainability

The Sustainability objective is improved with the Modified Preferred Plan as a result of the removal of one of the gas peaker resources and the addition of carbon-free stand-alone storage resources.

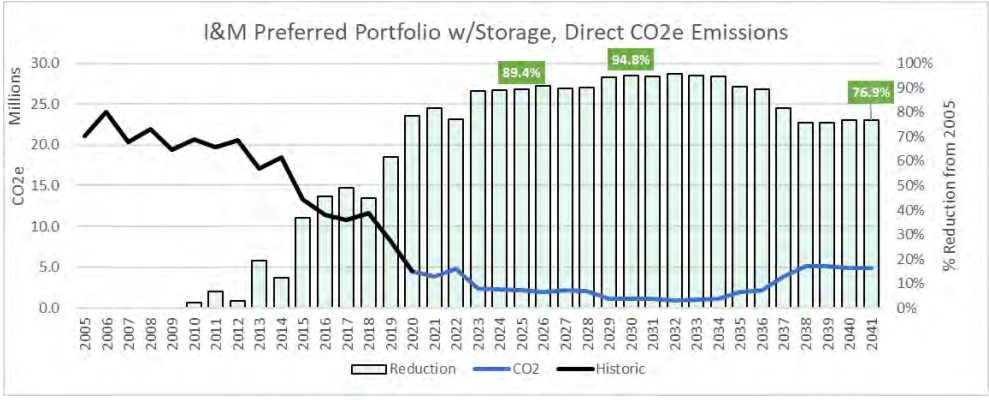



**Figure 58R. I&M Modified Preferred Portfolio $CO_2$ Direct Emission**

The Modified Preferred Portfolio retains the dramatic reductions of $SO_2$ and NOx emissions as illustrated in Figure 59R and further reduces NOx emissions by almost 8% compared to the Preferred Portfolio.

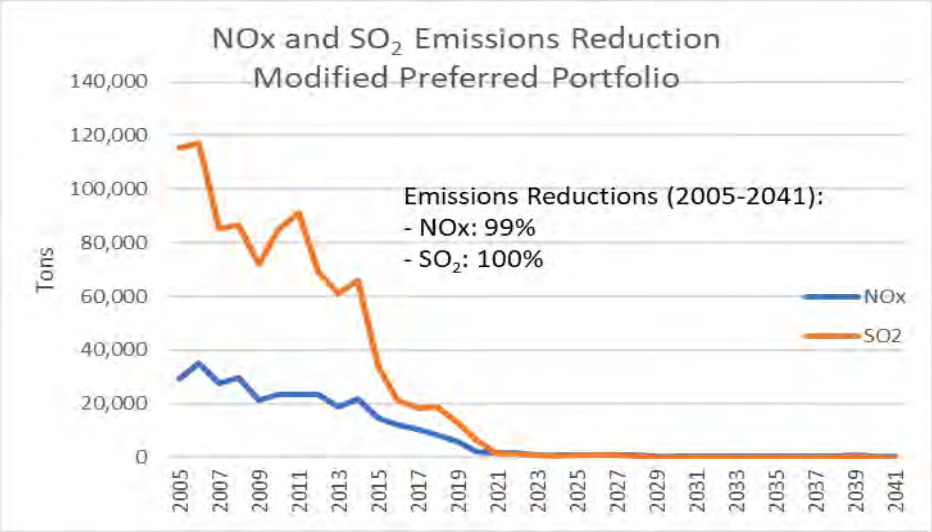



**Figure 59R: I&M Modified Preferred Portfolio $SO_2$ and NOx Emissions Reductions**

## 1.4 Market Risk Minimization

The Company expects the Modified Preferred Portfolio to continue to perform well in terms of energy market risk mitigation. The energy contribution in 2028 from the CT that was removed was approximate 1.1% of the total energy production of the Preferred Portfolio. The Company assumed a portion of the replacement energy would be purchased from the market and the amount of surplus energy available for off-system sales would be reduced. The estimated impact to market minimization metrics were less than 0.3%.

## 1.5 Reliability and Resource Diversity

The Modified Preferred Portfolio further increases resource diversity and maintains I&M's IRP Objectives associated with reliability. Specifically, the Modified Preferred Portfolio increases the Fuel and Technology Mix to account for up to nine fuel types, increases the number of unique generators and continues to result in surplus capacity above the PJM's Reserve Margin Obligation (2041). Additionally, the storage resource will complement the natural gas generation by providing the additional ability to store energy during low energy price periods and discharge during the higher load and higher energy price periods that serves to mitigate gas price risk. Storage also complements gas with its ability to be nearly instantaneously dispatchable when charged with negligible start up. Such storage also provides the opportunity to participate and provide value in the ancillary services market, including regulation and reserves, for the benefit of customers.

# 2 Short Term Action Plan Update

The Company's short term action plan was revised to adjust the All-Source RFP plans to reflect the resource targets under the Modified Preferred Portfolio. Specifically, the 2023 All-Source RFP reflected a 250 MW reduction to gas peaking resources and a 255 MW increase to storage resources.

## 2.1 Conclusion:

This Modified Preferred Portfolio incorporates modest changes to I&M's near-term resource plan that further improve I&M's Diversification and Sustainability metrics, and maintains customer and stakeholder benefits associated with Affordability, Rate Stability, Market Risk Minimization and Reliability.

**Attachment MAB-6**
**CPCN POA Generic Unit Assumptions**

**[Confidential Highly Sensitive – Not Reproduced Herein]**

**Attachment MAB-7**
**CPCN POA Brattle Adjustments**

**[Confidential Highly Sensitive – Not Reproduced Herein]**

**Attachment MAB-8**
**CPCN REC Price Forecast**

**[Confidential Highly Sensitive – Not Reproduced Herein]**