INTEGRATED RESOURCE PLANNING REPORT

to the:
Indiana Utility Regulatory Commission

Appendix – Volume 4

Submitted Pursuant to:
Commission Rule 170 IAC 4-7

January 31, 2022

INDIANA MICHIGAN POWER
An AEP Company
BOUNDLESS ENERGY

2021 I&M IRP Website Stakeholder Comment Summary				
	Stakeholder	Topic	Comment	I&M Response
CAC and Earth Justice submitted comments on Friday, March 26, 2021 7:39 PM; for tracking purposes Day 1 of the 15 working day clock begins on MARCH 29TH. The comments are due on April 16.				
1.	Citizens Action Coalition of Indiana ("CAC") and Earthjustice	Metrics/balanced scorecard	the proposed metrics are too narrow, arbitrarily limited to the "balanced scorecard" framework, and do not always capture the variables they intend. The "balanced scorecard" framework is arbitrary for several reasons. First, because it is a table, the metrics that populate it have to be presented as a single value. This would result in CO_2 emissions in a single year or in total, for example, being the single measure of "sustainability impact". But the impact of CO_2 emissions on climate change or as an economic risk to I&M and its customers is not the same in any given year. It would be far more informative to present a visualization of emissions for each simulated portfolio throughout the planning period. And the same is true for many of the other metrics, e.g. spot purchases and sales. We should be far more concerned with a proposal to sell large quantities of energy in the near-term than a portfolio that shows that happening in the late 2030s because the results that far out are far less certain than the near-term results. These important details cannot be shared in a scorecard framework. Using a scorecard prioritizes brevity of information over utility of information.	General Note: Please review the responses to these questions in total, as they will provide additional clarity for each individual question. The Balanced Scorecard provides many benefits to decision makers and consumers of the IRP analysis. A principle benefit of the Balanced Scorecard is that it can be used to communicate the balanced nature of the ultimate preferred portfolio. By displaying relevant metrics for sustainability, affordability and reliability, the Balanced Scorecard shows the manner in which these important portfolio attributes are balanced to best meet the needs of all of I&M's stakeholders. The Company plans to use Time Series metrics in addition to those used in the Balanced Scorecard and will consider the weighting methodologies that could be used within these metrics to address short-term vs. long-term impacts.
2.	Citizens Action Coalition of Indiana ("CAC") and Earthjustice	Scorecard Color Coding	Second, the scorecard is arbitrary because of the color coding.1 During the IRP workshop, Siemens and I&M both stated that the color coding is intended to make the scorecard easier to digest, but this is exactly the problem with color coding. Rather than allowing the reader to draw his/her own conclusions about the metrics, the color coding is effectively telling the reader which portfolio is preferable. We have observed in prior Siemens scorecards that the red, green, and yellow coding is sometimes assigned based on trivial differences, for example. So the color coding is not providing neutral guidance about what is important, rather it is a product of the totally subjective color coding that Siemens and I&M choose.	As with most visualization methods, colors provide another method of consumption for the information presented but it doesn't prevent readers from drawing their own conclusions. I&M continues to promote broad and diverse access to its publically available information. We will include in the report, the opportunity for those with disabilities to receive an alternative format.

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			1 It is also important to note that a color-coded scorecard does not communicate anything additional to those who are color blind.	
3.	Citizens Action Coalition of Indiana ("CAC") and Earthjustice	Metrics	Finally, the metrics proposed do not necessarily capture the concern they purport to. Rate stability is much more of a near-term concern in the sense that cost and rate impacts are more known in the near term. Testing portfolios stochastically and particularly in the manner proposed by Siemens, does not differentiate between near and long-term concerns. Nor do we think this methodology is actually representing revenue requirements. It is our understanding that Aurora is incapable of calculating revenue requirements, all capital costs are represented as a carrying charge (levelized charge) rather than as assets with depreciation schedules, which can have a very different rate impact. We also do not believe measuring reserve margin captures reliability concerns, all portfolios will have to meet that constraint. It would be much more informative to measure how resilient the system would be to a major contingency like a long-duration generation outage and/or to think about other points of weakness such as reliance on a single gas pipeline. Lastly, we do not believe "mix of adequate resources" is a good measure of Resource Diversity. Where fuel supply is not at issue, diversity by resource type has little meaning. A better indicator would be number of unique generators relied upon.	As part of our continuous improvement in IRP's, new metrics are being considered to which, many different attributes could be considered as part of the evaluation. The Company will continue to consider additional metrics associated with this IRP throughout the process to support the stated objectives. Detailed production cost modeling issues will be addressed in more context during the Aurora Technical Conference scheduled to occur in late May.
4.	Citizens Action Coalition of Indiana ("CAC") and Earthjustice	Metrics/Score card	**Our top-level recommendation as it relates to metrics would be to skip the scorecard altogether and talk about each metric qualitatively supplemented with quantitative data that captures the objective of the metric.** For example, a discussion of off-system sales and purchases in each portfolio with a chart showing how those change over time. It is much more informative, though no more subjective for I&M to then discuss how it balances these data into the selection of a preferred plan rather than simply color coding the "winning" portfolio.	See response to item 1 pertaining to the use of a scorecard. However, for metrics that change over the planning period, the Company is considering supplemental analysis methods to inform the relative value between portfolios.
5.	Citizens Action Coalition of Indiana		As it relates to a diversity, equity and inclusion ("DE&I") metric, because this metric should be reflective of the preferences of affected communities, it makes the most sense to solicit the feedback of those communities. Since those preferences may vary amongst different	Good feedback regarding our impact on communities. We are committed to working with the communities in which we work, live and locate resources. We have a team of

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<tr><th colspan="5">2021 I&M IRP Website Stakeholder Comment Summary</th></tr>
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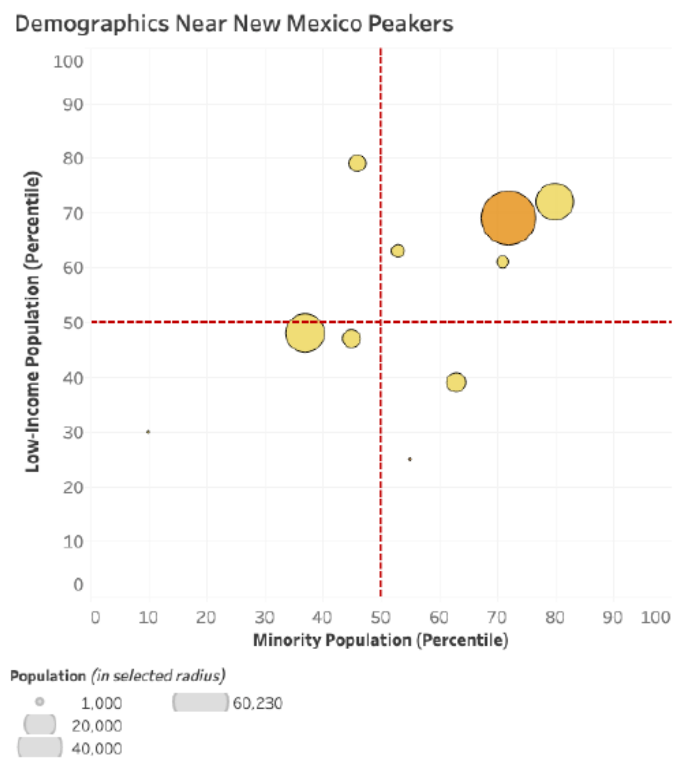
<tr><td></td><td>(“CAC”) and Earthjustice</td><td></td><td>service territories, we would propose the following as interim metrics. First, a metric that measures whether emitting units in each portfolio are located in low-income and/or communities of color. An example of this as it relates to peaker plants in New Mexico is given below. See comment package for example) .



The circle size indicates the population within a given radius of the plant and the color, in this case, distinguishes between peakers at their own</td><td>external affairs representatives that engage customers, officials, and community leaders and organizations to understand their interests and concerns and to help them understand our goals and objectives in meeting their needs. For this IRP, we also value the feedback we receive through the stakeholder process and are pleased that it is a diverse group of interests that includes communities we serve, customer groups and individual customers. We are also aware of the demographics of the communities in which we have existing resources and can discuss those as appropriate. The location of new resources is generally not known or specified when developing an IRP and the impact on communities of new resources may be better discussed as part of the review of a specific resource action. For more information regarding I&M’s and AEP’s commitment to a Just Transition within the communities we serve, please reference our recently issued Climate Impact Analysis.

http://www.aepsustainability.com/performance/report/docs/AEPs-Climate-Impact-Analysis.pdf</td></tr>
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			site versus those co-located with a combined cycle plant. We would also note that this is another example of useful information that cannot easily be included in a scorecard. For I&M's purposes, we would recommend keeping the low-income and community of color axes, but changing the color coding to reflect the fuel burned at emitting units. We would note that a similar graph, but for all fuel types, could be used to identify some of the positive and negative impacts as well as the equity of those impacts of replacement generation once those locations are identified.	
6.	Citizens Action Coalition of Indiana ("CAC") and Earthjustice	metrics	We would also propose a second DE&I metric that attempts to capture the potential for benefits of new resources (both supply and demand-side) to low-income and communities of color in I&M's service territory by quantifying the total investment that has potential to be located in these communities. That investment could include dollars spent on energy efficiency, dollars spent on solar, etc. This is a metric that will need future refinement, but should be accompanied by consideration of programs that will directly address the objective of the metric. Ideally, I&M would also be evaluating programs that directly impact affected communities as part of its IRP, e.g., low-income community solar, low-income electric vehicle incentives, investment in "green zones" in communities located near I&M's power plants, etc. 3 *3 Clearly, there is an implementation component to this that is important and complementary. And that is to weigh where to invest those dollars also using these metrics (and other metrics) once I&M moves from the generic resources modeled in the IRP to the specific resources it would seek to implement. At that stage, I&M could also supplement this analysis by considering whether historic investment has gone equitably towards affected communities.*	We appreciate this feedback and input. DE&I considerations are very important to our business goals and objectives. The IRP process typically is focused on a more macro resource plan level, however, consideration will be given to programs similar to what is described in the feedback. For example, IRP modeling could specifically capture some of the factors mentioned as they would be location and situation specific. That said, renewables and demand-side resources will continue to be key elements of the IRP and I&M will be incorporating DE&I considerations into future resource decisions and new customer programs. As an example, I&M recently proposed and received Commission approval of new programs in Michigan that expand opportunities for low-income and customers without broadband access to customize their electric service and manage their electric bill. I&M plans to seek approval of similar programs in Indiana. Also, see response to 5.

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7	Citizens Action Coalition of Indiana ("CAC") and Earthjustice	Scenarios	We believe the carbon reduction goal for Net Zero by 2050 should be at least a 95% reduction from a baseline year. Because we would have to transition so many end-uses to electricity to meet an economy wide climate goal, there will be extremely limited options to offset electric sector GHG emissions, and the modeled goal should reflect that reality. 4. *A common baseline year is 2005, but we recognize that AEP's corporate goal is relative to a year 2000 baseline.*	The Company agrees that a substantial reduction is necessary and is consistent with its recently released Climate Impact Analysis report.
8	Citizens Action Coalition of Indiana ("CAC") and Earthjustice	Scenarios	Furthermore, because a plan to achieve this goal would most reasonably result in system emissions reductions over time, it will likely make sense to model one or more interim goals. An annual constraint is probably overly limiting, but a 2030 goal could be reasonable. AEP's corporate goal of an 80% reduction from 2000 emissions by 2030, as applied to I&M's system, may be a good choice though it's unclear if this would be achieved by already contemplated reductions such as the retirement of Rockport. And because this magnitude of decarbonization will have to happen system-wide, we recommend two scenarios that include this goal: one with I&M's base case load forecast as proposed, and the other reflecting I&M's best estimate of the load impacts of large scale electrification (likely more electrification than would be reflected in the "market electrification" scenario).	The Company expects the final IRP scenarios will address a variety of alternative futures including increased ambitions around climate and scenarios around higher electrification. Further analysis related to the suggested additional high electrification scenario will be considered and reviewed through the stochastics analysis.
9.	Citizens Action Coalition of Indiana ("CAC") and Earthjustice	Scenarios	We also concur with Emily Medine's recommendation that gas assets should be modeled as fully depreciated, ideally by 2040, in at least this scenario. Finally, we note that in evaluating and modeling resource options, I&M should factor in the lifecycle GHG impacts of each option, rather than considering only the CO2 directly emitted by the resource. This is especially important with regards to gas-fired resources given the significant GHG impacts from the extraction and transport of natural gas.	The Company does not plan to modify the asset lives of its non-CCS fossil resources due to the expectation of the availability of low carbon fuels. Furthermore, the Company may constrain energy production from non-CCS fossil resources to support a "Net Zero by 2050" objective. The Company plans to review GHG impacts from the resource perspective and the lifecycle perspective.

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10.	Citizens Action Coalition of Indiana ("CAC") and Earthjustice	Scenarios	We understand that I&M wishes to keep its scenarios to a manageable number, so we would recommend the following: Reference Net Zero by 2050 Net Zero by 2050 with Electrification Rapid Technology Advancement	We appreciate the suggestion for a reduced number of scenarios and are considering the final set of scenarios and their inputs based on all the Stakeholder feedback. The Company intends to make adjustments to the proposed scenarios discussed in the Stakeholder Meeting #1 and will share these during Stakeholder Meeting #3.
11.	Citizens Action Coalition of Indiana ("CAC") and Earthjustice	Scenarios	We are uncertain about the value of the Market Electrification scenario. I&M's stakeholder presentation implied that High Load is merely reflective of more optimistic economic assumptions, which would not necessarily be reflective of electrification because the shape of load may not reflect the realities of electrification. If that is the case, we think high load is better reflected as a sensitivity than a scenario.	See response to 10.
12.	Citizens Action Coalition of Indiana ("CAC") and Earthjustice	Scenarios	We are also uncertain about the value of the Enhanced Regulation Case. Slide 48, pasted below, does not include the High CO2 price, so it is not clear what I&M would model.[5] Indeed, this graph raises the question of whether "Base" CO2 means no CO2 price at all, which would raise other concerns about the remaining scenarios.	The Chart shown illustrates only the Base CO2 price in the current fundamentals of $15/metric ton starting in 2028. The Enhanced Regulation case assumes a higher CO2 burden, as noted in slide 37 of the presentation. The charts will be updated as the Company continues through the process

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			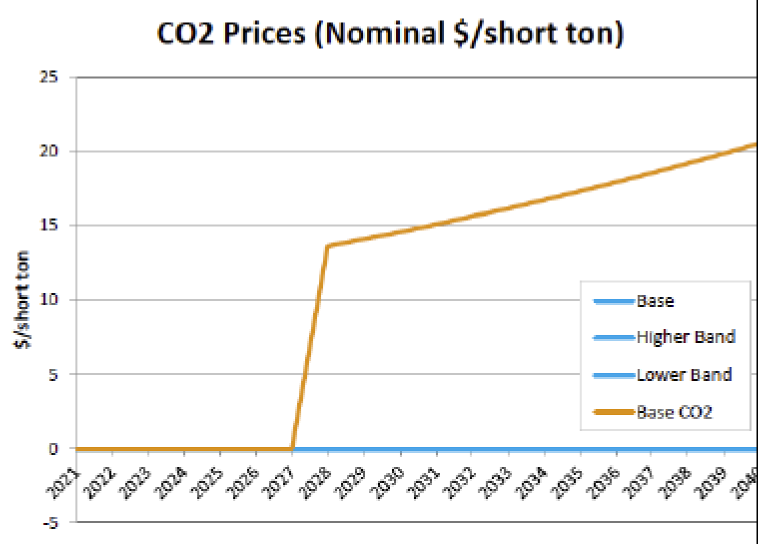 *5. We note that AEP's Climate Impact Analysis has a "Fast Transition" CO2 price of $30 per ton escalating at 3.5% per year, but it's not clear if this is what AEP intends as the High value. http://www.aepsustainability.com/performance/report/docs/AEPs-Climate-Impact-Analysis.pdf*	
13.	Citizens Action Coalition of Indiana ("CAC") and Earthjustice	Capital Cost Curves and Stochastics	As we stated during the IRP workshop, we do not believe it is appropriate to test capital costs stochastically. Capital costs, particularly those for renewables and battery storage, do not increase in one year, then decrease in the next, and then increase in the subsequent year, a situation that is entirely possible with the probability bands given. Renewable and battery storage capital costs are uncertain, but their overall trend is downward, a dynamic that makes scenario analysis the more appropriate way to examine their uncertainty.	While it may be correct that capital cost recovery for existing units does not vary from year-to-year, this is not the case for overnight costs or financing costs that are applicable for new units in Siemens PTI's analysis. Perhaps more importantly, capital cost uncertainty is not typically applied to candidate portfolios Capital cost uncertainty is most frequently applied to the dynamic build logic that is used to add or retire capacity in neighboring energy market areas in response to varying supply-demand

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				conditions across the stochastic simulations. This is necessary to ensure that the simulated inter-tied areas maintain a reasonable supply-demand balance while capturing the uncertainty regarding the technologies that neighboring regions might add.
14.	Citizens Action Coalition of Indiana ("CAC") and Earthjustice	Resource cost estimates	The proposed solar, wind, and storage costs appear to be roughly similar to National Renewable Energy Laboratory's Annual Technology Baseline (NREL ATB), which is often used to characterize generic pricing of these resources. However, we've found that the NREL ATB often overstates storage costs in particular. A possible solution to this may be to use I&M's RFP responses rather than Siemens' capital cost curve (similar to the approach that Vectren and Siemens used in preparing Vectren's 2019 IRP), and then apply the ATB's cost curves going forward	The capital costs depicted in the initial slide deck were still in development. The Siemens team will be incorporating the results of I&M's RFP responses.
15.	Citizens Action Coalition of Indiana ("CAC") and Earthjustice	Load Forecast	The presentation of I&M's load forecasts raised several questions. First, it is not clear why the extreme weather forecast would have the same compound average growth rate ("CAGR") as the Base forecast. If the extreme weather forecast is intended to account for significant climate impacts, it would seem likely that both the air conditioning loads and line losses would grow significantly. We also are not clear why the loss of wholesale customers in approximately 2034 would have such an outsized impact on the CAGR calculated over the entire period from 2020 – 2035. Finally, we renew our request that I&M not use "degradation" to adjust incentivized energy efficiency either in its load forecast or in the modeling of energy efficiency. This is a critical issue to the accurate modeling of energy efficiency in the IRP.	The extreme weather scenario had a neutralizing impact on overall load growth. In other words, the higher loads it created during the summer months (due to warmer temperatures) was offset by the lower heating loads during the winter (also caused by warmer temperatures). The load impact of wholesale contracts ending in 2034 has a significant impact on the compound average growth rates computed for the period between 2020-2035. You could exclude the wholesale load from the comparison, but it would no longer represent I&M's projected load growth. The Company is committed to accurately modeling the impact of energy efficiency in the IRP and is actively working with our Market Potential Study (MPS) Consultant, GDS, to ensure these resources are included appropriately.

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16.	Citizens Action Coalition of Indiana ("CAC") and Earthjustice	Stakeholder Engagement –define limits of renewables that will be modeled	We would also request that I&M work with stakeholders to define the limits on renewables that it will model consistent with Section 6(d) of the settlement regarding I&M's 2019 IRP that was filed with the Michigan Public Service Commission, which states, "I&M will work with stakeholders to define the modeling inputs for the IRP, including scenarios for […] renewable generation resources".	The Company has invited all Stakeholders to be part of the process that includes an open and transparent discussion on modeling inputs and scenarios.
17.	Citizens Action Coalition of Indiana ("CAC") and Earthjustice	Stakeholder Engagement – Rockport 1 5/31/25 scenario	Pursuant to Section 6(c) of the Michigan settlement, we urge I&M to work with stakeholders in establishing the inputs to be used in modeling a scenario that includes a May 31, 2025 retirement of Rockport Unit 1.	See response to item 16
18.	Citizens Action Coalition of Indiana ("CAC") and Earthjustice	Stakeholder Engagement – OVEC	We also urge I&M to include on the agenda for the next stakeholder meeting discussion of the approach to evaluating the costs to customers of the Inter Company Power Agreement and the economics of terminating the operation of the OVEC units under the ICPA by the end of 2030, as required by Section 10(k) and 12 of the Michigan settlement.	As discussed in I&M's first stakeholder meeting, I&M has a contractual obligation to purchase power from OVEC until 2040. The OVEC purchase is part of I&M's diversified resource portfolio and will be modeled as a going-in resource consistent with the term of the agreement and other I&M resources that are owned or under long-term purchase agreements. Given this, Section 10(k) and 12 of the referenced settlement agreement were specifically written to provide supplemental information and testimony that I&M will prepare and file in support of I&M's Preferred Plan as part of its next Michigan IRP filing.
Posted Q1-Q18 on April 16, 2021				
19.	Jennifer A. Washburn, Counsel Citizens Action Coalition of Indiana, Inc. 4/7/21	Request Stakeholder Presentation at Meeting #2	Could we please do a stakeholder presentation at the April I&M IRP meeting next week? Follow up: Thanks for the confirmation. We'll work to get you a presentation as soon as we can but we are unlikely to be able to meet the COB on Friday deadline. We'll be in touch. Follow-up on 4/12/21 : Here is our stakeholder presentation for Wednesday. Thanks!	Jennifer, thank you for the note. Interested stakeholders will have an opportunity to speak at the April 14th meeting. To ensure we are able to balance the amount of materials to be covered and allow multiple interested parties an opportunity to speak, I&M is making the following arrangements: • 30 minutes will be allotted for stakeholder presentations/comments

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				• Each presenter is asked to limit their presentation/comments to 15 minutes • Any presentation to be used during the stakeholder comments will need to be presented to I&M by COB this Friday, April 9, 2021 Presentation was provided on 4/12/21. Anna Sommer presented Modeling EE in I&M's IRP at stakeholder meeting #2.
20.	Gould, Karen (LARA) 4/15/21	GDS MPS	One other question, could you follow up with the question I think Dan posed to have GDS benchmark your average incentive as a % of incremental cost compared to other areas? I&M's numbers were fairly low which could be a great indicator why you've been unable to achieve the levels of other utilities in MI. Other utilities in Michigan are usually around 50 and can go as high as 100% (even for non-low income programs such as hard-to-reach commercial customers).	I&M has tasked GDS with recommending industry best practice measures and programs as part of the MPS deliverables. Part of the expected work product from GDS is to benchmark incremental costs for each EWR measure and recommend incentive pricing levels that are economic so that I&M can be aligned with industry best practice but analyzed under I&M's specific avoided costs. From GDS' MPS work product, I&M plans to implement EWR programs consistent with IRP selection and GDS' recommended program delivery models and pricing structures.
21.	Jennifer Washburn 4/14/21	Aurora Workshop	Just a note per Jay's request to let you know that my colleagues cc-ed here and I are interested in attending the late May Aurora technical workshop. (cc: Kerwin Olson, Reagan Kurtz, Anna Sommer , Chelsea Hotaling, Sameer Doshi . 4/15/21 follow-up: Our IRP expert, Anna Sommer, will be out May 10-28. Is there any way we can do a one off meeting with I&M to cover this Aurora subject matter, assuming the meeting may be scheduled when she is out? If so, perhaps sometime during the week of May 3rd?	Thank you for confirming your interest in this technical workshop. We are currently in the process of finalizing details associated with this and plan on providing more information to stakeholders in the near future. Ultimately, we plan on providing access to the model in June and holding the workshop at a later date that better aligns with when we expect to have more of the modeling input data available. Our goal is to make the workshop a meaningful opportunity for our stakeholders.
22.	Wesley Rice-Snow	Rockport	Hello; my home town of Muncie has experienced the many gifts that investing in solar power gives. When I volunteered to film an informative	I&M would like IRP stakeholders to be aware of the plans announced by AEP on April 22, 2021 to add more than

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	April 14, 2021		video about the local Unitarian Universalist church's solar installation, I talked with the many congregation members proud of their contribution to fighting climate change. I also saw first-hand the well-paying and meaningful jobs the process provided to a town where most factory jobs have disappeared. As the disastrous weather effects of climate change shake our country, I worry that renewable energy will not be implemented swiftly enough by I&M. I also think about the many low-income communities who would benefit greatly from solar initiatives. I ask if I&M will commit to not buying power from Rockport Unit 2 when the current lease ends. I also ask if I&M will commit to quickly implementing solar power, including in Muncie.	16,500 MWs of renewable energy across AEP's service area by 2030 (see below). I&M intends to engage stakeholders in the current IRP process to assist in the evaluation of the plan for I&M. AEP also announced that I&M and AEP Generating Company have agreed to acquire Rockport Unit 2 as a capacity resource to help bridge I&M's capacity needs as I&M continues its orderly transition to more renewable resources. I&M expects the inclusion of Rockport 2 in I&M's generation portfolio used to serve customers will be reviewed with state commissions and stakeholders in filings before the commissions and as part of the IRP process. The Rockport 2 agreement was reached after I&M decided to not renew the lease and began confidential discussions with the owners about how the unit would be operated after the lease ended. As those discussions progressed, I&M recognized that it would be beneficial to all concerned if I&M controlled the unit after the lease expired. The generation changes at AEP will help grow renewable generation to 51 percent of AEP's total capacity by 2030, as the company works to achieve its goal of net zero carbon emissions by 2050. Please refer to I&M's IRP webpage for additional information.
23.	Anna Sommer – Energy Futures Group April 14, 2021 8:26 PM; 4/15/21 for business purposes	G, T, and D modeling	I also wanted to follow up with my question for Bob and Carlos. We were part of a team that recently wrapped up a study looking at meeting up to 75% of Puerto Rico's energy needs from rooftop solar and battery storage. For that work our team did nodal simulations in Plexos, grid stability analysis in PSS/E, and distribution modeling using OpenDSS. So we can directly relate to the challenge of aligning these functions across different platforms that you were all describing. I had two big takeaways from that work that I think apply to the discussion today. First, it's really not tractable to perform G, T, and D modeling together with a lot of frequency. There is so much iteration	In response to the first comment related to the frequency of performing G, T and D planning together, we would agree that it can be highly iterative and complex, and therefore requires a tenor reflective of the nature of the work involved. What will be important is that all three processes have the same set of goals and objectives. Establishing this up front will influence what happens in each of the planning processes. The conceptual example described in the question highlights this need for a common set of goals and objectives. When the non-wires

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			that takes a lot of time. Second, we saw some counterintuitive results in our study, particularly as it relates to the distribution system. A relatively modest number of mitigations were needed on the distribution system to achieve 75% solar/storage penetration. This was in part because those systems were spread out across lines rather than concentrated. And so I wonder if what I&M might aim for, likely in the next IRP, is to bookend a heavy buildout of DERs throughout its distribution system but particularly on all lines that are or are likely to become overloaded? It seems like the main way we can get distribution planning results to interface with generation planning (for the moment) is if we can better evaluate and isolate the deferral benefit of DERs. And I worry that doing this on a piecemeal basis as is typically done in non-wires alternatives analysis leaves much to be desired in terms of optimizing the total value of DERs. I realize that is a super conceptual suggestion, but it also seems like having an analytical goal to aim for is the only way to start doing this work and figure out how to align these planning processes. So I'd be interested to hear what Bob and Carlos think about that?	alternatives analysis is approached from the perspective of distribution planning, it is done with the objective to resolve an emerging need on the distribution system more so than trying to address a more holistic concern that might involve G and T. If the perspective is changed to where the need is more broadly defined to include G and T requirements, then the analysis, solutions and economics all begin to look very different. This is the perspective the newly formed Grid Solutions organization is expected to bring to our planning efforts going forward – a holistic view of our customers' and/or system's needs and an array of solutions to best address those needs. Relative to the specific analytics being described in the question, there are likely steps we could take in the short-term. For example, distribution station transformers or feeder exits out of substations may be an area where we could focus our initial efforts. We would need to spend some time working out criteria, assumptions, assessment of benefits and costs and process details that don't exist today. For example, developing a set of assumptions around the type/sizing/performance expectations of the DERs would be extremely important. In addition, our planning criteria will need to be enhanced to be more inclusive of the types of solutions we would deploy and when and how we would deploy them. There are other challenges we would need to address, especially if we want to take this type of analysis to the broader reaches of the distribution system, including more detailed load forecasting, enhanced information technology to drive process efficiencies given the potential volume of work,

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				and the new tools and analytics required to develop solutions. All that said, this is a great aspirational goal to put in front of us and we agree that having the goal is a necessary requirement if we ever hope to get there.
24.	Jennifer A. Washburn, Counsel Citizens Action Coalition of Indiana, Inc. April 29, 2021	Aurora Meeting	Just touching base about our email below re: the Aurora meeting. "My pleasure. Our IRP expert, Anna Sommer, will be out May 10-28. Is there any way we can do a one off meeting with I&M to cover this Aurora subject matter, assuming the meeting may be scheduled when she is out? If so, perhaps sometime during the week of May 3rd? "	See response to Q 21.
25.	Jennifer A. Washburn, Counsel Citizens Action Coalition of Indiana, Inc. April 29, 2021	RFP	When will I&M be releasing the RFP and sharing that with the I&M IRP listserv?	I&M issued an All Source Informational Request for Proposal (RFP) on April 23, 2021. Additional information is available at: All-Source Informational RFP (indianamichiganpower.com)
Questions 26 - 30 were submitted on May 19, 2021 by the CAC and Earthjustice (comments on IRP Stakeholder Workshop 2)				
26.	CAC and Earthjustice	Stakeholder Workshop #2 and Feedback on stakeholder Questions	Citizens Action Coalition of Indiana ("CAC") and Earthjustice submit these comments on the materials presented during Indiana Michigan Power Company's ("I&M") April 14th stakeholder workshop for its 2021 Integrated Resource Plan ("IRP"). While we appreciate I&M's emphasis that stakeholder feedback is key and needed, we hope I&M will not just consider this feedback but use it to modify the analysis that it intends to undertake, and will provide written responses that includes descriptions of how the analysis was modified, or explanations of why it was not, in response to feedback. The responses given to our comments so far	The Company continues to develop inputs to the IRP informed by the feedback received by all stakeholders in the previous Stakeholder meetings and correspondences. The IRP is an extensive process that spans many months and represents the compilation of a vast amount of inputs, assumptions and modeling. As I&M receives questions from stakeholders we answer those based on the best information we have at the time. If I&M were to continually evaluate and update its responses to past

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			generally did not make clear whether I&M will actually use any of the feedback we have given to date. Even if I&M is not prepared to say one way or another at this juncture, we do think it is very important that I&M clearly state what stakeholder feedback it is incorporating into its IRP and, if not, give a clear explanation for why it is not utilizing that feedback. We also would appreciate actual dialogue with I&M, wherein I&M meets with us to discuss our comments, collaborate, and problem-solve like other Indiana utilities do. Thus far, I&M has simply posted responses to our comments on its website without notifying us.	questions and feedback, that effort would interfere with development of the IRP itself. I&M has been, and continues to be, forthright in its responses to the feedback received from stakeholders, including the CAC. All feedback is incorporated into I&M's IRP, as it is taken into consideration in the development of the IRP itself. For example, as detailed in response to comment 29 below, I&M plans to group EE measures into sector-level portfolios for inclusion in the IRP modeling based upon I&M's consideration of the CAC's input regarding that topic. The Company looks forward to continued collaboration with all stakeholders, including the CAC, during two additional stakeholder meetings intended to be a forum for productive dialogue throughout the IRP. Further insights into more specific decisions currently being analyzed will be shared during the remaining stakeholder meetings.
27.	CAC and Earthjustice	Supplemental Efficiency Adjustment	CAC would like to reiterate the concerns about I&M's supplemental efficiency adjustment that were discussed in Anna Sommer's presentation during the April 14th IRP stakeholder workshop. We continue to recommend that I&M not apply the supplemental efficiency adjustment, because it undervalues the impacts and overstates the cost of energy efficiency and does not arise from a legitimate concern about increasing codes and standards. The supplemental energy efficiency adjustment (Figure 1) results in a modeled lifetime that is condensed or expanded for many measures and a shape of savings that declines every year, which is completely divorced from how those savings actually accrue and how I&M is actually compensated for lost revenues associated with those savings.	I&M appreciates the CAC's interest in this element of the IRP process and we understand the CAC's recommendation. This matter has been discussed in multiple IRP's and other I&M regulatory proceedings. Most recently, the use of this adjustment was found to be reasonable by the IURC. See, e.g., Cause No. 45285, Order (Feb. 3, 2021). As addressed in that proceeding as well as in this and past IRP's, I&M disagrees with many of the CAC's statements and assertions as they misrepresent this element of the IRP process and the modeling of energy efficiency. That said, I&M appreciates the importance of this matter to the CAC and other stakeholders and shares many of the same interests in ensuring the accuracy of modeling energy efficiency and the alignment of that with I&Ms load forecast. I&M appreciates differing views and approaches to forecasting and is constantly looking for

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			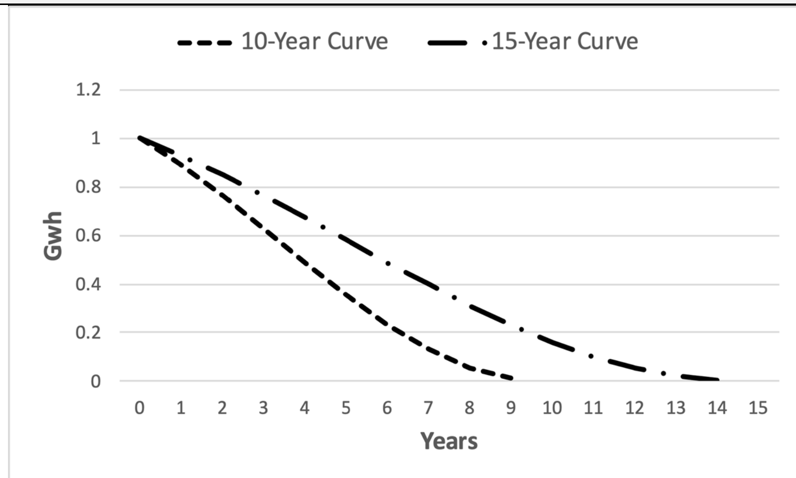 **Figure 1. I&M's Supplemental Efficiency Adjustment** CAC does not believe that a supplemental efficiency adjustment is needed. First, CAC's consultants have evaluated several IRPs from utilities that also utilize Itron's Statistical Adjusted End-Use ("SAE") model, including Duke Energy Indiana, AES Indiana, CenterPoint, NIPSCO, and Xcel. None of these utilities apply any type of "supplemental efficiency" adjustment either in their load forecasts or to their energy efficiency bundles. Second, I&M argues that the supplemental efficiency adjustment is necessary because its forecast has greater efficiency savings. However, AEO documentation of the information upon which that contention is based clearly refutes that. For example, its commercial demand documentation states, "One of the implicit assumptions in the Annual Energy Outlook 2021 (AEO2021) commercial sector Reference case projections is that, through 2050, technology and consumer behavior do not radically change. No new regulations of efficiency beyond current law or new government programs fostering efficiency improvements are assumed."[1]	ways to improve its processes. I&M continues to believe that CAC misunderstands this adjustment and places more emphasis on this adjustment than what is warranted. The Company has reached out to peer utilities in IN and MI including several mentioned and determined the CAC's claim is incorrect. Several of these utilities include adjustments to the forecasted DSM savings to prevent double counting energy efficiency in their load forecast with a net impact of I&M's supplemental efficiency adjustment not that different from the impact other utilities are using with their DSM coefficient adjustment. Furthermore, a discussion with respect to IRP optimization for EE resources should not conflate the way DSM savings are measured for lost revenues as the savings for lost revenue calculations are not dependent on a load forecast. The way DSM savings are measured for lost revenues (based on historical performance) is a completely separate calculation than what energy efficiency is modeled in an IRP optimization (future energy efficiency savings). They are not equivalent. Actual savings computed for the lost revenue calculation (from the EM&V process) does not depend on a load forecast. The IRP does depend on a load forecast and since I&M's load forecast model already includes the impact of future energy efficiency, an adjustment is necessary to prevent double counting energy efficiency in the IRP optimization. Additionally, the suggestion that the AEO documentation clearly refutes a point by I&M forecast has greater efficiency savings built in is not true. For example, the 2021 AEO Residential assumption documentation states,

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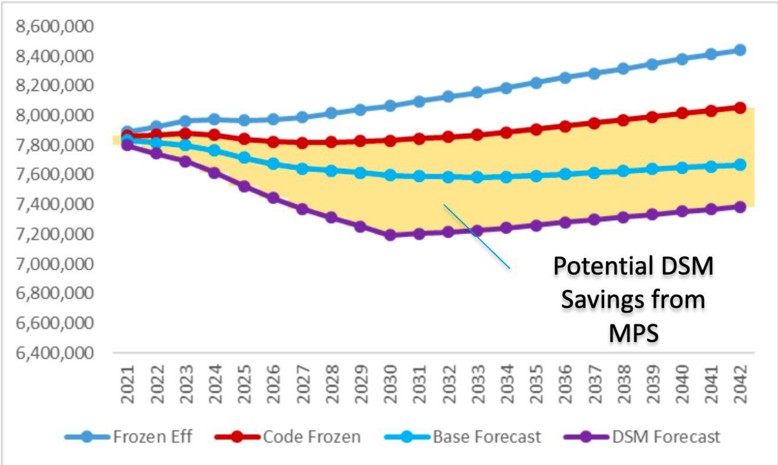
			The increase in end-use efficiency that I&M points to reflects improvements in stock efficiency because of measure turnover primarily and a small amount of incentivized energy efficiency. Figure 2 shows the load forecasts that I&M presented in the April 14th workshop. CAC does not believe that the "Code Frozen" forecast assumes greater efficiency savings in the forecast than the Market Potential Study ("MPS") baseline. I&M reports that the total potential demand-side management ("DSM") / energy waste reduction savings are computed based off the baseline from existing codes.[2] As a result, there should not be a significant difference between the "Code Frozen" (red line) and the "Base Forecast" (teal line).  **Figure 2. Load Forecasts Presented in Second Stakeholder Workshop3** It is CAC's position that continued use of the supplemental efficiency adjustment will radically distort energy efficiency in a way that makes it	"The RDM (Residential Demand Module) accounts for the effects of utility-level energy efficiency programs designed to stimulate investments in more efficient equipment for space heating, air conditioning, lighting, and other select appliances." As I&M has stated on numerous times this adjustment is necessary to ensure I&M's forecast does not overstate EE/DSM efforts that have already been implemented by I&M's customers. I&M worked very closely with GDS on this topic and GDS confirmed that the savings included in I&M's base models were different than the Code Frozen scenario from GDS. AEP uses this methodology in all 11 of the states that it operates in. Without this adjustment, I&M's forecast would overstate load obligations, which over time may lead to unnecessary build or buy decisions that could negatively impact future rates.

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			impossible to select the economically optimal level. It is critical to the accuracy and value of this IRP that I&M stop using this methodology.	
28.	CAC and Earthjustice	Energy Efficiency Recommendations	CAC asks that I&M implement the following recommendations for the modeling of energy efficiency resources for the 2021 IRP:	See responses to Q 28, parts a-e below.
28 a.	CAC and Earthjustice	Energy Efficiency Recommendations	Use the "No DSM" load forecast already created by I&M	The Company is already using a forecast that only accounts for historical and/or approved DSM.
28. b.	CAC and Earthjustice	Energy Efficiency Recommendations	Model energy efficiency savings in magnitude and with measure lives consistent with the GDS 2021 I&M Market Potential Study	The Company plans to model savings consistent with the GDS 2021 I&M Market Potential Study (MPS) and intends to bundle measures into sector-level portfolios for inclusion in the IRP modeling. The measure life of the sector-level portfolio will be developed as a weighted average measure life.
28. c.	CAC and Earthjustice	Energy Efficiency Recommendations	Levelize energy efficiency costs over the MPS life to ensure costs are on equal footing with supply-side resources	The Company does not capitalize Energy efficiency program costs. The costs will be modeled as fixed annual payments over the implementation life of the program/resource. As a result, Siemens PTI will ensure the costs over the life of the asset are placed on an equal footing with other supply side resources.
28. d.	CAC and Earthjustice	Energy Efficiency Recommendations	Use marginal, not average, line losses to convert the MPS savings at the meter to IRP savings at the generator	The 2021 I&M MPS utilized I&M's peak demand line loss factor (LLF), as a proxy for a marginal line loss factor, to adjust both energy and demand savings up to the generator level. The peak demand LLF is roughly 15% higher in the C&I sector, and 9% higher in the residential sector when compared to I&M's average energy LLF. For use in the IRP, the GDS Team will deliver to Siemens energy and capacity savings at the generation level using I&M's peak demand LLF.

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28.e	CAC and Earthjustice	Energy Efficiency Recommendations	Apply the avoided transmission and distribution ("T&D") cost as a reduction in energy efficiency program cost	The MPS included avoided T&D costs in its analysis and this will be applied as a reduction to the EE, DER and DR costs in IRP Modeling.
29	CAC and Earthjustice	Energy Efficiency Bundling	We are skeptical that the value-based approach gives a particularly better result than the cost-based approach, and neither are preferable to grouping measures into sector-level portfolios. It seems very likely that the value-grouped bundles will look similar to the cost-based bundles, which will lead I&M's model to "cream skim" – choosing the cheapest measures regardless of whether they will make a coherent program. And under any of these three approaches, it is highly likely that numerous programs/measures that I&M will actually offer will not be selected by its IRP model, which perpetuates the disconnect between the IRP modeling and DSM plan implementation.	I&M's original proposal for the Value-Based Approach was to recognize time-differentiated savings and the value-based approach would allow I&M to aggregate measures with similar system benefits together. However, based on the comments of the CAC and additional review, I&M intends to group measures into sector-level portfolios for inclusion in the IRP modeling. (Note, income-qualified savings will be included separately due to concerns that these costly program delivery approaches would unfairly impact the remaining residential sector savings). The sector-level portfolios or bundles retain their mix of savings by end-use at the hourly level as identified in the MPS, and are unique relative to the overall I&M system load shape.
30	CAC and Earthjustice	Rockport	In light of the April 22, 2021 announcement that I&M will buy a portion of Rockport 2,[4] we add a sixth recommendation to this slide, which is to add a sensitivity to the MPS that screens the economic potential using a combined-cycle gas generating unit ("CC") as the basis for avoided energy and capacity costs. There will clearly be a lack of capacity on I&M's system in 2028, given the announced retirements of both Rockport Units 1 and 2 that year and given the prior IRP's preference for a combined cycle, which has a much higher cost than the avoided costs I&M uses to screen DSM. Thus, it is much more fair and direct to use a CC as the basis for the avoided costs in the MPS. [4] We expect extensive dialogue and collaboration with stakeholders with regard to this announcement as part of the 2021 IRP stakeholder process, particularly around retirement analyses of Rockport Unit 2 at 2022 (the	The MPS will include a sensitivity analysis, one of which is where technology costs are reduced to support the IRP Emerging Technologies Scenario. The Company's IRP Scenarios are designed to capture a wide range of future market outcomes, i.e. avoided costs, which will influence future resource selection including DSM. This IRP modeling approach provides a comprehensive review of resources over various Scenarios.

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			date by which the lease was supposed to expire and I&M would have been relieved from this obligation) and much earlier dates than 2028 given Rockport's extremely poor capacity factors and other poor operating characteristics.	
Questions 31-36 were submitted by CAC Friday, June 4, 2021				
31.	Citizens Action Coalition of Indiana ("CAC")	Stakeholder Feedback	Please provide unredacted copies of any discovery responses to other interested parties' requests that have not already been provided to CAC. Please continue to provide unredacted copies of any discovery requests to other interested parties' requests through the pendency of this public advisory process.	I&M manages the information sharing components of its IRP Public Advisory Process in accordance with 170 IAC 4-7-2.6. When an interested party requests information related the IRP, I&M typically responds within 15 business days or another agreed upon timeframe. I&M's responses are posted to I&M's IRP webpage and are publicly available to CAC and all other interested parties at the following location: https://www.indianamichiganpower.com/community/projects/irp/.
32.	Citizens Action Coalition of Indiana ("CAC")	Rockport	What are I&M's plans regarding the modeling of possible retirement dates for Rockport Unit 1, as required by paragraph 6(c) of the Settlement Agreement in Michigan Public Service Commission Case No. U-20591 ("Michigan Settlement")?	The Company plans to model multiple scenarios and sensitivities related to the Rockport unit operations in accordance to the settlement agreement. These scenarios will be a topic for review during the upcoming Stakeholder Meeting #3. Scenarios and Sensitivities currently planned include: **Reference Case Scenario:** Rockport Unit 1 Retirement: December 31, 2028 Rockport Unit 2 Retirement: December 31, 2028 **Rockport Sensitivity # 1 (R1):** Rockport Unit 1 Retirement: December 31, 2028 Rockport Unit 2 Retirement: May 31, 2026 **Rockport Sensitivity # 2 (R2):** Rockport Unit 1 Retirement: December 31, 2028 Rockport Unit 2 Retirement: May 31, 2026, 50% I&M Share

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				Rockport Sensitivity # 3 (R3): Rockport Unit 1 Retirement: May 31, 2025 Rockport Unit 2 Retirement: December 31, 2028 **Rockport Sensitivity # 4 (R4)**: Rockport Unit 1 Retirement: May 31, 2025 Rockport Unit 2 Retirement: December 31, 2028, 50% I&M Share
33.	Citizens Action Coalition of Indiana ("CAC")	Rockport	What research and analysis has I&M performed to compare the cost of renewing the Rockport Unit 2 lease with other alternatives, including market purchases or asset acquisitions, as required by paragraph 14 of the Michigan Settlement?	Paragraph 14 of the referenced settlement agreement is specific to actions I&M would take in Michigan if I&M extended the Rockport Unit 2 lease. Late last year, I&M provided formal notice that it would not be extending the lease. On April 22, 2021, I&M advised registered IRP stakeholders of I&M's decision to reacquire Rockport Unit 2. The reacquisition will be incorporated and evaluated in this IRP and I&M will be making separate filings before both state commissions that will allow each state to fully assess the reasonableness of I&M's decision.
34.	Citizens Action Coalition of Indiana ("CAC")	New Resources	Is I&M planning to seek approval in Michigan or Indiana for adding new solar or wind resources prior to the filing of the 2021 IRP, as contemplated by paragraph 17 of the Michigan Settlement?	I&M is still evaluating the potential to add renewable resources prior to the filing of I&M's 2021 IRP but has not made any formal decisions.
35.	Citizens Action Coalition of Indiana ("CAC")	All Source RFP	What is I&M's expected timeline for completing evaluation of the All-Source RFP for which indicative responses were due May 21, 2021? When does I&M expect to publish the results?	A summary of results from the All-Source RFP will be shared with Stakeholders at the upcoming Stakeholder Meeting #3.
36.	Citizens Action Coalition of Indiana ("CAC")	OVEC	What research and analysis has I&M performed relative to the possibility of terminating the Ohio Valley Electric Cooperation ("OVEC") Inter-Company Power Agreement ("ICPA"), as required by paragraph 12(c) of the Michigan Settlement?	Paragraph 12 of the referenced settlement agreement is specific to testimony and supplemental analysis I&M will include in its Michigan IRP filing in mid-December 2021. In Michigan, I&M has an obligation to make a separate filing to seek formal approval of I&M's Total Company IRP. That filing will include the IRP that I&M submits in Indiana as well as additional testimony and supplemental analysis that is specific to requirements in Michigan and set forth in

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				the referenced settlement agreement. I&M has not yet prepared the OVEC analysis described in paragraph 12(c) of the Michigan settlement and will provide as part of the Michigan IRP filing.
37	Citizens Action Coalition of Indiana ("CAC") and Earthjustice	IRP Inputs	What research and analysis has I&M performed to define modeling inputs for the installation of new renewable resources, as required by paragraph 6(d) of the Michigan Settlement?	As stated in paragraph 6(d) of the Michigan settlement, I&M will work with stakeholders to define the modeling inputs for the IRP, including scenarios for renewable generation resources. The inputs for these resources are informed by multiple sources including the AEO2020 report, RFP responses and Siemens subject matter experts. These inputs will be a topic of discussion in the Stakeholder Meeting #3.
38	Emily Medine	IRP Metrics	As indicted on the call, multiple parties are concerned about the economic analysis, specifically because of its failure to consider rates impacts. It is undisputed that the NPV analysis is not a proxy for a rate analysis. As a user of Aurora, I well understand that the NPV results from Aurora cannot be used for this purpose as the costs in Aurora are levelized which is inconsistent with how ratemaking is done. Further, sunk costs cannot be ignored in a rate analysis because of the timing issues. Costs from retired assets will continue to be charged to ratepayers at the same time the costs of new resources are charged. Therefore, the rate analysis must reflect this. Duke Energy Indiana has indicated it is looking at a separate rate impact analysis in its IRP. At a minimum, it is important for IMP to note in the IRP that its economic analysis does not represent customer rate impacts and therefore no conclusions about affordability can be derived from it.	In order to provide information about customer affordability and rate impacts of the resource additions in the Preferred Plan, I&M intends to prepare a traditional, or non-levelized, calculation of the annual cost of service and the change in revenue requirement for the period of the IRP through 2031. This forecast will be prepared in a spreadsheet model outside of the Aurora model, using the underlying capital and O&M costs which were the source of the levelized costs used in Aurora.

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			Should you wish to discuss, please contact Jeff Earl or me.	
39	Ben Inskeep	IRP Inputs	What impact has recent spiking natural gas prices had on I&M's resource planning in the near and longer terms? How is this reflected in your modeling and scenario analysis?	While forward prices for Winter 2022/23 are 40% higher than AEP's forecast, they are only 13% higher in Winter 2023/24, and within 1% of Winter 2024/25 prices. Given the long-term outlook has not changed significantly between the release of the Fundamentals Forecast and now, the gas price assumptions remain reasonable and have not been adjusted for this IRP.
Questions 40- 42were submitted by CAC Friday, November 3, 2021				
40	Citizens Action Coalition of Indiana ("CAC") and Earthjustice		Citizens Action Coalition of Indiana ("CAC") and Earthjustice submit these comments on the materials presented during I&M's October 14th IRP stakeholder workshop. We appreciate I&M's emphasis that stakeholder feedback is key and needed. As we have said throughout this process, we hope I&M will not just consider this feedback but use it to modify the analysis that it intends to undertake before the IRP is finalized, and will provide written responses in response to feedback that includes descriptions of how the analysis was modified or explanations of why it was not.	The Company has actively listened, and where appropriate incorporated feedback provided throughout the Stakeholder process. The feedback received, including Company responses, has been captured and posted on the I&M IRP website and will continue to be addressed throughout the remainder of the IRP process.
41	Citizens Action Coalition of Indiana ("CAC") and Earthjustice		CAC would like to reiterate the concerns we have raised repeatedly, including at the October 14th workshop: I&M is not sharing information with stakeholders in a timely manner that permits feedback on key details before the modeling is finalized. In a September 2nd email, Jay Boggs from Siemens (I&M's Aurora modeling contractor) said: *The assumptions and input data will be provided in Excel format. It will be available for download from a secure site maintained by Siemens PTI.* *We anticipate emailing an announcement during the week of 9/7 when the data is officially posted to the site.* *** *We will also provide an overview of the data in a special session for Technical Stakeholders on September 10 at 11:00am Eastern*	Siemens led I&M through a 4 Step process to systematically identify key inputs and assumptions and to develop associated portfolios for analysis in order to identify a Preferred Plan. This 4 Step process aligned with the Indiana Stakeholder process to allow for a collaborative interaction at each step. In each stakeholder meeting the Company has held, key details have been shared with the Stakeholders, including the additional meetings related to the RFP and the two specific meetings held with the CAC and Energy Futures Group related to EE modeling held to date with an objective to solicit feedback for the Company to consider while proceeding through the process. The Company has

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<tr><th></th><th>Stakeholder</th><th>Topic</th><th>Comment</th><th>I&M Response</th></tr>
<tr><td></td><td></td><td></td><td>Standard Time. Please look for an invitation from me for this meeting within the next 24hrs.
The following week, we will conduct the I&M IRP Stakeholder Meeting 3B. As part of the agenda for this meeting, we will be reviewing the assumptions and key inputs used in the analysis. You may register for this meeting on I&M's website.
To complete the review of these IRP Inputs and Key Assumptions, we will be offering a follow up meeting for Technical Stakeholders on 9/24 @ 11:00am Eastern Standard Time to answer any questions and solicit feedback.
***
On or about the middle of September, we will send Technical Stakeholders an email preparing for the initiation of Stage 3 of this process…
We anticipate posting the I&M Aurora model on the secure website during the last week of September.
The meetings planned for September 10th and 24th were canceled. The September 10th meeting was rescheduled for October 7th but, to our knowledge, that meeting never happened and has not been rescheduled, nor have the Excel formatted input and assumptions data or the Aurora model been provided either. Furthermore, we have received conflicting feedback from Siemens about whether I&M and Siemens will actually provide the data files to make use of the Aurora licenses provided to stakeholders.

We do acknowledge and support that it was necessary to delay the schedule somewhat due to the pending Rockport acquisition settlement in IURC Cause No. 45546 insofar as the settlement changes the manner in which the Rockport units need to be represented throughout I&M's modeling.
Our concern, however, is that the schedule still has not been updated and communicated to stakeholders. We still do not know when we will receive the Excel formatted input and assumptions data, when we will</td><td>considered all feedback in its journey throughout the process.

As noted in this particular feedback, due to the complexities introduced with the pending Rockport acquisition settlement in IURC Cause No. 45546, as well as other requests made to the team, the target dates for data provisioning to the Technical Stakeholders were delayed.

This IRP Process Step 4 calibration was completed 11/8. The Reference Case Data and Assumptions Book was offered to the Technical Stakeholders who had a fully executed Non-Disclosure Agreement on 11/18.

Stakeholder access to the Aurora model is to allow Technical Stakeholders who were interested in using the Aurora modeling tool the ability to independently review the Company's IRP modeling and results prior to submitting its own comments and assessment of the Company's IRP. It is important for Technical Stakeholders to understand how the inputs and assumptions reviewed over the past 8 months are implemented within the tool. To that end, if Technical Stakeholders have questions regarding the data inputs and assumptions, we are open to additional review discussions of the material.

Finally, we will be producing Aurora data model for the Reference Case, as well as the change sets to generate the scenarios and sensitivities to provide the ability for the Technical Stakeholders to analyze alternative dispatch simulation scenarios and sensitivities. We currently anticipate producing this Aurora modeling file in the December 2021 – January 2022 timeframe.</td></tr>
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			receive the Aurora files, whether those Aurora files will be those necessary to replicate I&M's modeling runs, and whether there will be sufficient time for I&M to incorporate changes and feedbacks from stakeholders as part of the IRP stakeholder process and before the IRP modeling is finalized. Again, as we have continued to articulate, the IRP stakeholder process is intended to help us avoid future disputes by working together before IRP modeling is finalized. It is critical to the IRP stakeholder process that we be allowed the opportunity to adequately review the files and modeling, offer reasonable changes, and collaborate with the utility and its vendors. Please ensure adequate time is provided in the revised schedule for this collaboration.	
42		IRP Metrics	During the 3B workshop, Siemens asked CAC's consultants to provide examples of how other utilities have looked at resource diversity, and CAC consultant, Anna Sommer, responded that her expert consulting firm, EFG, does not typically see other utilities use this metric. Siemens representative, Art Holland, explained that the metric is intended to address a concern regarding adequate generation to supply load. The industry as a whole is taking stock of its resource adequacy methodologies, particularly after the events of Winter Storm Uri in February of 2021. Qualitative analyses without adequate evidence do not give useful insight into the question of whether there is sufficient capacity to meet load, rather that is the very reason that PJM develops a reliability requirement. We fully agree, however, that is a good idea to critically evaluate whether resource adequacy requirements provide the desired level of reliability. We would strongly prefer that I&M take on this issue quantitatively instead. How, for example, does the recent PJM study looking at winter resource adequacy affect I&M's view of this question, (https://insidelines.pjm.com/system-remains-strong-in-stress-test-	Consistent with the feedback, I&M is keenly focused on resource adequacy and providing reliable capacity and energy for our customers and works closely with PJM on these matters The Company is following the PJM RTO guidance for capacity planning, including the use of Effective Load Carrying Capability (ELCC) for intermittent resources for its IRP modeling. The Company also appreciates the inquiry to the PJM Fuel Security Study Update report. As the report concludes "Results from this Study do not indicate a winter reliability concern in the near-term" and goes on to conclude continued monitoring on an annual basis is needed. The Company will continue to monitor this issue in the PJM stakeholder process, including additional PJM assessments, and will make adjustments in future IRPs, as necessary. The Company appreciates the feedback related to resource diversity as a metric. As discussed in Stakeholder meeting 3b, in addition to counting the unique generator types,

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			examining-future-resource-adequacy/) and how does the move to accreditation through an ELCC approach impact I&M?(https://www.utilitydive.com/news/esa-storage-advocates-applaud-pjms-capacity-market-valuation-proposal/601273/) We ask I&M and Siemens to reconsider their approach and rely on more credible quantitative analyses, rather than qualitative, for this important topic.	these generator type resources will be further defined by the potential for their unique generating sites based on the modeled blocksize used in the model.
43.	Sierra Club, Wendy Bredhold	Plans for future gas plant CPCN	Submitted on December 8, 2021: Can you tell me when I&M plans to file the CPCN for its initial planned gas units, the 1,000 MW of CT in 2028?	I&M does not have any definite plans at this time regarding the 1,000MW of CT's in 2028. I&M's focus up to this point has been to complete the IRP modeling and develop its preferred plan. With the preferred plan now established, I&M's immediate focus is on initiating the RFP for the 2025 and 2026 capacity needs. I&M expects to convene a project team in 2022 to begin formulating a high level timeline associated with the potential gas capacity identified in the preferred plan in 2028. Ultimately, the decisions regarding 2028 capacity will be made based on the results of an all-source RFP and the best information I&M has available at the time.
The OUCC submitted DR set 1, with 4 questions 0n 12.21.22. They are tracked here as stakeholder questions 44-47. Per the request: In connection with our work in the above-referenced Cause, we are submitting the following request(s) for information or documentation. Please identify the person(s) providing each segment of information or each document. Also, please indicate the witness or witnesses to be called in your Case-in-Chief and Rebuttal who can answer questions regarding the substance of or origination of information supplied by the utility in each instance of the responses to this request. Thank you for your prompt assistance in this matter. I. Definitions and Instructions. A. Indiana Michigan Power Company, I&M, Ind-Mich or Petitioner means and refers to Indiana Michigan Power Company, including its officers, directors, employees, agents, attorneys and representatives, and any other entity to the extent acting under the direction or control of Petitioner. B. "Documents" means and includes any and all materials within the scope of Ind. Trial Rule 34(A)(1) and shall be construed broadly to encompass, without limitation, all handwritten, typed, printed or otherwise visually or orally reproduced materials, whether copies or originals and irrespective of whether they are privileged, and includes drafts and translations of any document, microfilm of documents that may have been destroyed, computer tapes, data sheets, punch cards, discs, diskettes, data contained in any computer, information that can be retrieved from any computer, and any information produced or reproduced mechanically, magnetically, electrically, electronically,				

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	Stakeholder	Topic	Comment	I&M Response
photographically, chemically or by any other means. Any original or copy of a document containing thereon or having attached thereto any alterations, notes, comments, or other material not included in the first document shall be deemed a separate document. C. "Identify" means: i. As to an individual, state the individual's name, business address, present occupation, present organizational title, and, where relevant, past occupation and organizational title; ii. As to an entity other than an individual, state its full name, the address of its principal place of business, and its state of incorporation or organization; iii. As to a document, state its author or maker, date, general subject matter, addressees, and recipients, if any; iii. As to a document, state its author or maker, date, general subject matter, addressees, and recipients, if any; iv. As to a meeting or oral communication, state the date and place of such meeting or oral communication, the purpose and subjects of such meeting or oral communication, every person participating in or present at such meeting or oral communication, and every document referring or relating to such meeting or oral communication; v. As to a fact, state the subject and substance of the fact, each meeting, communication, or other event, which constitutes the fact, and each document referring or relating to the fact. D. For each data request, please identify all persons who provided responsive information or materials. Also, please indicate the witness or witnesses to be called in your case-in-chief and rebuttal who can answer questions regarding the substance of or origination of information supplied by Petitioner in each instance of the responses to this request. E. With respect to any document or thing being withheld from production on the basis of privilege, please provide the author, addressee and all recipients of copies of the documents, all other persons to whom the document was shown or discussed, the subject matter of the document and the basis of the claim of privilege. F. Except as otherwise indicated explicitly or by context, these requests shall be deemed to be continuing. Any information or document responsive to these requests which Petitioner acquires, or which becomes known to Petitioner subsequent to the initial response shall be provided within a reasonable time after such information or document is acquired or becomes known to Petitioner. G. This set of data requests requires supplemental or amended responses to the extent required by Ind. Trial Rule 26(E). In addition, these requests shall be deemed to be continuing requests for supplemental responses pursuant to Ind. Trial Rule 26(E)(3). H. Please provide copies of all responses, both formal and informal, to data requests from all other parties in this proceeding.				
44.	OUCC	Modeling, retirements & buildouts	OUCC DR Set 1 Q1: As part of its work in this IRP, did I&M model the build-out and retirement of generation facilities beyond the build-out and retirement of units for I&M itself? If so, please describe: a. The purpose of that modeling; b. The extent of that modeling (e.g. MISO or Eastern Interconnect); and c. The software and methodology used for performing that modeling.	Yes, as part of the candidate portfolio modeling, I&M utilized the Siemens PTI team to model generation facilities beyond the build-out and retirement of units for I&M itself. The results are derived from a dynamic build and retirement process that produces two-hundred variations of build paths that surrounding utilities could undertake.

2021 I&M IRP Website Stakeholder Comment Summary				
	Stakeholder	Topic	Comment	I&M Response
				a. The purpose of the portfolio analysis IRP step is to ensure a realistic surrounding in which I&M will be interacting with in future years that represents the changing dynamics of the electric grid. b. PJM and MISO Zones 3-7. c. The retirement assumptions are a combination of announced retirements derived from EIA 860 as well as a dynamic retirement process for the economic retirement of existing coal units. The buildout for the surrounding regions is created using a dynamic build process that is integrated into the stochastic analysis. A summary of the mean stochastic result of the expansion plan is provided as part of question #2.
45.	OUCC	Modeling, nameplate and UCAP capacity	OUCC DR Set 1 Q2: To the extent modeling was conducted for the build-out and retirement of generation facilities beyond the build-out and retirement of units for I&M itself (as asked in question 1), please provide: a. The nameplate capacity modeled as existing at the end of each year modeled by generation type (e.g. coal, natural gas combustion turbine, natural gas combined cycle, wind, solar, hydro, storage). b. The UCAP value of capacity modeled as existing at the end of each year modeled by generation type (e.g. coal, natural gas combustion turbine, natural gas combined cycle, wind, solar, hydro, storage).	Requested information provided in excel format.
46.	OUCC	Modeling, customer	OUCC DR Set 1 Q3: For each resource planning model run performed by I&M, please respond to the following questions:	Due to the volume of data that would be produced, the Siemens IRP team's stochastic analysis does not output the

2021 I&M IRP Website Stakeholder Comment Summary				
	Stakeholder	Topic	Comment	I&M Response
		demand and resource output	a. Please identify the top ten hours based upon the difference between the level of I&M's customer demand and the output from I&M's generation resources for each year of the planning horizon; b. For each hour identified in part 'a' of this question please provide the following data: i. I&M's modeled customer demand; ii. Modeled output of I&M's generation resources by generation type (e.g. coal, natural gas combustion turbine, natural gas combined cycle, wind, solar, hydro, storage); iii. MISO market price for that hour (to the extent MISO prices are modeled as being different for I&M's generation vs. its load, please provide both prices); iv. Natural gas price forecast for that hour.	required hourly data from the stochastic simulations in order to fulfill this request.
47.	OUCC	ancillary services	4) Regarding ancillary services expected to be provided by MISO over I&M's resource planning horizon: a. Does I&M expect that the level of ancillary services provided by MISO (PJM) and related costs will increase as the level of intermittent resources increases over the planning horizon? Please explain your answer. b.Did I&M's modeling in this IRP incorporate the effects of any expected increases in the level of ancillary services provided by MISO(PJM) and related costs? If so, please explain how this was modeled. If not, why not.	a. The Company is uncertain as to what level of ancillary services provided by PJM might change, although generally, it is anticipated that changes will occur. PJM is expected to undertake an analysis of what additional "reliability services" would be needed in the future, although these discussions have not started at this time. The Company will continue to monitor this issue in the PJM stakeholder process, including additional PJM assessments. b. Because of the uncertainty related to future ancillary services, no assumptions were made to incorporate the effects of any expected increases in the modeling
The CAC submitted the following 4-part question on November 29, 2021.				
48.	CAC	Bundling of DSM Measures	Good evening,	48.1 The inputs template spreadsheet contained SEA bundles. Inputs were provided for both the net to gross and SEA bundles.

2021 I&M IRP Website Stakeholder Comment Summary				
	Stakeholder	Topic	Comment	I&M Response
			I wanted to follow up on our conversation regarding the bundling of DSM measures in I&M's IRP. We had a few questions about the workbooks provided and then one comment. Thanks! Anna. 1. To confirm the spreadsheet "I&M IRP EE - Aurora Inputs Template - Siemens - Final" gives the net to gross bundles not the SEA bundles, correct? 2. Could you provide the peak hour of the Aurora load forecast? 3. Could you provide the spreadsheets used to create the savings shape for each bundle? We wondered if the shapes were based on end-use consumption and not savings? For example, C&I bundle 5 has some daylighting controls in it but peaks in the winter time, when you'd expect summer time daylighting savings to be higher because there is more daylight. 4. The Siemens calculation on of annual persisting savings is problematic in that it assumes the cumulative persisting savings are equally distributed across all years of a bundle vintage. As shown in the example below for RES Vintage 2023-2025 Block 6, the savings associated with 2023 increase in the 2nd and 3rd years of persistence (purple box), which is not possible. This outcome is due to the treatment of cumulative savings, which are simply distributed evenly across all vintage years (red box). Incremental annual savings change year to year due to varying measure lives and adoption rates in the MPS.	48.2 The peak hour in 2021 is 7/9/2021 Hour 19. 48.3 yes, the spreadsheets will be provided via a secure file transfer application due to their size. For the EE shapes, the annual saving for each measure are mapped to a specific end-use load shape. Generally, the end-use load shape used to convert the annual savings value to 8760 reflects end-use consumption patterns. 48.4 The approach to the cumulative energy efficiency savings resulting from the data provided by GDS was applied as a simplifying assumption to allow the Aurora model to select energy efficiency programs annually. This method ensured the total potential savings across the three years in the bundle was equal to the total potential savings identified for the bundle.

2021 I&M IRP Website Stakeholder Comment Summary

	Stakeholder	Topic	Comment	I&M Response

Operating Life 7

SOURCE	GDS	SIEMENS			
Year	DSM MWh	DSM MWh	2023 Program Annual Savings (MWh)	2024 Program Annual Savings (MWh)	2025 Program Annual Savings (MWh)
2021					
2022			↓ 2023 persisting savings *increase* in years 2 and 3		
2023	42,904	42,904	42,904		
2024	88,841	44,421	44,421	44,421	
2025	134,599	44,866	44,866	44,866	44,866 ← Equal savings a
2026	116,203	38,734	38,734	38,734	38,734
2027	96,198	32,066	32,066	32,066	32,066
2028	75,585	25,195	25,195	25,195	25,195
2029	55,529	18,510	18,510	18,510	18,510
2030	31,728	15,864		15,864	15,864
2031	13,084	13,084			13,084
2032	0	0			

The CAC submitted the following 10 part question containing CONFIDENTIAL INFORMATION as CAC DR Set 2 on December 10, 2021

	Stakeholder	Topic	Comment	I&M Response
49.	CAC	Rockport, OVEC, Cook, DR, Resource production profiles, gas and coal prices and stochastics	1. Overall, Rockport O&M values seem low. In 2020, Rockport reported $175 million in non-fuel O&M. At a 50% capacity factor, the 2021 modeled values would be 2620 MW x 50% x 8760 x $1.09 = $12.5 million + $21.3 million in FOM = $33 million, why is there such a difference? 2. Is any capitalized maintenance for any units, new or existing modeled? If so, can you provide that? If not, why not? 3. Can you please provide the Clifty and Kyger Creek contract and exit costs? 4. Minimum up time for Rockport units is 72 hours, why is it so long?	49.1 Without confirming your source, we believe the $175M for 2020 non-fuel O&M includes the Rockport Unit 2 lease payment of $136.5M. 49.2 Capitalized maintenance for existing units is generally considered to the extent it is incrementally or decrementally changed relative to different cases. It is modeled as a part of O&M for new units.

2021 I&M IRP Website Stakeholder Comment Summary				
	Stakeholder	Topic	Comment	I&M Response
			5. Are any thermal units, besides the Cook units assumed to be self-committed? 6. Are the capital charges those that were used for all modeled areas or just non-AEP areas? And if the latter, can you provide the AEP IM assumptions as well? 7. So that these assumptions are fleshed out for all parties, can you please provide DR and EE assumptions including not just savings and costs, but resource parameters such as whether/how these resources were grossed up for line losses or the reserve margin (peak credit assumption), min up time, max hours/energy, etc.? 8. Can you please provide the resource production profiles, FCRs, ILR assumptions, or the battery limits (SoC, roundtrip efficiency, etc.)? 9. Siemens said that it produced its gas and coal price distributions off a reference high and low case give to it by AEP. Can you please provide that high and low case and also explain and show how Siemens transformed those cases into its distributions? 10. Will we able to rerun the stochastic simulations once the .apz files are delivered to stakeholders? On the question of modeling EV load as responsive to at least a TOU rate, here's one study that gives an indication, somewhat accidentally, of the difference between charging with a TOU rate or not. You can see the effect in the charging profiles by metro region. For example, San Diego had a TOU rate for EVs during these time periods, but Phoenix did not.	Due to the late addition of multiple Rockport unit 1 early retirement scenarios, associated capitalized maintenance was not included in the original modeling. However, I&M agrees that some reduction to ongoing capital would occur for these earlier cases relative to the 2028 retirement baseline. The additional maintenance cost savings were incorporated into the Balanced Scorecard CTSL metric results for the early Rockport Unit 1 retirement cases discussed in the IRP. The estimated capitalized maintenance cost assumptions for the different RP1 retirement portfolios will be included with an updated file of the AEP IM Assumptions Book workbook made available to the Technical Stakeholders group. 49.3 The Inter-Company Power Agreement is publicly available on FERC's eTariff website. I&M assumed two scenarios, one assuming I&M only exited and one assuming all Sponsoring Companies exited. In the first scenario I&M assumed that its ongoing costs (costs I&M would be obligated to pay under the contract notwithstanding its exit) would be a total of $45.9M from 2030-2040. In the second scenario, ongoing costs would be a total of $235M from 2030-2040. These include Debt Repayment and Other Fixed Cost Responsibility costs.

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2021 I&M IRP Website Stakeholder Comment Summary				
	Stakeholder	Topic	Comment	I&M Response
				49.4 The purpose is to limit the number of thermal cycles on the equipment. The thermal cycles result in thermal stresses in the equipment from the expanding and contracting and reduces the life of the equipment. 49.5 There are no thermal units set to must run for I&M units in the modeling. 49.6 The capital charges that were used for AEP areas was the same capital charge rate applied to non-AEP areas. 49.7 The inputs provided to Siemens were grossed up from the meter up to generation. In the C&I sector, a multiplier of 1.0513 to increase retail meter savings to generation was used. For residential, the multiplier was 1.0869. 49.8 Batteries were modeled using AURORA's storage logic, specifically the demand control setting, in which the shape will target generation for the highest demand hours of the week within the zone that the battery is placed. The roundtrip efficiency is assumed at 90% and SoC at 50%. 49.9 The file will be provided as requested.

2021 I&M IRP Website Stakeholder Comment Summary				
	Stakeholder	Topic	Comment	I&M Response
				49.10 The stochastic inputs will be able to be loaded into the AURORA model and stakeholders will be able to recreate the stochastic simulations in the IRP Report.

Indiana Michigan Power Company

2021 Integrated Resource Plan

Stakeholder Workshop #1 Meeting Minutes

(March 9, 2021)

INDIANA MICHIGAN POWER
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1. Welcome and Introductions – Dona Seger-Lawson, Director of Regulatory Services

Dona began the meeting at 9:30 and covered slides 1-5.

Dona began the meeting and welcomed participants to the 2021 I&M Integrated Resource Plan (IRP) stakeholder workshop. Dona reviewed a safety moment for electrical safety while working from home and introduced the American Electric Power (AEP), Indiana Michigan Power (I&M) and Siemens Power Technologies International (PTI) team members.

Dona introduced Jay Boggs, Siemens Managing Director, and Moderator for the Stakeholder Workshop.

2. Meeting Guidelines – Jay Boggs, Siemens Managing Director

Jay covered slides 6-8

Jay presented the Meeting Guidelines portion of the presentation and established the role of Moderator for the Stakeholder Meeting. He stated that the purpose of the presentation is to explain the IRP process and collect feedback from stakeholders and that participants would hear from several individuals today from AEP, I&M and Siemens PTI. He introduced the role of Siemens PTI as part of the 2021 IRP Process and provided an overview of the webinar platform and tools.

Meeting guidelines were discussed.

Jay also provided an overview of the Questions and Feedback process, including directing stakeholders to submit comments and stay informed at the I&M IRP Website: http://www.indianamichiganpower.com/info/projects/IntegratedResourcePlan.

In addition, stakeholders are encouraged to submit questions via email to I&MIRP@aep.com

Jay introduced Toby Thomas, I&M President and Chief Operating Officer (COO), to provide opening remarks.

3. Opening Remarks – Toby Thomas, I&M President and COO

Toby covered slides 9-13

Toby welcomed everyone to the meeting and stated that the 2021 IRP will be developed over the next several months and that stakeholder feedback will be critical. He discussed the strategic importance of the 2021 IRP and provided an overview of I&M service territory, reviewing areas served and the Company's generation portfolio. Toby also provided an overview of I&M's energy efficiency and demand response (EE/DR) programs.

Toby went on to discuss the transformation strategy underway at I&M which is focused on generation transmission, modernizing the grid, expanding customer choice, embracing new technology and developing a work force of the future. He explained that the transformation strategy is focused not on generation, but also on the way in which I&M interacted with customers and stakeholders. He also discussed planning for distributed energy resources (DER), electric vehicles (EVs) and expanding customer choices. Toby then discussed the Company's Diversity and Inclusion Strategic Plan Roadmap.

Toby introduced Greg Soller, I&M Resource Planning Analyst.

4. <u>I&M 2021 IRP Process – Greg Soller, I&M Resource Planning Analyst</u>

Greg covered slides 14-16

Greg began this section by reinforcing the objective of the IRP is to provide a roadmap for planning purposes. Greg discussed the major components associated with developing the IRP, including the development of a portfolio of preferred resources and stakeholder engagement.

Greg stated that every year I&M looks at potential IRP enhancement opportunities to implement and provided an overview of the various improvement opportunities I&M has for the 2021 IRP. He mentioned the improvement opportunity to enhance coordination between the distribution and planning teams, which is already underway internally. He also mentioned the new Grid Solutions internal team, which will create enhanced coordination overall among transmission and distribution planning functions.

Greg introduced the Siemens IRP Team, Art Holland, Jay Boggs, and Peter Berini, to present the remainder of the slides in this section.

5. <u>I&M 2021 IRP Process – Art Holland; Siemens Managing Director; Jay Boggs, Siemens Managing Director; Peter Berini, Siemens Project Manager</u>

Siemens IRP Team, including Art Holland, Jay Boggs and Peter Berini, covered slides 17-20

Siemens IRP Team, led by Art Holland, discussed the proposed 2021 IRP Process that will be administered by Siemens PTI. Art discussed the five-step process that Siemens has used to conduct IRP filings across the US. The five steps discussed were: Determine Objectives, Identify Metrics, Create Candidate Portfolios, Analyze Candidate Portfolios and Balanced Scorecard and Report.

Peter Berini provided an overview of Key Vendors anticipated as part of the process.

Jay Boggs provided an overview of the Stakeholder Process. Four stakeholder meetings will be held. There will also be a stakeholder meeting on the all-source RFP and an Aurora technical workshop.

Table 1 Verbal Questions Captured Related to 2021 IRP Process

<table>
<tr><th>Question #</th><th>Question</th><th>Response</th></tr>
<tr><td>Q1</td><td>Is there another all-source RFP being issued?</td><td rowspan="6">The All-source RFP was agreed upon in the MI IRP settlement and will be used to capture indicative long-term pricing to inform the IRP. It differs from the current Renewable RFP which is designed for a short-term period. The Company will facilitate a Stakeholder Review process for the draft RFP prior to issue.</td></tr>
<tr><td>Q4</td><td>How will the All-Source RFP results fit into the process (timing and use)?</td></tr>
<tr><td>Q6</td><td>Why do you have two RFPs?</td></tr>
<tr><td>Q7</td><td>Will you give stakeholders an opportunity to weigh in on all-source RFP?</td></tr>
<tr><td>Q9</td><td>Are you sending the new RFP to all who responded to the first RFP?</td></tr>
<tr><td>Q11</td><td>What are the main differences with the RFPs?</td></tr>
<tr><td>Q5</td><td>Can we get copies of the modeling files as we have in the past?</td><td>Yes, we will talk about that in detail at the modeling workshop.</td></tr>
<tr><td>Q10</td><td>Where will future workshops be held?</td><td>COVID-19 policies prevent us from attending large in person meetings currently.</td></tr>
</table>

6. **Objectives and Measures – Art Holland, Siemens Managing Director, Jay Boggs, Siemens Managing Director, Peter Berini, Siemens Project Manager**

Siemens IRP Team, including Art Holland and Peter Berini, covered slides 21-28

The Siemens IRP Team, led by Peter Berini, discussed the I&M IRP team's approach to establishing objectives and measures for use in the IRP analysis. Peter noted that the critical first step in the IRP Process is the determination of objectives in which portfolios will be evaluated against. Objectives will be assigned Metrics, which will feed directly into the Balanced Scorecard and aid in the selection of the preferred portfolio.

Peter discussed how IRPs are generally centered around three main objectives: Affordability, Reliability, and Sustainability objectives. He also noted that each set of stakeholders may have a different set of priorities when examining IRP objectives and it is important to illustrate and identify the various trade-offs stakeholders may have.

Peter then discussed the proposed Objectives and Metrics for use in the study (slide 24)

He then discussed how the preferred resource portfolio will incorporate each of the objectives and measures through a balanced scorecard that weighs attributes in accordance with stakeholder needs, economic and load growth projections, I&M input and practical considerations. He stated that the Balanced Scorecard allows for broad comparisons of the Candidate Portfolio's and will align with the Objectives and Metrics.

Peter introduced the Siemens IRP Team, Art Holland, Jay Boggs, and Peter Berini to discuss Proposed Scenarios.

Table 2 Verbal Questions Captured Related to Objectives and Measures

Question #	Question	Response
Q14	How will I&M value resource diversity?	The details related to the Resource diversity metric are still be developed but it is intended to capture in some manner, including technology type, location, and count.
Q18	Will you evaluate diversity of resources?	
Q20	Fuel diversity: one method is to consider geographic diversity and total counted generation	
Q22	Do you mean resource count by technology count as a measure of diversity?	
Q19	Will you provide 5-year and 10-yr NPV?	Yes.
Q23	Are your metrics set in stone?	Our goal for today was to provide a preliminary set of metrics to get your feedback. At the next meeting we will look to finalize.

7. **<u>Proposed Scenarios – Art Holland, Siemens Managing Director, Jay Boggs, Siemens Managing Director, Peter Berini, Siemens Project Manager</u>**

Siemens IRP Team, including Art Holland, Jay Boggs and Peter Berini, covered slides 29-40.

Once a set of objectives and metrics have been determined, the next step in the process is to define the Scenarios for consideration in the selection of alternative portfolios. In the case of I&M, Art provided an overview of the Reference Scenario and four alternative scenarios envisioned for the 2021 IRP Analysis.

In addition to providing an overview of the scenarios, Art mentioned the importance of input diversity in this process. He also noted that scenarios will inform Candidate Portfolio Development but is not the only means. Sensitivities will be applied to the scenarios as well, which were not discussed on the call.

Art introduced Greg Soller, I&M Resource Planning Analyst, to discuss I&M's Going-in Position.

Table 3 Verbal Questions Captured Related to Proposed Scenarios

Question #	Question	Response
Q15	How do we look at CO2 emissions in the Scenarios?	We will subject the portfolios to a broad range of CO2 costs and sensitivities.
Q33	How will the development of scenarios change as you get more certainty around capital costs?	Expectation is the all-source RFP will provide insight to the market cost, which will influence the portfolios that emerge.
Q34	Will there be a metric for diversity and inclusion?	The Company is interested in considering Stakeholder ideas for this matter; at this time, the Company is considering this to be a qualitative discussion regarding the attributes of the Portfolios.

8. Preliminary Base Case Inputs – Greg Soller, I&M Resource Planning Analyst, Connie Trecazzi, Fundamental Forecasts, Chad Burnett, Load Forecasts

Greg covered slide 41-42

Greg covered the current plans and capacity needs for the I&M portfolio (slide 42). The slide depicts the Company's net unforced capacity (UCAP) and shows I&M position for reserve margins and load. He noted the amount of capacity required at various intervals of the study horizon, all of which coincide with currently planned retirements or contract expirations at existing facilities. He also noted a drop in the total load obligation that occurs in the early 2030's because of wholesale contract expirations.

Greg introduced Connie Trecazzi, Economic Forecast Analyst, to discuss Reference Scenario Inputs.

Connie covered slides 43-48.

Connie introduced the Reference Scenario inputs and discussed the key market drivers and the fundamental forecast process.

Connie discussed the forecasting process for fundamental pricing. The Aurora model is used for projecting long-term energy prices. It uses a wide range of information in developing the forecast – internal and external. The process is iterative to reflect the impact of changes in power generation demand on underlying fuel prices and the subsequent impact on power prices. The process is repeated until an equilibrium has been reached.

Connie explained that the forecast is a baseline forecast covering the entire country. It is used for analysis across AEP's entire service territory.

Connie also indicated that AEP is in the research phase of the process used to update its fundamental forecast and expects to provide updates once that process is completed. She then discussed a few base case inputs, such as gas prices, coal prices and CO2 prices.

Importantly, AEP is working to integrate the transmission and distribution planning teams as part of the IRP process.

Connie introduced Chad Burnett, Director of Economic Forecasting, to discuss the Load Forecast process.

Chad covered slides 49-55

Chad discussed the load forecast process as it relates to the I&M 2021 IRP and reinforced the use of county level economic data. He discussed the process whereby customer forecasts by class are used as an input into monthly sales forecasts, which feed into peak demand. The analysis works in demographics, macroeconomics, and weather, and applies efficiency and adoption of new technologies. He then discussed many of the drivers of load, which are consistent between years. Chad noted the importance of population growth and industrial customers on load growth in I&M's service territory.

Chad also discussed the Company's forecasts by class, including the expiration of wholesale contracts in the early 2030's. He also discussed the load forecast scenarios and the assumptions.

Table 4 Verbal Questions Captured Related to Base Case Inputs

Question #	Question	Response
Q13	How will I&M address the cost of climate change?	The modeling will include a cost for carbon for carbon emitting resources.
Q25	How will the level of electrification be forecast?	The level of electrification is in the load forecast.
Q25	How will the OVEC resource be evaluated?	We have a contract for the OVEC resources and will include this as a going in resource. This resource will be included throughout the study period.
Q27	Are you assuming the OVEC capacity is in every scenario, or are you evaluating if it would be economical to shorten the life?	
	How will I&M incorporate better technology to support solar?	Storage and renewable costs will be critical. We have a robust approach to consider battery storage as part of the IRP.
Q30	Will the load forecast change in the final modeling?	Yes. We issue a new load forecast annually. It will be out before the final modeling.
Q31	How will $0 resources affect market prices?	Electric energy market prices are a function, in part, of short-run marginal costs. Short-run

Question #	Question	Response
		marginal costs are the variable costs of production of the last MWh produced. An increase in zero-variable-cost generating technologies in the mix is likely to apply downward pressure on energy market prices. However, producers will expect to be fully compensated for their capital investments before they will enter the market with needed capacity. Therefore, other means to compensate those producers, possibly capacity prices, will adjust to fill in the void left by falling energy prices.
Q35	Will you commit to retire Rockport U1 by 2025 and not pursue power from Rockport U2 after the lease expires? How much profit did you make last year? Will you commit to debt forgiveness for your low-income customers?	No. We are at the beginning of the IRP process and the process will provide transparency into these types of considerations. We are mindful of our low-income customers and have programs in place to assist them.
Q37	Can you provide your capacity cost forecast?	Yes.
Q38	Do you plan to purchase any power from Rockport U2 after the lease is terminated?	We are at the beginning of the process. We are not ready to commit to anything now.
Q30	Will you look at landfill gas as a DER?	We can look at it.

9. Resource and Technology – Holt Bradshaw, Siemens Managing Director, Jon Walter, Manager EE and Consumer Products

Holt covered slides 56-59.

Holt discussed the process by which Siemens will incorporate new all-source RFP data to inform capital cost and performance characteristics of resource options. He discussed how Siemens regularly estimates generation technology costs and performance for many alternatives (e.g. sizing). The proposed approach is to use the all-source RFP and apply Siemens technology forecast shapes to project capital costs forward.

Jon covered slides 60-62.

Jon provided an update on the market potential study (MPS), including the sampling, response, and response outcome. The MPS stakeholder engagement is currently ongoing, and Jon noted the importance for Siemens and GDS (The vendor engaged to perform the Market Potential Study) to align on model inputs.

Jon noted the second stakeholder workshop is dedicated to review the results of the MPS.

10. Stakeholder Process and Q&A – Jay Boggs, Siemens Managing Director

Jay covered slides 63-65.

Jay reiterated the Stakeholder Process. Four stakeholder meetings will be held. There will also be a workshop on the all-source RFP and an Aurora technical workshop in addition.

Jay introduced Andrew Williamson, Director of Regulatory Services, to provide closing remarks.

11. Closing Remarks

Andrew covered slide 66.

Andrew provided closing remarks for the meeting. He noted this was a great start of dialogue and that I&M is excited to continue the dialogue with stakeholders. He mentioned that over 100 participants attended for most of the day, and he reminded stakeholders to please submit any additional questions or comments on the material covered during the meeting within 10 calendar days.

12. Appendix A: Poll Results

Over 100 attendees joined the 2021 IRP Stakeholder Meeting #1. I&M facilitated three polls during the meeting. The results are displayed below.

Question: Please Rank Order the Top Three Objectives		
Objective	**# of Votes**	**% of Votes**
Affordability	21	43%
Sustainability Impact	18	37%
Rate Stability	15	31%
Market Risk Minimization	10	20%
Resource Diversity	10	20%
Total Responses	49	

Question: Please Identify the Most Important Metric		
Objective	**# of Votes**	**% of Votes**
Affordability	20	43%
Sustainability Impact	15	32%
Rate Stability	6	13%
Market Risk Minimization	6	13%
Resource Diversity		
Total Responses	47	

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Question: Opinion on Proposed Scenarios		
Response	**# of Votes**	**% of Votes**
Additional Scenarios	19	39%
Scenarios Sufficient	15	31%
Unknown	9	18%
Total Responses	43	

13. Appendix B: List of Questions Answered on Call

Table 5 List of Questions Addressed on the Call Verbally

Question Asked	Response
Can you elaborate on load growth? What was I&M's load growth prior to COVID-19, prior year (2020), forecasted?	As answered by Chad Burnett
Refer to slide 42. Without data prior to 2021, it appears the trendline of your Load Obligation is increasing. It would help if you can show how I&M load trended prior to 2021 (at least going back 3-5 years).	As answered by Chad Burnett
Contrast Slides 52, 53 against Slide 42. What is the driver that will arrest the load decline trend by 2021?	As answered by Chad Burnett
Refer to Slide 42. What supports the 300 MW short in capacity taking in consideration the load decline trend in prior years.	As answered by Andrew Williams
How does I&M address the cost of climate change as it impacts health, weather disruptions of supply chain, etc. as it pertains to "affordability"?	As answered by Marc Lewis and Scott Fisher
Does I&M ever ask customers or address customer choice?	As answered by Scott Fisher
How does I&M evaluate or rank Indiana-based renewable resources for resource diversity? Including looking at economic impact of giving preference to Indiana-based resources to the local economy?	As answered by Marc Lewis and Scott Fisher
Has I&M specifically asked customers about their interest and willingness to participate in a community solar project?	As answered by Marc Lewis
What is driving downward capital costs for fossil fuel in the reference case?	As answered by Scott Fisher and Holt Bradshaw
What does the energy forecast assume about electric vehicles (and other possible electrification)?	As answered by Chad Burnett
Why do you include reliability when you won't plan a system that doesn't meet reliability metrics?	As answered by Andrew
How does I&M value different resource characteristics when considering the resource diversity of a plan (6th metric)? For example, is diversity measured by fuel source used? Operational characteristics (baseload/peaking)? Or some combination of multiple factors?	As answered by Art Holland

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Question Asked	Response
Important to look at annual revenue requirements as well as NPV for first five and first 10 years. Will you provide?	As answered by Scott Fisher
CO2 emissions only make sense for cases with CO2 taxes. Assume you plan to look at alternative cases such as net zero by 2035. Is that the case?	As answered by Art Holland.
How does reliability capture risk of curtailments of natural gas supply due to cyber or physical disruptions or freeze-offs?	As answered by Art Holland and Marc Lewis
Is resource recovery using renewable biogas driven generation being considered as a Distributed Energy Resource	As answered by IRP Team
Mr. Soller stated that I&M "will conduct an all-source RFP." Is he referring to the all-source RFP that was already issued and for which bids were received around mid-January? Or is there another all-source RFP being issued?	As answered by Greg Soller
1. How does the timing of the separate RFP allow for incorporation given that IRP inputs, etc. are already being set? 2. Is the RFP that is currently being evaluated going to play a role in this IRP? If not, why not? 3. Citizen Action Coalition of Indiana would request access, subject to an appropriate NDA, to the results of both the current RFP and separate RFP, just as we have received from other utilities in Indiana during IRP processes.	As answered by Marc Lewis
Why is I&M doing a second all-source RFP, as opposed to relying on the one that they are currently evaluating the results from?	As answered by Marc
For sustainability impacts, will you be factoring in the life-cycle CO2 impacts of different resources? For example, for gas plants, there are significant up stream CO2 impacts from the drilling and transport of gas that could be considered in making resources decisions.	As answered by Scott
On market risk minimization, are there specific percent of spot market exposure that you consider to be too high or too low?	As answered by Scott
On resource diversity, how are you defining a "mix of adequate resources"? Are you factoring in the number of generators that I&M would be relying on in order to reflect the fact that a plan that relies on a mix of smaller resources that can be easily scaled up or down, rather than only a few large centralized generating units, would be more responsive if load ends up being significantly different than projected?	As answered by Toby
When you say that thermal generation retirements are driven by unit age limits and announced retirements, are you saying that retirement dates for thermal units are assumed or input into the model, rather than the modeling being used to identify the least cost retirement date?	As answered by Scott
In what scenario(s) are you evaluating retiring Rockport Unit 1 by May 31, 2025, as required in the settlement in your last IRP process in Michigan?	As answered by Andrew

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Question Asked	Response
To what extent do the scenarios you are proposing here match the scenarios that other utilities in Michigan are required to evaluate in IRPs submitted to the Michigan PSC?	As answered by Scott Fisher
Does I&M intend to include in its Indiana filing the analyses of the OVEC units and the Rockport Unit 1 2025 retirement that I&M committed to in its Michigan settlement? If not, why not?	As addressed by Andrew Williamson
If the thermal generation retirement dates are an input into the model, what analyses will I&M provide to show that the retirement dates that are input are the most economic dates?	As addressed by Scott Fisher
Has AEP done any backward-looking analyses of how its projections of capacity prices, energy prices, load, etc. from its Fundamentals Forecasts end up comparing to actual capacity prices, energy prices, load, etc.? If so, is that something that can be shared with stakeholders?	As responded by Connie Trecazzi
If we submit comments regarding today's discussion, will those be responded to in writing? And will the 2021 IRP Update at the April 14 meeting include a discussion of how input received today and in writing have led to modifications of the objectives, metrics, scenarios, and inputs that were discussed today?	As answered by Andrew Williamson
Perhaps I missed it, but I didn't see in the presentation your capacity price forecast. Can you provide that forecast?	As answered by Connie Trecazzi
Are you sending the new RFP to all of the entities that responded to your first RFP?	As answered by Marc Lewis
Besides the temporal aspect, what are the main substantive differences with the RFPs?	As answered by Marc Lewis
How are you going to evaluate the OVEC PPA? Is it going to be a sensitivity for all scenarios?	As answered by Andrew Williamson
It looks like the growth reported for the different load scenarios is negative for both the extreme weather and the EV load scenarios. Can you explain what is driving this negative growth in both scenarios? For the extreme weather scenario, is it the case that the reduction in heating load is not being made up for by the increase in cooling load?	As answered by Chad Burnett
Comment to AEP. Zero-variable-cost resources like solar and wind can be economically chosen in an IRP even when there is no capacity need, or at least when there is no capacity need for several years. Running Aurora in capacity additions mode may fail to select resources that reduce NPV revenue requirements.	*Participant left meeting shortly after asking question*
What is the motivation for having Siemens PTI moderate the stakeholder sessions?	As answered by Marc Lewis
Why is the base case on carbon a tax? And what is the basis of a 2028 start date given that Senator Manchin has made it quite clear a carbon tax would not be considered.	As answered by Connie Trecazzi
Why is Net Zero 2035 not considered?	As answered by Scott Fisher
Will the assumed life of new natural gas CC be adjusted to in Net Zero case?	As answered by Scott Fisher

Question Asked	Response
When the Company answered Anna Sommer's question about the resource count as a way to quantify resource diversity, do you mean the resource count by technology type?	As answered by Scott Fisher
Does this mean that AEP's IRP will be based on Aurora rather than PLEXOS modeling?	As answered by Art Holland
Can we get copies of the modeling files when they are available around July as we did in the prior stakeholder process?	As Answered by Jay Boggs
Will you give stakeholders an opportunity to weigh in on the language in the all-source RFP?	As Answered by Jay Boggs
Which variables are you sampling to do those 200 draws to determine the 95th percentile value of NPV?	As answered by Art Holland
Particularly as you move to a fuel-less resource mix, I don't think resource diversity measured by technology type makes sense. That's based on the antiquated concerns around fuel diversity that don't apply if you're not consuming fuel. A better way to measure resource diversity would be the count of generators relied upon.	As answered by Scott Fisher
On the market risk minimization metric, is this an average over time or a snapshot of a single year? And are you showing just purchases or the net of purchases and sales? And if the former, why?	As answered by Art Holland
What other metrics for reliability are you considering? I agree that "reserve margin" doesn't make sense. It's a binding constraint on the optimization so every portfolio must satisfy it. I could see it as a potential metric for whether a portfolio is overbuilt, i.e. if you had a particularly high RM. But again, over what period would you judge that? The whole planning period, a single year?	As answered by Scott Fisher
How will you be forecasting electrification? Are you doing a bottom up forecast of some kind?	As answered by Chad Burnett
If population is decreasing, what drives the increase in non-farm employment?	As answered by Chad Burnett
What causes the tail-end to drop off in energy and peak in about 2034?	As answered by Chad Burnett
Do these load forecast charts align with your intended planning period, i.e. ending in 2035?	As answered by Chad Burnett
Did/will all-source include EE?	As answered by Jon Walters

Indiana Michigan Power:
2021 Integrated Resource Plan
Public Stakeholder Meeting #1

March 9, 2021

Presented via GoToWebinar -> https://attendee.gotowebinar.com/register/6179953951330336780

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Agenda

Time		
9:30 a.m.	WELCOME AND INTRODUCTIONS	**Dona Seger-Lawson**, I&M Director of Regulatory Services
9:40 a.m.	MEETING GUIDELINES	**Jay Boggs**, Siemens Managing Director
9:45 a.m.	OPENING REMARKS	**Toby Thomas**, President and COO I&M
10:00 a.m.	I&M 2021 IRP PROCESS	**Greg Soller**, I&M Resource Planning Analyst, **Art Holland**, Siemens Managing Director, **Peter Berini**, Siemens Project Manager
10:45 a.m.	BREAK	
11:00 a.m.	OBJECTIVES AND MEASURES	**Art Holland**, Siemens Managing Director, **Peter Berini**, Siemens Project Manager
12:00 p.m.	LUNCH	
1:00 p.m.	SCENARIOS AND SENSITIVITIES	**Art Holland**, Siemens Managing Director, **Peter Berini**, Siemens Project Manager
2:00 p.m.	BREAK	
2:15 p.m.	BASE CASE INPUTS	**Greg Soller**, I&M Resource Planning Analyst, **Connie Trecazzi**, Fundamental Forecasts, **Chad Burnett**, Load Forecasts
2:45 p.m.	RESOURCE AND TECHNOLOGY UPDATE	**Holt Bradshaw**, Siemens Managing Director, **Jon Walter,** Manager EE & Consumer Programs
3:15 p.m.	STAKEHOLDER QUESTIONS	**Jay Boggs**, Siemens Managing Director
3:30 p.m.	NEXT STEPS AND CLOSING REMARKS	**Andrew Williamson**, I&M Director Regulatory Services
3:45 p.m.	ADJOURN	

WELCOME AND INTRODUCTIONS

Safety Moment

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IRP Team Introductions

I&M Leadership Team

Toby Thomas | President and COO

Dave Lucas | Vice President, Regulatory and Finance

Dona Seger-Lawson | Director, Regulatory Services

Andrew Williamson | Director, Regulatory Services

Marci Grossman | Director, Communications

Tammara Avant and Christen Blend | Legal

I&M IRP Planning Team

Kelly Pearce | Managing Director, Resource Planning and Strategy

Scott Fisher | Manager, Resource Planning and Grid Solutions

Greg Soller | Staff, Resource Planning and Grid Solutions

Jon Walter | Manager, EE & Customer Programs

I&M Transmission and Distribution Planning Team

Nick Koehler | Director, Transmission Planning

Carlos Casablanca | Managing Director Distribution Planning & Analysis

Subin Mathew | Director, Reliability and Grid Modernization

Siemens IRP Planning Team

Arthur Holland | Managing Director, Siemens PTI

Jay Boggs | Managing Director, Siemens PTI

Holt Bradshaw | Managing Director, Siemens PTI

Peter Berini | Project Manager, Siemens PTI

MEETING GUIDELINES

Questions and Feedback

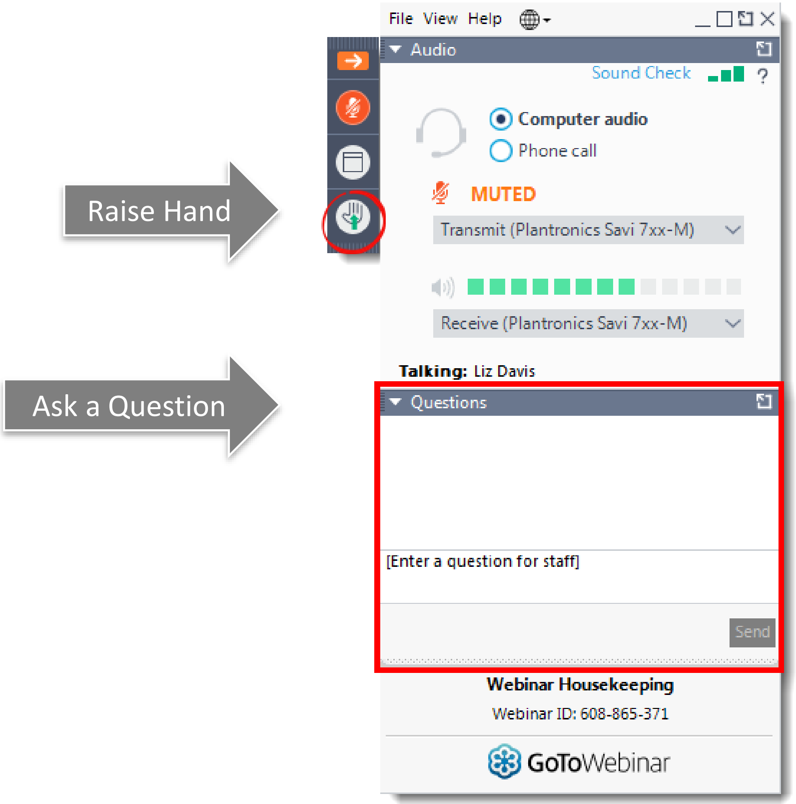
The purpose of today's presentation is to explain the IRP process and collect feedback from stakeholders. Stakeholder feedback will be posted on the I&M website IRP portal and will be considered as part of the Final IRP.

If you have a question about the IRP process during this presentation:

- Type your question in the Questions area of the GoToWebinar panel
- During the feedback and discussion portions of the presentations, please raise your hand via the GoToMeeting tool to be recognized
- Time permitting, we will address all questions and hear from all who wish to be heard
- Any questions that cannot be answered during the call will be addressed and posted on the website above

If you would like to make a comment or ask a question about the IRP process after the presentation has concluded:

- Please send an email to I&MIRP@aep.com
- Stay informed about future events by visiting the I&M IRP Portal located at www.indianamichiganpower.com/info/projects/IntegratedResourcePlan



Guidelines

1. Due to the number of participants scheduled to join today's meeting, all will be in a "listen-only" mode by default.

2. Please enter questions at any time into the GoToWebinar portal. Technical questions related to the GoToWebinar tool and its use will be addressed by the support staff directly via the chat feature.

3. Time has been allotted to answer questions related to the materials presented. Unanswered questions will be addressed after the presentation and posted in accordance with the Questions and Feedback slide.

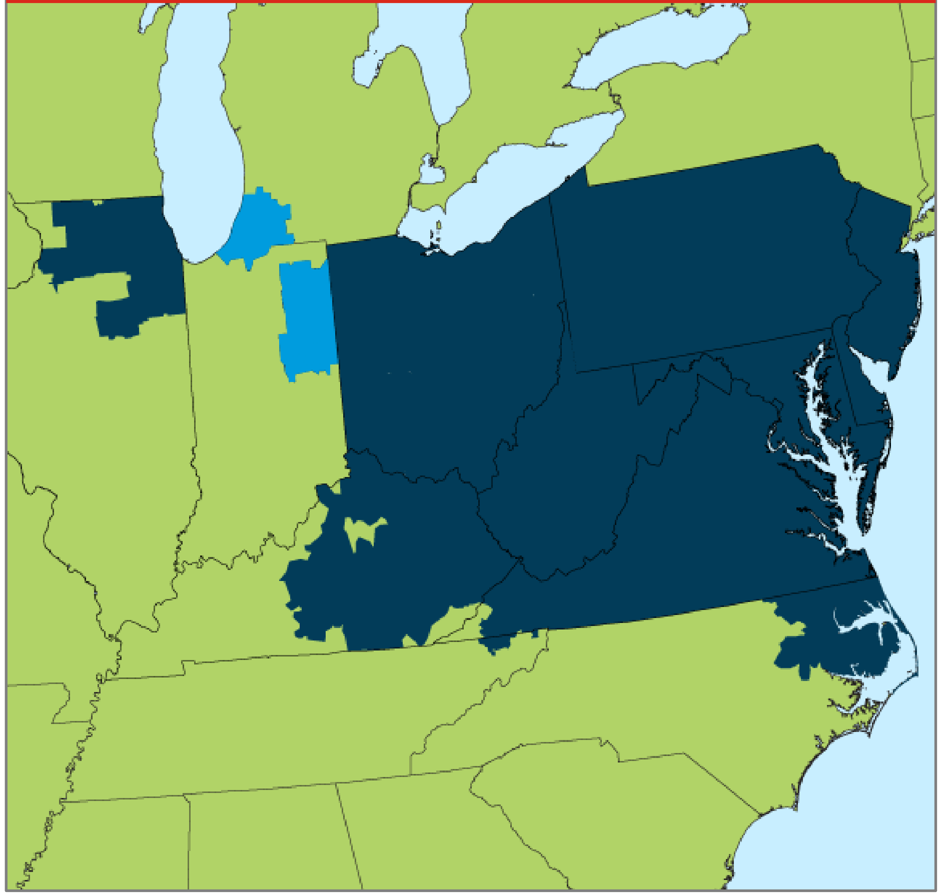
4. At the end of the presentation, we will open-up the floor for "clarifying questions," thoughts, ideas, and suggestions.

5. Please provide feedback or questions on the Stakeholder Meeting #1 presentation within ten business days of the conclusion of the meeting.

OPENING REMARKS

Indiana Michigan Power Overview

PJM Interconnection



Overview of Indiana Michigan Power

Headquartered in Fort Wayne, IN and part of the American Electric Power system

Multi-jurisdictional entity with more than 600,000 retail customers in IN and MI and over 390 MW in long-term wholesale generation contracts

- Indiana: ~470,000 customers
- Michigan: ~130,000 customers

Serves 23 counties and includes cities such as Elkhart, Fort Wayne, Marion, St. Joseph, Muncie & South Bend.

Fully Integrated Electric Service Provider

- Generation ~ 5,400 MW
- Transmission ~ 5,300 Line Miles
- Distribution ~ 20,500 Line Miles

Indiana Michigan Power Resource Diversity

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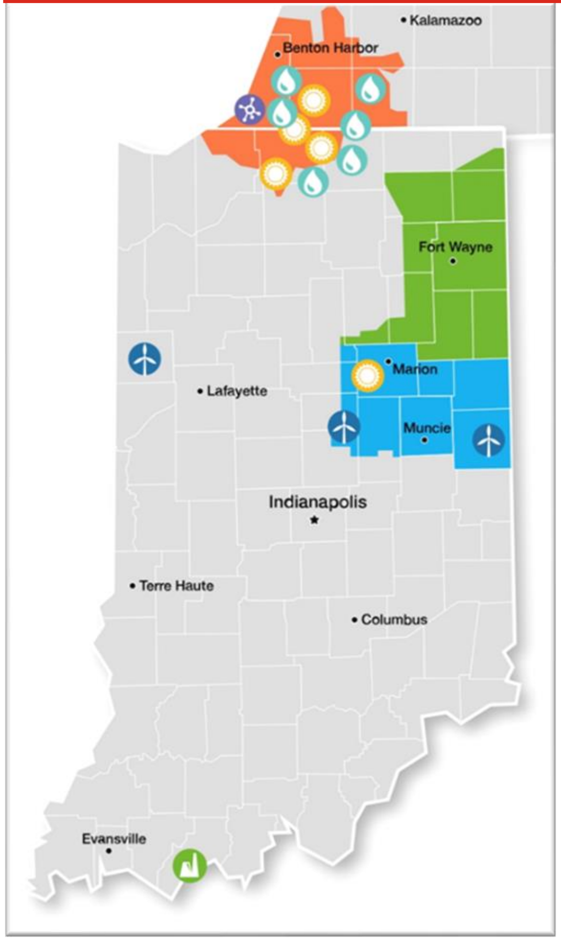
I&M Service Territory



I&M has a diverse set of Generation Resources and PPAs, including:

- 2,278 MW Cook Nuclear Plant
- 2,223 MW Rockport Coal Plant
- 22 MW of Hydroelectric Power
- 35 MW of Universal Solar
- 450 MW of Wind Power under PPA;
  - 150 MW from the Fowler Ridge Wind Farm in Benton County, IN
  - 100 MW from the Wildcat Wind Farm in Madison County, IN
  - 200 MW from Headwaters Wind Farm in Randolph County, IN

80+%

Carbon-free Generation In 2020

I&M Energy Efficiency and Demand Response Programs:

- Since 2010 I&M sponsored EE programs have saved ~ 1,400 GWh of energy or approx. the annual usage of 10,500 average homes
- During 2020 I&M sponsored EE programs saved ~ 14MW of demand or approx. 2,800 average homes peak usage
- ~ 300 MW of Interruptible and Demand Reduction programs
- Additional AMI-related demand response programs are expected

I&M Transformation Strategy

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COMPANY TRANSFORMATION AND CUSTOMER RELATIONSHIPS

Generation Transformation	Modernizing the Grid	Expanding Customer Choices	Embracing New Technology	Developing a Work-force of the Future
Evaluate transition of generation resources to all emission free resources	Deploy smart grid technologies to optimize reliability, operability, and bi-directional grid flow	Implement a portfolio of customer programs that provide a more personalized experience	Identify, develop, and implement new business technologies and deliver customer benefits	Leverage data analytics and mobility to optimize operations for a better employee and customer experience

2021 Integrated Resource Plan

- ❑ Load changes across customer classes
- ❑ Enhanced coordination of generation and energy delivery planning
- ❑ Diversification of resource profiles
- ❑ Updated resource pricing
- ❑ Updated Market Potential Study
- ❑ AMI deployment & technology integration
- ❑ New customer program choices
- ❑ Planning for distributed resources and EV expansion
- ❑ Avoided or deferred T&D cost evaluation

AEP D&I Roadmap to 2025

I&M 2021 IRP PROCESS

IRP Overview

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The purpose of the IRP is to provide a roadmap at a point in time that utilities and load serving entities use as a planning tool when evaluating resource decisions necessary to meet forecasted electric energy demand in an approach that balances affordability, reliability, and sustainability for customers and stakeholders.

There are two main components in creating an IRP: **Development of a Portfolio** and **Stakeholder Engagement**

Development of a Portfolio

- The end goal of the IRP is to develop a preferred resource portfolio (set of supply and demand-side resources) that can be used as a roadmap designed to inform future resource actions for electric energy demand to serve load
- I&M has partnered with Siemens PTI to create a set of Candidate Portfolios based on a series of Conditions that are informed by Scenarios and Sensitivities
- The Conditions will be tested, analyzed and used by I&M management to determine the preferred resource portfolio

Stakeholder Engagement

- The IRP will take into consideration stakeholders and public feedback in the analysis that will help inform the preferred resource portfolio recommendation

Enhancement Opportunities

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I&M has received excellent feedback and input into its ongoing IRP process from numerous stakeholders, including the Indiana Utility Regulatory Commission (IURC) and Michigan Public Service Commission (MPSC), which will be incorporated into the IRP and/or subsequent IRP filings. As a starting point to the 2021 IRP, we are planning the following:

Stakeholder Engagement:

- Enhance stakeholder process and improve remote accessibility of stakeholder meetings
- Dedicate one stakeholder meeting to energy efficiency and demand response
- Work with stakeholders to review and define new scenarios and modeling inputs for the IRP

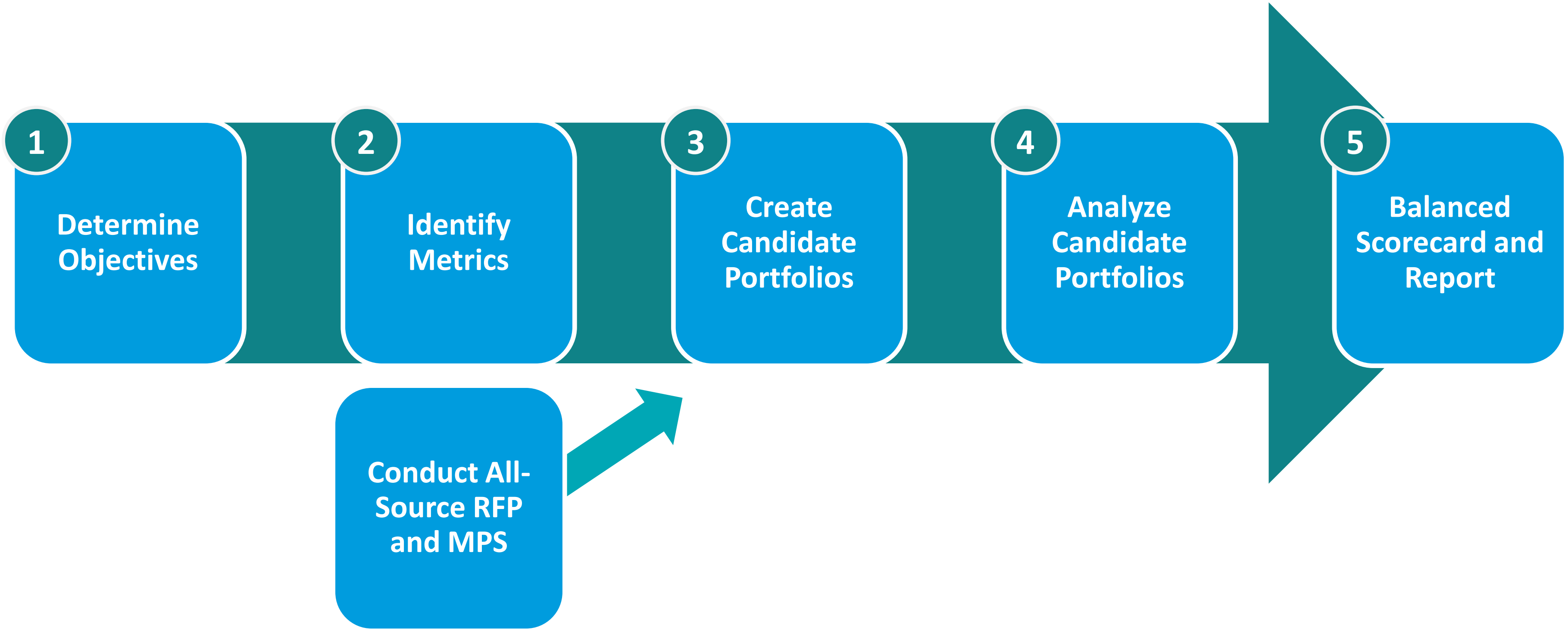
Model Inputs

- Conduct a new Market Potential Study (MPS) specific to each of I&M's retail jurisdictions, including evaluation of demand response (DR) and distributed energy resources (DER)
- Conduct and incorporate an all-source RFP to inform capital cost and performance of all qualifying facilities
- Expand resource options to include both owned and purchased renewable resource options
- Improve coordination among resource, transmission and distribution planning processes

2021 IRP Process

The 2021 IRP Process, detailed below, has been administered by Siemens PTI across the country.

Siemens PTI: Approach to Integrated Resource Plan Modeling



Key Vendors

As part of the 2021 IRP Process, I&M has engaged several vendors.

Integrated Resource Plan

- Siemens PTI IRP Team
  - Moderation of Stakeholder Meetings
  - Management of IRP Modeling and Report
  - Testimony Support

All-source RFP

- Siemens PTI RFP Team
  - Draft RFP Language
  - Solicit Stakeholder Input on RFP Language
  - Management of RFP Process
  - Conversion of results into modeling inputs

Market Potential Study

- GDS Associates
  - Kicked off in Q4 2020
  - Assess EE/EWR, DR, DER and AMI Consumer Programs & Technology
  - I&M Indiana and I&M Michigan over 30-year planning horizon
  - Conversion of results into modeling inputs

Stakeholder Process

I&M has established a stakeholder engagement process to encourage questions, make suggestions and provide data. As part of the IRP process, I&M will seek stakeholder participation throughout the IRP development process. At the core of the process is a series of four workshops.

March 9, 2021	April 14, 2021	July 14, 2021 (tentative date)	September 14, 2021 (tentative date)
2021 IRP Process	DSM IRP Inputs and Modeling	Draft Candidate Portfolios	Probabilistic Modeling Results
Objectives and Metrics	EE/EWR, DR and DER Results	All-Source RFP Results	Review of Preferred Portfolio
Proposed Scenarios	2021 IRP Update	Stochastic Modeling Approach and Assumptions	Other(s)
Base Case Inputs			

In addition, an Aurora Technical Conference and an invite to provide input on the RFP process will be provided to stakeholders

All-Source RFP Stakeholder Process

TBD:	Early April:	Mid April:	Late May:
Draft RFP Available	RFP Stakeholder Meeting	Issue RFP	Responses Due

Feedback and Discussion

OBJECTIVES AND MEASURES

Determine Objectives

The purpose of the IRP is to develop a preferred resource portfolio that starts with I&M's current resource portfolio and evaluates a range of alternative future portfolios that can meet the customers' capacity and energy needs in an affordable, reliable and sustainable manner.

A critical first step in the IRP Process is the determination of objectives in which portfolios will be evaluated against.

Portfolios are evaluated in terms of Affordability, Reliability and Sustainability objectives.

Metrics are assigned to the objectives to allow the analysis to compare portfolio performance across diverse scenarios

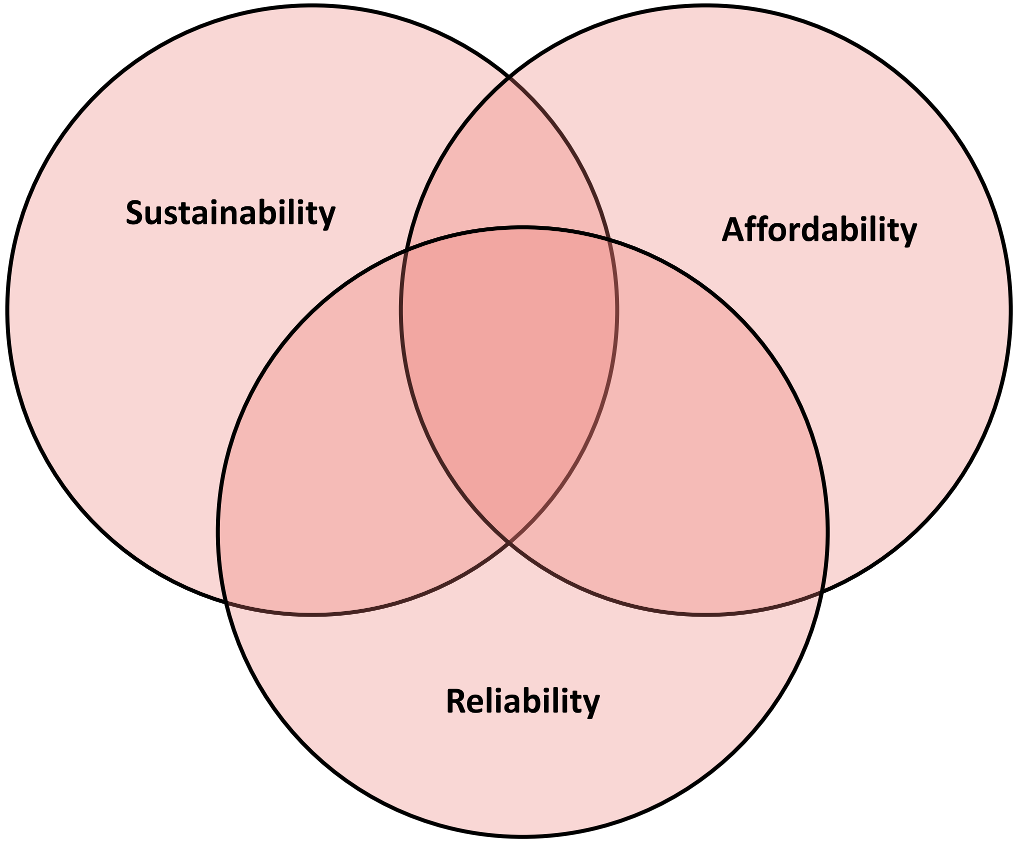
IRP Objectives
Affordability
Rate Stability
Sustainability Impact
Market Risk Minimization
Reliability
Resource Diversity

Identify Tradeoffs

An IRP is centered on providing electric service in a way that balances:

- ***Affordability***: meet energy and demand requirements of our customers at an affordable cost with price stability
- ***Reliability***: effectively meet customer energy and capacity requirements
- ***Sustainability***: meet customer energy requirements in a way that addresses environmental concerns

Each set of stakeholders may have a different set of priorities when examining IRP objectives.



Assign Metrics

For each portfolio, objectives will be tracked through identified metrics that will be used to measure and evaluate performance of the Candidate Portfolios.

IRP Objectives	IRP Metric
Affordability	NPV-RR
Rate Stability	95^{th} percentile value of NPV-RR
Sustainability Impact	CO2 Emissions
Market Risk Minimization	Spot Market Exposure (Purchases/Sales)
Reliability	Reserve Margin
Resource Diversity	Mix of Adequate Resources

Balanced Scorecard (Illustrative)

The preferred resource portfolio will incorporate each of the objectives and measures through a balanced scorecard that weighs attributes in accordance with stakeholder needs, economic and load growth projections, I&M input and practical considerations.

Balanced Scorecard (Illustrative)

	Affordability	Rate Stability	Sustainability Impact	Market Risk Minimization	Reliability	Resource Diversity
Candidate Portfolios	NPV RR	95th Percentile Value of NPV RR	CO2 Emissions	Purchases as % of Generation	Reserve Margin	Mix of Resources
Reference Case	$92.0	$115.0	-62.0%	10.0%	15%	5
Portfolio #1	$94.0	$138.0	-39.0%	15.0%	15%	4
Portfolio #2	$108.0	$145.0	-50.0%	18.0%	15%	6
Portfolio #3	$81.0	$123.0	-38.0%	24.0%	15%	4
Portfolio #4	$97.0	$146.0	-42.0%	42.0%	15%	4
Portfolio #5	$101.0	$167.0	-54.0%	34.0%	15%	5
Portfolio #6	$87.0	$113.0	-64.0%	41.0%	15%	3
Portfolio #8	$102.0	$172.0	-40.0%	34.0%	15%	5
Portfolio #9	$120.0	$198.0	-90.0%	24.0%	15%	6
Portfolio #10	$99.0	$210.0	-84.0%	12.0%	15%	5

Poll Question

Please Rank Order the Proposed Objectives

Feedback and Discussion

LUNCH

PROPOSED SCENARIOS

Scenario Development

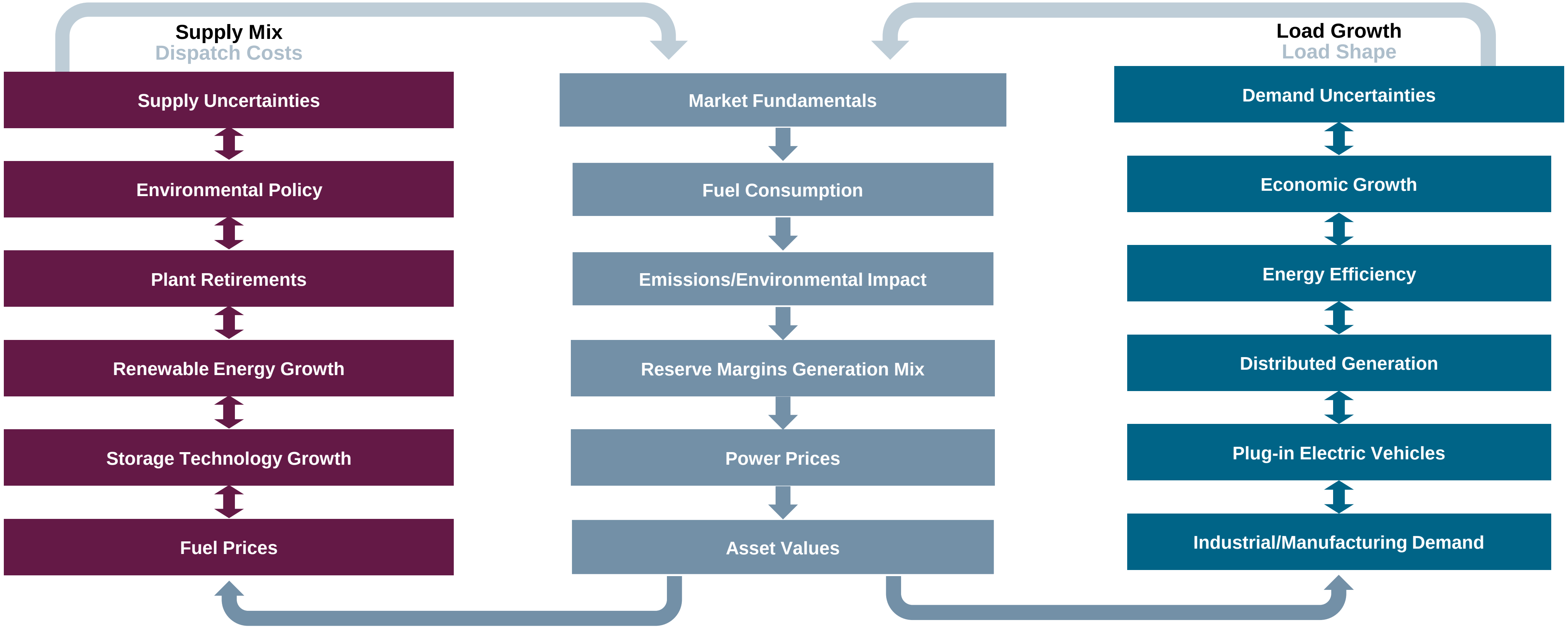
I&M and Siemens have developed **a Reference scenario** and **four alternative scenarios** to implement a scenario- and sensitivity-based approach to create Candidate Portfolios and test which portfolios perform the best over a wide range of future market and regulatory conditions. The development of scenarios considered I&M strategic decisions, stakeholders and Indiana and Michigan filing requirements.

As part of the IRP Development Process:

- Portfolios are constructed based on a range of scenarios to create a series of **Potential Candidate Portfolios** that are important to management and stakeholders alike.
- Each **Potential Candidate Portfolio** will be developed from the Scenarios and will include a selection of sensitivities aimed at providing further depth in the analysis.
- **Candidate Portfolios** are then subjected to stochastic risk analysis to measure performance across many future scenarios. The stochastic process will produce hundreds of internally consistent simulations that can provide a more realistic understanding of the potential variation in future scenarios.
- The Scenarios include a Rapid Technology Advancement scenario, a Net Zero Carbon by 2050 scenario, a Market Driven Electrification scenario, an Enhanced Regulation scenario and other potential Stakeholder scenarios.

Key Market Drivers

In order to frame Scenario Development, it is important to consider how various market drivers impact the supply mix and load growth of I&M and the surrounding region.



Overview of Proposed Scenarios

I&M will use a scenario- and sensitivity-based approach to construct future market and regulatory environments. The Reference scenario is the most expected future scenario and includes the base case inputs described herein. The changes in the alternative scenarios are shown relative to the Reference scenario.

Scenario	Load	Gas Price	Coal Price	CO2	Renewable and Storage Costs	EE / DR Cost
Reference	Base	Base	Base	Base	Base	Base
Net Zero by 2050	Base	Base	Base	Net Zero	Base	Base
Rapid Technology Advancement	Base	Base	Base	Base	Low	Low
Market Driven Electrification	High	High	High	Base	Base	Base
Enhanced Regulation	Base	High	High	High	Base	Base
Other(s)						

The directional basis of the Scenario drivers are as compared to the Reference scenario.

Scenario Narrative: Reference Scenario

Scenario	Load	Gas Price	Coal Price	CO2	Renewable and Storage Costs	EE / DR Cost
Reference Scenario	Base	Base	Base	Base	Base	Base

The Reference Scenario

The Reference scenario is the most expected future scenario that is designed to include a consensus view of key drivers in power and fuel markets. The existing generation fleet is largely unchanged apart from new units planned with firm certainty or under construction. All other scenarios reference the Reference scenario.

In the Reference scenario, major drivers include:

- Coal prices remain relatively flat over the forecast horizon in constant dollars consistent with EIA reference
- Natural gas prices move upward in real dollars to 2050 consistent with EIA reference
- Energy and Demand decrease moderately through 2050
- Capital costs are downward sloping for fossil and wind resources, and decline significantly for solar and storage resources
- Carbon regulations limiting CO2 emissions will commence in 2028 and remain in effect throughout the forecast horizon

Scenario Narrative: Net Zero Carbon by 2050

Scenario	Load	Gas Price	Coal Price	CO2	Renewable and Storage Costs	EE / DR Cost
Net Zero by 2050	Base	Base	Base	Net Zero	Base	Base

Net Zero Carbon by 2050

The Net Zero Carbon by 2050 scenario assumes increased carbon reduction to achieve net zero in electric sector and will highlight incremental goals through the 20-year IRP planning period. Increased renewable and storage additions are driven by renewable portfolio standards and goals, economics, and prevailing best practices to meet carbon regulations while maintaining reliability.

In the Net Zero Carbon by 2050 scenario, major drivers include:

- Non-carbon dioxide emitting resources will be increased to meet Net Zero requirements
- Nuclear units are assumed to have license renewals granted and remain online
- Thermal generation retirements are driven by unit age-limits and announced retirements, consistent with Reference scenario
- Technology costs for thermal units remain consistent with the Reference scenario
- Fundamental drivers (load and commodity prices) remain constant to the Reference scenario

Scenario Narrative: Rapid Technology Advancement

Scenario	Load	Gas Price	Coal Price	CO2	Renewable and Storage Costs	EE / DR Cost
Rapid Technology Advancement	Base	Base	Base	Base	Low	Low

Rapid Technology Advancement

The Rapid Technology Advancement scenario assumes technological advancements, favorable regulation and overall economies of scale that impact renewable resources. The scenario assumes technology costs for supply- and demand-side renewable resources decline over time, resulting in up to 35% reductions in technology costs; significantly faster than in the Reference scenario.

In the Rapid Technology Advancement scenario, major drivers include:

- Technology cost reductions for renewables and storage result in lower capital costs
- Technological advancement and economies of scale contribute to greater potential for energy efficiency and demand response
- Carbon regulations limiting CO_2 emissions will commence in 2028 and remain in effect throughout the forecast horizon
- Thermal generation retirements are driven by unit age-limits and announced retirements, consistent with Reference scenario
- Fundamental drivers (load and commodity prices) remain constant to the Reference scenario

Scenario Narrative: Market Driven Electrification

Scenario	Load	Gas Price	Coal Price	CO2	Renewable and Storage Costs	EE / DR Cost
Market Driven Electrification	High	High	High	Base	Base	Base

Market Driven Electrification

The Market Driven Electrification scenario assumes an increase in economic activity drives load and commodity prices higher than the Reference scenario, resulting in increased energy market prices. As a result, commercial and residential customers accelerate the transition to full electrification and continued installation of demand side resources.

In the Market Driven Electrification scenario, major drivers include:

- High energy and demand scenario driven by customers drive to electrification
- Natural gas and coal prices are increased to support economic growth and improve viability of alternative technologies
- Technology costs for thermal and renewable units remain consistent with the Reference scenario
- Thermal generation retirements are driven by unit age-limits and announced retirements, consistent with Reference scenario
- Carbon regulations limiting CO2 emissions will commence in 2028 and remain in effect throughout the forecast horizon

Scenario Narrative: Enhanced Regulation

Scenario	Load	Gas Price	Coal Price	CO2	Renewable and Storage Costs	EE / DR Cost
Enhanced Regulation	Base	High	High	High	Base	Base

Enhanced Regulation

The Enhanced Regulation scenario assumes increased environmental regulations covering natural gas, coal and CO2. Illustrative examples include a potential fracking ban and increases of carbon reduction targets.

In the Enhanced Regulation scenario, major drivers include:

- Natural gas, coal prices and CO2 prices are increased to reflect enhanced regulation
- Technology costs for thermal and renewable units remain consistent with the Reference scenario
- Thermal generation retirements are driven by unit age-limits and announced retirements, consistent with Reference scenario
- Carbon regulations limiting CO2 emissions will commence in 2028 and remain in effect throughout the forecast horizon

Stakeholder Scenarios

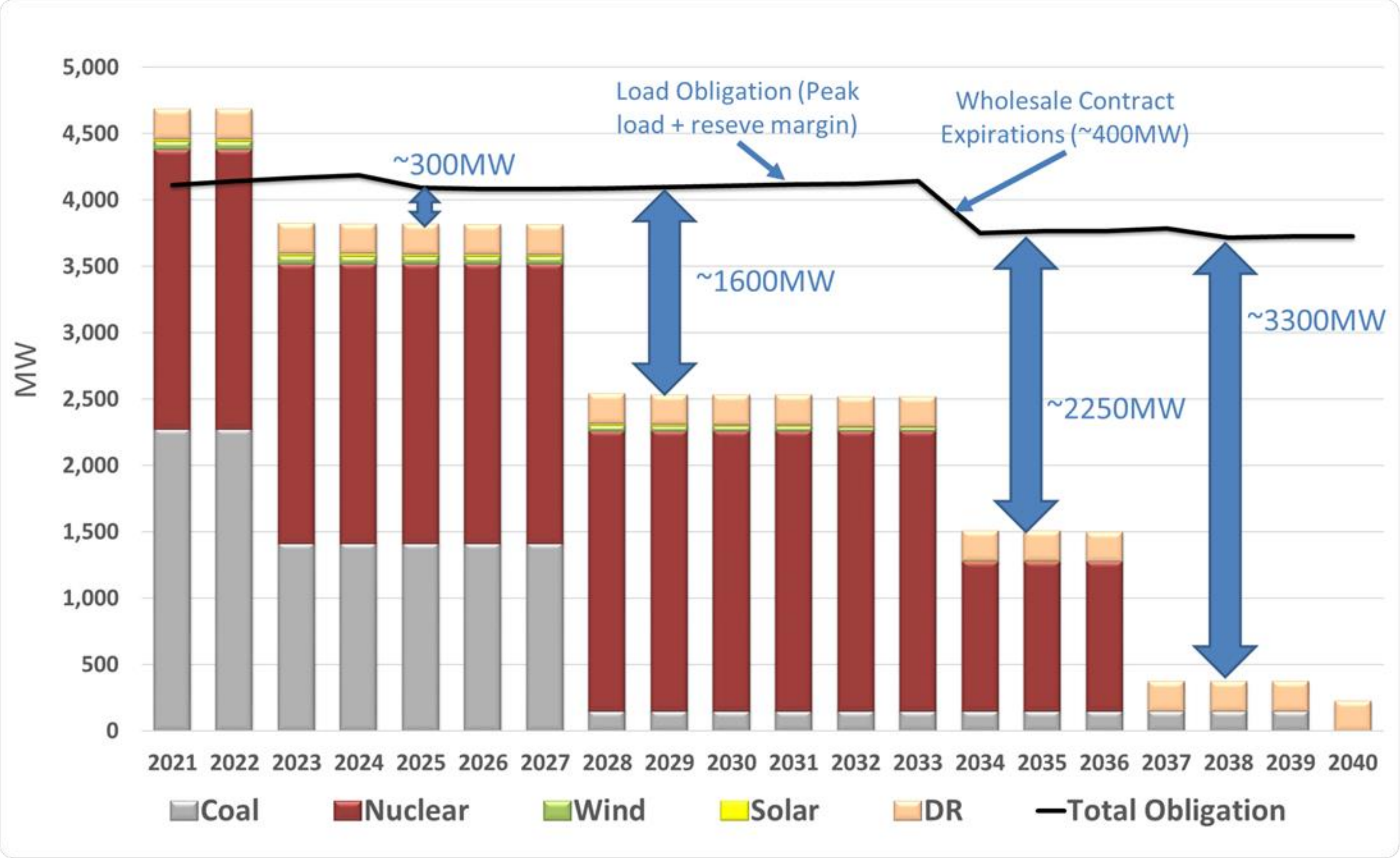
Scenario	Load	Gas Price	Coal Price	CO2	Renewable and Storage Costs	EE / DR Cost
Reference	Base	Base	Base	Base	Base	Base
Net Zero by 2050	Base	Base	Base	Net Zero	Base	Base
Rapid Technology Advancement	Base	Base	Base	Base	Low	Low
Market Driven Electrification	High	High	High	Base	Base	Base
Enhanced Regulation	Base	High	High	High	Base	Base
Other(s)						

Feedback and Discussion

BREAK

PRELIMINARY BASE CASE INPUTS

Going-in PJM Capacity Position – (UCAP MW)



Reference Scenario Inputs

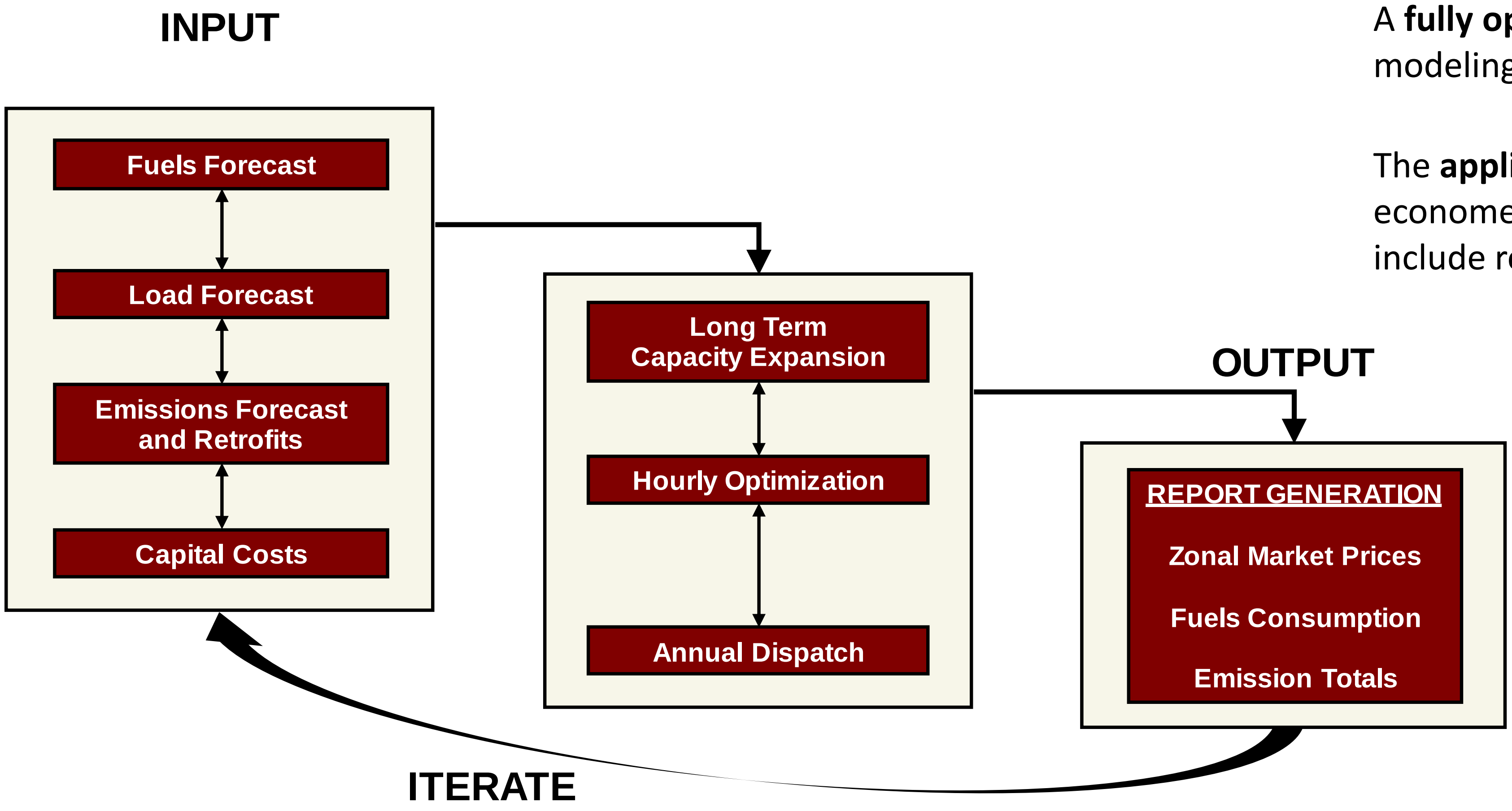
I&M developed a set of base case assumptions, including the following key drivers:

Key Market Drivers:
- I&M and PJM energy and demand
- Henry Hub natural gas prices
- PRB Coal Prices
- Capital Costs for various generation technologies

It is important to note that on- and off-peak power prices and capacity prices are an output of the scenario assumptions

Fundamentals Forecast
- Base Case: Reflects EIA Reference scenario with no carbon price assumption
- Base Carbon Case: Includes a $15/metric ton carbon price beginning in 2028, escalating at 3.5% annually thereafter
- High Case: Includes Base Case assumptions with high fuel prices (1 standard deviation) and higher loads
- Low Case: Includes Base Case assumptions with low fuel prices (1 standard deviation) and lower loads

Fundamental Forecast Process



A **fully optimized** forecast requires iterative modeling to satisfy all relationships

The **application of constraints** takes an econometric model output and shapes it to include real world limitations.

Linkage Between Forecast Zones

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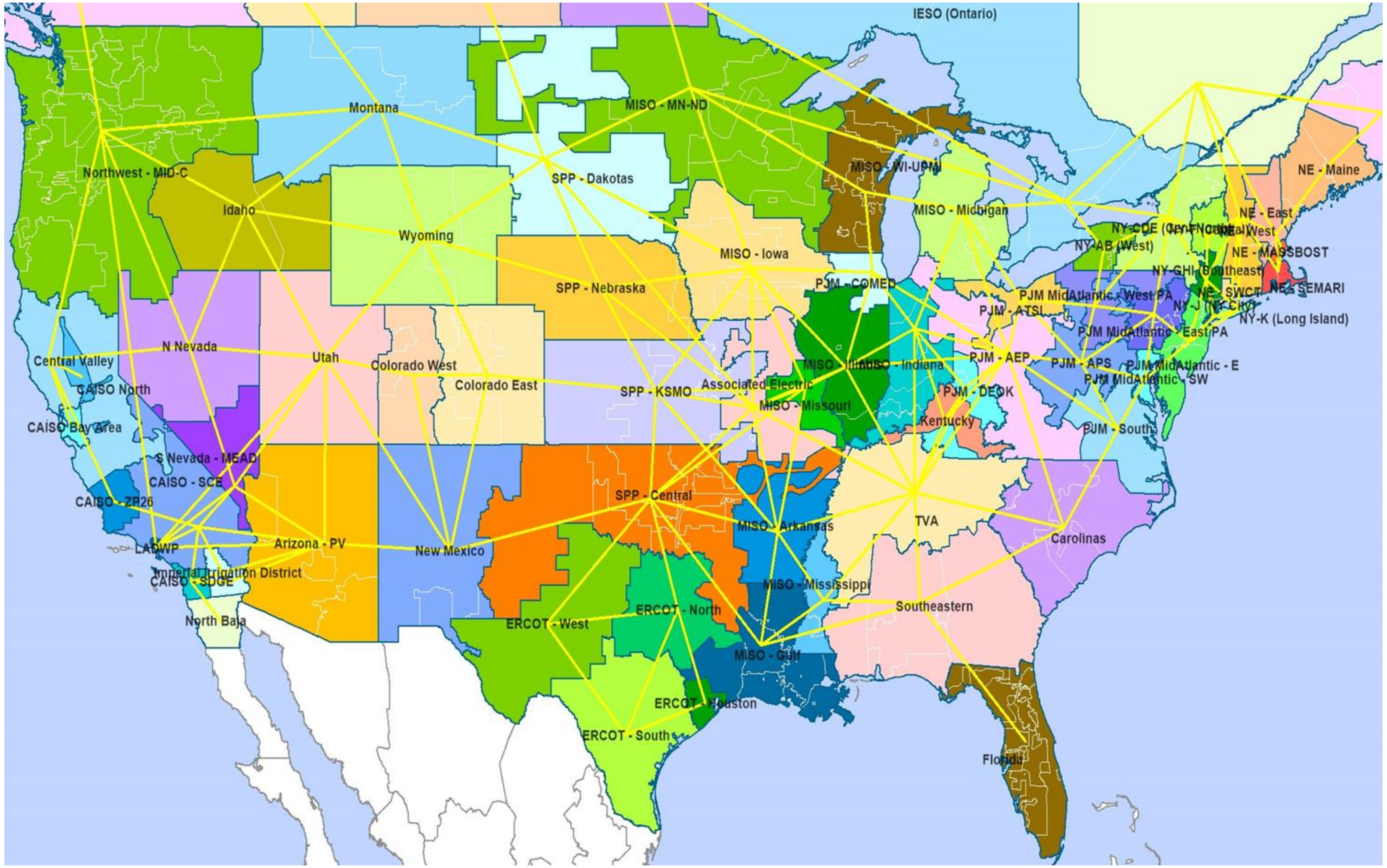
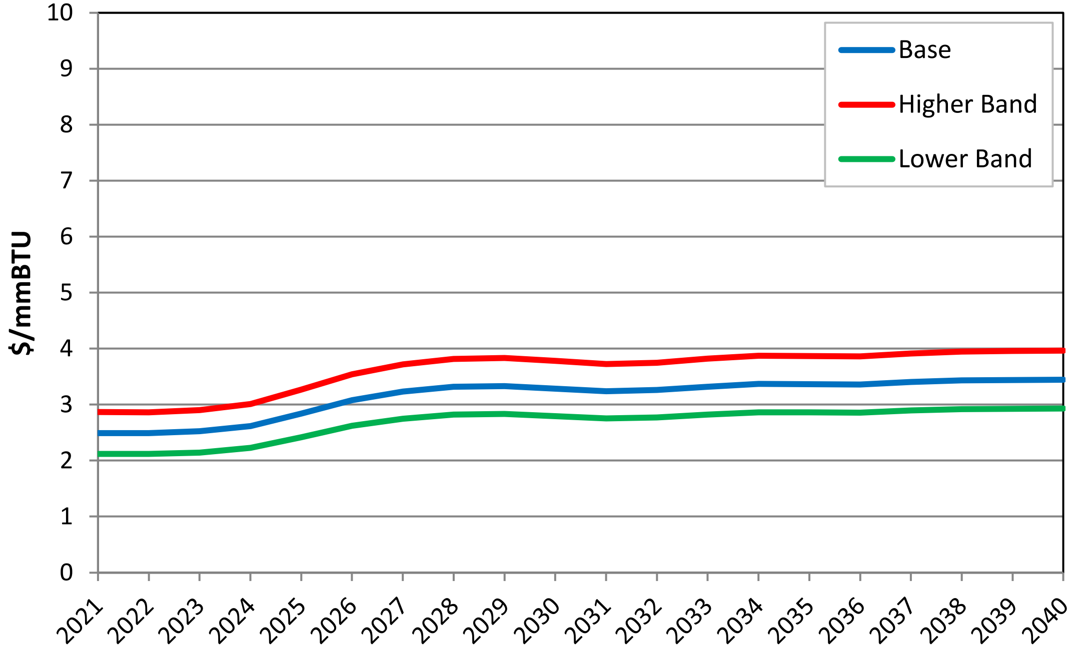


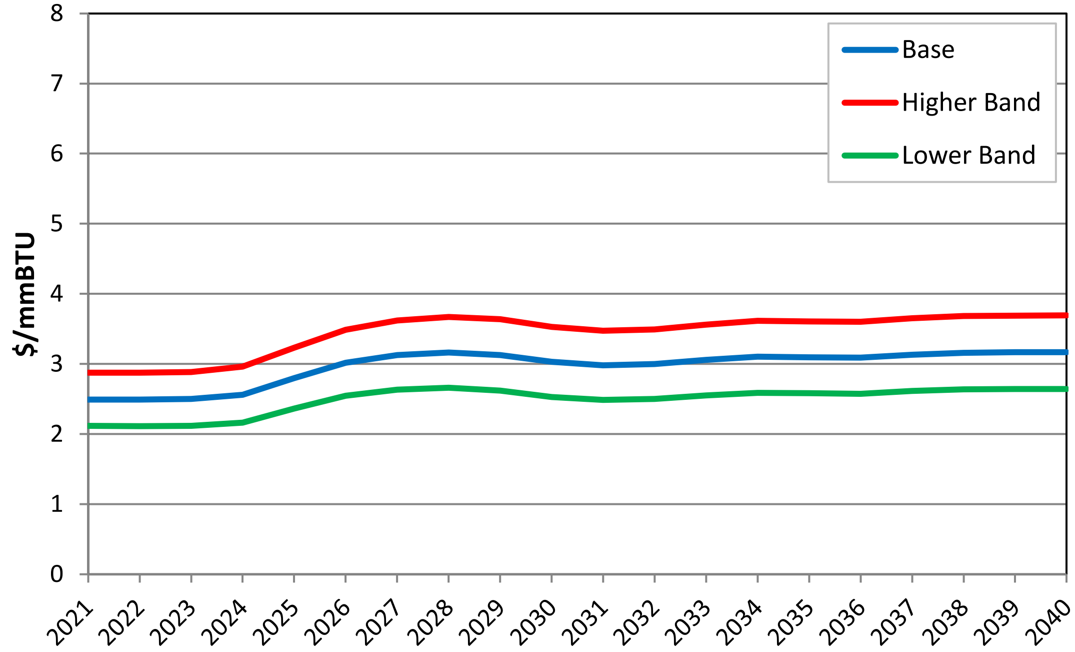
Base Case Fuel Forecast: Henry Hub

2020 H2 Fundamental Forecast

Henry Hub Gas Prices (Real $/mmBTU)



TCO Delivered Gas Prices - (Real $/mmBTU)



Base Case Coal Forecast: I-Basin and PRB

2020 H2 Fundamental Forecast

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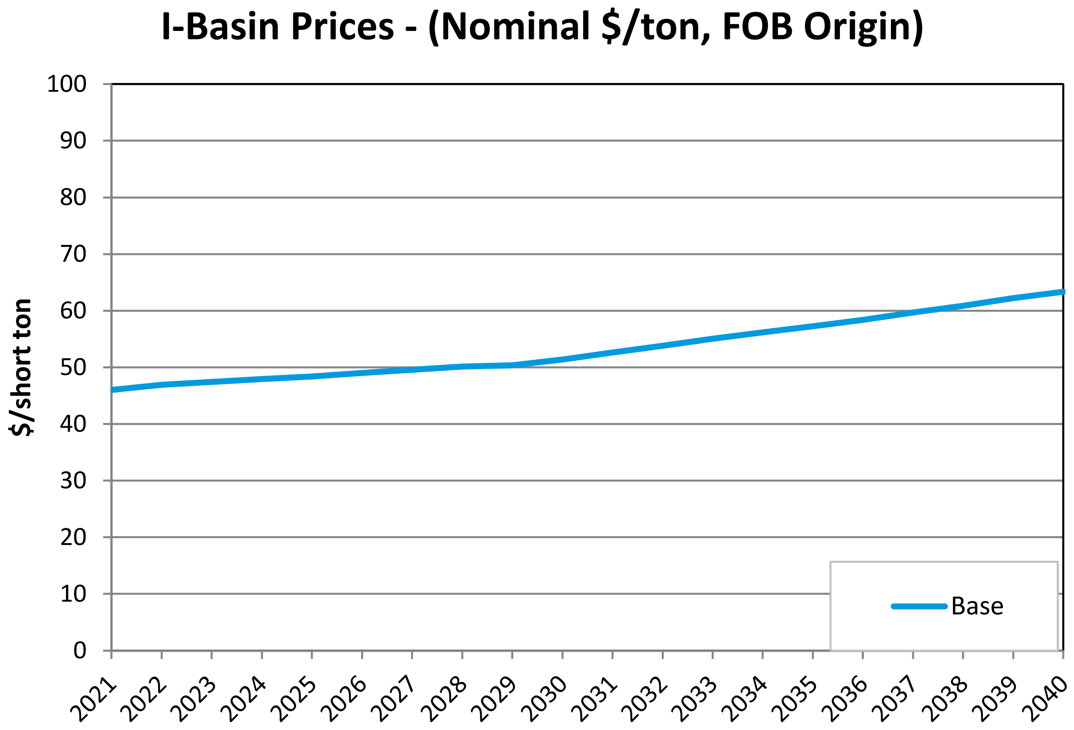
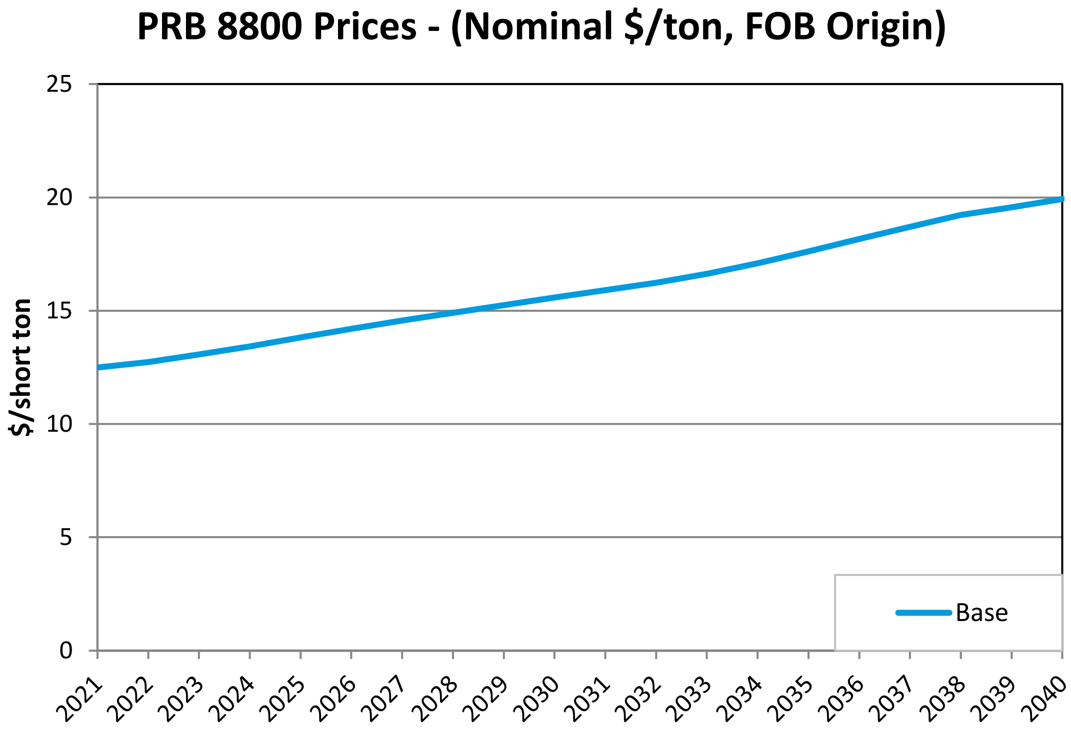
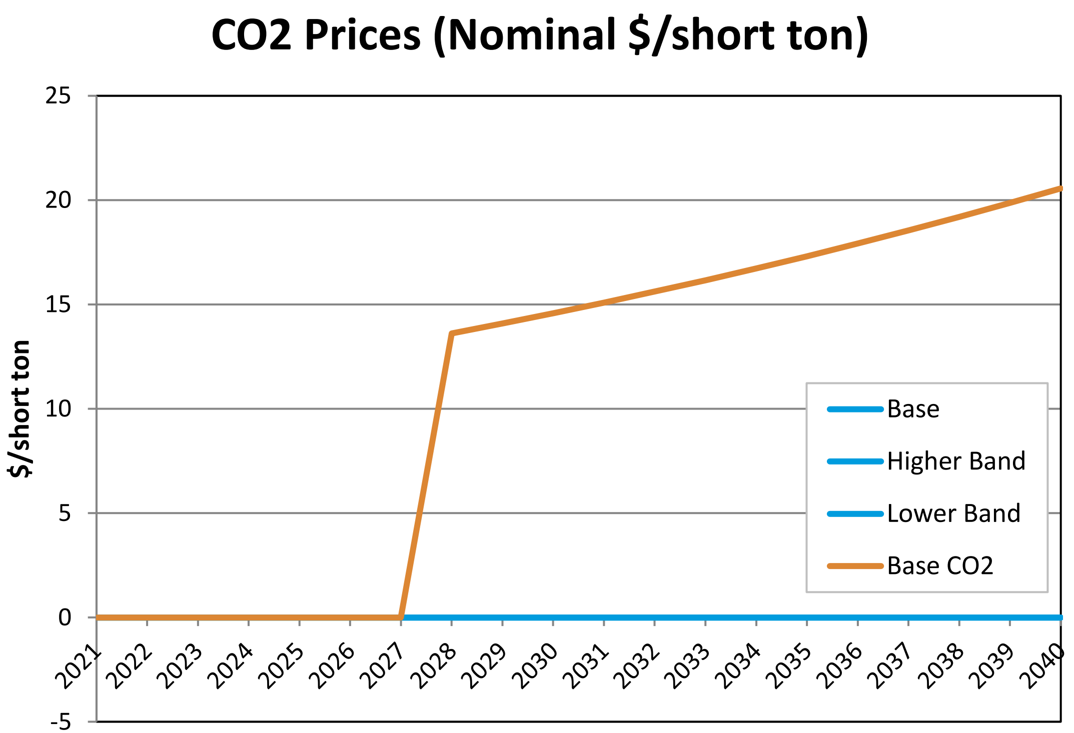


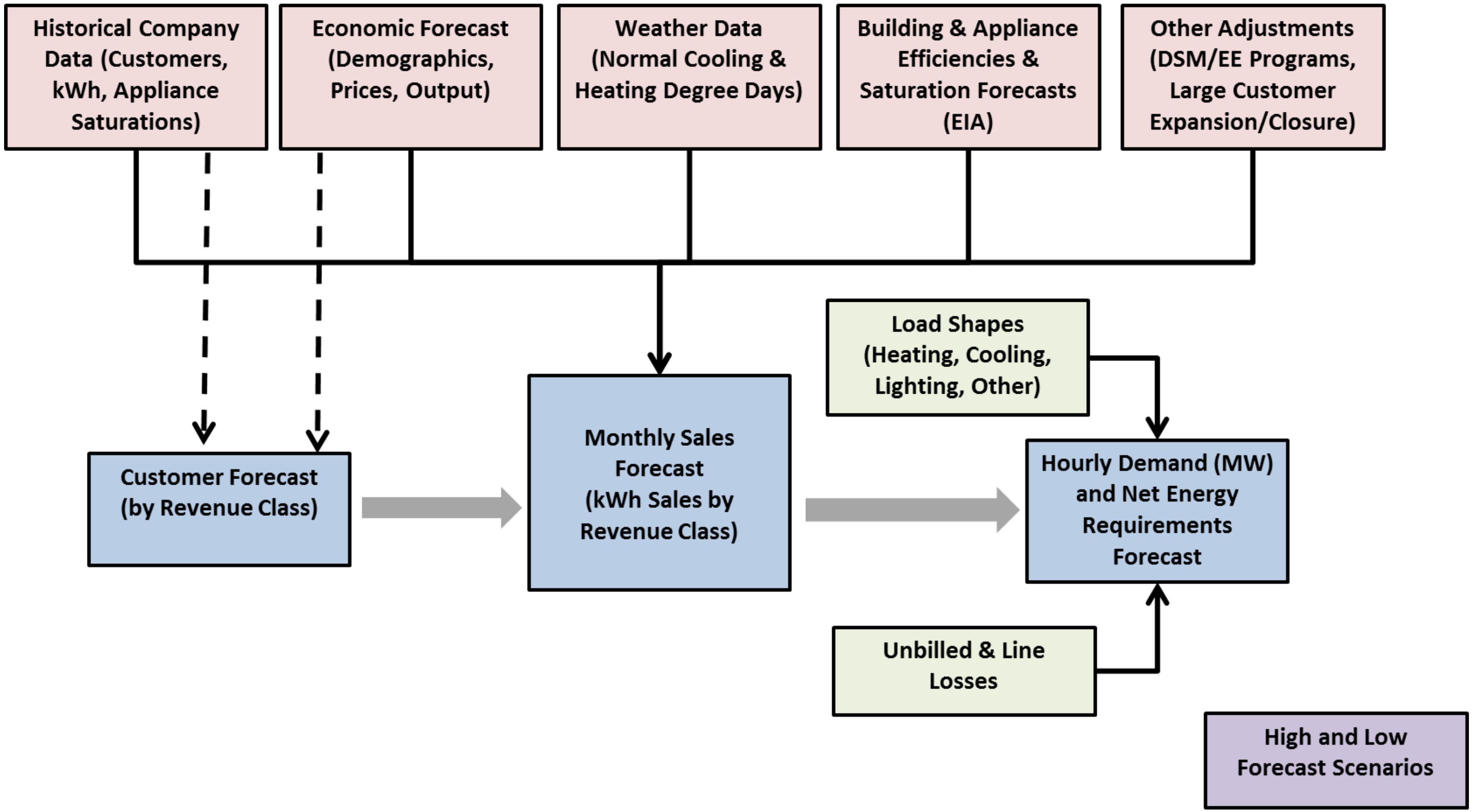


Base Case CO2 Forecast: National CO2 Price

2020 H2 Fundamental Forecast



Load Forecast Process



Load Forecast Drivers

Residential

- Regional Economic Variables (Employment, Income)
- Demographics (Population, Households)
- Gross Regional Product
- Electricity Price
- State Natural Gas Price
- Mortgage Interest Rate
- Heating & Cooling Degree Days
- Prior period kWh and Customer count
- Appliance saturation
  (surveyed every 3-4 years)
- Appliance efficiency standards & trends
- Building standards & trends

Other Ultimate

- Regional Economic Variables (Employment)
- Heating & Cooling Degree Days
- Prior Period kWh

Commercial

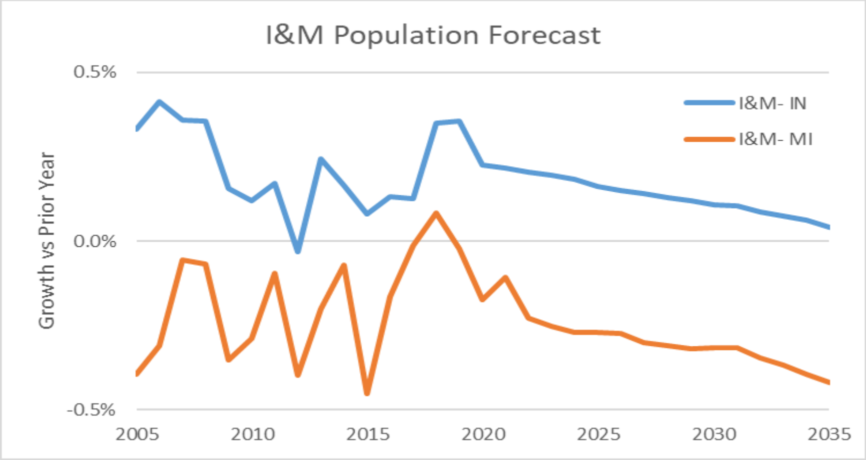
- Regional Economic Variables (Employment, Income)
- Commercial Gross Regional Product
- Electricity Price
- State Natural Gas Price
- Heating & Cooling Degree Days
- Prior period kWh and Customer count
- Appliance saturation
- Appliance efficiency standards & trends
- Building standards & trends

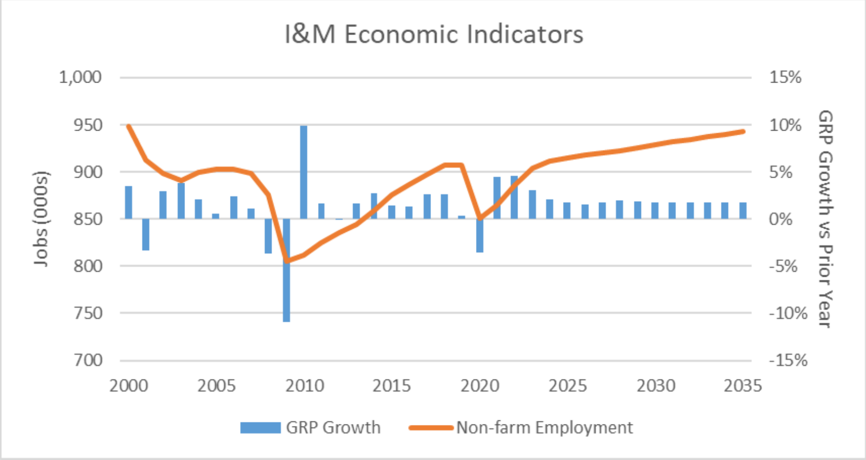
Industrial

- FRB Industrial Production Indices (Selected)
- Regional Economic Variables (Employment)
- Regional Coal Production
- Manufacturing Gross Regional Product
- Electricity & Petroleum Prices
- State Natural Gas Prices
- Prior period kWh

(Economic data is provided by Moody's Analytics)

Economic Forecast Highlights





<u>Economic Forecast Highlights: I&M Service Territory</u>

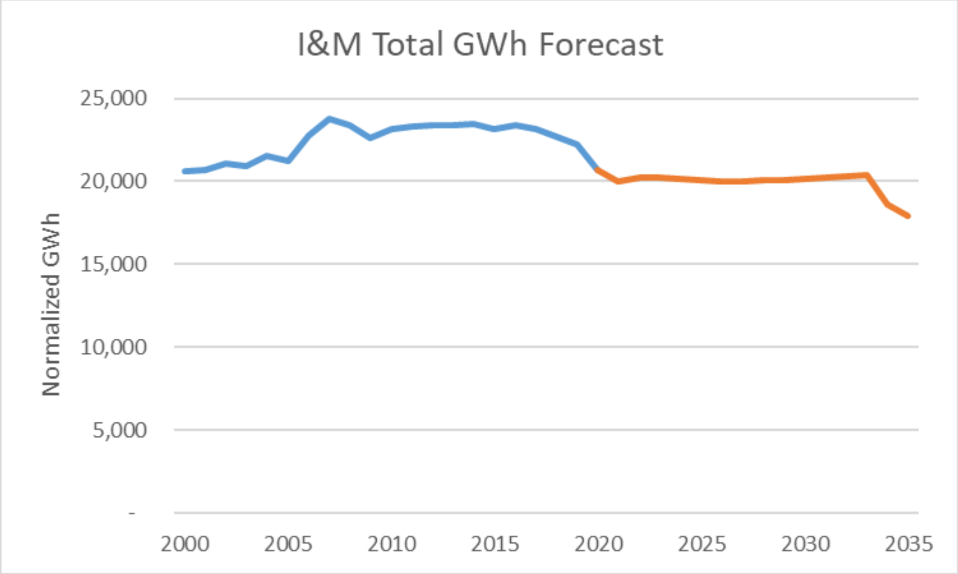
- I&M service territory population is expected to continue to slow. I&M MI population growth has been declining since the turn of the century.
- The COVID-19 pandemic and recession in 2020 had a significant impact on I&M's regional economy.
- It will take years before the gross regional product and non-farm employment reach their pre-pandemic levels.
- According to Energy Information Administration (EIA) Annual Energy Outlook for 2021, "US energy demand takes until 2029 to return to 2019 levels".

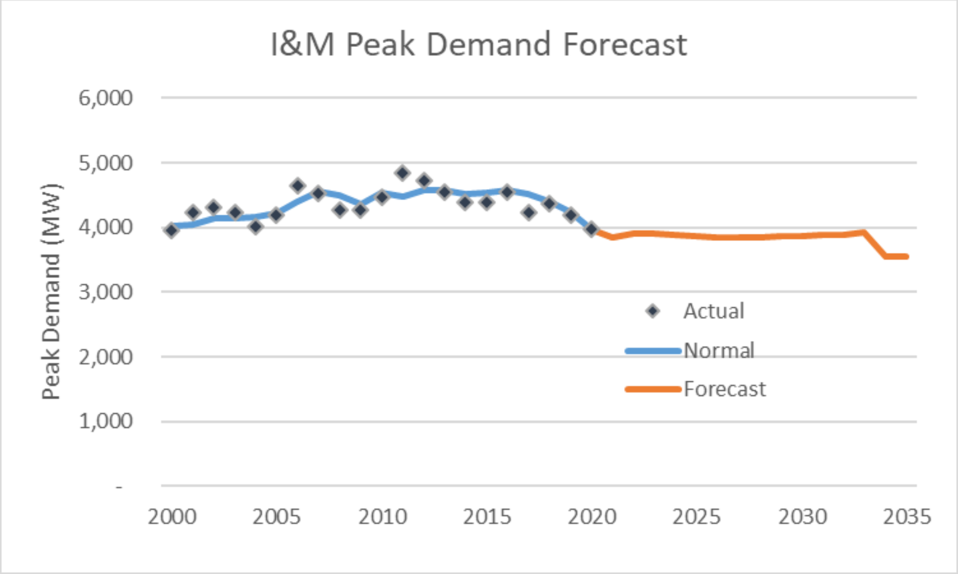
Energy and Peak Demand

Forecast Currently Being Updated, Expected June 1

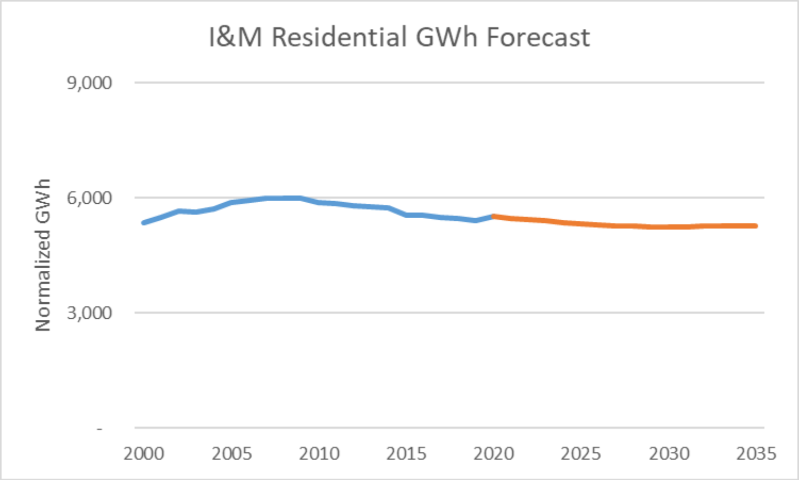
I&M Load and Peak Energy Forecast

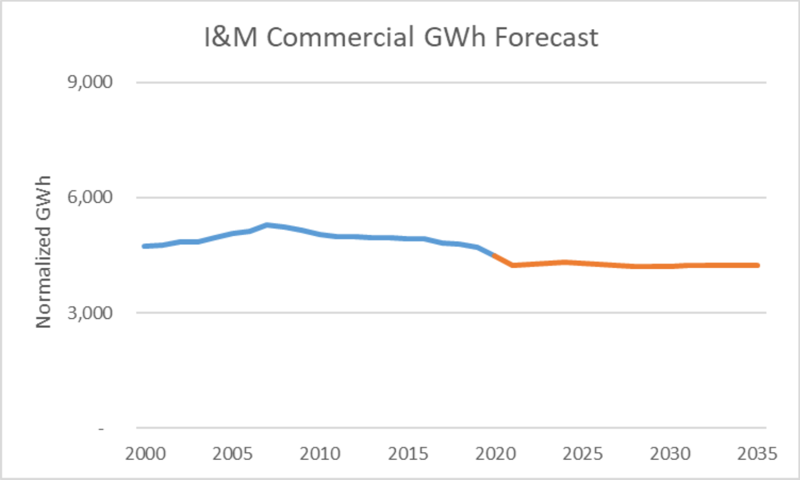
- I&M's weather normalized load never reached its pre-pandemic levels
- I&M's peak demand forecast (and capacity load obligation) is relatively flat for the planning horizon.
- The combination of slower demographics, recovery from a historic pandemic/ recession, increasing saturations of energy efficient technologies, and the expiration of some key wholesale contracts all combine to create significant headwinds for load growth into the future.

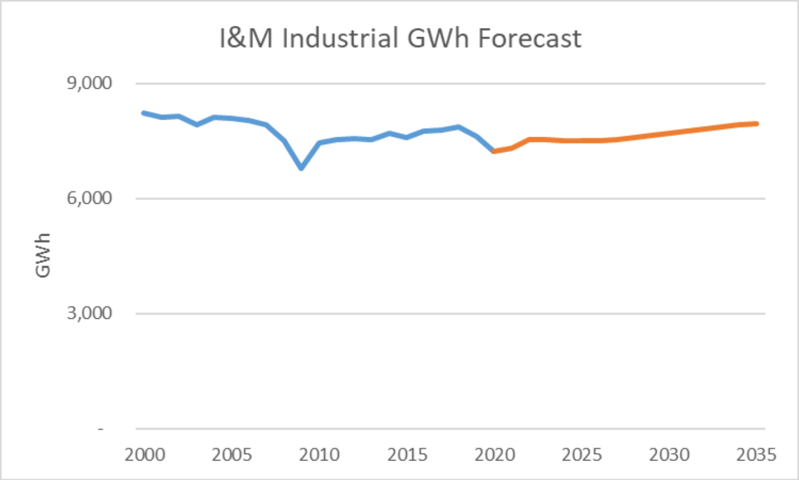


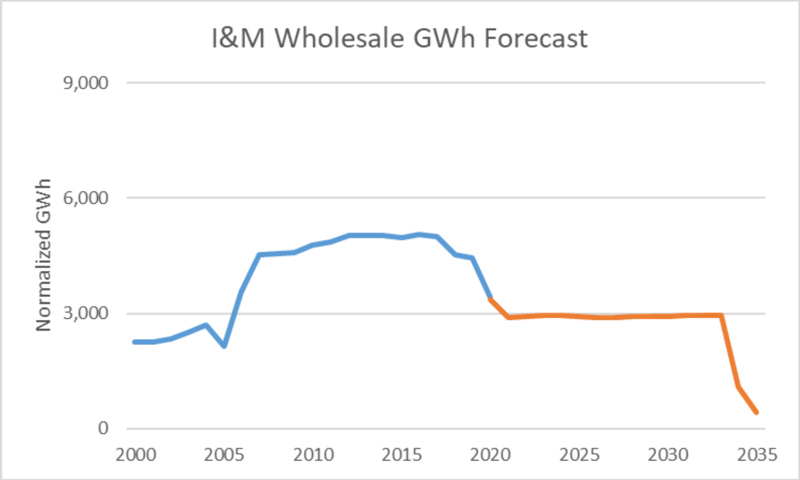


Load Forecast by Class









Load Forecast Scenarios

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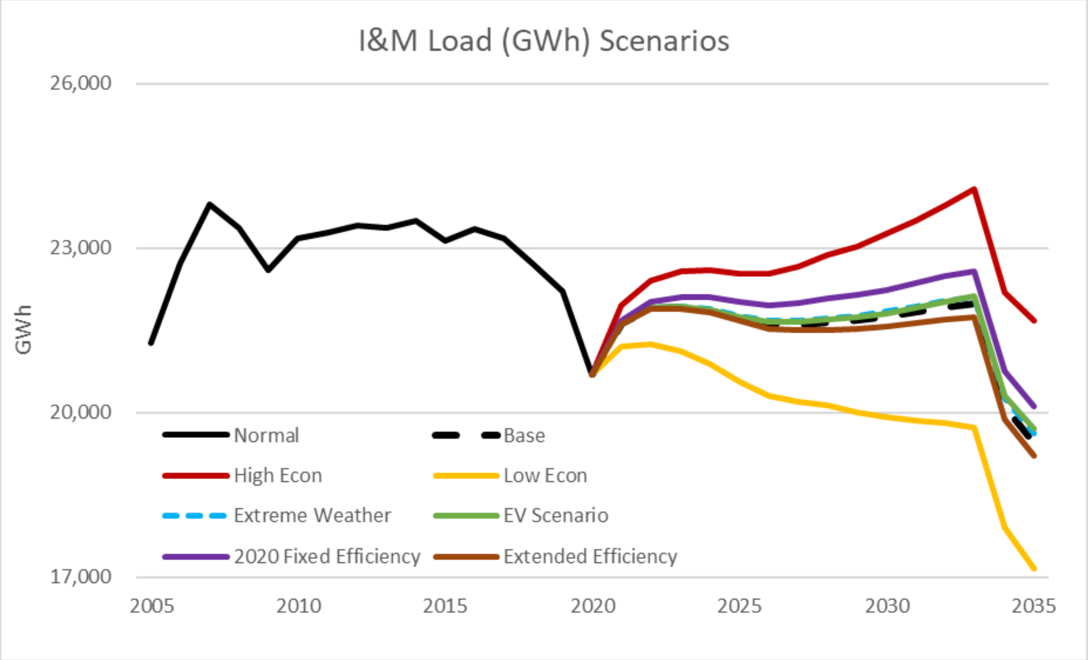

Compound Annual Growth Rate (2020-2035)

Base	-0.4%	The baseline forecast (highest probability outcome)
High Economic	0.3%	Forecast under much stronger economic conditions than assumed in baseline
Low Economic	-1.2%	Forecast under much weaker economic conditions than assumed in baseline
Extreme Weather	-0.4%	Assuming extreme warming trend in temperatures (Purdue study)
EV Scenario	-0.3%	Base EV adoption scenario assuming 33% average growth per year
2020 Fixed Efficiency	-0.2%	Forecast assuming current technology efficiencies are fixed at current levels.
Extended Efficiency	-0.5%	Assuming additional energy efficiency standards are implemented in future

I&M Load Forecast Scenarios

- In addition to the Base load forecast, a number of additional load scenarios are developed for use in the IRP optimization modeling.
- While multiple load forecast scenarios are developed, only the highest and lowest are generally utilized in the optimization to understand how the optimal resource mix would be impacted by any of the potential load scenarios.

Feedback and Discussion

RESOURCE AND TECHNOLOGY

Available Technologies

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Siemens regularly estimates generation technology costs and performance for typical alternatives.

Fuel	Technology	Description
Natural Gas	Advanced 2x1 Combined Cycle	2x1, H/G/J/HA, no DF, wet
	Advanced 1x1 Combined Cycle	1x1, H/G/J/HA, no DF, wet
	Advanced 1x1 Combined Cycle w/ CCS	1x1, H/G/J/HA, no DF, wet
	Advanced Simple Cycle Frame CT	1x0, G/H/J/HA
	Conventional Simple Cycle Frame CT	1x0, F/FA
	Small Aero Simple Cycle CT	1x0, LM6000
	RICE	6x0 Wartsila 18V50SG
	RICE	4x5.6MW
Coal	SCPC w/ CCS	Ultra-Supercritical
Nuclear	Large Nuclear	AP 1000
	Small Modular Reactor	NuScale
Green Hydrogen	Advanced 1x1 Combined Cycle	1x1, H/G/J/HA, no DF, wet
	Conventional Simple Cycle Frame CT	1x0, F/FA
	Fuel – Third Party Purchase	
	Fuel - Derived synthetic natural gas	

Fuel	Technology	Description
Renewable	Utility Solar PV - Single Tracking	100 MW Single Tracking
	Utility Solar PV - Single Tracking + BESS	100 MW Single Tracking, 33 MWx4hr BESS
	BTM Solar PV - Single Tracking	5 MW Single Tracking w/ 1x2 Storage
	BTM Solar PV - Single Tracking	5 MW Single Tracking w/ 1x4 Storage
	BTM Solar PV - Single Tracking	5 MW Single Tracking w/ 1x8 Storage
	Onshore Wind	100-300 MW
	Offshore Wind	Fixed Bottom
Storage	Lithium-Ion Batteries	Li-Ion, Utility Scale, 4 hr
	Pumped Hydro	300-1,200 MW
	Compressed Air Storage	Underground, 16h RTE = 52%
	Flow_Battery Storage	Various Chemistries

Other Requested Technologies: Small CCs, Conventional CCs, Floating OSW, LFG, RNG, Biomass, Cogen, CAES, Fuel Cells, PHES, Hydro, RoR Hydro, Geothermal, Various Fuel/ Technology Conversions, Different Technology Capacities

Overview of Technology Forecasting Approach

Current technology costs and performance based on RFP; forecasted using Siemens' technology shapes.

Conduct new all-source RFP → Apply Siemens technology forecast shapes to project capital costs for each year → Review and combine forecasted RFP results → Consider technologies to screen out

Technology metrics may include, but not limited to

1. Technology Risk (immature)
2. Capital Risk (capex spread)
3. Levelized Cost of Energy (LCOE)
4. Appropriate Capacity (available capacity suits utility load forecast)
5. Support Requirements (land and water needs)

All-in Capital Cost Curves, 2020$/kW (Illustrative)

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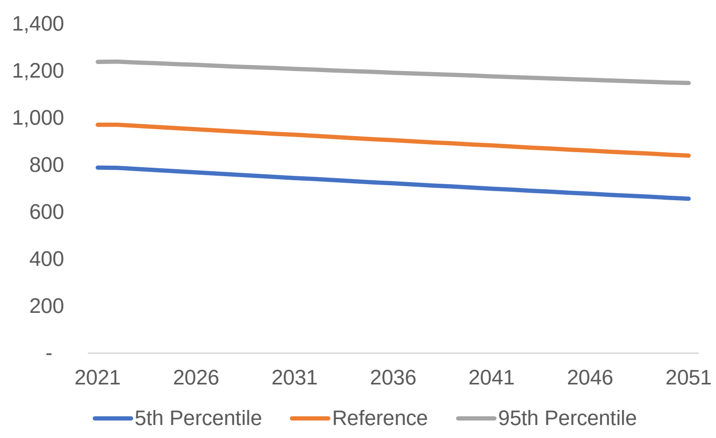
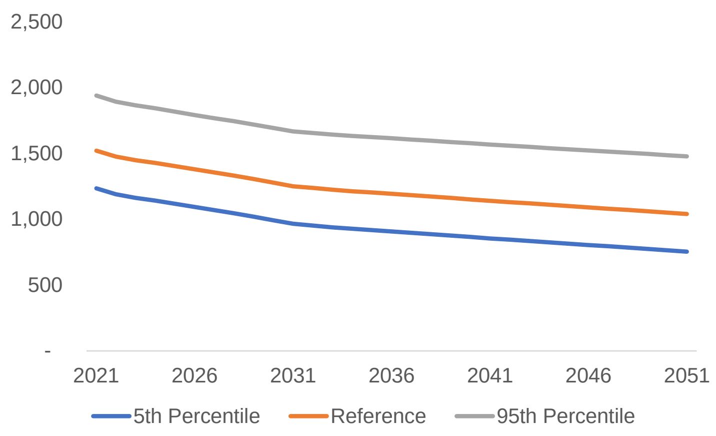
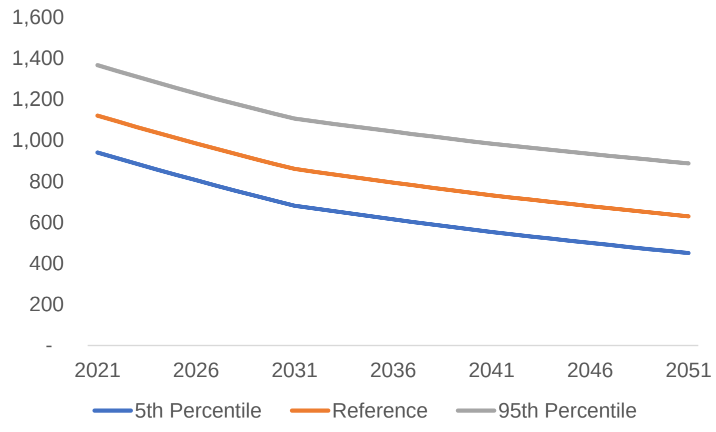
Advanced 2x1 Combined Cycle



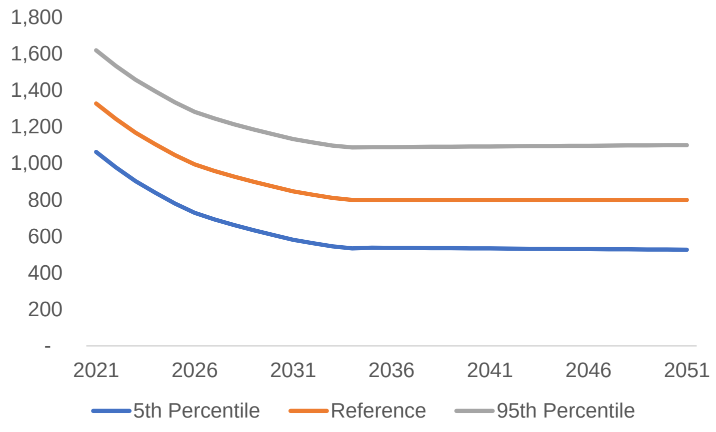
Onshore Wind



Solar PV, Single Axis Tracking



Li-Ion Battery Storage, Utility Scale, 4 hr



Market Potential Study Approach

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State	Completes - Baseline Questions
BUSINESS CUSTOMER SURVEY *(Stratification by: state, small / large)*	
Indiana	504
Michigan	218
Total	*722*
RESIDENTIAL CUSTOMER SURVEY *(Stratification by: state, single / multi-family, and income qualified / market rate)*	
Indiana	1,085
Michigan	1,114
Total	*2,199*

Biz WTP Modules	Completes
EE – Refrigeration	102
EE – HVAC	345
EE – Water Heating	126
EE – Lighting	170
DR – Central AC	307
DR – Critical Peak Pricing	477
DER – Solar Purchase	85
DER – Solar Lease	86

Res WTP Module	Completes
EE – HPWH	274
EE – Heating System	1,726
EE – Building Shell	1,351
EE – Appliances	1,316
DR – Central AC	400
DR – Water Heating	403
DR – Electric Vehicles	375
DR – Time of Day Pricing	338
DER – Solar Purchase	1,371

Building/Equipment Baseline Research

Sampling Objective: 90% confidence, 10% relative precision (90/10) at strata-level for all questions

Response Outcome:

- Business survey: 90/10 at strata level for baseline questions; at state level for other questions
- Residential survey: 90/10 for all strata except multi family

Willingness-to-Participate Research

Surveys included “modules” to investigate barriers, awareness, and adoption rates for different EE technologies, DR offerings, and PV.

Response Outcome:

- Biz: 90/10 at the state level across all modules, by strata (state) for others
- Res: 90/10 at state level and income-status for most modules

Market Potential Study Status Update

Stakeholder engagement is currently ongoing

MPS Stakeholder Engagement	Status
Kickoff Meeting	Complete
Market Research Survey Instruments Feedback	Complete
Measure Lists Feedback	Complete
Study Methodological Decision Points Feedback	In Process

I&M and GDS are currently working through MPS load forecast development, stakeholder questions and concerns, and MPS outputs to be used as IRP inputs

May 1, 2021 Study completion with final report

Feedback and Discussion

STAKEHOLDER PROCESS AND Q&A

Stakeholder Timeline

March 9, 2021	April 14, 2021	May TDB, 2021 (tentative date)	July 14, 2021 (tentative date)	September 14, 2021 (tentative date)
2021 IRP Process	DSM IRP Inputs and Modeling	AURORA Technical Workshop	Draft Candidate Portfolios	Probabilistic Modeling Results
Objectives and Metrics	EE/EWR, DR and DER Results		All-Source RFP Results	Review of Preferred Portfolio
Proposed Scenarios	2021 IRP Update		Stochastic Modeling Approach and Assumptions	Other(s)
Base Case Inputs				

If you would like to make a comment or ask a question about the IRP process after the presentation has concluded:

- Please send an email to I&MIRP@aep.com
- Stay informed about future events by visiting the I&M IRP Portal located at www.indianamichiganpower.com/info/projects/IntegratedResourcePlan

Feedback and Discussion

CLOSING REMARKS

APPENDIX

Definitions

Term	Definition
Aurora	Electric modeling forecasting and analysis software. Used for capacity expansion, chronological dispatch, and stochastic functions
Condition	A unique combination of a Scenario and a Sensitivity that is used to inform Candidate Portfolio development
Deterministic Modeling	Simulated dispatch of a portfolio in a pre-determined future
Renewable Portfolio Standards	Renewable Portfolio Standards (RPS) are policies designed to increase the use of renewable energy sources for electricity generation
Portfolio	A group of resources to meet customer load
Preferred Portfolio	The portfolio that management determines will performs the best, with consideration for cost, risk, reliability, and sustainability
Probabilistic modeling	Simulate dispatch of portfolios for several randomly generated potential future states
Reference Scenario	The most expected future scenario that is designed to include a current consensus view of key drivers in power and fuel markets (reference case, consensus case)
Scenario	Potential future State-of-the-World designed to test portfolio performance in key risk areas important to management and stakeholders alike
Sensitivity Analysis	Analysis to determine what risk factors portfolios are most sensitive to

Indiana Michigan Power Company

2021 Integrated Resource Plan

Stakeholder Workshop #2 Meeting Minutes

(April 14, 2021)

1. Welcome – Toby Thomas, I&M President and COO

Toby began the meeting at 9:30 and covered slides 1-3.

Toby began the meeting by thanking Stakeholders for their participation and time on the call. He continued to reinforce the importance of this forum to allow AEP I&M to voice the planned approach to the 2021 Integrated Resource Plan (IRP) and to solicit feedback and input from others throughout the process.

Toby introduced Jay Boggs, Siemens Managing Director and Moderator for the Stakeholder Workshops.

2. Meeting Guidelines – Jay Boggs, Siemens Managing Director

Jay covered slides 4-6.

Jay presented the Meeting Guidelines portion of the presentation and established the role of Moderator for the Stakeholder Meeting. He stated that the purpose of the presentation is to explain the DSM/EE components of the IRP process and collect feedback from stakeholders. He provided an overview of the webinar platform and tools and discussed meeting guidelines.

Jay also provided an overview of the Questions and Feedback process, including directing stakeholders to submit comments and stay informed at the I&M IRP Website: http://www.indianamichiganpower.com/info/projects/IntegratedResourcePlan.

In addition, stakeholders are encouraged to submit questions via email to I&MIRP@aep.com

Jay introduced Dona Seger-Lawson, Director of Regulatory Services, to provide a safety moment and introductions.

3. Safety Moment and Introductions – Dona Seger-Lawson, Director of Regulatory Services

Dona covered slides 7-10.

Dona reviewed a safety moment and introduced the American Electric Power (AEP), Indiana Michigan Power (I&M), Siemens Power Technologies International (PTI) and GDS Associates (GDS) team members.

Dona introduced Andrew Williamson, Director of Regulatory Services, to provide opening remarks.

4. Opening Remarks – Andrew Williamson, Director of Regulatory Services

Andrew covered slide 11

Andrew stressed the importance for feedback and continued participation from Stakeholders and gave an overview of Energy Efficiency (EE), Demand Response (DR) and Distributed Energy Resources (DER) programs in Indiana and Michigan. He mentioned the main topics for today would be the Market Potential Study (MPS) approach, preliminary MPS results, the impact of EE on load forecasting and the selection of EE, DR and DER in the IRP modeling.

In addition, Andrew highlighted that the meeting minutes and presentation from Stakeholder Workshop #1 have been posted.

Andrew introduced Bob Bradish, SVP Regulated Investment Planning, to discuss integrated grid planning at AEP.

Table 1 Verbal Questions Captured Related to 2021 Opening Remarks

Question #	Question	Response
Q1	Are there currently any specific planning activities for community solar projects?	Will continue to be explored by I&M and will be encouraged in the future.
Q2	Who should virtual power producers contact within AEP Indiana and Michigan?	Point them to the "All-source RFP" that will be online next week, this is the best way to get info out there.
Q3	Is there a goal for a date to remove carbon from the portfolio?	AEP just released an analysis. Goal is net zero by 2050.
Q4	Will transmission be part of the resource planning exercise?	Transmission plans will be considered. AEP has made organizational changes to support the alignment of GT and D resource planning.

5. Bob Bradish, SVP Regulated Investment Planning

Bob covered slides 12-17

Bob discussed the evolution of the grid and the way in which AEP as an organization is addressing the changing analytical and planning environment. He characterized the continued evolution of the industry that is driving changes in how utilities plan and operate systems. Common themes are decentralization, digitialization and decarbonization that are driven by active stakeholder engagement and public policy drivers. AEP sees DERs as an emerging and important source of supply to the power system and wants to create further alignment to inform new resource characterization approaches and DER sourcing mechanisms.

Bob discussed how the planning alignment occurs by bringing the processes together from the integrated resource planning and analysis, transmission planning and analysis, distribution planning and analysis and interconnection services groups. Specifically, Bob discussed how the direction would be provided through consistent set of policy objectives, the input assumptions driven would form a common foundation and that decisions would be informed through information exchange.

Bob introduced Carlos Casablanca, Managing Director for Distribution Planning and Analysis, who covered slide 18

Carlos discussed the importance of non-wire alternatives as the future needs of the grid system. He discussed that a major goal of the new alignment is to improve and enhance the internal methodologies used for valuing various transmission and distribution applications, which include updating assumptions and planning tools.

Carlos introduced Kamran Ali, VP of Transmission Planning and Analysis, who covered slide 19-20

Kamran discussed the approach to transmission planning and analysis and highlighted the current activities of the group. He noted that their group is looking to understand and guide interconnection values and opportunities to be utilized in fundamental commodity forecasts, as well as evaluating delivery potential for renewable RPS. The current goal is to understand value streams and benefits that the non-wire alternatives offer to provide a holistic view of the solutions when facing transmission or power delivery issues.

Kamran introduced Jay Boggs, Siemens Managing Director and Moderator to facilitate Stakeholder Feedback / Q&A.

6. <u>GDS Associates, Market Potential Study</u>

Jon Walter from AEP covered slides 21-25

Jon provided an update on the Market Potential Study (MPS), noting that the results are in the development phase. He also provided an expanded overview of the various expected results of the MPS, detailing utility sponsored EE programs, DSM programs, AMI programs and CVR programs. Jon also reiterated important definitions for stakeholder to grasp as part of the GDS presentation, including technical potential, economic potential, maximum achievable potential and realistic achievable potential.

Jeffrey Huber from GDS Associates covered slides 26-55

Jeffrey introduced GDS Associates and the Brightline Group team members that have contributed technically to the MPS. GDS is the prime subcontractor for the MPS and is leveraging the Brightline groups' expertise in DSM program planning and evaluation. Jeffrey provided an overview of the MPS study tasks and key considerations for the planning study. An important feature is that the MPS study will assess potential for I&M's separate jurisdictions and be customized and tailor-made to each local.

Jeffrey and Patrick Burns then discussed the market research performed to inform the MPS. Patrick discussed how the market research performed for the MPS was used to assemble baseline data and to inform the technology adoption curves used in the modeling. He described the web surveys that were constructed and provided to participants, noting that the results provide insights into current equipment being used in homes and residential and non-residential willingness to participate (WTP) data. Residential WTP Survey Data is used to help estimate the long-term adoption rates that might be expected across various end uses and technologies.

Jeffrey then went into detail on the expected results of the three MPS products being looked at, including EE potential, DR potential and DER potential. EE Potential: Jeffrey provided a flow chart and equation to describe the process by which the study results form from various energy efficiency potentials. He described two potential EE scenarios, including a high case that assumes 75% incentives relative to measure cost and a realistic potential case, which reflects more traditional incentive levels. DR Potential: Regarding DR Jeffrey spoke about the way in which the study will assess and screen load shifting options through incorporating over 20 performance and cost metrics. As part of the MPS, GDS looked at 37 sector and technology permutations for load shifting options. DER Potential: Lastly, Jeffrey noted the DER potential study that is focused on solar PV and combined heat and power and that DER will result from a market adoption based on bass diffusion theory.

Jeffrey concluded by talking about how the MPS study will create program portfolio recommendations and IRP inputs, which include converting achievable potential results into transparent formats and deliverables to the IRP team. More specifically, he noted that the approach includes mapping measures to potential programs and delivery channels, creating delivery streams / measure bundles, and recommending a portfolio of programs for consideration. GDS noted they will work closely with Siemens PTI during the formation of IRP inputs.

Table 2 Verbal Questions Captured Related to Market Potential Study

Question #	Question	Response
Q5	Will it be a rebate program for the EV charger?	Based on the costs associated with installing the charger and acquisition of the EV. Thus, based on the whole package of acquiring an EV.
Q6	Are food Sales for Grocery stores?	Yes

Q7	Were low-income customers included in the survey?	Did target low-income customers. Split up the data as much as possible to capture any difference between customer segments.
Q8	For EV specifically, when researching willingness to participate do you also research the ability to participate?	By giving information about the costs, it also includes the incentive. So given the incentive, are people willing and able to participate? 6 different categories that we questioned for the customer.
Q9	Is there a similar awareness adjustment for residential and is that also adjusted by 78%?	Yes
Q10	Curious about what IM has planned for its AMI data. Other studies looked at correlation between residential type. Was interesting from the standpoint visually of how they should target different consumption. Wondered if I&M would consider doing something like that?	In general, the benefits that I&M can bring is of key interest as we move forward, to get better information and analysis of how customers use energy and approach them about different EE offers. Don't have full AMI yet so cannot deal with that yet. We will be looking to do that as we get the information.
Q11	In looking at the level of awareness and participation in your survey have you reached out the churches and other community centers to increase their participation?	We did not include that in the engagement. Might come out of the analysis that will be done at the end of the market potential study.
Q12	Jacob gave the example of the residential AC. You said that the AEO forecast exceeds 15%. Make sure we are confident with that. Efficiencies that come out of AEO are done on national level not regional level.	We are sure the East North Central efficiency gets up to 14.8 so more than 14 not 15. Interpretation of the forecast is that there is a code and EIA does not project this will change in the future but does allow for customers to operate above code.

7. Impacts on Load Forecasting – Chad Burnett, AEP Load Forecasts

Chad covered slides 56-65

Chad provided an overview of the various methods for accounting for DSM/EWR in load forecasts and the mechanisms by which utility sponsored programs can help accelerate adoption of programs at an earlier date than otherwise. He provided an illustrative example of the impact of recent DSM programs within I&M's service territory but highlighted that there are differences between measuring EE savings within the market potential study and within the load forecast that need to be understood.

Chad went on to discuss the load forecasts provided by GDS and the way in which AEP plans to apply the results of the MPS study.

Table 3 Verbal Questions Captured Related to Impacts on Load Forecasting

Question #	Question	Response

Q13	For future projection on heating and cooling temperatures are the new normal from climate change considered?	The load forecast and the weather we are using is trended normal, so it does account for the warming trend. We are also doing other load scenarios and one of those scenarios where we saw temperatures warming at a much faster pace. It would go up by about 10 degrees over a 10-year period.
Q14	Jacob had agreed that there was no changing codes and standard in the EIA data. Anna understood from Jacob that there may be changes to that and wanted to confirm.	What GDS found is what is in the base SAE is above the baseline that would be provided by SAE.
Q15	Regarding Slide 61 and 62. The lines that we are seeing are illustrative or based on the forecast from the SAE model?	GDS built this graphic, the red line is somewhat illustrative and is back of the envelope calculation. The base and frozen is actual but red is hypothetical.
Q16	How is it estimated what effect the code changes had on the forecast?	Looked at starting efficiency of the HVAC and relative to 2023 code, how much of the change that we are seeing between the top line and the base forecast would be relative to code and above code. Was approximately 50%.
Q17	The lines are based on the change of efficiency level over time. Isn't it is also true that assumed efficiency over time could be due to turn over?	With that stock turnover people could only go to 14, but because the MPS goes above that GDS is trying to back out the stock turnover. EIA data that is being used does not assume new codes and standards. There is a list of codes and standard that is assumed in EIA. All are either already passed or approved.
Q18	Curious to hear if the intend of this approach is to avoid double counting the savings from MPS. Chad is it reasonable to use the method proposed by Anna? Is there a way to compare without double counting anything?	ITRON does not necessarily recommend that and an important consideration is consistency in our load forecast that is used for many purposes, including various regulatory filings where it has been determined to be reasonable and accurate.

8. Preliminary IRP Inputs – Art Holland, Siemens Managing Director

Art covered slides 66-73

Art provided an overview of the approach that will be used within the modeling framework to test energy efficiency, demand response and distributed energy resources. He discussed that for energy efficiency Siemens PTI, GDS and the I&M IRP team will collaborate on the appropriate bundling for the EE measures. The bundles will be tested against other resources and the volume will be optimized for each candidate portfolio. Art then discussed demand response, which he detailed that for each candidate portfolio there will be an assumed quantity of demand response resources defined by the GDS Market Potential Study. Art noted however that volume may vary by candidate portfolio. And lastly, he discussed that regarding DER the associated volume, costs, and performance characteristics are included equally as a part of all candidate portfolios.

Art introduced Jay Boggs, Siemens Managing Director and Moderator to facilitate Stakeholder Feedback and Timelines.

9. Stakeholder Timelines – Jay Boggs, Siemens Managing Director

Jay covered slides 74-76

Jay reiterated the Stakeholder Process. Four stakeholder meetings will be held. The initial stakeholder meeting about the all-source RFP was held. There will also be an AURORA technical workshop. Additional detail will be released shortly on the AEP I&M IRP website.

Jay introduced Anna Sommer from the energy futures group to provide a stakeholder presentation on modeling EE IRPs.

10. Modeling EE in I&M's IRP – Anna Sommer, Energy Futures Group (Stakeholder Presentation)

Anna covered slide 77 of the Stakeholder Presentation and slides 1-9 of the Stakeholder Provided presentation.

Anna provided an overview of I&M's approach to modeling EE in the current and past IRPs and made requests for I&M to modify approaches used in this IRP cycle.

Anna concluded and Andrew Williams followed to provide closing remarks.

11. Closing Remarks

Andrew covered slide 78-79

Andrew provided closing remarks for the meeting.

12. Appendix A: List of Questions Answered on Call

Table 4 List of Questions Addressed on the Call Verbally

Question Asked	Response
Specifically, for electric vehicles, when researching willingness to participate are you also asking about ability to participate? Many electric vehicles are very expensive, so while someone may be willing, there still may be an economic barrier to actually participating.	As answered by GDS
Will I&M used the responses to its informational RFP to pre-qualify vendors and developers in any future bidding?	As answered by Greg S.
What actions is I&M taking to engage Virtual Power Plant providers into this IRP process?	As answered by Andrew W.

I have been contacted and talked to several virtual power plant companies who are interested in doing business in Indiana. Who should they contact at I&M/AEP?	As answered by Andrew W.
Are there currently any specific planning activities for community solar projects?	As answered by Andrew W.
Will all participants in today's IRP stakeholder meeting receive information about the I&M RFP to be issued on April 23? If not how can I request to receive this information?	As answered by Greg S.
Will I&M consider coupling DER solar incentives with any DSM and EE programs?	As answered by John W.
Does I&M plan to evaluate how expected T&D investments vary under the different scenarios and portfolios that are chosen for review in the IRP?	As answered by Siemens
Is the electric vehicle incentive question based on an incentive for the charger?	As answered by GDS
I would like to add that MI Staff agrees with EFG assessment of the supp. eff. adjustment. No MI utility apply this type of adjustment to EE, and all MI utilities apply a T&D savings to lower EE costs. I think you just missed me raising my hand. Karen Gould	Noted.
For future projections on heating & cooling energy usage, is climate change and the resulting "new normal" temperatures being taken into account? I'm referring to the charts coming up within this presentation on the study.	As answered by Chad B.
Obviously, cost-effectiveness is a consideration in every study and final decision, whether we're talking about generation methods, energy efficiency programs, etc. I imagine that I&M/AEP are always looking for a certain profit margin range. And I know that AEP is a highly profitable company. My concern is that for a sustainable, livable future, the balance needs to move towards a philosophy of People & Planet OVER Profit. Is there ever a conversation about adjusting the profit expectation downward? I'm aware that this may be a hypothetical question aimed at the higher echelon of management, but I'll ask it anyway!!	As answered by Andrew W.
WIs the EV incentive applicable to the car or to the in-home charger?	As answered by GDS
Is there a similar awareness adjustment for non-residential, and if so is that also using the JD Power estimate of 74%	As answered by GDS
How were the incremental measure costs calculated? The values appear to be much lower than the values used/assumed in I&M's most recent DSM plan.	As answered by GDS
Can you please post this correction for others to see? I misspoke regarding non-residential lighting, the incentive % of incremental costs are not 100% in the DSM plan. I had referenced at the wrong table from the DSM plan. Nonetheless, there still appears to be some differences between the DSM plan and what was presented here today. If GDS could share the calculation of incentive % of incremental cost, and benchmark against the DSM plan, that would be appreciated.	As answered by GDS

How was the difference between a code frozen forecast and base forecast calculated? Are the trend lines shown on Jacob's slide illustrative, or are they reflective of actual forecasts?	As answered by Chad B. and GDS
Is there a goal for a date to remove fossil fuels from our energy production? Are there benchmark dates to reach certain percentages of renewable energy to help achieve those goals?	As answered by Andrew W.
What would it take to end coal leases sooner than the leases dictate?	As answered by Andrew W.
I didn't understand whether that was a yes or no on the community solar. Can you clarify?	As answered by Greg S.
Were low-income customers included in the survey? Was community solar asked about?	As answered by GDS
In looking at level of awareness/participation in your survey, have you considered enlisting churches, neighborhood associations, environmental groups, etc. to reach a higher level of participation? Is that a question for a later stage?	As answered by GDS
Jon, Duke did some interesting analysis with its AMI data showing that they could identify correlations between energy consumption and characteristics like housing type (e.g. mobile home vs. single family detached) that seemed to me to hold a lot of potential for better targeting and better EE program design though Duke was not, unfortunately, going to use it for that. Is that something you would consider doing?	As answered by John W.
Jacob, IN IRP rules require consistency between the IRP and the subsequent DSM plan. Because of that, in considering these three bundling approaches, I ask myself, which of these three approaches would be most useful in informing the DSM plan? And I think the answer is "none". There's a fourth option that's not mentioned which is bundling by portfolio and I think that's preferable.	As answered by Greg S.
On slide 60, are these load forecasts that I&M has actually developed or are these just representative examples?	As answered by Chad B. and GDS
Jacob said before the break that he agreed that there was no changing codes and standards in the EIA data that is being in the load forecast. But Chad, you are saying that there is?	As answered by Chad B.
Given this discussion, is I&M doing a hosting capacity analysis?	As answered by John W.
Thanks, Andrew. We hope to hear back from I&M as to our request presented on Anna's last slide. Are your statements, Andrew, that I&M is nonetheless going to continue its methodology?	AEP will respond to the CAC presentation in writing

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INDIANA MICHIGAN POWER
An AEP Company

Indiana Michigan Power:
2021 Integrated Resource Plan
Public Stakeholder Meeting #2

April 14, 2021

Presented via GoToWebinar -> https://attendee.gotowebinar.com/register/4716397322613361422

Agenda

Time		
9:30 a.m.	**WELCOME**	**Toby Thomas,** President & COO
9:35 a.m.	**MEETING GUIDELINES**	**Jay Boggs**, Siemens
9:40 a.m.	**INTRODUCTION** **OPENING REMARKS**	**Dona Seger-Lawson**, I&M Director of Regulatory Services **Andrew Williamson,** I&M Director of Regulatory Services
9:50 a.m.	**GRID SOLUTIONS INTRODUCTION**	**Bob Bradish,** SVP Regulated Investment Planning
Developing DSM/EE/DER Inputs for the Integrated Resource Plan		
10:20 a.m.	**MARKET POTENTIAL STUDY**	**Jon Walter,** Manager EE & Consumer Programs **Jeffrey Huber**, GDS Associates
12:00 p.m.	**LUNCH**	
1:00 p.m.	**IMPACTS ON LOAD FORECAST**	**Chad Burnett**, AEP Load Forecasting
1:30 p.m.	**PRELIMINARY APPROACH FOR IRP**	**Art Holland,** Siemens
2:00 p.m.	**BREAK**	
2:30 p.m.	**STAKEHOLDER ENGAGEMENT**	**Jay Boggs**, Siemens
2:45 p.m.	**STAKEHOLDER PRESENTATION**	
3:00 p.m.	**NEXT STEPS AND CLOSING REMARKS**	**Andrew Williamson,** I&M Director of Regulatory Services
3:30 p.m.	**ADJOURN**	

WELCOME

TOBY THOMAS | PRESIDENT AND COO

MEETING GUIDELINES

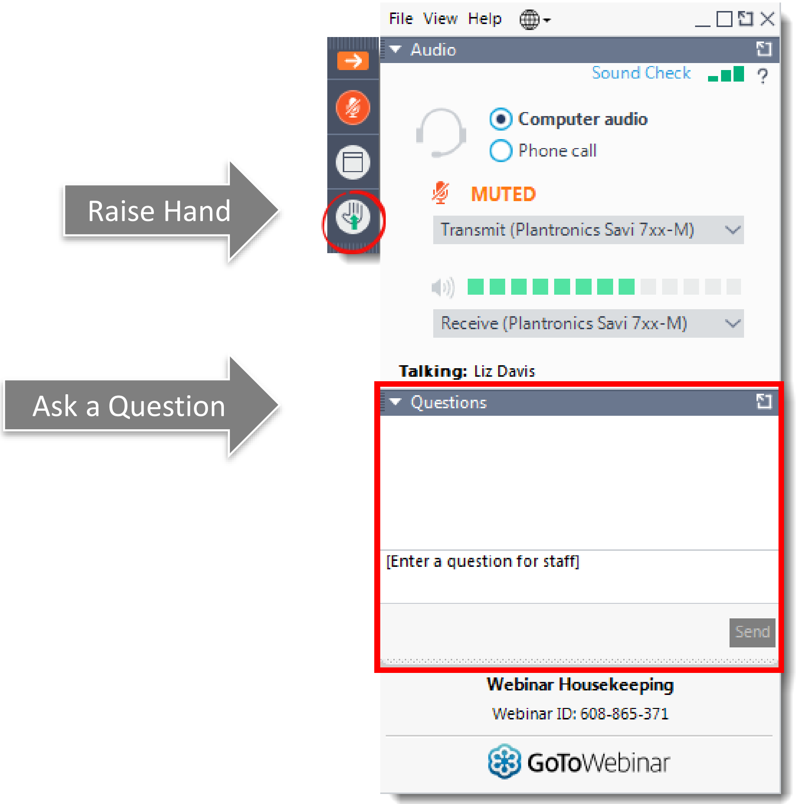
JAY BOGGS | SIEMENS PTI

Questions and Feedback

The purpose of today's presentation is to explain the Demand Side Management (DSM) process and collect feedback from stakeholders. Stakeholder feedback will be posted on the I&M website IRP portal and will be considered as part of the Final IRP.

If you have a question about the IRP process during this presentation:

- Type your question in the Questions area of the GoToWebinar panel
- During the feedback and discussion portions of the presentations, please raise your hand via the GoToMeeting tool to be recognized
- Time permitting, we will address all questions and hear from all who wish to be heard
- Any questions that cannot be answered during the call will be addressed and posted on the website below.



If you would like to make a comment or ask a question about the IRP process after the presentation has concluded:

- Please send an email to I&MIRP@aep.com
- Stay informed about future events by visiting the I&M IRP Portal located at www.indianamichiganpower.com/info/projects/IntegratedResourcePlan

Guidelines

1. Due to the number of participants scheduled to join today's meeting, all will be in a "listen-only" mode by default.

2. Please enter questions at any time into the GoToWebinar portal. Technical questions related to the GoToWebinar tool and its use will be addressed by the support staff directly via the chat feature.

3. Time has been allotted to answer questions related to the materials presented. Unanswered questions will be addressed after the presentation and posted in accordance with the Questions and Feedback slide.

4. At the end of the presentation, we will open-up the floor for "clarifying questions," thoughts, ideas, and suggestions.

5. Please provide feedback or questions on the Stakeholder Meeting #2 presentation within ten business days of the conclusion of the meeting.

INTRODUCTION AND OPENING REMARKS

DONA SEGER-LAWSON | DIRECTOR, REGULATORY SERVICES
ANDREW WILLIAMSON | DIRECTOR, REGULATORY SERVICES

Safety Moment

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BBQ Safety

- Inspect and clean your gas barbecue before using it for the first time each season.
- Clean the grill to ensure there is no grease buildup. Grease fires cannot be easily extinguished.
- If the fittings, flex hose, or burners are worn or rusted, replace them and replace missing or worn ‘O’ rings.
- Use a flexible brush to clean tubes between gas valve and burner.

On the Call Today

INDIANA MICHIGAN POWER
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I&M Leadership Team

Toby Thomas | President and COO

Dave Lucas | Vice President, Regulatory and Finance

Dona Seger-Lawson | Director, Regulatory Services

Andrew Williamson | Director, Regulatory Services

Marci Grossman | Director, Communications

Tammara Avant and Christen Blend | Legal

I&M IRP Planning Team

Kelly Pearce | Managing Director, Resource Planning and Strategy

Scott Fisher | Manager, Resource Planning and Grid Solutions

Greg Soller | Staff, Resource Planning and Grid Solutions

Jon Walter | Manager, EE & Customer Programs

I&M Transmission and Distribution Planning Team

Nick Koehler | Director, Transmission Planning

Carlos Casablanca | Managing Director Distribution Planning & Analysis

Subin Mathew | Director, Reliability and Grid Modernization

Siemens IRP Planning Team

Arthur Holland | Managing Director, Siemens PTI

Jay Boggs | Managing Director, Siemens PTI

Holt Bradshaw | Managing Director, Siemens PTI

Peter Berini | Project Manager, Siemens PTI

GDS Associates – Market Potential Study Team

Jeffrey Huber | Project Manager, GDS

Patrick Burns | Brightline Group Lead

Jacob Thomas | Load Forecast & Segmentation Lead, GDS

OPENING REMARKS

ANDREW WILLIAMSON | DIRECTOR, REGULATORY SERVICES

Opening Remarks

- Purpose of the meeting
  - Continue Stakeholder Engagement
  - Focus on EE, DR & DER / EWR Opportunities in the IRP
- IRP Updates
- Introduction to Grid Solutions

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INTEGRATED GRID PLANNING

BOB BRADISH | SVP REGULATED INVESTMENT PLANNING

AMERICAN ELECTRIC POWER
BOUNDLESS ENERGY™

Evolving Grid – Current State

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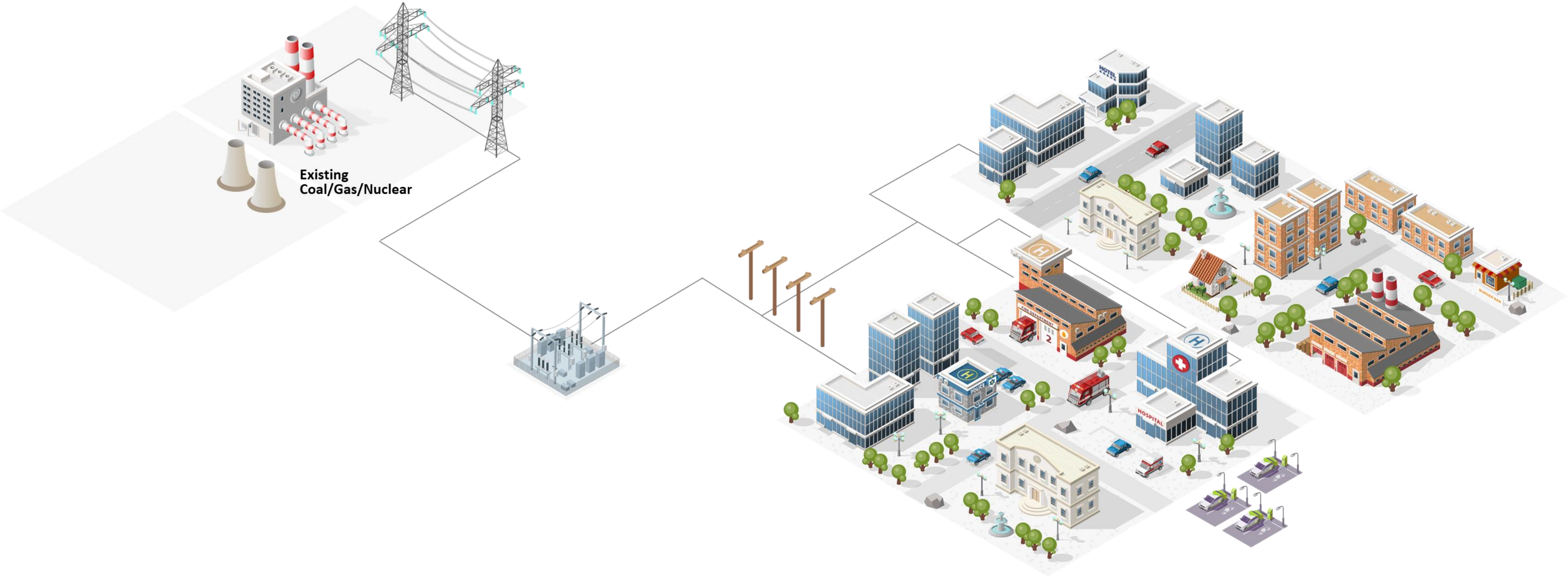

Evolving Grid – Future State

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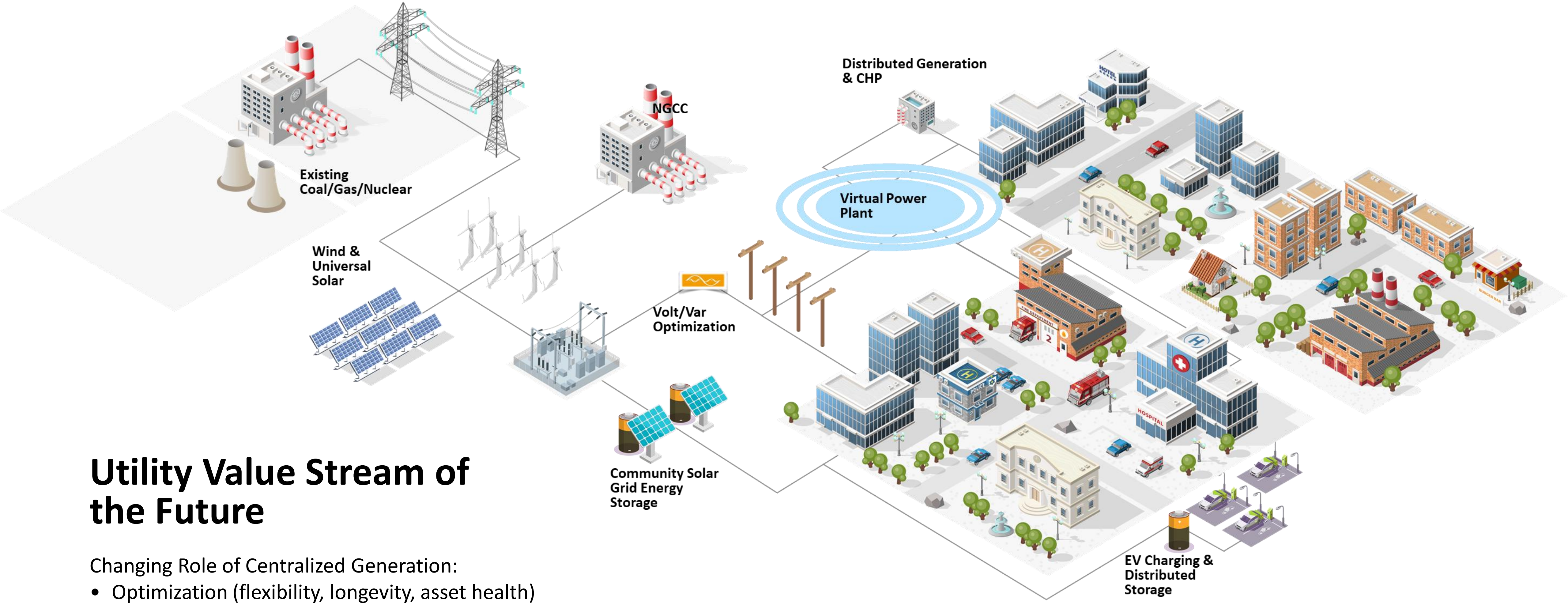

Utility Value Stream of the Future

Changing Role of Centralized Generation:

- Optimization (flexibility, longevity, asset health)
- Innovation (analytics, technology, operations)
- “Glide Path” (extracting value over remaining life)

Grid Solutions – Regulated Investment Planning (G, T & D)

Organizational and Leadership Overview

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An AEP Company

Regulated Investment Planning (G, T & D)

Integrated Resource Planning & Analysis

Kelly Pearce, Managing Director

In collaboration with Operating Companies transform the regulated generation fleet to meet all goals -

- Continuing affordable and reliable service for our customers
- Lowering carbon and other emissions for a sustainable Future Forward

Results in greater value to customers and regulators and reducing risks to our business

Transmission Planning & Analysis

Kamran Ali, VP

- In collaboration with Operating Companies and RTOs develop 5-year Transmission plans to enhance customer experience and reliability
- Find integrated solutions to offset and reduce costs to our customers
- Prepare for a seamless grid of the future that will require enhanced alignment, collaboration, data governance, and analytics

Distribution Planning & Analysis

Carlos Casablanca, Managing Director

- In collaboration with Operating Companies develop 5-year Distribution plans to enhance customer experience and reliability across all regions
- Evolve our tools, processes, and standards to thrive in a world with dynamic distributed energy resources and increased electrification of transportation

Interconnection Services

Michele Bair, Director

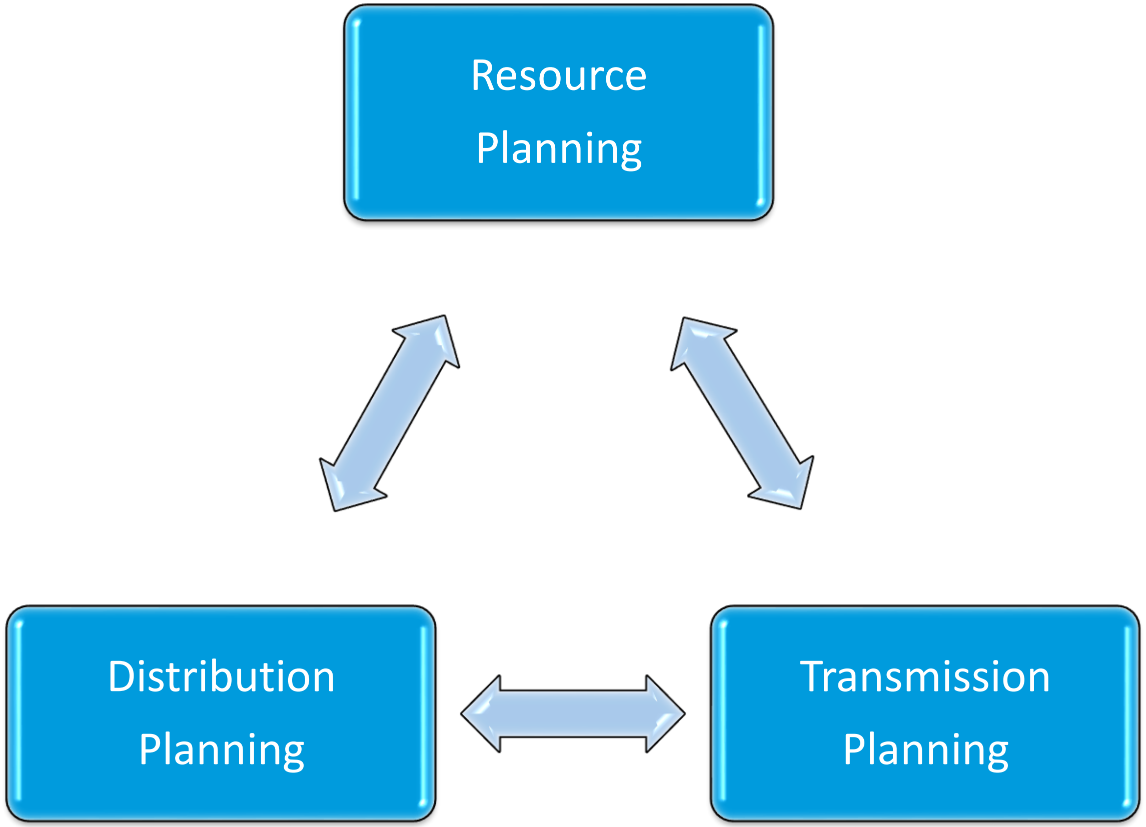
- Facilitate transmission facility interconnection services for interconnecting entities focusing on studies, agreements and performance

Regulated Investment Planning will plan AEP's regulated infrastructure programs across G, T, and D and work with Grid Solutions to commercialize new regulated solutions that best meet the needs of our customers

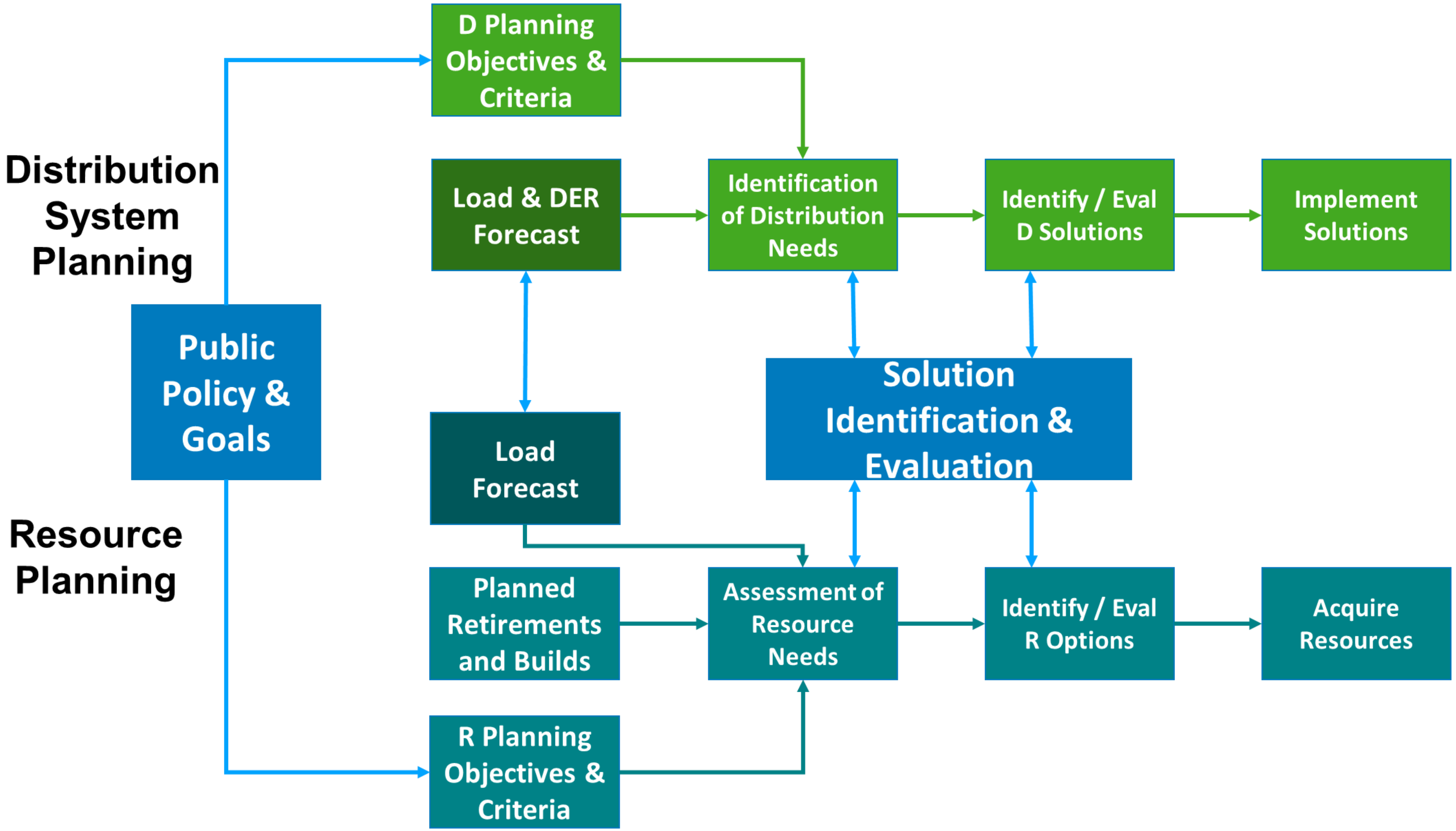
Aligning Planning within AEP

Planning alignment occurs by bringing the processes together

- Direction provided through consistent set of policy objectives
- Input assumptions driven from a common foundation
- Decisions informed through information exchange



Integration of Distribution & Resource Planning



Distribution Planning & Analysis

- Importance of Non-Wires Alternatives as we consider the future needs of the system
- Today we will review key data from our Market Potential Study that will inform our Resource and Distribution plan
- Evolve our tools, processes, and standards to thrive in a world with dynamic distributed energy resources and increased electrification of transportation
- Leverage new technologies, analytics, and automation as needed to deliver value for all stakeholders

Transmission Planning & Analysis

- Importance of Non-Wires Alternatives as we consider the future needs of the system
- Current Activities:
  - Understanding and guiding Interconnection values and opportunities to be utilized in our Fundamental Commodity Forecast
  - Evaluating delivery potential for the Renewable RFP
- Evolve our tools, models, processes and standards to thrive in a world with dynamic system planning requirements
- Leverage new technologies, analytics, and automation as needed to deliver value for all stakeholders
- Coordination with RTOs

Regulated Investment Planning

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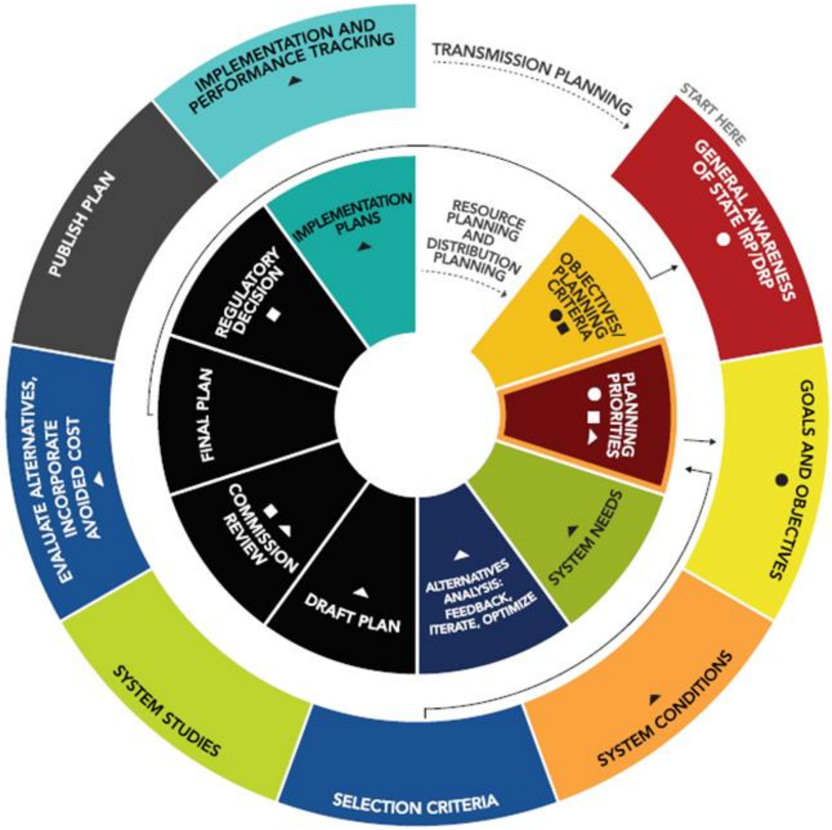
An AEP Company

Path Forward:

- Continue to work with EPRI and NARUC-NASEO on coordinated utility planning
- Reviewing recommendations from NARUC-NASEO task force, currently considering the Coral and Amber Cohort Roadmaps
- Evolve our tools, processes, and standards to thrive in a world with dynamic system planning requirements



Coral Cohort Roadmap — NARUC-NASEO Task Force on Comprehensive Electricity Planning | 19

MARKET POTENTIAL STUDY

JON WALTER | EE & CONSUMER PROGRAMS

I&M Market Potential Study for End-Use Resources

I&M's MPS will develop residential and C&I portfolios containing the following IRP resource models for each I&M jurisdiction (Indiana and Michigan):

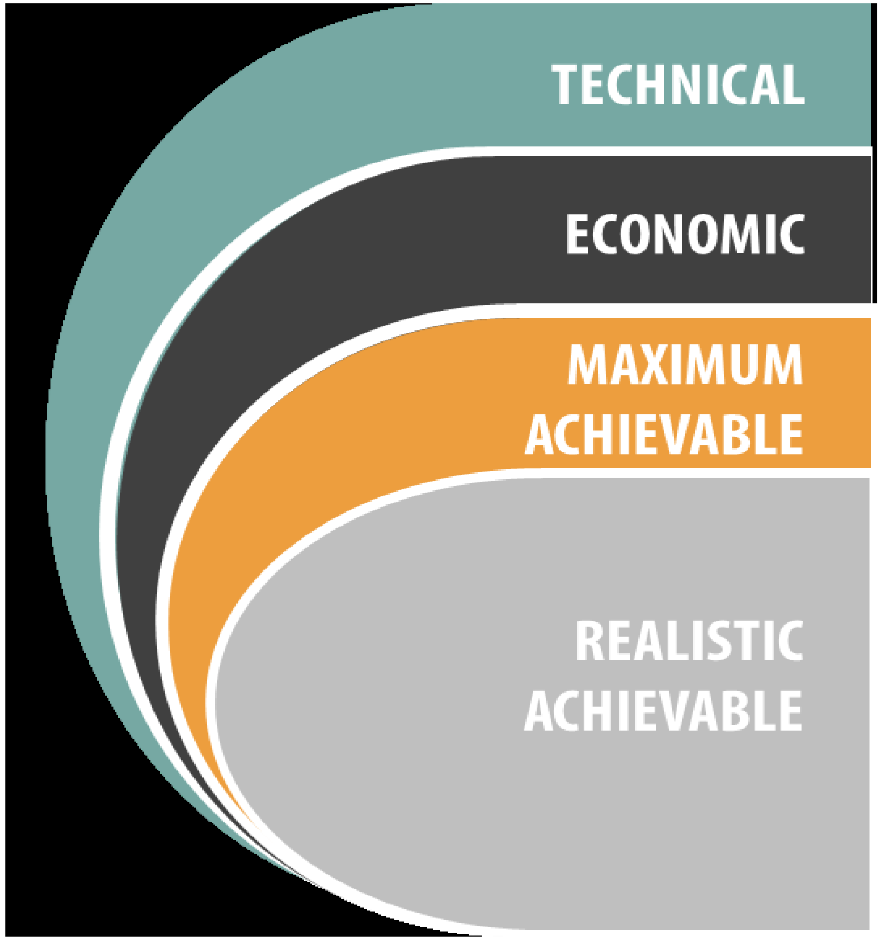
- Utility sponsored Energy Efficiency (EE) Program Potential
- Demand side Management (DSM) Program Potential
  - Demand Response
  - Direct Load Control
  - Tariff-based electricity pricing options potential
  - Customer owned Distributed Energy Resource (DER) Potential
- Automated Metering Infrastructure (AMI) Consumer Program Potential
- Conservation Voltage Reduction (CVR) Potential

I&M Market Potential Study for End-Use Resources

I&M has partnered with GDS & Associates for the development and characterization of consumer end-use resource "inputs" to the IRP.

The MPS will assess Technical, Economic, Maximum Achievable and Realistic Achievable Potential for all MPS resources studied.

Generally, the MPS "outputs" of achievable potential will be used as IRP "inputs".

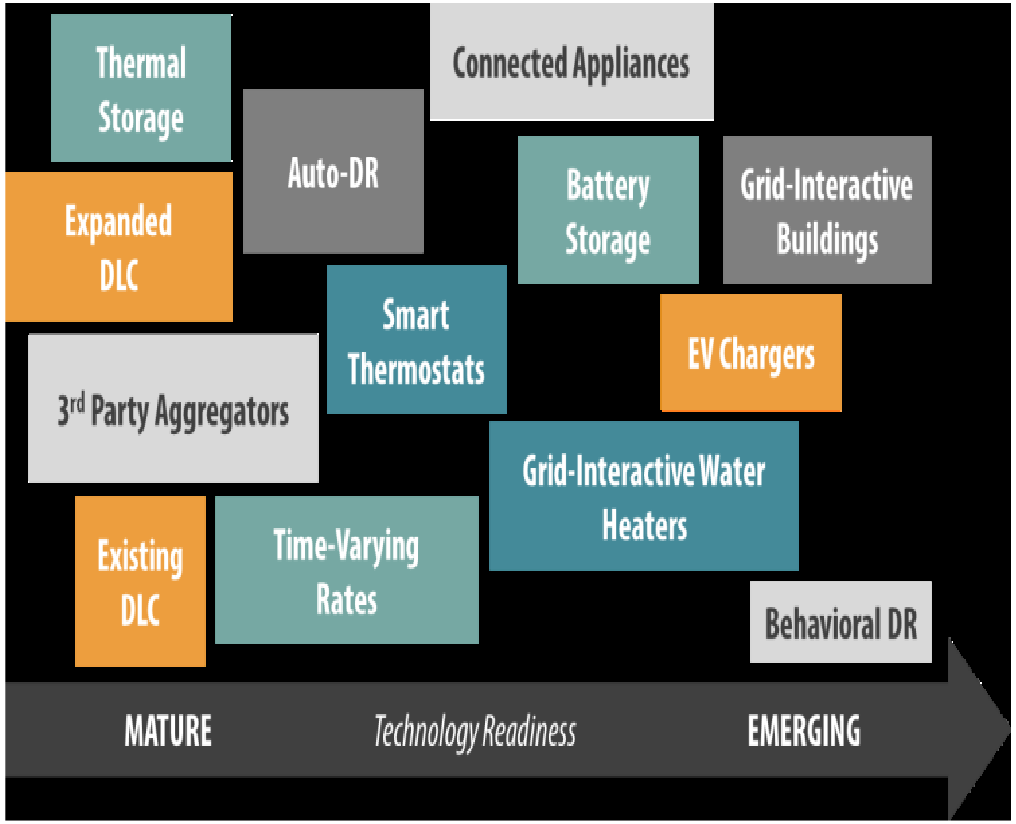


I&M Market Potential Study for End-Use Resources

INDIANA MICHIGAN POWER
An AEP Company

As an example, demand response (DR) will be assessed for potential using the following:

- System impacts (e.g. generation, transmission, and distribution savings)
- Saturation/applicability
- Effective useful life (EUL)
- Participant Costs (Equipment and Labor)
- Participant Incentives (e.g. per device, per kW, per year)
- Utility Costs (Equipment and Labor)
- Savings (e.g. per device, per premise)
- Program Costs (e.g. development, administration, marketing, consulting, evaluation)



I&M Market Potential Study for End-Use Resources

The MPS is well underway and is in the potential development phase, with (3) stakeholder engagement meetings held to-date.

Current Stage:

MPS Task 5 Deliverables: Fully transparent Excel models demonstrating technical, economic, and achievable potentials by sector.

Final MPS Deliverable for all resources studied:

Task 15: Produce 8,760 hourly inputs that reflect time-differentiated savings for the input into the IRP.

INTRODUCTION TO THE GDS TEAM

GDS Associates, Inc.
ENGINEERS & CONSULTANTS

GDS will serve as the prime contractor for these studies. GDS is a privately-held multi-service engineering and consulting firm, with more than 175 employees. Our broad range of expertise focuses on clients associated with, or affected by electric, natural gas, water and wastewater utilities. GDS has completed over 75 energy efficiency and demand response potential studies over the last two decades. GDS also has significant experience in: Statistical & Market Research Services, Integrated Resource Planning, Load Forecasting Services, and Regulatory Support Services.

brightline GROUP

Woman-owned collective of industry experts in DSM program planning and evaluation, with over 60 years of combined experience in the energy efficiency and engineering industry. Members of the Brightline Group has previously worked for GDS on Ameren Missouri, California POU, and Pennsylvania PUC evaluation and market research projects.

JEFFREY HUBER
Overall Project Manager
GDS Associates

PATRICK BURNS
Brightline Group Lead & Regulatory Compliance/IRP Support
Brightline Group

JACOB THOMAS
Load Forecast & Segmentation Lead
GDS Associates

WARREN HIRONS
Residential Sector EE & Reporting Lead
GDS Associates

MARY HALL-JOHNSON
Demand Response/ CVR Lead
Brightline Group

WYLEY HODGSON
Distributed Energy Resources Lead
Brightline Group

PRIOR POTENTIAL STUDY EXPERIENCE

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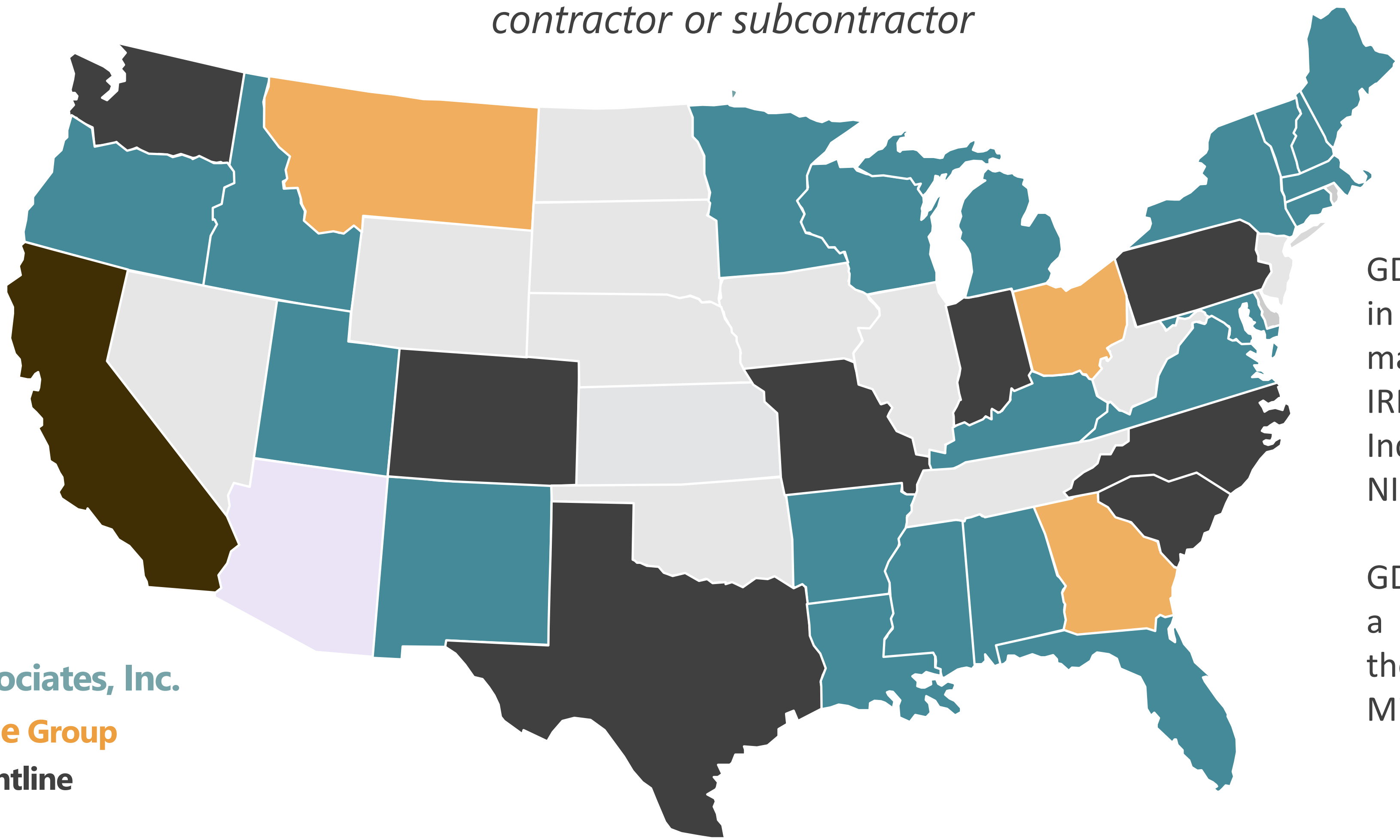
GDS Team members have completed over 85 potential studies completed as either the prime contractor or subcontractor



GDS Associates, Inc.
Brightline Group
GDS/Brightline

GDS has recently completed or in the process of completing market potential studies and IRP support for Centerpoint, Indianapolis Power & Light, and NIPSCO.

GDS also previously completed a market potential study for the Lower Peninsula in Michigan.

WHAT IS A MARKET POTENTIAL STUDY (MPS)?

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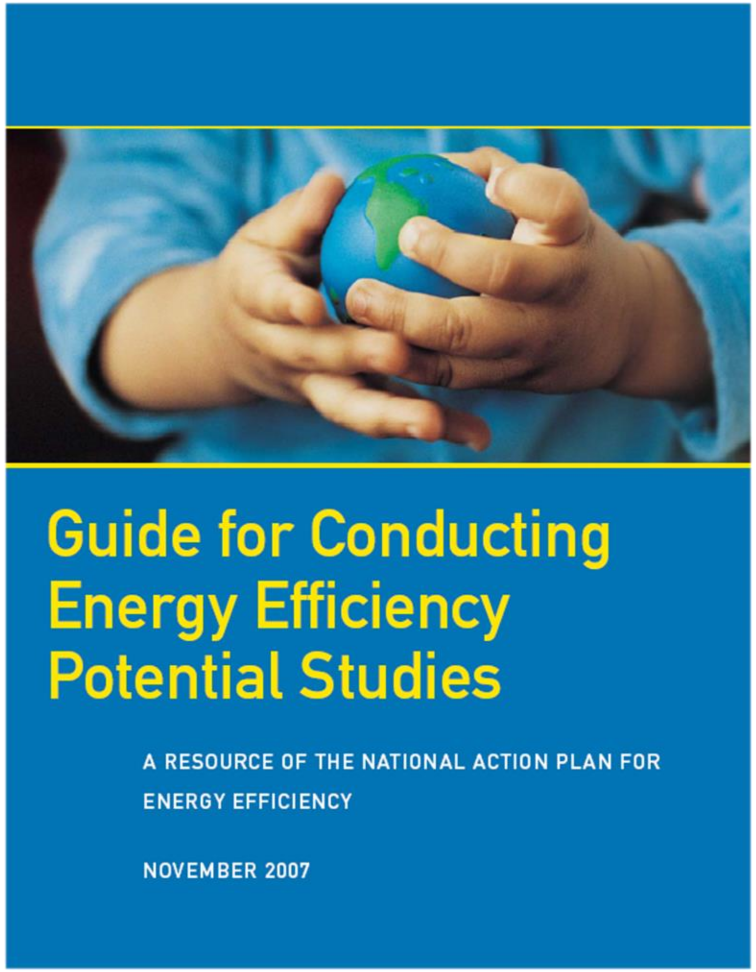
Simply put, a potential study is a quantitative analysis of the amount of energy savings that either exists, is cost-effective, or could be realized through the implementation of energy efficiency programs and policies.



I&M MARKET POTENTIAL STUDY TASKS

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I&M MARKET POTENTIAL STUDY KEY CONSIDERATIONS

- The assessments of potential for I&M's separate jurisdictions will be customized and tailor-made to each jurisdiction to the extent possible, though the study will culminate in an overall assessment for I&M that will yield results which can be used in subsequent IRP planning.

- Key differentiating factors across the jurisdictions are expected to include:
  - Unique measure-level savings assumptions as applicable (i.e. weather-sensitive savings estimates)
  - Unique measure-level saturation estimates
  - Incorporation of jurisdictionally separate sales and customer forecasts
  - Recognition of any state-specific regulatory requirements or other Stakeholder concerns

MARKET RESEARCH PERFORMED FOR MPS

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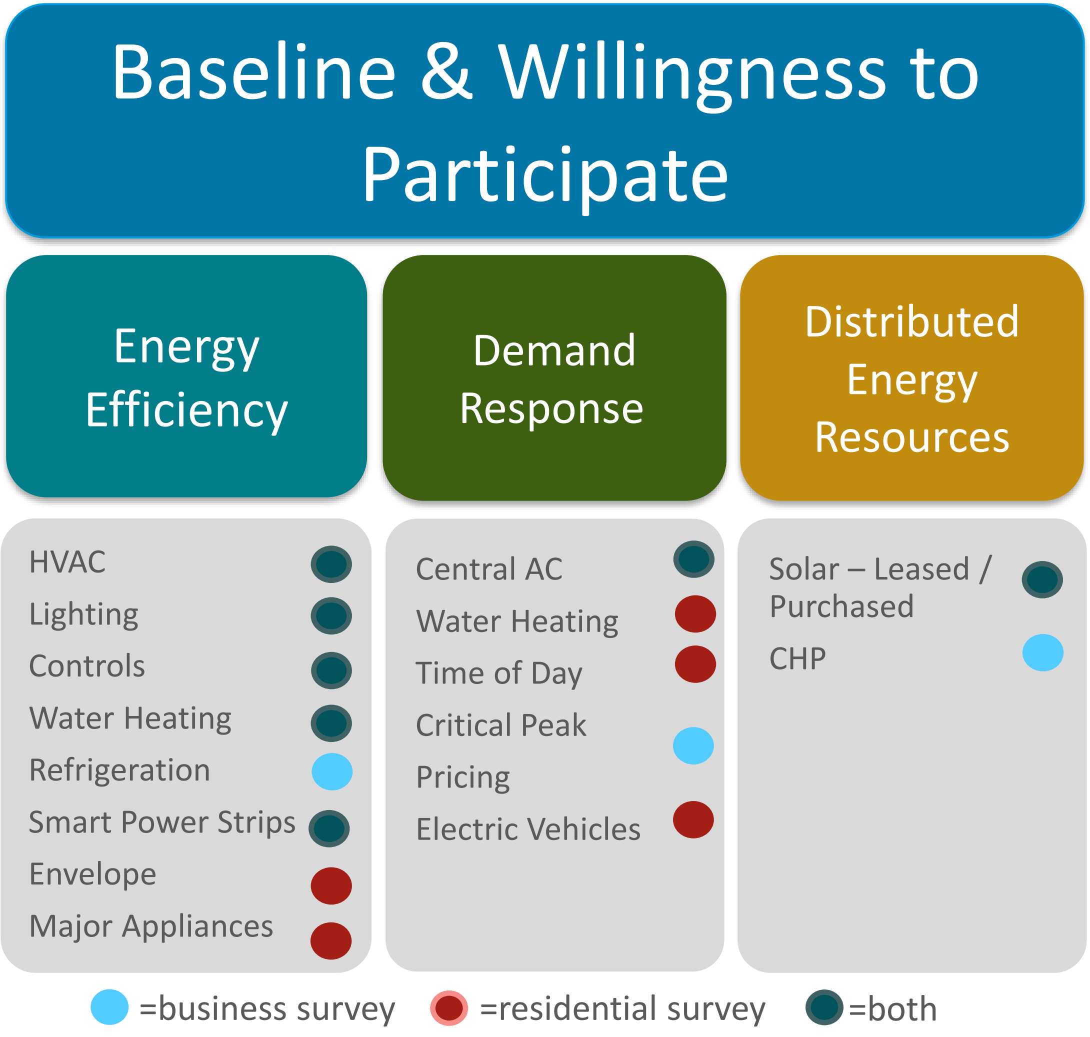

Purpose: Assemble baseline data and information to inform technology adoption curves.

Topics:

- Willingness to participate
- Baseline / Saturation data
- Program awareness
- Barriers
- Limited demographic / firmographic information

Audiences:

- Business customers
- Residential customers
- Residential rental property owners / managers

Format: Web survey with recruitment via email.

Timing: Surveys fielded January 26 – February 19

EQUIPMENT CHARACTERISTICS FROM MARKET RESEARCH

(Draft Results)

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- Data collection elements limited to items that may be answered accurately
- Nonresidential survey focused on key electric end-uses
  - Ex: Lighting, Cooling, Heating, Ventilation, Water Heating, Refrigeration
  - Key Equipment Penetration
  - Limited Efficiency Saturation Characteristics
- Residential survey collected limited saturation characteristics as well, but most saturation data will come from the most recent Residential Appliance Saturation Survey (RASS)

NONRESIDENTIAL EQUIPMENT CHARACTERISTICS	TOTAL	IN	MI
% of Lighting			
LED Linear	23%	22%	26%
LED Nonlinear	17%	15%	22%
Linear Fluorescent	38%	40%	31%
Incandescent/Halogen	10%	10%	10%
CFL	6%	5%	6%
HID	4%	4%	4%
Lighting Controls (% of all lighting)			
Occupancy Sensors	15%	16%	15%
Daylight Dimming	5%	5%	7%
Timing Controls	11%	11%	10%
Advanced Networked Controls	4%	2%	7%
Exterior Lighting			
LED (% of all Mounted Lighting)	45%	46%	42%
LED (% of all Site Lighting)	40%	41%	40%

RESIDENTIAL WILLINGNESS TO PARTICIPATE (WTP) DATA
(Draft Results)

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- Residential WTP Survey Data is used to help estimate the long-term adoption rates that might be expected across various end-uses and technologies.
- Residential consumers were asked about their likelihood to purchase and install measures given a range of incentive scenarios.
- Awareness Adjustment is also applied to reflect non-financial barrier to participation. Based on JD Power survey research, awareness adjustment is estimated at 74%. *(i.e. WTP Factor * Awareness Adjustment = Long Term Adoption Rate)*

EE/EWR/DER End-Use /Technology	Incentive Level				
	0%	25%	50%	75%	100%
Appliances	19%	27%	41%	56%	73%
Water Heating	20%	30%	43%	56%	75%
HVAC Equipment	32%	42%	55%	67%	81%
HVAC Shell					
Solar Panels	6%	14%	28%	45%	72%
Electric Vehicles	5%	12%	24%	36%	56%

Demand Response – Load Control	Incentive Level				
	$0	$15	$25	$35	$50
DR- Central AC	25%	35%	40%	44%	57%
DR- WH	17%	24%	28%	33%	44%

Demand Response – Rate Option	Off Peak Rate ($/kWh)			
	$0.08	$0.06	$0.04	$0.03
Time of Use Rate	26%	31%	40%	49%

NONRESIDENTIAL WILLINGNESS TO PARTICIPATE (WTP) DATA
(Draft Results)

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- Similar WTP questions were also posed to nonresidential survey participants to understand their likelihood to purchase and intall energy efficiency equipment and/or DER technologies, as well as participate in demand response programs.
- For nonresidential participants, WTP were typically structured to around measure payback periods in lieu of overall incentive levels.

EE/EWR/DER End-Use /Technology	**Payback Period**				
	10 yrs	5 yrs	3 yrs	1 yrs	0 yrs
HVAC	43%	53%	62%	70%	76%
Lighting	34%	41%	49%	58%	64%
Refrigeration	46%	56%	67%	48%	83%
Water Heating	40%	49%	57%	68%	73%
Purchased Solar	n/a	37%	50%	65%	71%

DER	**Incentive Level**				
	$0	MIN	LOW	HIGH	MAX
Leased Solar	16%	24%	33%	42%	49%

Demand Response – Load Control	**Incentive Level**				
	$0	$15	$25	$35	$50
Leased Solar	29%	33%	37%	40%	46%

Demand Response – Rate Option	**On Peak 5X Higher, but Off Peak Rate (% Lower)**			
	5%	10%	20%	40%
Critical Peak Pricing	25%	31%	42%	55%

MARKET SEGMENTATION

- Market segmentation is conducted to better understand the make-up of the I&M service area and quantify remaining efficiency opportunities for future programs.
- Market segmentation relies on data underlying I&Ms load forecast and other supporting market data

- ***Residential market segmentation includes analysis by:***
  - Housing Type
  - Income Type
  - End Use
- ***Nonresidential market segmentation includes analysis by:***
  - Building/Industry Type
  - End Use

Residential Segmentation

Housing Type	Indiana	Michigan
Single Family (SF)	84.5%	94.2%
Multifamily (MF)	15.5%	5.8%

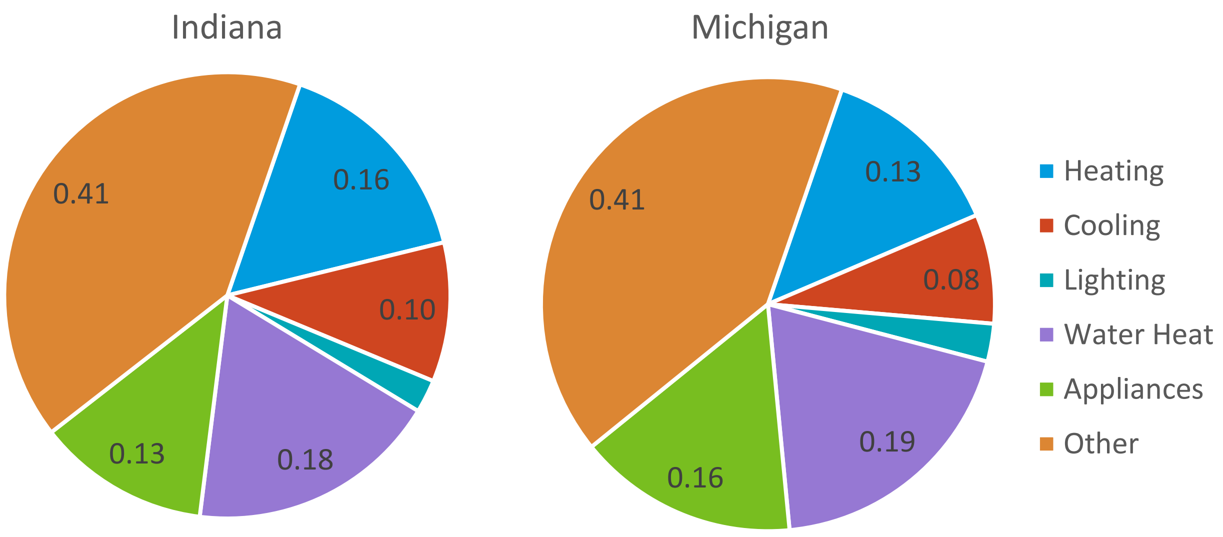
** From I&M Residential Appliance Saturation Survey*

Housing/Income Type	Indiana	Michigan
SF IQ	20.9%	23.8%
SF MR	63.6%	70.4%
MF IQ	7.7%	3.1%
MF MR	7.8%	2.7%

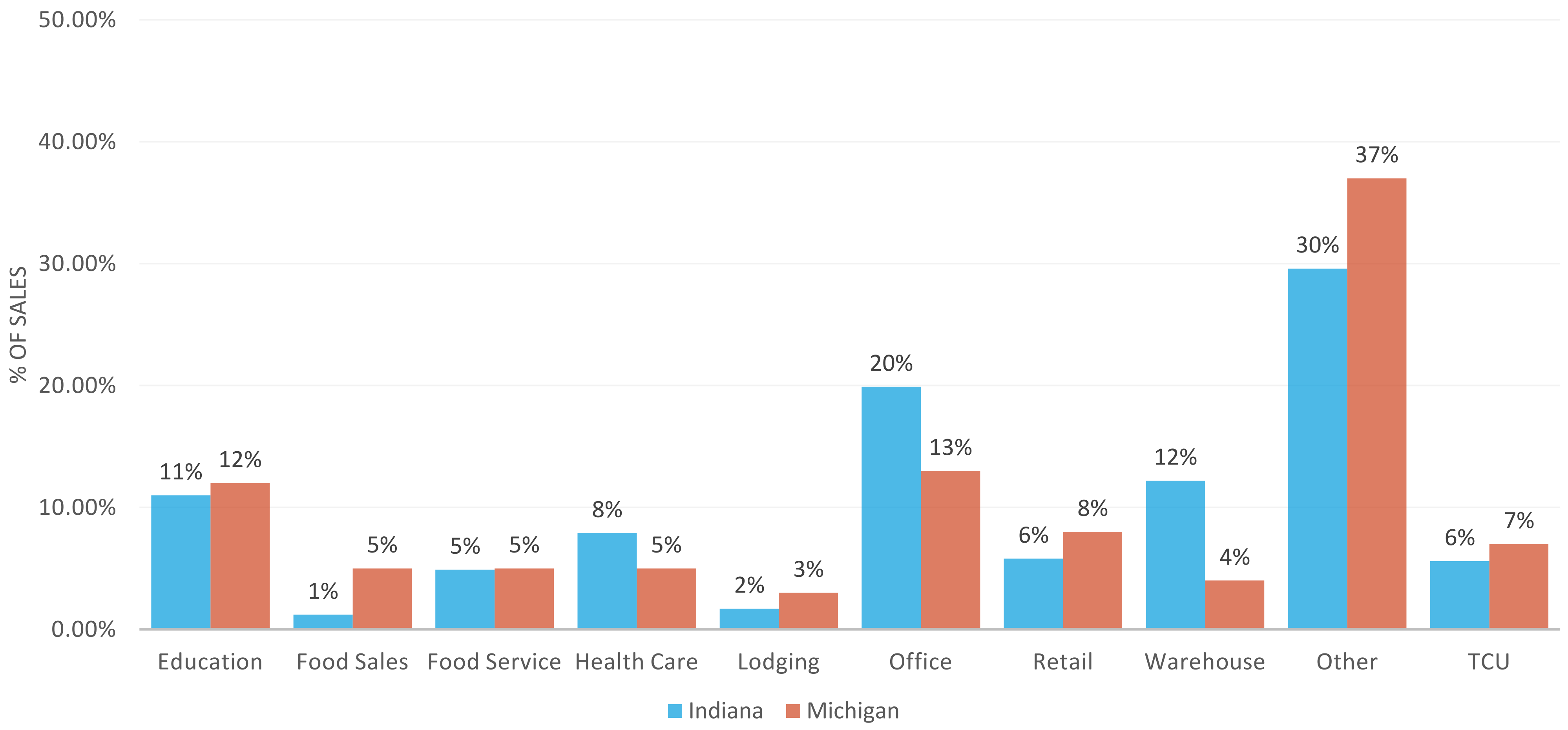
IQ: Income Qualified
MR: Market Rate

** 2019 5-YR American Community Survey + I&M RASS*

2041 Sales Breakdown by End-Use
(primarily derived from I&M long-term sales forecast data)

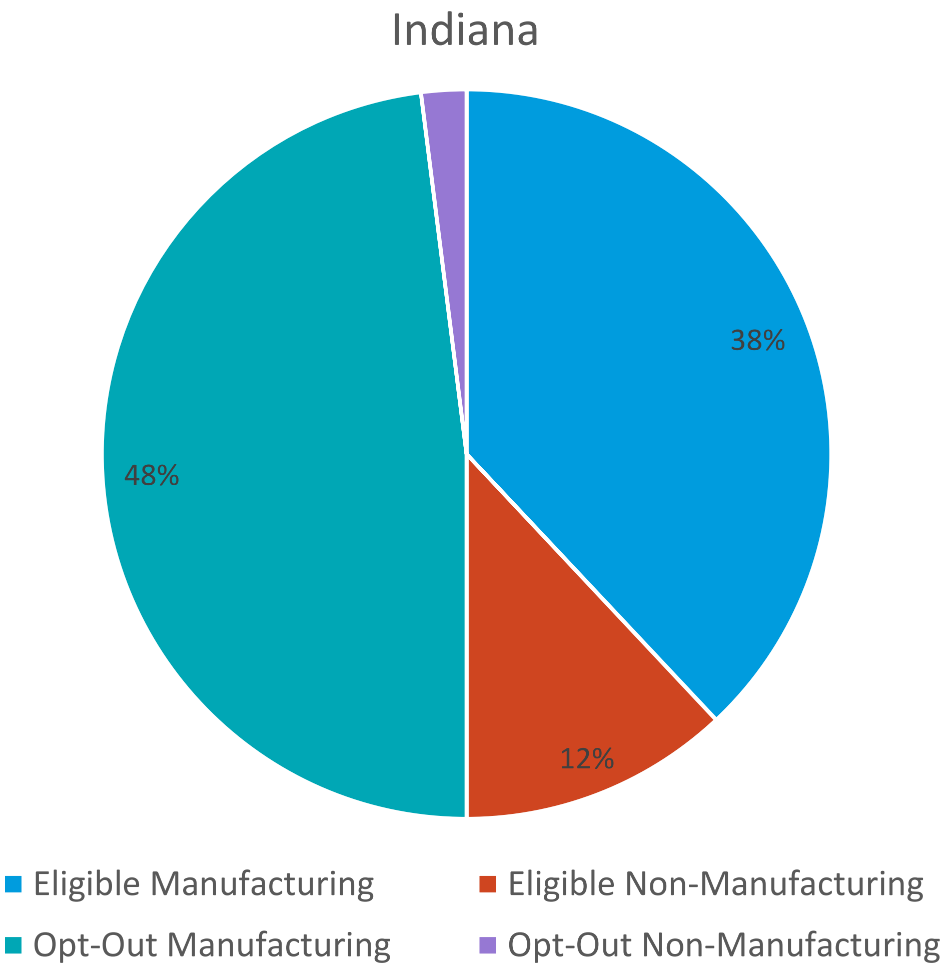


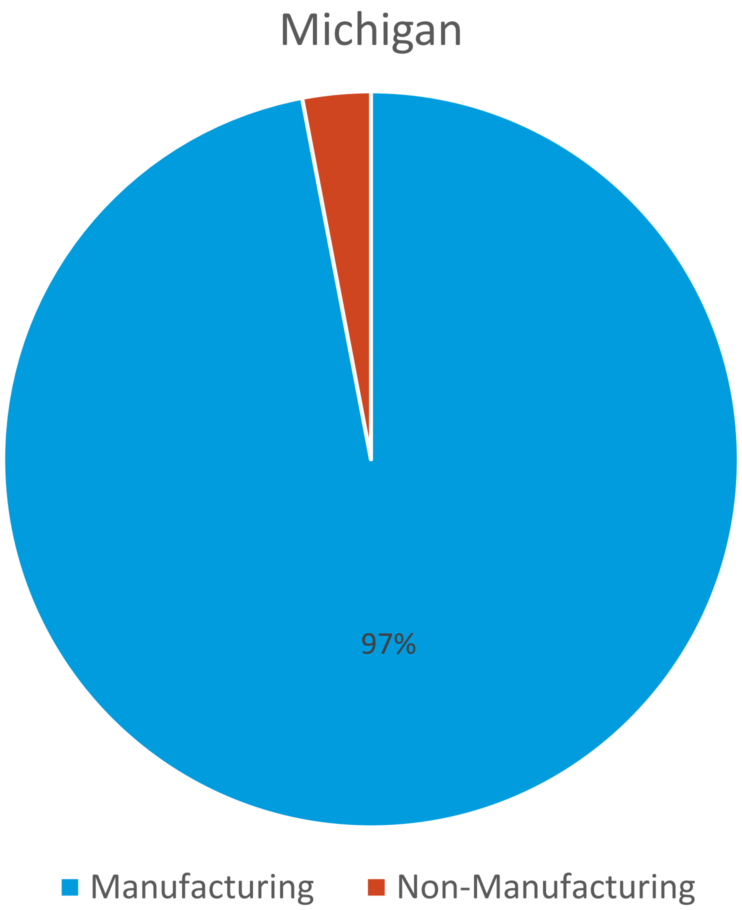
COMMERCIAL SECTOR SEGMENTATION
(Percent of Commercial Sales by Building Type)



** Commercial segmentation for Indiana excludes current opt-out customers*

INDUSTRIAL MARKET SEGMENTATION
(Percent of Industrial Manuf. Vs. Non-Manuf. Sales)





** Eligible refers to industrial load that currently is eligible to participate in I&M's energy efficiency programs*

MEASURE CHARACTERIZATION

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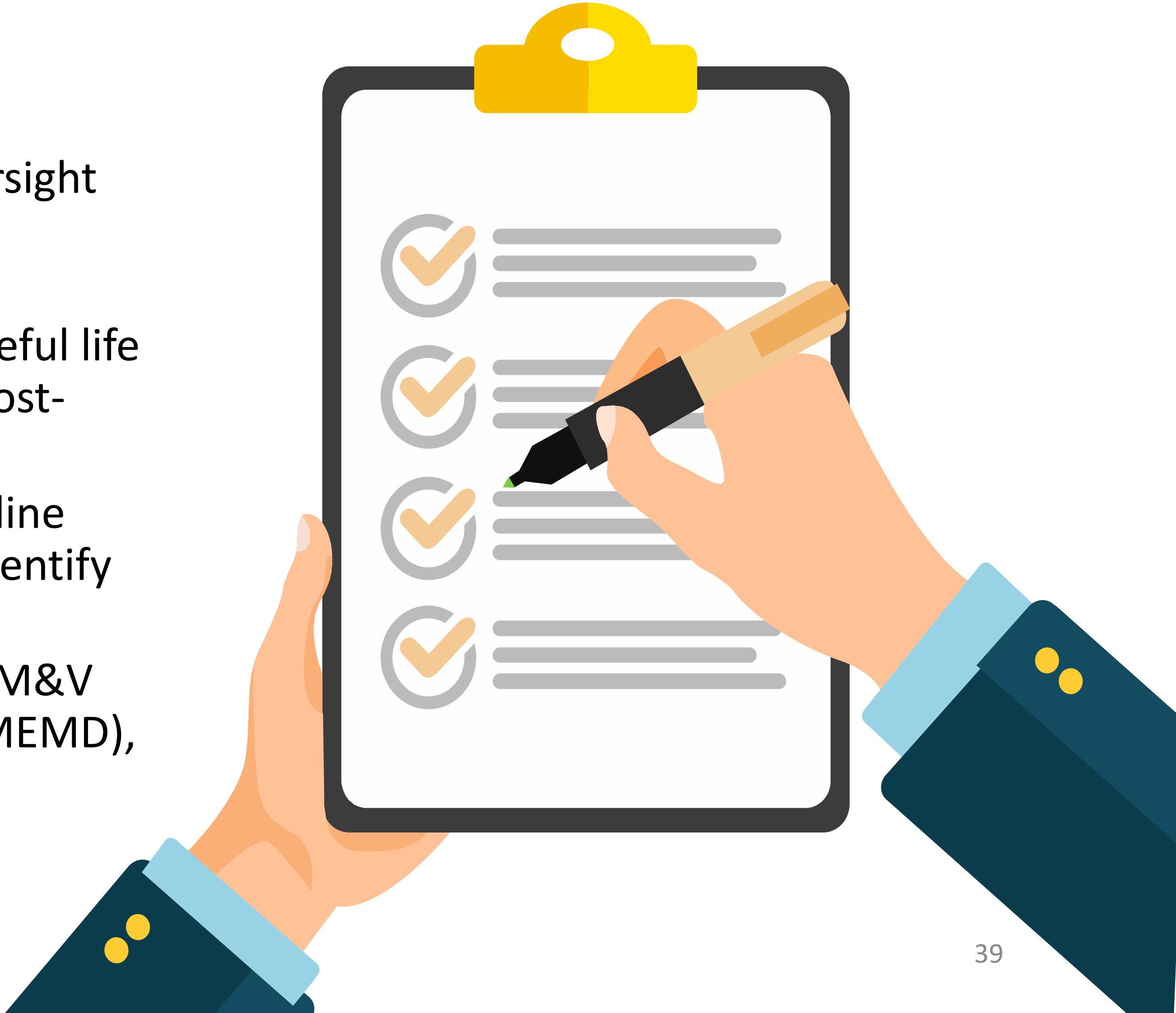
- 264 EE/EWR measures will be considered (91 residential, 173 C/I)
- Draft list was shared with I&M, the Indiana Oversight Board, and MPSC Staff
- Key measure data inputs: kWh and savings, incremental and full cost estimates, measure useful life – all of these data will allow for measure-level cost-effectiveness and potential to be calculated
- Measure market data inputs: estimates of baseline saturation and energy efficiency saturation to identify remaining opportunities
- Key data sources: I&M DSM/EWR Filings, I&M EM&V reports, Michigan Energy Measures Database (MEMD), Illinois TRM, and Indiana TRM, market research baseline / saturation data



BENCHMARKING DATA AND RESULTS

Residential	Incentive as a % of Incremental Measure Cost	
	IN	MI
HEP		
Hot Water	31%	31%
HVAC Equipment	29%	28%
Lighting	57%	60%
Other	25%	25%
IQW		
Direct Install	100%	100%
Hot Water	64%	64%
HVAC Equipment	93%	93%

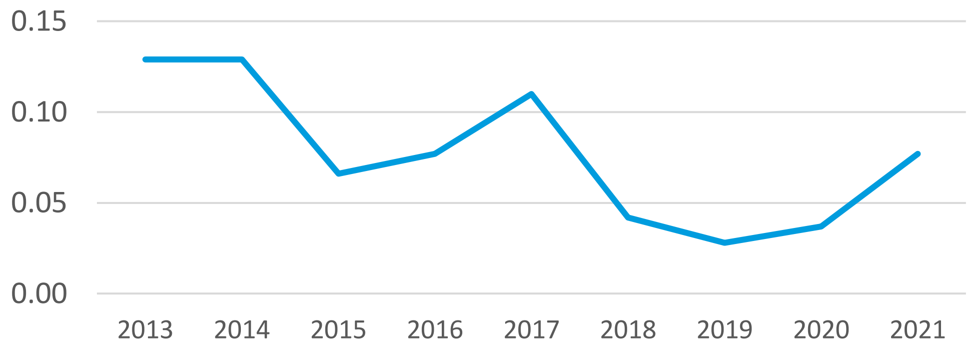
C&I	Incentive as a % of Incremental Measure Cost	
	IN	MI
Prescriptive		
Cooking	31%	31%
HVAC Equipment	11%	11%
Lighting	36%	45%
Other	27%	27%
Refrigeration	25%	25%
VFDs	39%	39%
Custom		
Lighting	$.07/kWh	$.07/kWh
Non-Lighting	$.08/kWh	$.08/kWh

- Initial benchmarking of historical data to understand typical incentive levels offered by I&M as well as historical non-incentive costs.
- Additional benchmarking to understand historical performance (energy and costs) by program for near-term calibration
- ***Final benchmarking*** *will be performed to understand results in relation to other similar studies*

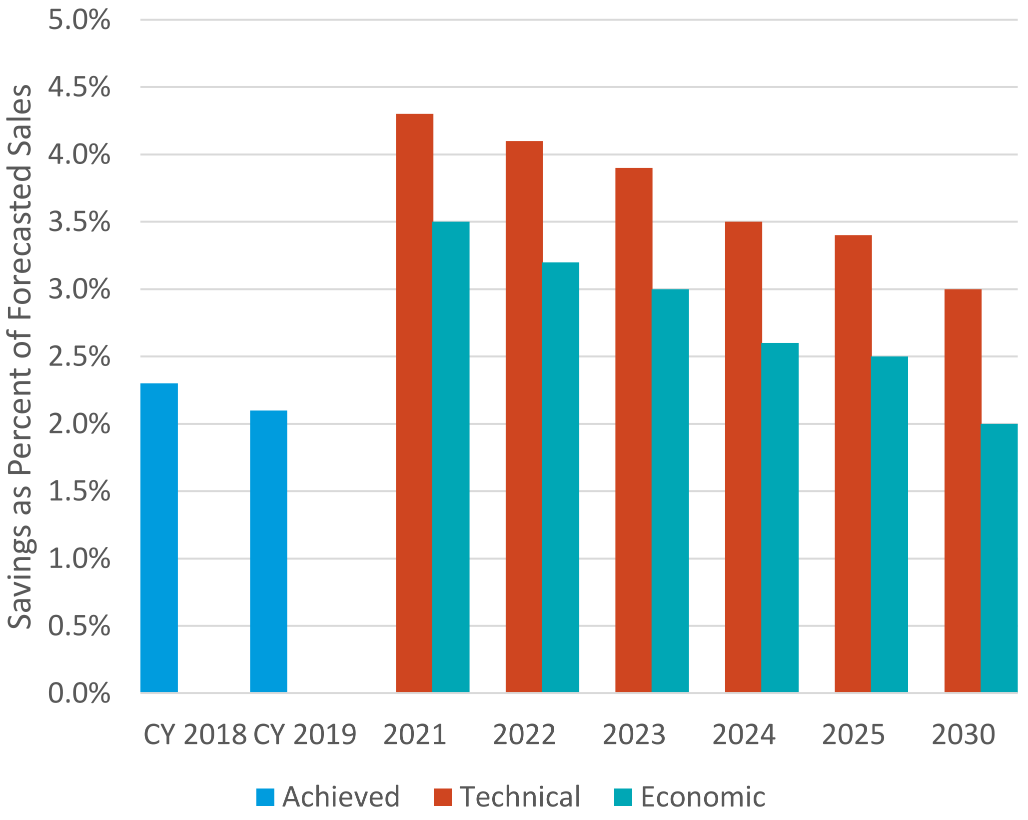
RESULTS BENCHMARKING & TRENDS

- Comparison to other recent market potential study assessments will help understand recent trends.
- Perceptions around the market baseline for lighting can influence the remaining future potential in both the residential and nonresidential sectors.

Average Annual Potential Savings Rate – Economic Potential



** Data from DOE EE Potential Studies Catalog*



** Reproduced from 2020 ComEd Potential Study*

ENERGY EFFICIENCY POTENTIAL

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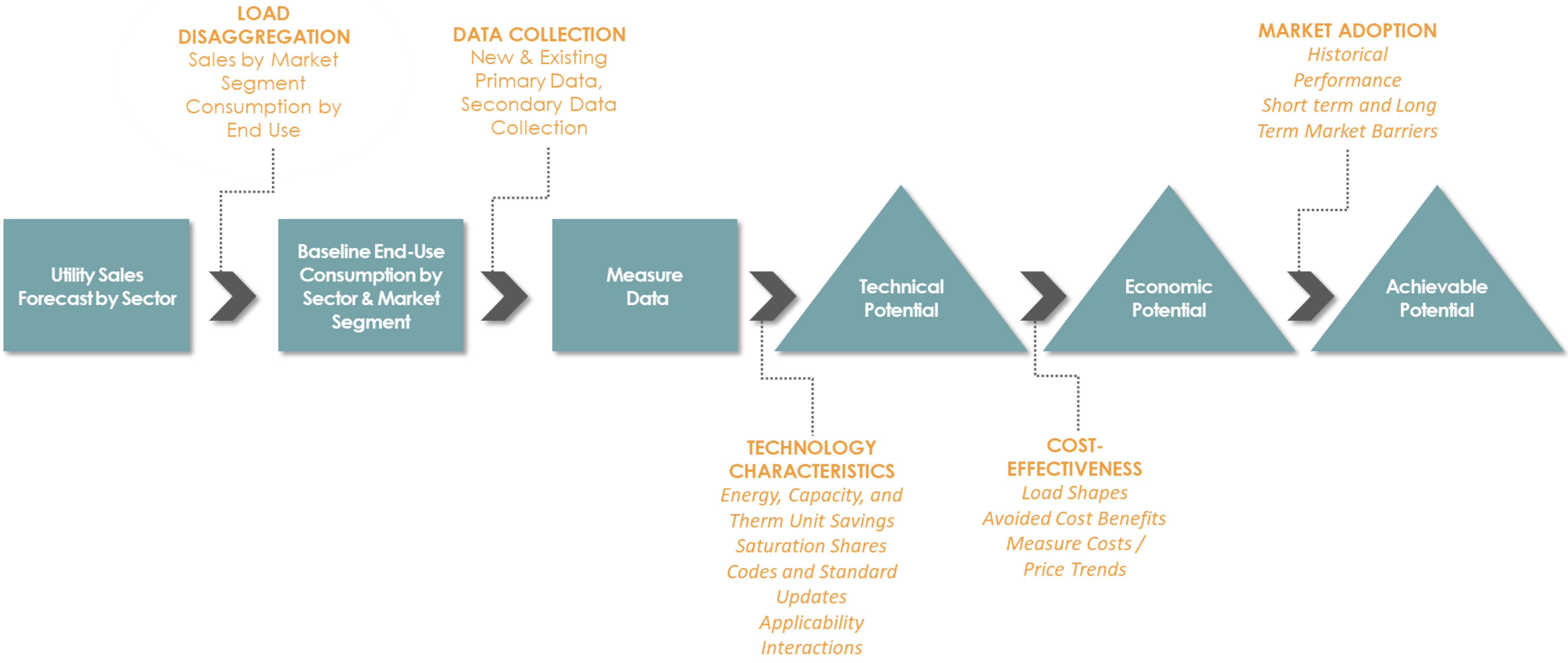


ENERGY EFFICIENCY POTENTIAL

TECHNICAL POTENTIAL

All technically feasible measures are incorporated to provide a theoretical maximum potential.

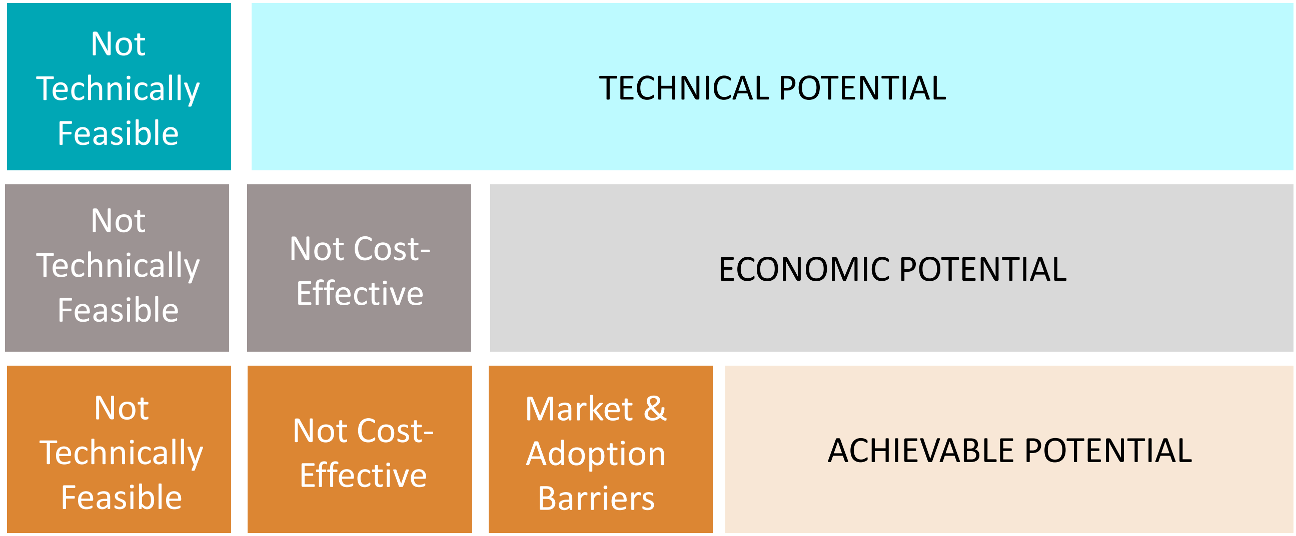
ECONOMIC POTENTIAL

All measures are screened for cost-effectiveness using the UCT Test. Only cost-effective measures are included. Screening includes avoided energy, capacity, and T&D costs.

ACHIEVABLE POTENTIAL

Cost-effective energy efficiency potential that can practically be attained in a real-world program delivery case, assuming that a certain level of market penetration can be attained.

Types of Energy Efficiency Potential



ENERGY EFFICIENCY POTENTIAL

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RESIDENTIAL EQUATION

TECHNICAL POTENTIAL OF EFFICIENT MEASURES = *Total Number of Households* X *Base Case Equipment End Use Intensity* X *Saturation Share* X *Applicability Factor* X *Savings Factor*

- Technical and Economic Potential utilize the equation shown above, with 100% of eligible measures being converted to the efficient alternative over time.
- Achievable potential includes an assumed long-term adoption rate (derived the WTP primary research noted earlier)
- Two Achievable Potential Scenarios:
  1. High Case Achievable Potential: Assumes 75% incentives (relative to measure cost) and increased program awareness.
  2. Realistic Achievable Potential: will reflect more traditional (i.e., current) incentive levels and program delivery efforts.

DEMAND RESPONSE POTENTIAL

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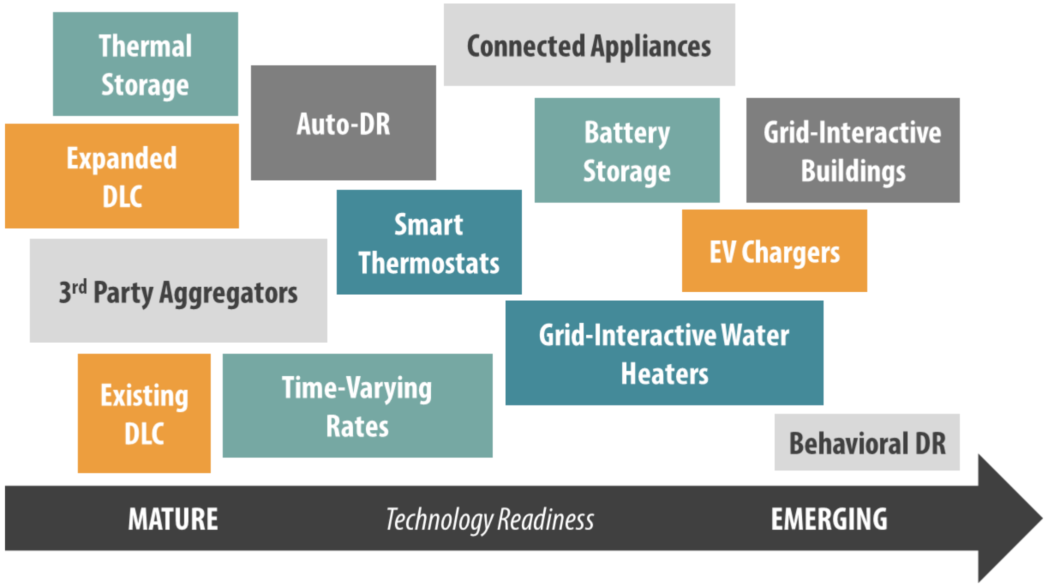
- Characterize Available Technologies
  - Assess and screen load shifting options for IM's territory and customer base
  - Measure List:
    - 37 Sector/Technology Permutations



  - 20 performance and cost metrics researched for each permutation

DEMAND RESPONSE POTENTIAL

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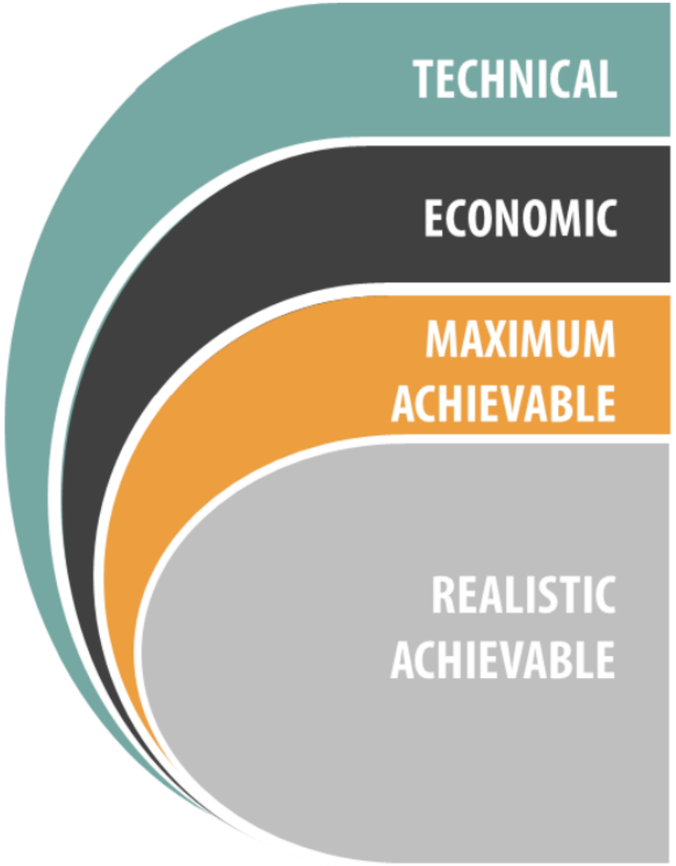
- Technical Potential
  - Characterize potential using:
    1. IM current, past, pilot offering results
    2. Other PJM utility offerings
    3. Non-PJM utility offerings aligned to PJM peak definition
  - Measure competition
    - Participation weighted to most impactful option



DISTRIBUTED ENERGY RESOURCES (DER) POTENTIAL

- Study focuses on solar PV and combined heat & power (CHP)
- Measures screened at permutation-level based on TRC
- Sectors modeled include:
  - Solar PV: residential and non-residential
  - CHP: non-residential
- Market adoption based on Bass diffusion theory

DISTRIBUTED ENERGY RESOURCES (DER) POTENTIAL

Solar PV

- Potential area suitable for solar PV
  - Primarily focuses on rooftops but also considers ground systems
  - Rooftop eligible area based on NREL criteria
    - Net of existing systems
- Define solar generation
  - Model using PVWatts
  - Region-specific azimuth based on Google Project Sunroof data
  - System efficiencies based on PVWatts

Combined Heat & Power

- Potential number of available host sites
  - Based on customer electric usage
  - Without natural gas usage data, thermal factor applied to identify eligible sites
    - Screen sites for consistency in thermal and electric loads
    - Net of existing systems
- CHP generation
  - Electricity impacts modeled using system parameters and benchmarked capacity factors

DISTRIBUTED ENERGY RESOURCES (DER) POTENTIAL

Solar PV

- Economic screening based on TRC
  - 1.0 hurdle
  - Costs based on system installation fees inclusive of ITC
    - Cost research based on Solar Sage and NREL studies
- Achievable derived from Bass adoption curves
  - Curves based on market research data as well as NREL adoption research

Combined Heat & Power

- Economic screening based on TRC
  - 1.0 hurdle
  - Costs based on EPA studies
    - ITC cost savings included but are minimal
- Achievable derived from Bass adoption curves
  - Curves based on historic adoption benchmarks

PROGRAM PORTFOLIO RECOMMENDATIONS

- **Purpose**: Convert achievable potential results (measure-level) into a format that reflects program implementation-related considerations (e.g., potential delivery options, and alignment with I&M's program framework) and can serve as inputs to the IRP modeling process.
- **Process**:

Map Measures to Potential Programs & Delivery Channels	Create Delivery Streams / Measure Bundles to Interface with IRP Model	Recommend a Portfolio of Programs for Consideration
• Further characterize measures, adding implementation-related characteristics (e.g., costs of alternative delivery channels). • Consider potential new program offerings to address market needs. • Align with existing program structure / framework.	• Group measures by end use, program, delivery channel / cost characteristics. • Seek to group measures in a way that aligns with I&M's program framework and would not undermine program infrastructure if "turned off."	• Recommend a cost-effective portfolio that includes measure groupings addressing the range of market needs, and evolving market conditions. • Optimizing a portfolio is outside the scope.

DSM INPUTS FOR IRP

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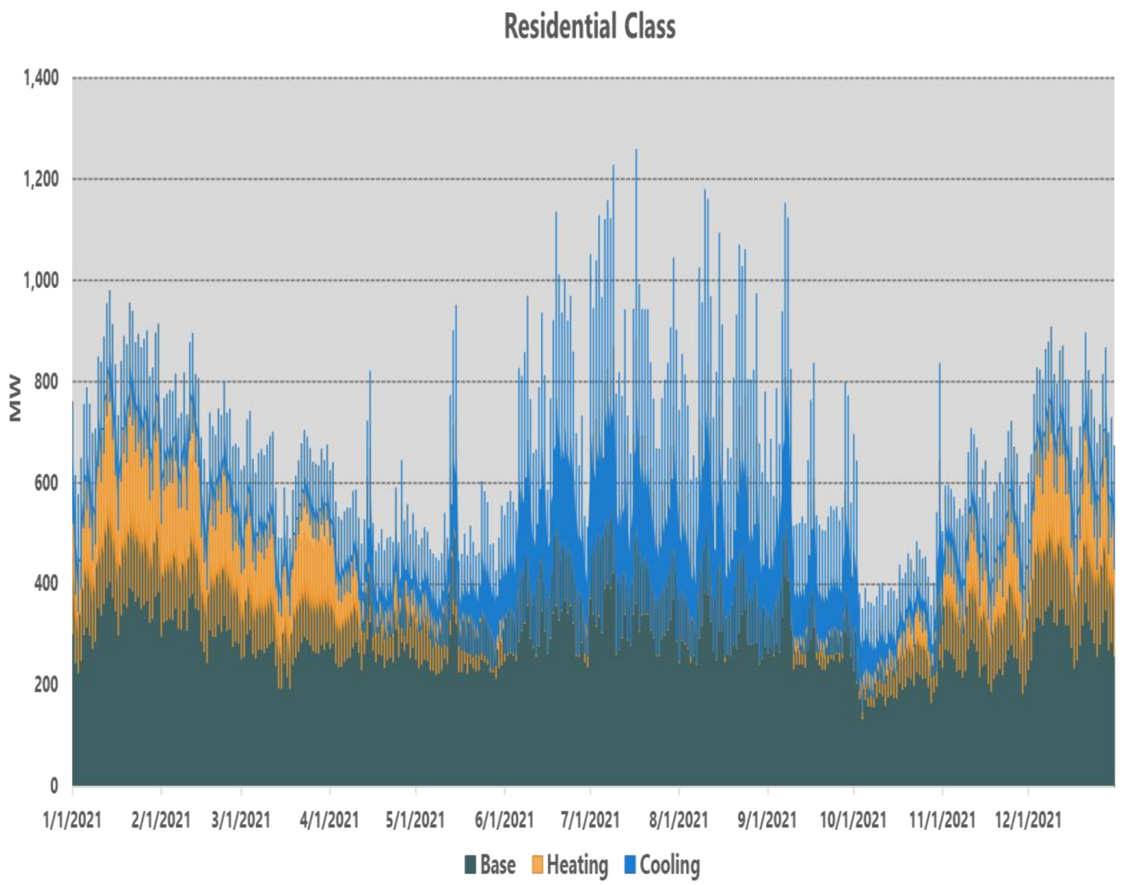
- DSM Savings identified in MPS (beginning in 2023) will be aggregated for inclusion in the IRP both by vintage (years) as well as measure characteristics
- Vintage groups will be for 2023-2025, 2026-2028, and 2029-2040. 3-year vintage cycles were chosen to algin with current I&M planning cycles.*
- Measure characteristic grouping may include: cost-based, load shape-based, or value based (see next slide)
- Recognizing potential value in time-differentiated savings, GDS will breakout the annual DSM savings into hourly (8760) impacts, typically at the end-use level.
  - Total number of 8760 load shapes is TBD.



***Example 8760 load data for I&M.*

*** In accordance with I&M's DSM Plan Order (#45285), I&M will utilize the results of the MPS to examine the potential and estimated cost of additional reasonably achievable potential in 2021 and 2022.*

DSM INPUTS FOR IRP – "EE BUNDLING"

(Discussion will be continued later in slide deck)

VALUE BASED APPROACH ✓

Bundles in which the avoided cost values are similar (e.g. a bundle of programs designed to reduce summer peak demands might be one bundle)

- PROS: Provides analysis and selection based on value creation; Will likely result in similar bundles as the "load curve" bundle approach ; Provides more detailed analysis of timing of DSM measures and how that relates to avoided costs
- CONS: The tie between load curve, timing of costs, and DSM measures is looser than the load curve approach

LOAD-SHAPE BASED APPROACH

Bundles in which the manner in which the program impacts the load curve are grouped together (e.g., all programs with primary effectiveness during summer on-peak periods bundled together)

- PROS: Provides analysis and selection based on details of load curves ; Programs within a bundle will likely have similar avoided cost characteristics ; Mimics how a generation resource would be included in a model (base DSM bundles would be effective nearly all the time just as a baseload resource runs nearly all the time)
- CONS: May create many different bundles to most effectively achieve the granularity sought by such an approach

COST-BASED APPROACH

Bundles based lowest cost to highest cost measures (may be on a $/kWh basis)

- PROS: Bundles can be created to likely lead to acceptance of most cost-effective bundles ; Allow for greater differentiation in cost effectiveness relative to single bundle approach ; Easy to define a certain number of bundles
- CONS: No granularity with respect to load curve and timing of costs (on/off peak energy and timing of peak demands) ; Risk of model selecting some bundles that are less cost effective than other bundles that are rejected and having to explain why that happened

DSM INPUTS FOR IRP – SUPPLEMENTAL EFFICIENCY ADJUSTMENT

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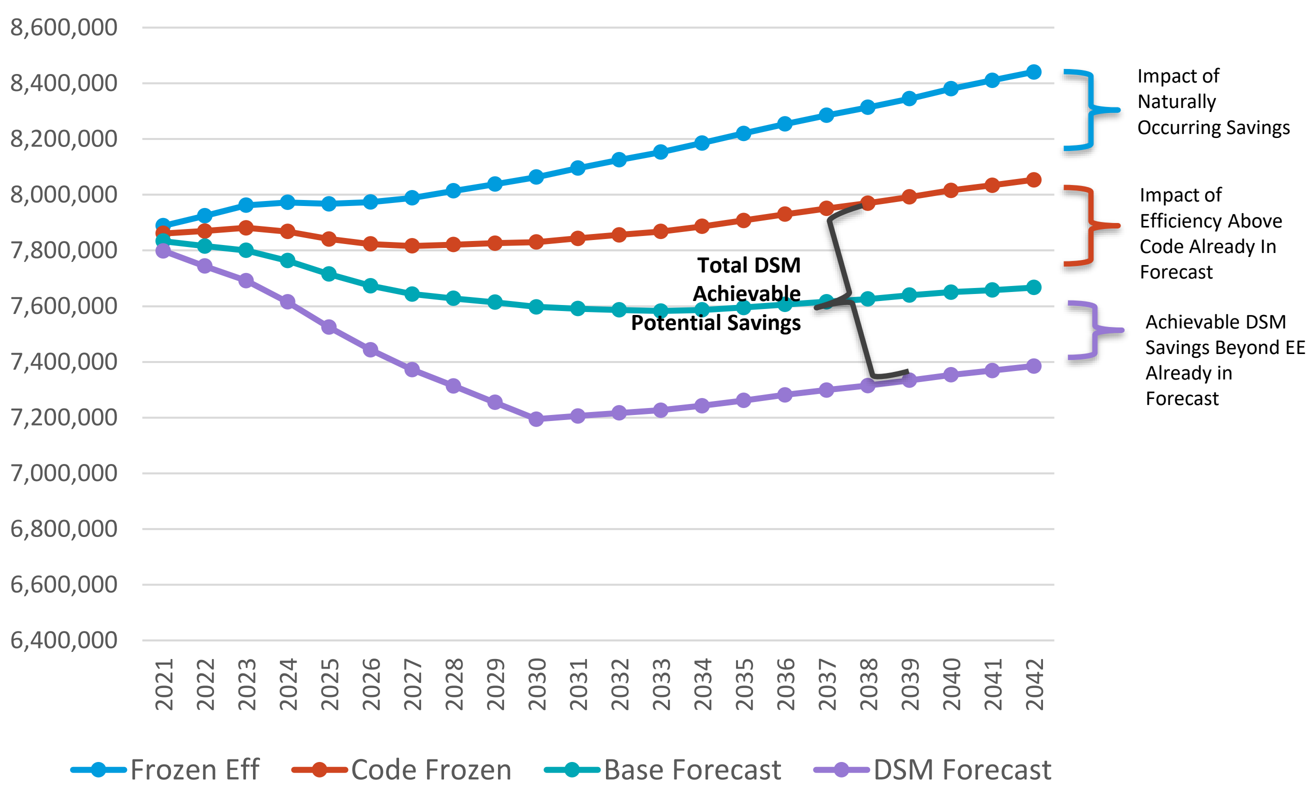
- DSM Savings are typically quantified relative to federal code versus the market baseline
- I&M's base forecast has an assumed level of increased efficiency (above and beyond federal codes) over time, resulting in average equipment well above current known standards/codes.
  - Ex: the average equipment efficiency of central air conditioning approaches SEER 15 in the East North Central region over the 20-year forecast horizon.
- GDS intends to estimate efficiency impacts first relative to a "frozen code efficiency" forecast and coordinate with I&M to adjust for EE savings already recognized in the base case forecast.



FEEDBACK AND DISCUSSION

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Time	
9:30 a.m.	WELCOME
9:35 a.m.	MEETING GUIDELINES
9:40 a.m.	OPENING REMARKS
9:50 a.m.	GRID SOLUTIONS INTRODUCTION
10:20 a.m.	MARKET POTENTIAL STUDY
12:00 p.m.	LUNCH
1:00 p.m.	IMPACTS ON LOAD FORECAST
1:30 p.m.	PRELIMINARY APPROACH FOR IRP
2:00 p.m.	BREAK
2:30 p.m.	STAKEHOLDER ENGAGEMENT
2:45 p.m.	STAKEHOLDER PRESENTATION
3:00 p.m.	NEXT STEPS AND CLOSING REMARKS
3:30 p.m.	ADJOURN

LUNCH

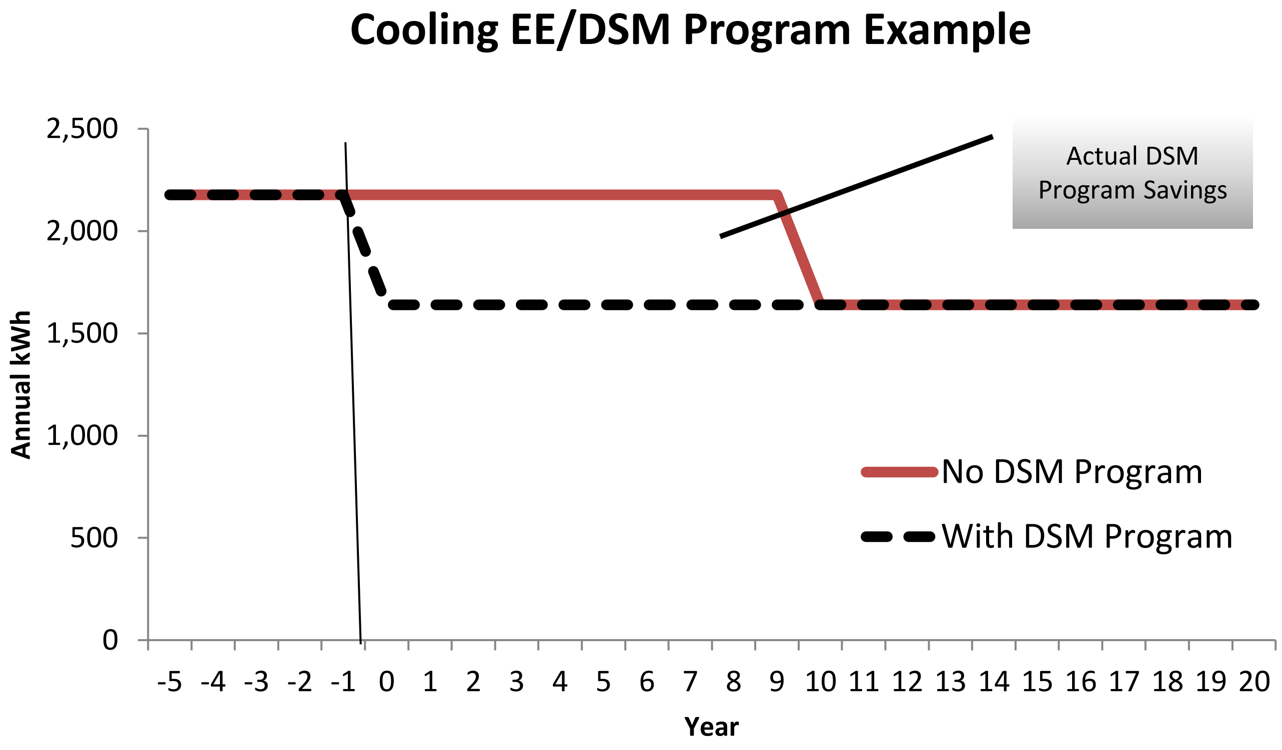
PLEASE PLAN A RETURN BY 1:00PM EST

IMPACTS ON LOAD FORECASTING

CHAD BURNETT | LOAD FORECASTS

Accounting for DSM/EWR in Load Forecast

The purpose or effect of the Company's DSM/EE programs is to accelerate the adoption of energy efficient technology to enable our customers to be more efficient consumers of energy.



Example: The J Doe family replaced their HVAC system 5 years ago with a SEER 13 system. Since then, the industry has introduced more efficient (SEER 15) units. 10 years from now, J. Doe will have to replace the system with whatever is available in the market at that time (SEER 15). Today, the utility offers an incentive to help J. Doe replace his HVAC system now with a SEER 15 and begin saving energy immediately.

Residential Lighting Example

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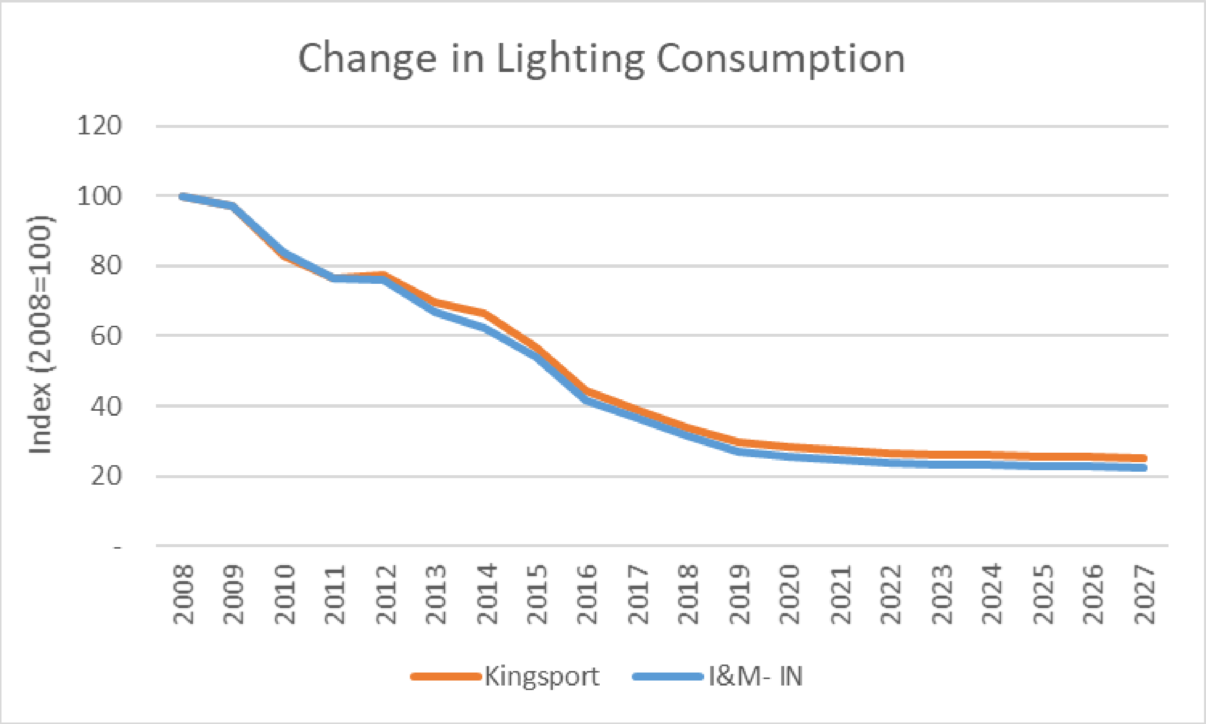
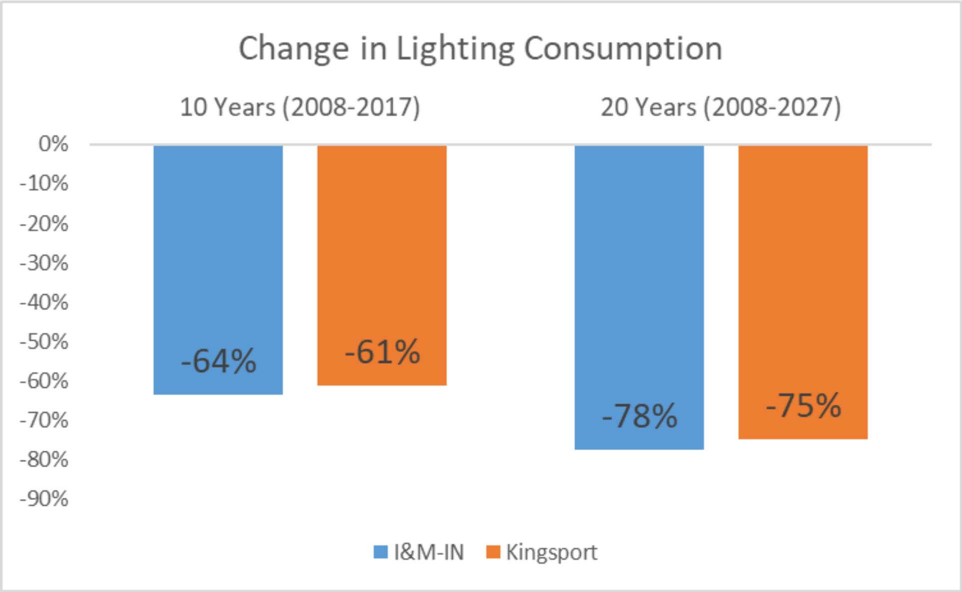
- I&M started its DSM programs in IN in 2008 with a particular emphasis on lighting programs.
- Kingsport (I&M's affiliate in TN) has yet to implement a DSM program.
- I&M's DSM programs in IN accelerated the adoption of energy efficient lighting faster than Kingsport, where there were no utility sponsored energy efficiency programs.





TRANSLATING MPS SAVINGS INTO THE IRP OPTIMIZATION

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- There are benefits to leveraging the market intelligence from the Market Potential Study (MPS) in the Integrated Resource Plan (IRP) optimization.
- The load forecast is a common link between the MPS and IRP.
- However, the way EE savings are <u>measured in a MPS</u> are different than the way EE savings are <u>modeled in the load forecast</u> that is used in the IRP optimization.

Chips

US

UK

Biscuits

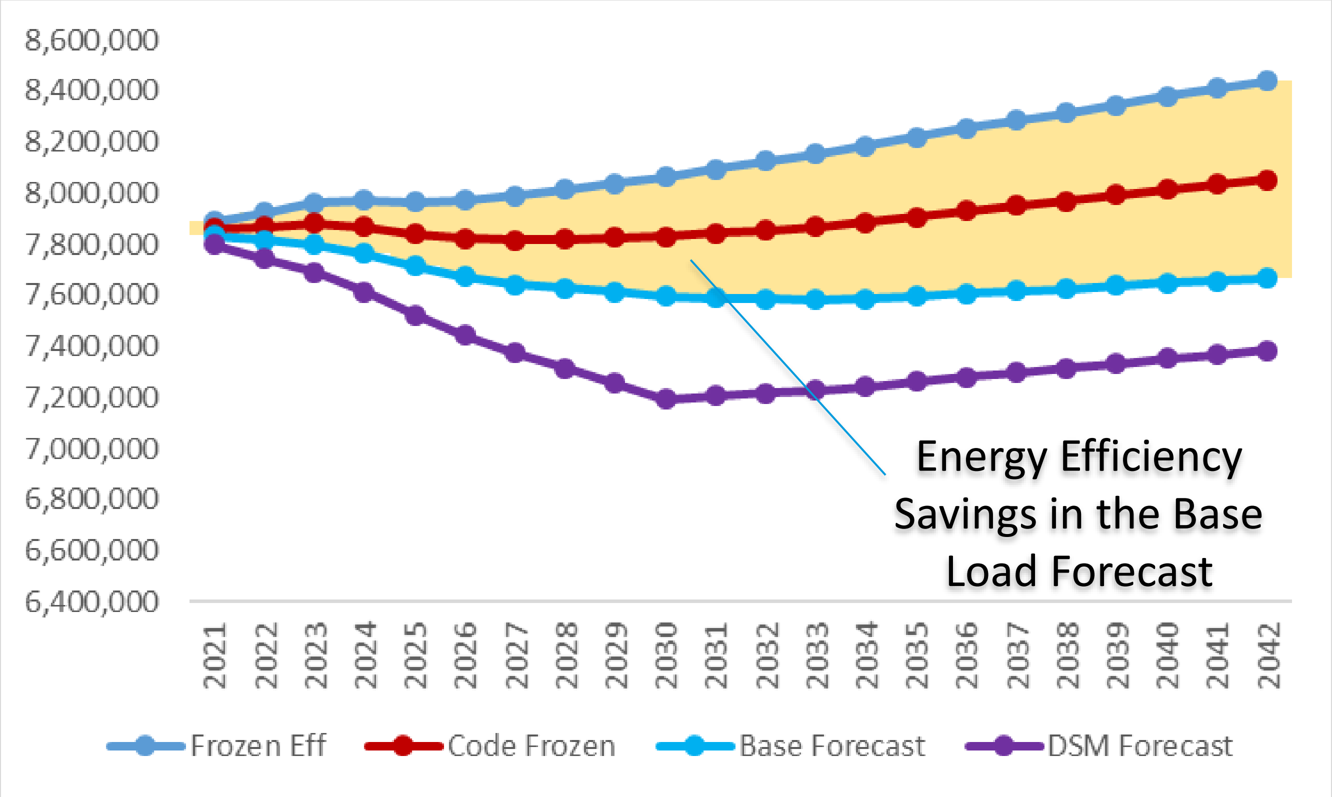
US

UK

DSM/EWR Savings ???

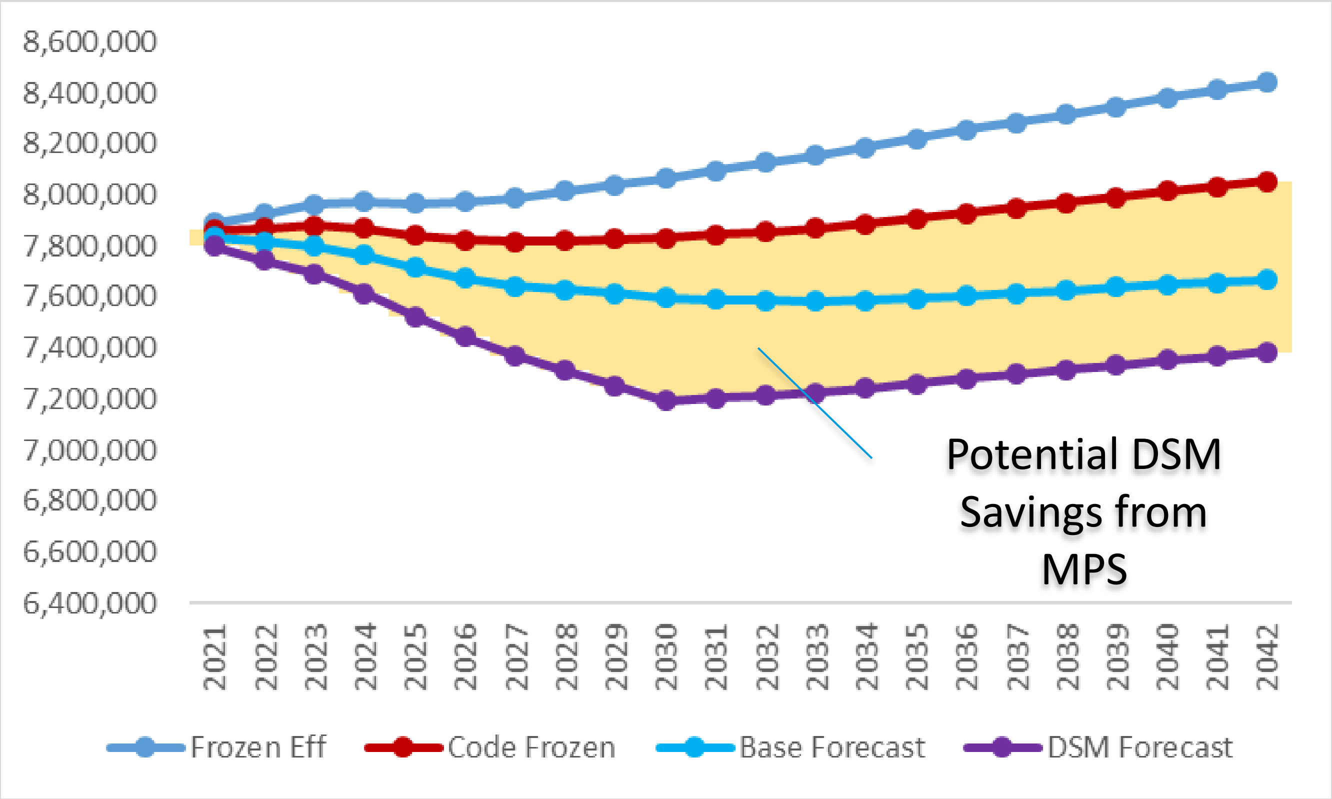
Energy Efficiency in the SAE Load Forecast

- Using the example from slide 52, the total energy efficiency included in the Statistically Adjusted End-Use (SAE) load forecast models is shown as the difference between the frozen efficiency forecast (blue line) and the base forecast (teal line).
- This includes naturally occurring energy efficiency saving.



DSM/EWR Savings From Market Potential Study

- In the Market Potential Study, total potential DSM/EWR savings are computed based off the baseline from existing codes (red line).
- Actual DSM/EWR program savings are measured using a similar comparison (to a baseline at a specific point in time).



DSM Saving Used in IRP Optimization

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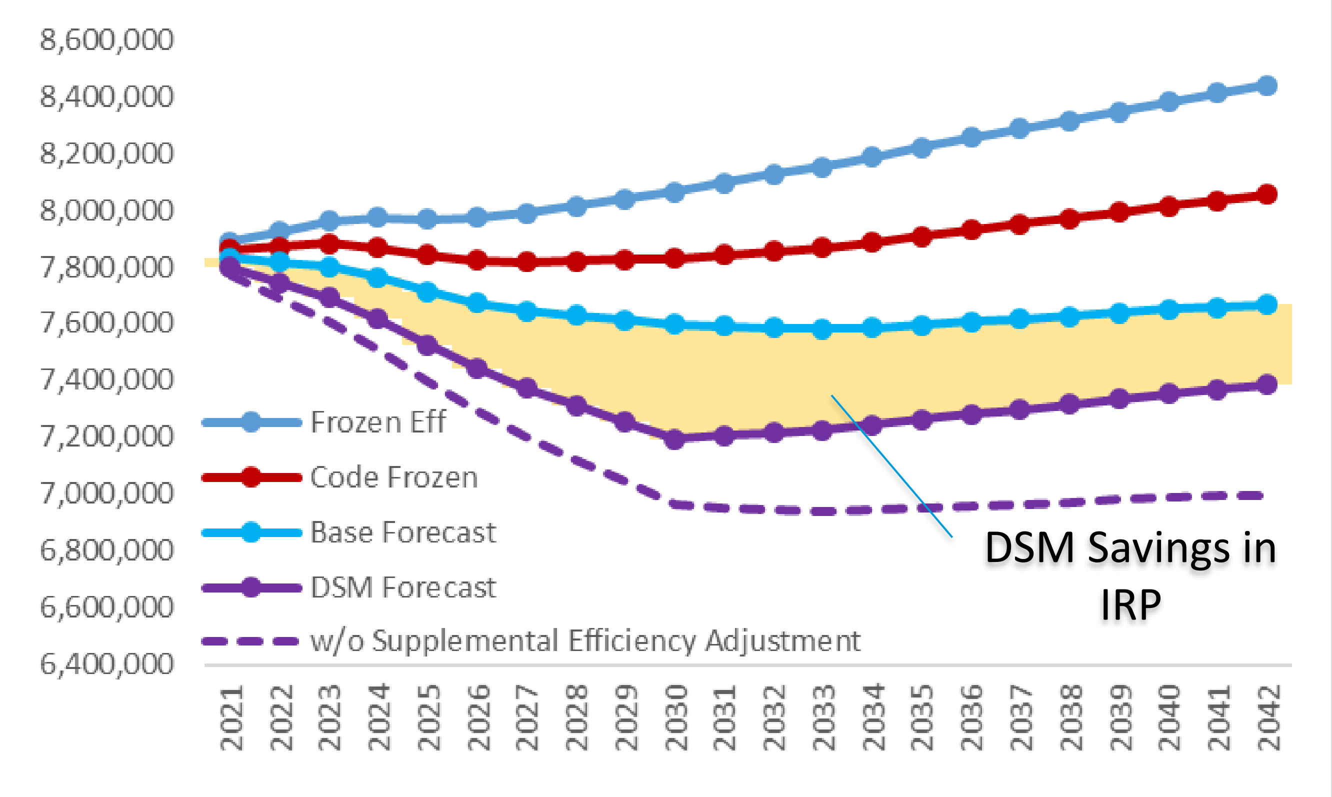
- Since the load forecast models assume greater efficiency savings in the forecast than the MPS baseline, the savings used in the IRP optimization are computed from the teal line.
- A Supplemental Efficiency Adjustment is made to prevent double counting the impact of energy efficiency in the load forecast.
- If the IRP used the same DSM savings from the MPS without the Supplemental Efficiency Adjustment, the total impact of energy efficiency would be overstated in the IRP (purple dashed line).

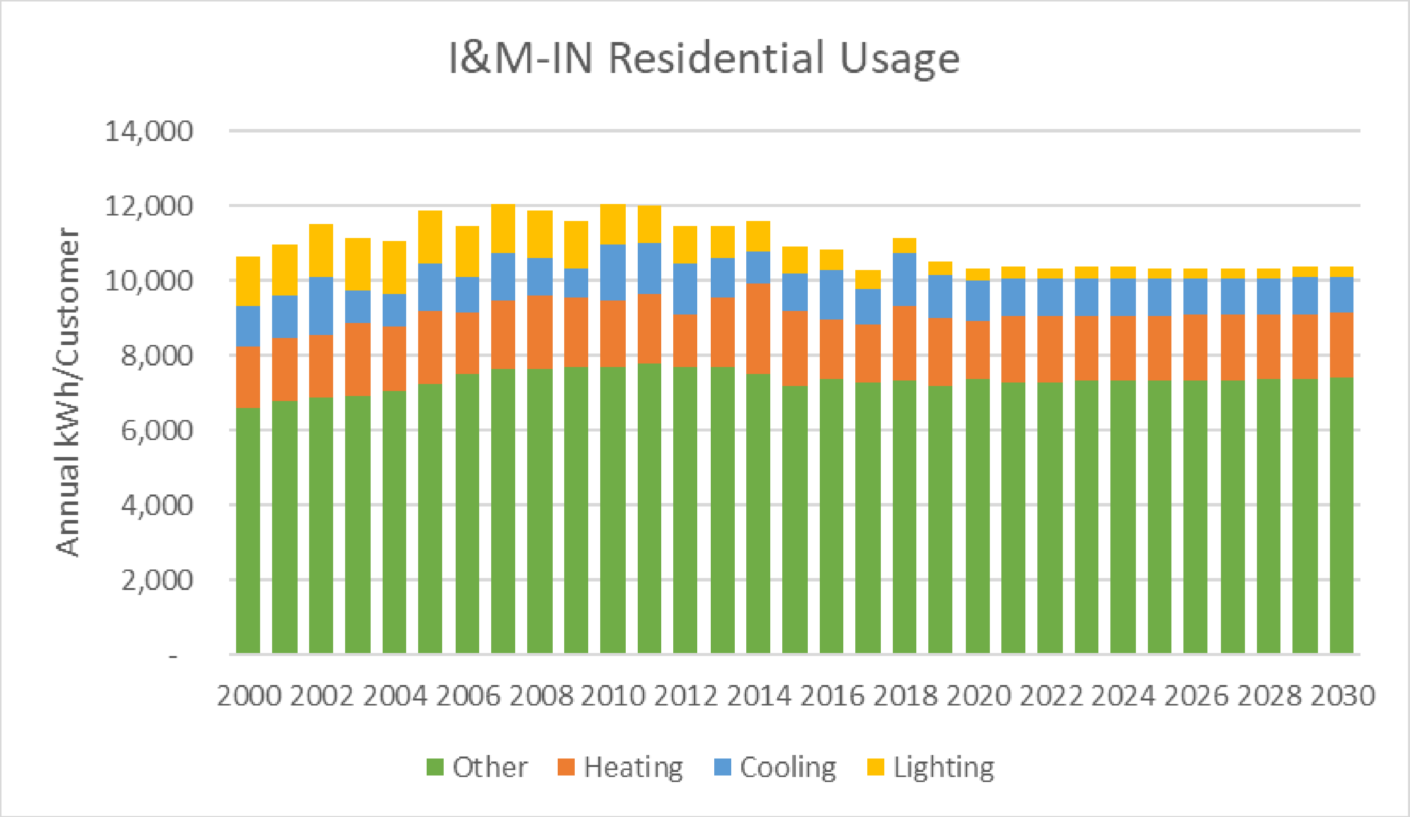


Near-term vs Long-term DSM/EWR Assumptions

- I&M's load forecast has multiple applications:
  - Regulatory (Base Rate Cases, Fuel Filings, Integrated Resource Plans, etc.)
  - Finance (Budgeting, Earnings Guidance, Financing, etc.)
- In every application, the near-term DSM/EWR assumptions come from the most recently filed/approved DSM/EWR portfolio (usually a 3-year cycle).
- Long-term DSM/EWR savings are solved for as part of the IRP optimization modeling. Therefore, the load forecast that goes into the IRP modeling only includes the impact of currently filed programs.
- Long-term financial forecast uses the DSM/EWR savings selected in the most recently completed IRP.

Load Forecast By End Use

- The SAE model provides the ability to dissect the load forecast by end-use type.
- This is important when evaluating DSM/EWR programs that target a specific end-use and it's impact on the I&M system load shape.



FEEDBACK AND DISCUSSION

PRELIMINARY IRP INPUTS

SIEMENS PTI TEAM

Overview – Demand Side Management

Siemens PTI, GDS and the I&M IRP team will collaborate on developing the forecasted inputs needed to include Demand Side Management (DSM) Resources in the analysis.

The AEP I&M IRP will include the following DSM options:

- Energy Efficiency (EE)
- Demand Response (DR)
- Distributed Energy Resources (DER)

Each DSM Resource option will be treated differently in the IRP approach and will be discussed in more detail later.

- Energy Efficiency → Optimized Approach
- Demand Response → Non-Optimized Approach*
- Distributed Energy Resources → Common Portfolio Approach

*Capacity additions of DR resources will be defined for each scenario. Note, however, that the operation of DR resources will be optimized in commitment and dispatch.

Energy Efficiency Approach

Siemens PTI, GDS and the I&M IRP team will collaborate on the appropriate bundling for the Energy Efficiency measures.

- The bundles are driven by increments of Energy Efficiency value. (breakpoints informed by MPS)

- Demand impacts will be represented on an hourly basis (8760 hours per year for the development of the candidate portfolios).

Demand Response Approach

Each candidate portfolio has an assumed quantity of demand response resources defined by the GDS Market Potential Study.

- Different candidate portfolios may have different volumes and costs for demand response.
- Siemens PTI will use the GDS-defined quantities of Demand Response capacity for the AEP I&M system in select scenarios.
- Siemens PTI will optimize the hourly operation of Demand Response resources in each candidate portfolio.

Distributed Energy Resources

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Distributed Energy Resources and their associated volume, costs, and performance characteristics are included as a part of all candidate portfolios.

- Distributed Energy Resources forecast will be identified from the Company's MPS
- Each DER technology will be an individual resource

IRP Inputs – DSM Overview

Siemens PTI, GDS and the I&M IRP team will collaborate and develop a forecast and other input parameters to be implemented into the analysis. Each specific DSM measure will be treated differently based on the predetermined approach.

DSM Measure	Approach
Energy Efficiency	Volume Optimized for each candidate portfolio
Demand Response	Volume may vary by candidate portfolio
Distributed Energy Resources	Volume the same for each candidate portfolio

FEEDBACK AND DISCUSSION

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BREAK

PLEASE PLAN A RETURN BY 3:00PM EST

Time	
9:30 a.m.	WELCOME
9:35 a.m.	MEETING GUIDELINES
9:40 a.m.	OPENING REMARKS
9:50 a.m.	GRID SOLUTIONS INTRODUCTION
10:20 a.m.	MARKET POTENTIAL STUDY
12:00 p.m.	LUNCH
1:00 p.m.	IMPACTS ON LOAD FORECAST
1:30 p.m.	PRELIMINARY APPROACH FOR IRP
2:00 p.m.	BREAK
2:30 p.m.	STAKEHOLDER ENGAGEMENT
2:45 p.m.	STAKEHOLDER PRESENTATION
3:00 p.m.	NEXT STEPS AND CLOSING REMARKS
3:30 p.m.	ADJOURN

STAKEHOLDER PROCESS AND Q&A

Stakeholder Timelines

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March 9, 2021 ✓	April 14, 2021 (this session)	May TDB, 2021 (tentative date)	July 14, 2021 (tentative date)	September 14, 2021 (tentative date)
2021 IRP Process	DSM IRP Inputs and Modeling	AURORA Technical Workshop	Draft Candidate Portfolios	Probabilistic Modeling Results
Objectives and Metrics	EE/EWR, DR and DER Results		All-Source RFP Results	Review of Preferred Portfolio
Proposed Scenarios	2021 IRP Update		Stochastic Modeling Approach and Assumptions	Other(s)
Base Case Inputs				

All-Source RFP Timeline

- **March 26:** Draft RFP Available ✓
- **April 9:** RFP Stakeholder Meeting ✓
- **April 23:** Issue RFP
- **May 21:** Responses Due

FEEDBACK AND DISCUSSION

STAKEHOLDER PRESENTATION

CLOSING REMARKS

ANDREW WILLIAMSON | DIRECTOR, REGULATORY SERVICES

THANK YOU!

Indiana Michigan Power Company

2021 Integrated Resource Plan

Stakeholder Workshop #3A Meeting Minutes

1. Welcome and Safety Moment – Andrew

Andrew kicked off the meeting at 9:30 and covered slides 1-5.

Andrew kicked off the meeting and welcomed participants to the 2021 I&M Integrated Resource Plan (IRP) stakeholder workshop. Andrew reviewed a safety moment for heat safety.

2. Meeting Guidelines – Jay Boggs, Siemens PTI

Jay covered slides 5-8

Jay introduced the Meeting Guidelines section and its content and established the role of Moderator for the Stakeholder Meeting.

Meeting guidelines and agenda were discussed.

Jay also provided an overview of the Questions and Feedback process, including directing stakeholders to submit comments and stay informed at the I&M IRP Website: http://www.indianamichiganpower.com/info/projects/IntegratedResourcePlan.

In addition, stakeholders are encouraged to submit questions via email to I&MIRP@aep.com

3. IRP Process and Tools – Peter Berini, Siemens PTI

Peter covered slides 9-19

Peter covered definitions to be used throughout the presentation, specifically bolded definitions.

Peter covered the IRP overview and explained that the IRP is a roadmap of where the organization (AEP I&M) is going and how AEP I&M is going to get there. I&M partnered with Siemens to create the reference portfolio and set of candidate portfolios with the incorporation of stakeholder feedback. Reference and candidate portfolios will be analyzed to identify the preferred portfolio.

Peter then reviewed the 5-step process of creating, screening, analyzing, and reporting portfolios.

Peter went through each step-in detail on slides 14-19 and pinpointed which step in the 5-step process was completed and where Siemens is currently at in the process (Step 3 "Create Reference & Candidate Portfolios")

On slide 16, Peter noted the 2 scenarios AEP I&M and Siemens have landed on which include #7-8 (Rapid Technology Advancement & Enhanced Regulation scenarios) and gave high level detail of the assumptions behind each.

Feedback and Discussion

Oral questions from the audience

Comment on Peters comment regarding "metrics and objectives vetted with stakeholders"; The following disagreements were noted: Already submitted comments related to metrics including AURORA not calculating NPV and diversity metric. Think balanced scorecard is biased. Does not believe their comments were considered.

Q: Question about Rockport 50% scenario and what the 50% represents.
A: Peter B clarified 50% was referring to ownership.

Q: Follow up if the selling of the remaining 50% not owned is included in the IRP process.
A: Andrew W responded with IRP only modeling 50% and other 50% is excluded all together from the modeling.

Concern given on capturing the total Rockport economics.

Q: OVEC sensitivity question.
A: Andrew responded with OVEC being a contract obligation incorporated into the modeling consistent with past IRP filings.

Q: Slide 16, concerned this is conflating portfolios and scenarios. 1-6 appear to be constraining resource selection based on items identified in notes. 7-8 appear to be actual changes to scenarios.
A: Peter B specified this is correct, 1-6 are sensitivities based off reference scenario and 7-8 are scenarios which produce more than 1 portfolio for inclusion.

4. Informational RFP's -Angelina Martinez

Angelina covers slides 21-25

Angelina covers the process that Siemens PTI follows for the All-Source Informational RFP

Clarifying questions regarding acronyms including:

PPA- Power purchase agreement
BOT- Build own transfer

Small/local developers not analyzed, international companies included and analyzed (ex: NextEra).

Jay asks Angelina to cover the definition of non-compliant bid. Angelina explains this includes projects not interconnected to PJM, COD not after 2024 and locals without terms or conditions which are considered outliers.

5. I&M 2021 IRP Reference Case, Peter Berini and Thijs Everts

Peter covered slides 28-33

Peter kicks off this section by reviewing the scenario inputs and key drivers on slide 28 as well as a review of AURORAxmp and the way the analysis will be using the model on slide 29.

Peter notes that all inputs seen today will be in 2019$. Reviews input graphs in slides 30-33.

Thijs covered slide 34

Thijs reviews transmission topology on slide 34. Covers the AEP I&M to AEP zonal structure as well as specifying NYISO is running as well but is not shown on slide due to size constraints.

Feedback and Discussion:

Oral questions from the audience

Q: What is basis for 15$/ton CO2 cost in 2028 and the annual increase?
A: Connie T responds saying it was developed internally with environmental team at AEP. She clarified it is not meant to be carbon tax, but a carbon burden. Escalation was reasonable estimate and timing was determined to be reasonable time to implement.

Q: Natural Gas is already above the forecasted price for next 30 years?
A: Connie T responds they do scenarios around base case. Was using EIA at the time this was developed. Stochastic analysis should cover the higher prices we are currently seeing in the market.

Q: Comments on OVEC not considered. I&M should evaluate OVEC sensitivities.
A: Andrew W responds saying I&M will provide supplemental analysis regarding OVEC in I&M's Michigan IRP filing in Dec 2021 as specified in the settlement agreement in I&M's last Michigan IRP filing

Q: Supplemental filing will include modeling that does not include OVEC units?
A: Will provide all information necessary to comply with the settlement agreement and other applicable Michigan orders.

6. Resource Options – Supply Side – Thijs Everts

Thijs covers slides 36-42

Thijs reviews different technologies as well as their advantages and disadvantages. He then covers renewable tax credits.

Feedback and Discussion:

All questions discussed in this section are recorded in the following Questions Section of the minutes.

7. Resource Options – DSM/EWR, Thijs Everts, Siemens PTI, Chad Burnett, AEP Load Forecasting, Huber, GDS Associates

Thijs covered slides 44-46

Thijs discussed a general overview of the various DSM options (EE, DR, DER). Levered info from GDS and Brightline.

Jeffery covered slides 47-52

Thijs passes slides onto Jeffery Huber (GDS) who begins to cover on slide 47 and goes through greater detail on the development of the EE bundle inputs. Cost based approach, end-use based approach and value-based approach were analyzed and ultimately the value-based approach was decided to be used for the EE inputs. Jeffery goes into deeper detail regarding the clustering approach on creating the bundles.

Question

Q: Slide 49 – What do the cost and benefits metrics measure on slide 49?
A: Actual metric was lifetime NPV. Charts don't show that, they show statistical distribution points to create clusters/ basically how they relate to each other. Actual values don't mean anything, but the relationships are what is important here.

Thijs covered slides 53-55

Thijs covered the way Siemens PTI will be representing each bundle with graphs in slide 53. Solid line represents fixed cost, dotted lines represent O&M for both Indiana and Michigan separately but structured the same way. DR programs only turn on 5 hours a year, most for 2 hours in a day.

Chad Burnett covered slides 56-59

Chad begins with discussion on how AEP I&M reached out to other utilities in Indiana and Michigan to get different approaches as well as Itron for EE approach following stakeholder questions in 2nd stakeholder meeting. Majority use Itron approach across industry, specifically Indiana and Michigan.

Feedback and Discussion:

Q: Difference between Clusters vs Bundles vs Blocks? Different End use measures spread across different blocks or bundles?

A: Clusters like bundles, all relatively synonymous. Possibly a similar end use ends up in different cluster or bundle depending on end net use. It is possible measures occur in separate bundles depending on benefit and cost.

8. Scenarios: Peter Berini

Peter covers slides 62-65

Peter gives brief overview of proposed scenarios and highlights changes. Note's selection of proposed scenarios was selected by regulations and proposals as well as taking stakeholder feedback into account. Peter calls out last bullet on net zero carbon by 2050 on slide 63, specifying it is creating an economic incentive for portfolio to optimize around.

Peter goes into slightly deeper detail regarding the reference case and 2 scenario assumptions.

Feedback and Discussion:

Q: Is there the ability for Natural Gas Combined Cycle 2x1 to be built at smaller increments (allowing partial builds)?

A: Yes, the Natural Gas Combined Cycle 2x1 is only resource that was allowed to be partially build (and EE).

Q: Are there various potential limits on solar, particular to low tier solar costs?

A: The plan is to present any technology limits, incremental and cumulative in stakeholder meeting 3B. These items are still under review.

9. Stakeholder Session

Jay reviews slide 68 and the process for this stakeholder session to take place.

In previous stakeholder meeting, polls were taken to solicit feedback if the proposed scenarios were sufficiently broad and diverse for the IRP analysis. The results of the polling suggested stakeholders were not sure if they were.

As a result of this polling and other stakeholder feedback, it was felt by the I&M IRP Team and I&M leadership that we need to provide the opportunity for stakeholders to comment further, providing guidance on specific strategies that should be analyzed. This can be in the form of scenarios, sensitivities from already identified scenarios, or the designation of specific market, economic, resource-specific, or other not previously identified options.

Once again, key in this process is obtaining feedback from stakeholders. This will only improve the process and end result.

Jay asked for feedback from the stakeholder group. Comments:

Anna Sommer responds – gas prices appear to be assuming stable prices throughout year, not seasonal which could be an important thing to look at. Feb 16 126$/MMBtu as an example. Look at hourly level the value of different resources on those types of assumptions. Jay clarifies are you looking to incorporate black swan event? Anna responds if this becomes frequent event and if prices spike in similar winter events, how would that affect value of resources?

Jennifer Washburn: back to SEA, could they have separate meeting dedicated entirely to SEA discussion.

Doug Jester: Mentions Anna volatility question. Gas prices are volatile in short term even absent extraordinary event. Anything regarding storage is absent when using averages as the idea of storage is to take advantage of those extremes/volatility.

Reliability/resource adequacy is different than customer reliability. Customer reliability issues are largely distribution issues. Micro grids don't affect all but do affect some. Thinking about DG to customers should be accounted for in evaluating those resources. Refers to EE resources as well. We tend to not value customer benefits of those types of generation.

Art responds to Anna and Doug on volatility: we will try to address very high and very low gas prices in step 4. Capture "extremes" and uncertainty is all areas (gas/coal/etc.) in stochastics.

Anna: what do those look like? How do you correlate from day to day? Art: Correlations are considered. Not many strong correlations except for a small one between gas and CO2. Allow for extreme weather events to impact load. Intent is to look at 95th and 99 percentiles.

Anna: still does not capture the volatility this refers to since they are averaged.

Jay reviews slide 71 and stakeholder process timeline. Session 3B in August.

10. Closing Remarks

Andrew Williamson responds regarding EE/SEA questions brought up throughout the presentation. I&M has taken significant steps to thoroughly evaluate the stakeholder feedback we have received, including the benchmarking results that were discussed by Chad Burnett earlier today. I&M is committed to providing customers with options to better manage their electric bills in a cost-effective manner. We will continue to consider this matter as we are completing our modeling and determining our preferred plan. EE is an important component to the IRP for I&M and many of its stakeholders, but it is one component of a much larger IRP that I&M will use to evaluate and support significant near-term resource actions. Given the timing of these resource actions and our regulatory filing requirements it is necessary we maintain our IRP timeline.

11. Appendix A: List of Questions Answered on Call

List of questions addressed on the call:

Question Asked	Answer
Do you ever run R-A Sensitivity and R-B Sensitivity together? Do you ever consider an earlier retirement of the whole Rockport plant?	As answered by Andrew
I have some questions for Peter when he's at a stop pointing.	As answered by Andrew W and Peter B
Does that mean that I&M is considering buying Rockport unit 2 now and then sell it right away	Expectation is that ownership would be consistent with today's structure whereby I&M and AEG have 50% of Rockport 2, respectively, with the difference being Rockport Unit 2 will be owned by both entities, not leased.
What about Anna's OVEC question? Thanks.	As answered by Andrew
Why is resource diversity only baseload resources?	The metric for resource diversity should have been related to the number of distinct resources and technologies in the I&M portfolio (not limited to baseload resources). We will present our proposed approach for calculating this metric in the Stakeholder meeting. .
To follow up on Peter's questions, will you be dispatching to price or load? And if the latter, will you put in a maximum reserve margin constraint?	The analysis will be conducted to ensure that load is served reliably and affordably and with consideration of AEP's sustainability objectives. A maximum reserve margin metric would be inappropriate and produce potentially perverse outcomes, but surplus capacity will be captured in the cost metrics.

Is I&M considering buying Rockport unit 2 and then selling it or a portion of the unit to another AEP subsidiary?	Andrew W responds AEP I&M has no plans to buy Rockport 2 and selling. Expectation is that ownership would be consistent with what it is today at 50% ownership.
What is BOT? Is that Build Transfer?	As answered by Angelina Martinez
One question that I didn't get to ask: Could you please provide more detail as to how you plan to implement what you mentioned as modeling to implement AEP's goal of net zero carbon by 2050? If you don't have time to talk about that today a written response would be fine.	AEP's IRP will consider the requirements for a net 0 carbon by 2050 goal. Since the IRP filing will only be through 2040, actual achievement of that goal will not be reflected in the IRP filing, but the necessary progress toward that goal will be.
To what extent do the renewable prices/LCOEs include federal tax credit availability? Does that vary across the responses?	Renewable cost and performance inputs into the IRP process reflect the benefits of ITCs and PTCs to the extent those credits are available in the years that resources enter commercial operations.
Which companies bid into the RFP?	As answered by Angelina Martinez
Are you considering future stranded asset costs associated with any new CC/CT generation?	Any new CC and CT capacity will be modeled to operate through the Forecast Horizon.
Do you have a list of companies? The other IOUs have been providing a list of those who submitted bids.	As answered by Jessica.
How do these prices for utility scale solar compare to the EDG rate for rooftop solar under HEA 309?	The proposed EDG rate in Cause No. 45506 is \$0.02451/kW for nameplate capacities not more than one (1) megawatt. LCOE's for Utility Scale Solar range from \$52- \$56/MWh.
Why were the smaller bidders not compliant?	A few bidders did not conform to the requirements of the bid and were thus considered non-compliant. Examples include not being in the PJM Zone, proposals missing price and not credit worthy offtakers.
Does I&M have a theory about why this RFP got so few responses? NIPSCO received over 100 renewable bids in response to its last RFP.	No, we do not.
Could you please provide a list of why bidders were eliminated?	As answered by Jessica.
What was the basis for the \$15/ ton co2 cost in 2028 and the annual increase?	As answered by Connie
Natural gas prices are already above your forecasted prices for the next 30 years. Does that price forecast need to be changed to reflect the recent large runup in prices?	As answered by Connie

Are you modeling this full topology as part of portfolio optimization? Or is just the topology you are using for market price forecasting?	The topography shown in the stakeholder presentation is used to construct candidate portfolios and to conduct the analysis of the candidate portfolios for any metrics that are determined through computer simulation modeling.
At what point will I&M turn over the documents, workbooks, etc. supporting the reference case assumptions? It's hard to react to these on the fly and in a vacuum of understanding how they were developed.	Once the Reference Case is completed, we will immediately proceed to prepare for stakeholder review the collection of inputs related to the Reference Case. Our goal is to have these items ready for stakeholders to review prior to Stakeholder Meeting #4.
Could you explain your electric vehicle demand? That demand will vary with the rate of charging, won't it? Is it some kind coincident demand?	The electric vehicle demand was derived off the EV energy forecast provided to Siemens PTI. The forecast was used to calculate a MW number and then Siemens applied a typical charging shape to determine the MWs of EV.
Are you also going to relax the integer settings on other resources then?	No. Furthermore, we removed this option for the CC 2x1
Why is CC and CT FOM so low?	As answered by Holt B and Thijs E
Are FOM assumptions that are prepared by AEP IM confidential/proprietary (w/reference to note on slide 39)?	As answered by Greg S
how much of each resource will you let the model pick? This is one of the assumptions that the MI IRP settlement requires I&M to work with stakeholders on.	The MI Settlement includes an agreement to “work with stakeholders to define the modeling inputs for the IRP”. During this meeting, we specifically asked for input and feedback related to strategies, scenarios, sensitivities, and the designation of specific market, economic, resource-specific options. Receiving specific stakeholder input around these inputs is very important to the process. We encourage all stakeholders to provide **at any time**, specific feedback so that we can incorporate your comments into the analysis. You can register your feedback on the I&M website, via email, and during stakeholder meetings. We intend to continue to provide specific assumptions related to capital costs, amounts of resources and other inputs during the next stakeholder meeting.
Do the CVR measures represent existing deployments, new deployments, or both?	As answered by John W
Does it make sense to treat CVR for residential customers separately from C&I? They are often on the same circuit.	As answered by John W

The restrictions on hours of DR call seem pretty small compared to what is often used. This would be especially true for residential adjustments such as thermostat adjustments	IRP model inputs for DR were reviewed and modified to be consistent with the I&M summer cooling season DR event-hour opportunity set forth in I&M's DR tariffs, which allows I&M the opportunity to call up to 15 events/year with the typical per-event window at 3 hours/event. The hours modeled exceed the Company's experience of actual DR hours called over the past several years.
What do the "cost" and "benefit" metrics measures on slide 49?	As answered by Jeffrey H
How will costs of EE be modeled, as levelized costs or in as spent dollars?	EE costs will be analyzed as incurred and will not be levelized to ensure a fair comparison to all other competing resources.
Why are there no optimized DR bundles? During the 2nd workshop Jeffrey said that they would also be evaluating new DR measures.	As discussed in the stakeholder presentation, Siemens PTI will use the results of the Market Penetration Studies to determine potentially varying amounts of DR to be included and tested across candidate portfolios. DR will not be optimized in each candidate portfolio to minimize computer resource burdens and ensure that credible results emerge from the optimization process for each candidate portfolio.
Additional questions for slide 49: • Do each of the colors represent bundles?	As answered by Jeffrey H
What does each individual point represent? Is each point a single measure?	As answered by Jeffrey H
Questions for Jeffrey: What is the difference between a cluster, bundle, and block? Is it possible that similar end-use measures will be spread across different blocks/bundles?	As answered by Jeffrey H
You can delay the IRP submission in IN and MI, and we will support you on that. This has shown to be terrible for EE investments.	As answered by Andrew W
But there's only one DR bundle per sector, so how would you test different levels of DR?	Different candidate portfolios can have differing amounts of DR. By comparing the performance characteristics of different candidate portfolios with differing amounts of DR we can assess the relative contribution of varying levels of DR. To take full advantage of this approach, we will need to structure competing candidate portfolios that are largely similar except for their varying levels of DR.
Please allow for good discussion. We are okay running late. This is important.	As answered by Andrew W

We disagree. It will have material change.	As answered by Andrew W
We support you on turning IRP in late	As answered by Andrew W
Please note that I&M can turn in IRP late. This is important to fix now	As answered by Andrew W
Setting aside our disagreement about whether degradation is proper or not, if it doesn't change the load forecast, then leave the forecast alone but remove it for EE. It has a huge impact on EE. And as Chad noted, none of the utilities I&M reviewed making any adjustments to EE bundles. That is what we care about the most and has the biggest impact. And that can be removed easily and without causing a delay to this IRP.	The Company pointed out on slide 56, that the average DSM variable coefficient was within 1% of the total impact over the life of the program from using the Company's Supplemental Efficiency Adjustment matrix. The mix of DSM programs (which classes and end-uses are targeted) would determine the size of the change in the load forecast compared to the SEA approach. As discussed byMr. Burnett during the meeting, the survey of peer utilities confirmed that the majority of utilities that are using Itron's SEA models are making adjustments to the DSM savings amounts, consistent with the Company's approach, to prevent double counting the energy efficiency amounts in the forecast.
We provided feedback on this SEA problem early on and in prior IRPs. Please make the change now in this IRP cycle. It warrants turning in the IRP late. We would like a meeting with IN and MI PUC staff to discuss this ASAP	As answered by Andrew W. The proposed meeting is being taken under consideration.
The fact that we are not talking about those technology limits is symptomatic of our concerns about I&M not utilizing stakeholder feedback. We should be talking about them now and not when they are finalized.	Specific assumptions related to capital costs, amounts of resources and other inputs will be provided in next stakeholder meeting. Furthermore, Stakeholders are also encouraged to submit their questions and comment at any time through the I&M IRP email address at any time.
Just to clarify, when we get a chance to see the specific assumptions around resource capital costs, amounts of resources that the model will be able to select from, etc., we will have additional feedback on whether these scenarios capture a reasonable range of scenarios.	
I believe I mentioned this at the first meeting, but Sierra Club does question the inclusion of reliability as a metric, since you would not plan a system that doesn't meet reliability metrics.	Reliability is considered an **objective** and not a metric of I&M's Integrated Resource Plan, as was explained and affirmed by feedback received in Stakeholder Meeting #1. Correct, AEP I&M would not plan an unreliable system. This does not mean that we would not include reliability as an objective of the IRP process. As AEP I&M continues the process of refining and measuring candidate portfolios for a balance of

	reliability, affordability, and sustainability, additional attention may be required on reliability to ensure a reliable system is maintained. However, there are varying degrees of reliability that may be related to economic risk. We ask all stakeholders to continue to provide recommendations as to what **metrics** (qualitative and quantitative) you believe we should use to properly assess our stated **objectives**.
Jay, I think your tone with Jennifer Washburn was inappropriate - it caught me off guard and made me feel uncomfortable. Additionally, while I appreciate there's been conversations offline on this subject, having you provide some background on what the exchange was about for those who weren't part of those discussions would have been helpful.	We sincerely apologize if the tone was believed to be inappropriate. The intent was to continue to keep the conversations related to the topics being presented. We will arrange for more time for Q&A in Stakeholder Meeting 3B.
It would be helpful to see everyone's questions even if you aren't planning to address them all. Will that be available afterwards at least?	Yes, the questions will be available in the posted Meeting Minutes

Indiana Michigan Power:
2021 Integrated Resource Plan
Public Stakeholder Meeting #3A

July 27, 2021

Presented via GoToWebinar --> https://attendee.gotowebinar.com/register/2455690913279924

BOUNDLESS ENERGY℠

Agenda

Time		
9:30 a.m.	WELCOME AND SAFETY MOMENT	**Toby Thomas**, President and COO I&M, **Andrew Williamson**, I&M Director Regulatory Services
9:40 a.m.	MEETING GUIDELINES AND AGENDA	**Jay Boggs**, Siemens PTI
9:45 a.m.	IRP PROCESS AND TOOLS	**Peter Berini,** Siemens PTI
10:00 a.m.	INFORMATIONAL RFP'S	**Angelina Martinez,** Siemens PTI
10:15 a.m.	REFERENCE CASE DEVELOPMENT	**Peter Berini,** Siemens PTI, **Thijs Everts,** Siemens PTI
10:45 a.m.	BREAK	
11:00 a.m.	RESOURCE OPTIONS – SUPPLY SIDE	**Thijs Everts**, Siemens PTI
11:30 a.m.	LUNCH	
12:30 p.m.	RESOURCE OPTIONS – DSM	**Thijs Everts**, Siemens PTI, **Chad Burnett**, AEP Load Forecasting, **Jeffrey Huber**, GDS Associates
1:15 p.m.	SCENARIOS	**Peter Berini,** Siemens PTI
1:30 p.m.	STAKEHOLDER INTERACTION	**Art Holland**, Siemens PTI, **Jay Boggs**, Siemens PTI
2:00 p.m.	ADJOURN	

WELCOME AND SAFETY MOMENT

Safety Moment

MEETING GUIDELINES

JAY BOGGS | SIEMENS PTI

Questions and Feedback

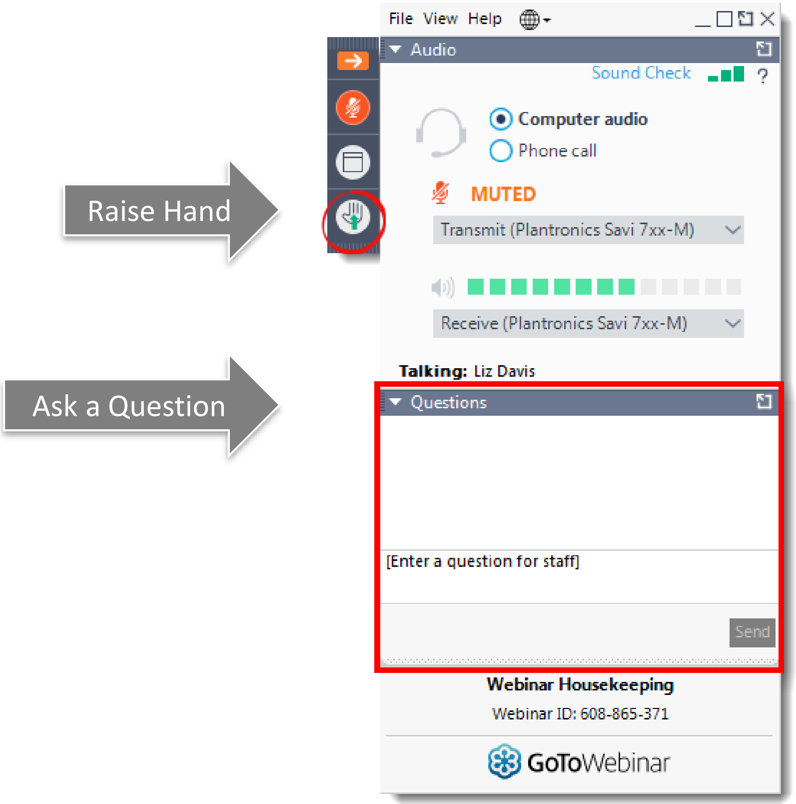
The purpose of today's presentation is to explain the IRP process and collect feedback from stakeholders. Stakeholder feedback will be posted on the I&M website IRP portal and will be considered as part of the Final IRP.

If you have a question about the IRP process during this presentation:

- Type your question in the Questions area of the GoToWebinar panel
- During the feedback and discussion portions of the presentations, please raise your hand via the GoToMeeting tool to be recognized
- Time permitting, we will address all questions and hear from all who wish to be heard
- Any questions that cannot be answered during the call will be addressed and posted on the website above

If you would like to make a comment or ask a question about the IRP process after the presentation has concluded:

- Please send an email to I&MIRP@aep.com
- Stay informed about future events by visiting the I&M IRP Portal located at www.indianamichiganpower.com/info/projects/IntegratedResourcePlan



Guidelines

1. Due to the number of participants scheduled to join today's meeting, all will be in a "listen-only" mode by default.

2. Please enter questions at any time into the GoToWebinar portal. Technical questions related to the GoToWebinar tool and its use will be addressed by the support staff directly via the chat feature.

3. Time has been allotted to answer questions related to the materials presented. Unanswered questions will be addressed after the presentation and posted in accordance with the Questions and Feedback slide.

4. At the end of the presentation, we will open-up the floor for "clarifying questions," thoughts, ideas, and suggestions.

5. Please provide feedback or questions on the Stakeholder Meeting #3A presentation within ten business days of the conclusion of the meeting.

Agenda

Time		
9:30 a.m.	WELCOME AND SAFETY MOMENT	**Toby Thomas**, President and COO I&M, **Andrew Williamson**, I&M Director Regulatory Services
9:40 a.m.	MEETING GUIDELINES AND AGENDA	**Jay Boggs**, Siemens PTI
9:45 a.m.	IRP PROCESS AND TOOLS	**Peter Berini,** Siemens PTI
10:00 a.m.	INFORMATIONAL RFP'S	**Angelina Martinez,** Siemens PTI
10:15 a.m.	REFERENCE CASE DEVELOPMENT	**Peter Berini,** Siemens PTI, **Thijs Everts,** Siemens PTI
10:45 a.m.	BREAK	
11:00 a.m.	RESOURCE OPTIONS – SUPPLY SIDE	**Thijs Everts**, Siemens PTI
11:30 a.m.	LUNCH	
12:30 p.m.	RESOURCE OPTIONS – DSM	**Thijs Everts**, Siemens PTI, **Chad Burnett**, AEP Load Forecasting, **Jeffrey Huber**, GDS Associates
1:15 p.m.	SCENARIOS	**Peter Berini,** Siemens PTI
1:30 p.m.	STAKEHOLDER INTERACTION	**Art Holland**, Siemens PTI, **Jay Boggs**, Siemens PTI
2:00 p.m.	ADJOURN	

I&M 2021 IRP PROCESS AND TOOLS

Definitions

Term	Definition
AURORAxmp	Electric modeling forecasting and analysis software. Used for capacity expansion, chronological dispatch, and stochastic functions
Condition	A unique combination of a Scenario and a Sensitivity that is used to inform Candidate Portfolio development
Deterministic Modeling	Simulated dispatch of a portfolio in a pre-determined future
Renewable Portfolio Standards	Renewable Portfolio Standards (RPS) are policies designed to increase the use of renewable energy sources for electricity generation
Portfolio	A group of resources to meet customer load
Preferred Portfolio	The portfolio that management determines will perform the best, with consideration for cost, risk, reliability, and sustainability
Probabilistic modeling	Simulate dispatch of portfolios for several randomly generated potential future states
Reference Scenario	The most expected future scenario that is designed to include a current consensus view of key drivers in power and fuel markets (reference case, consensus case)
Scenario	Potential future State-of-the-World designed to test portfolio performance in key risk areas important to management and stakeholders alike
Sensitivity Analysis	Analysis to determine the impact of early retirements and other inputs portfolios are most sensitive to

Integrated Resource Plan Overview

The purpose of the IRP is to provide a roadmap at a point in time that AEP I&M can use as a planning tool when evaluating resource decisions necessary to meet forecasted electric energy demand. The approach is meant to balance affordability, reliability, and sustainability for customers and stakeholders in the development and selection of the **Preferred Portfolio**.

Development of Reference and Candidate Portfolio

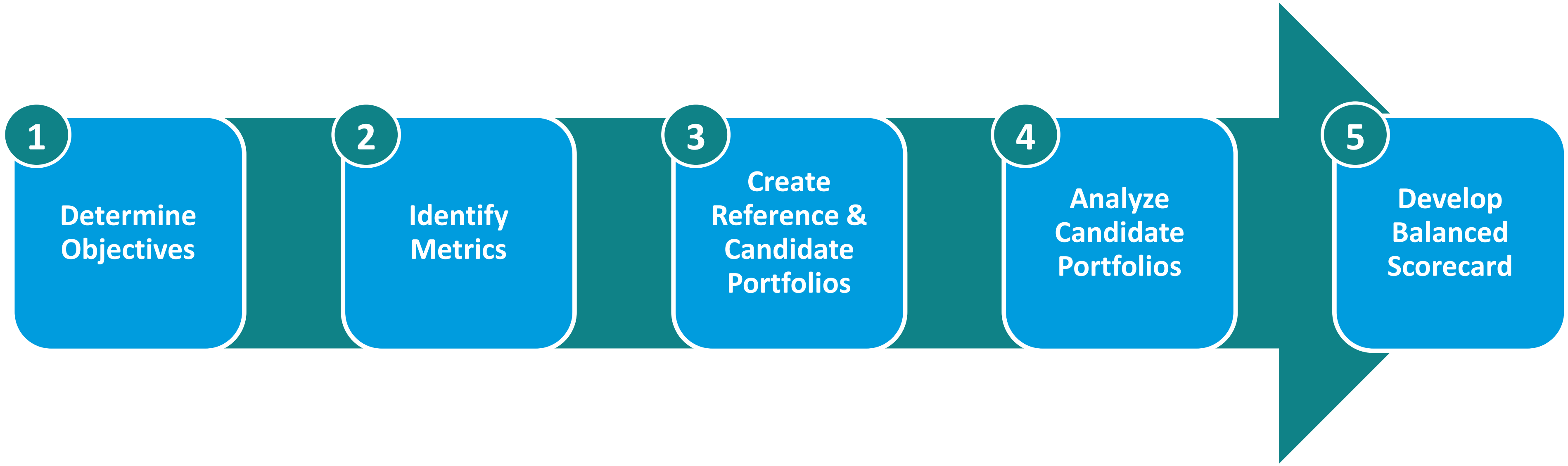
- The end goal of the IRP is to develop a **Preferred Portfolio** (set of supply- and demand-side resources) that can be used as a planning tool to inform future resource actions for electric energy demand to serve load
- I&M has partnered with Siemens PTI to create a **Reference Portfolio** and a set of **Candidate Portfolios** based on a series of inputs that are informed by various **Scenarios** and **Sensitivities**
- The **Reference Portfolio** and the **Candidate Portfolios** will be tested, analyzed and used by I&M management to identify the **Preferred Portfolio**

The discussions today will be focused on the approach and progress for developing the **Reference Portfolio**.

IRP 5-Step Process

Siemens PTI applies the following 5-Step process for modeling, analyzing, and reporting the **Reference Portfolio** and **Candidate Portfolios** related to the AEP I&M IRP. The process, detailed below, provides a holistic approach to identifying the **Preferred Portfolio** that best meets I&M's defined **Objectives** and **Metrics** over a wide range of potential future conditions.

Siemens PTI: Approach to Integrated Resource Plan Modeling



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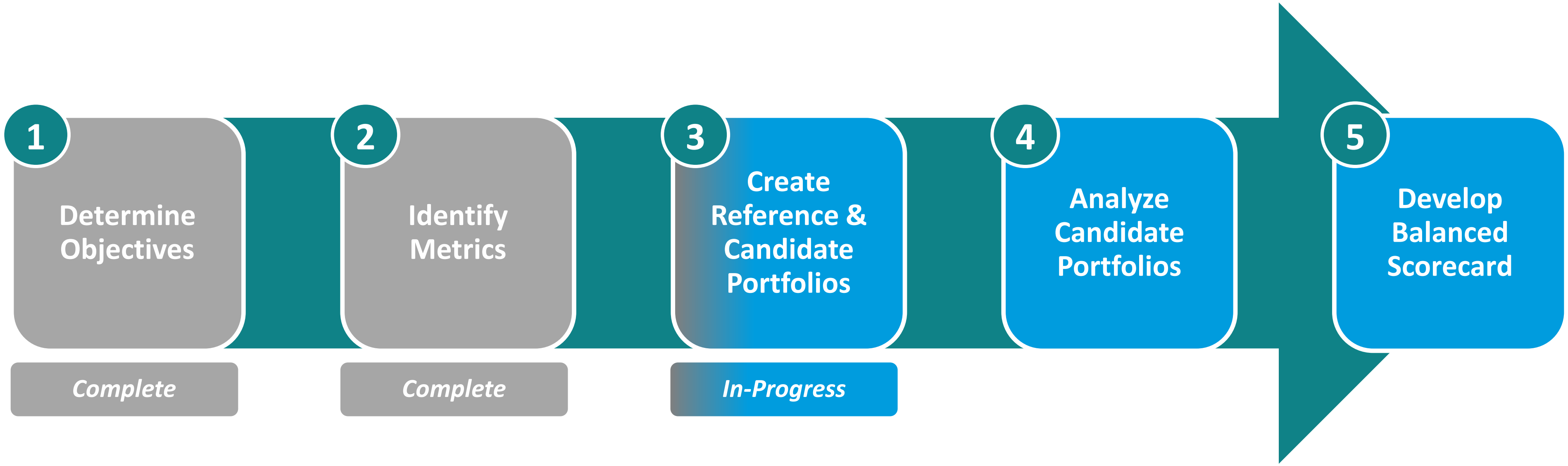

Step 1: Determine Objectives

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The purpose of the IRP is to evaluate I&M's current energy resource portfolio and a range of alternative future portfolios to meet customers' electrical energy needs in an affordable and holistic manner. The process evaluates **Candidate Portfolios** in terms of environmental stewardship, market and price risk, reliability, and resource diversity.

IRP Objectives
Affordability
Rate Stability
Sustainability Impact
Market Risk Minimization
Reliability
Resource Diversity

Each **Objective** is important and worthy of balanced consideration in the IRP process

Step 2: Assign Metrics

For each **Candidate Portfolio**, the **Objectives** are tracked and measured through **Metrics** which evaluate portfolio performance across a wide range of possible future market conditions. All measures of portfolio performance are based on probabilistic modeling of 200 futures and addressed in Step 4: Analyze Candidate Portfolios.

IRP Objectives	IRP Metric	Unit
Affordability	NPV-RR	$
Rate Stability	95^{th} percentile value of NPV-RR	$
Sustainability Impact	CO_2 Emissions	tons
Market Risk Minimization	Spot Energy Market Exposure (Purchases/Sales)	%
Reliability	Reserve Margin Exposure	%
Resource Diversity	Mix of Baseload Resources	MW

Objectives will be tracked through identified **Metrics** that will be used to measure and evaluate performance of the Candidate Portfolios

Step 3A: Create Reference and Candidate Portfolios

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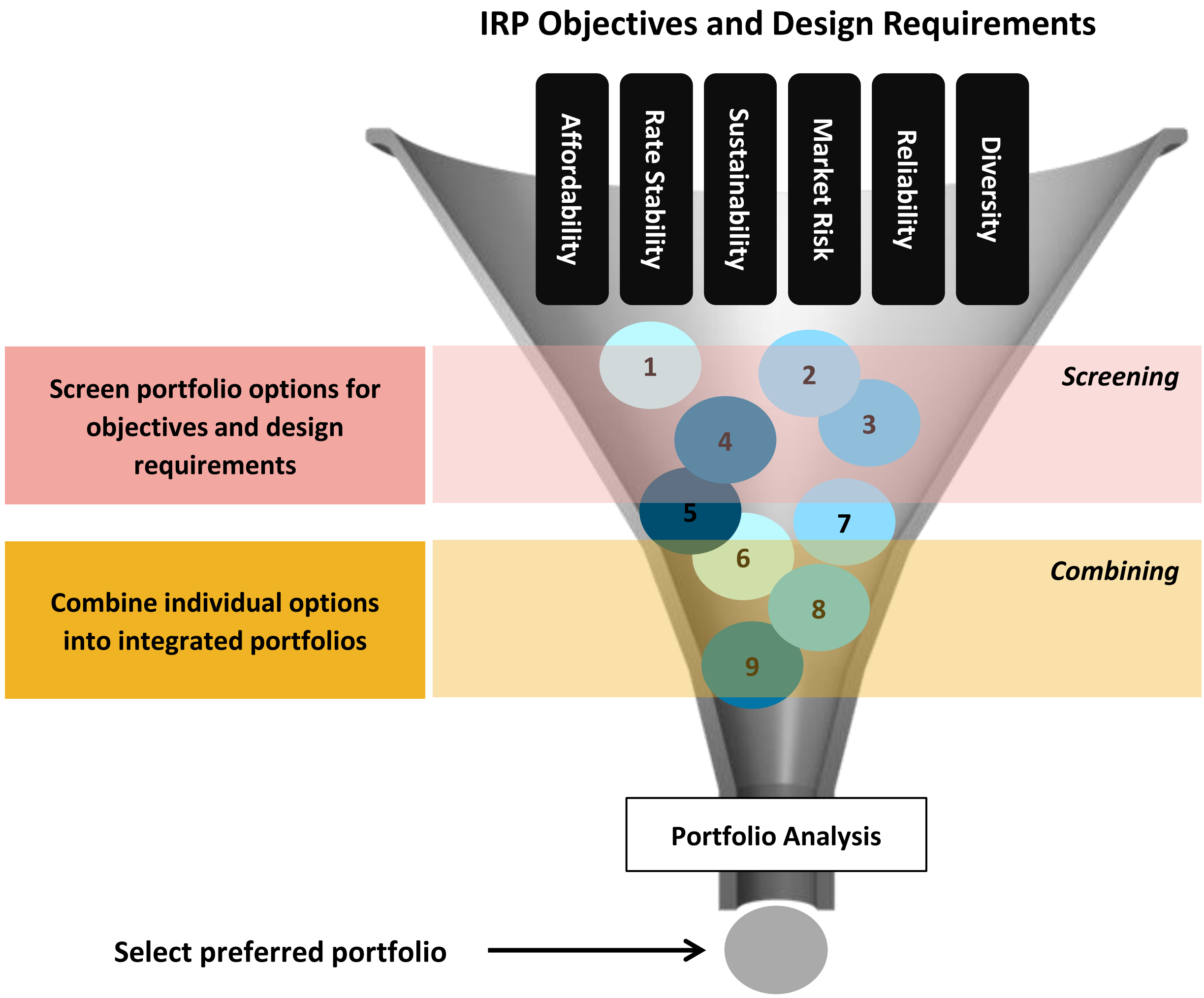
I&M and Siemens have developed **a Reference Case**, two alternative **Scenarios**, and a handful of **Sensitivities** to implement a scenario- and sensitivity-based approach to inform **Candidate Portfolios**. Each **Candidate Portfolio** will be developed from the **Scenarios** and/or the **Sensitivities** below.

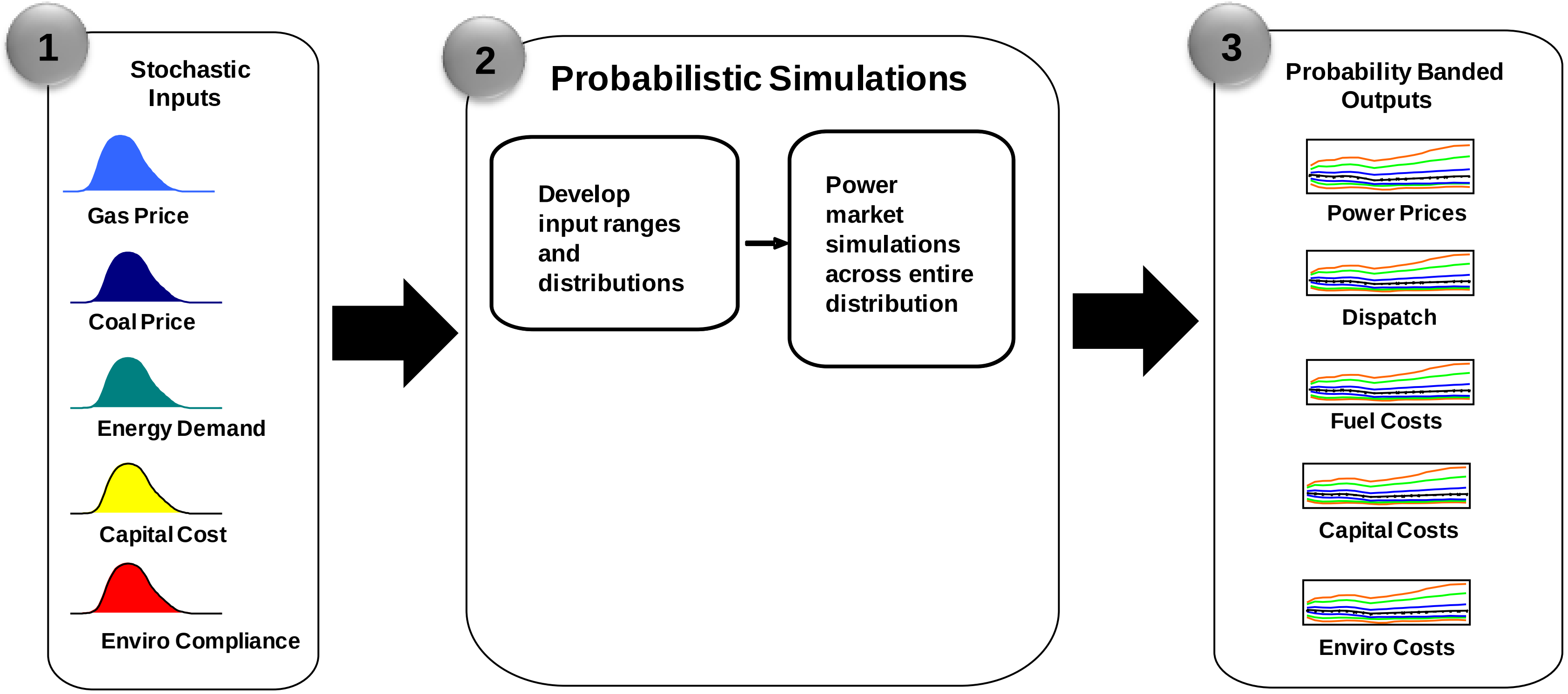
#	Group	Portfolio	Notes
1	Reference	Reference Case	Rockport (2028) and Cook (2034, 2037) Retire as Planned
2	R-A Sensitivity	Reference with Rockport Sensitivity	Rockport Unit 1 Early Retirement (2025)
3	R-B Sensitivity	Reference with Rockport Sensitivity	Rockport Unit 2 Early Retirement (2026)
4	R-C Sensitivity	Reference with Rockport Sensitivity	R-A Sensitivity : 50% of Rockport 2 Capacity
5	R-D Sensitivity	Reference with Rockport Sensitivity	R-B Sensitivity : 50% of Rockport 2 Capacity
6	C-A Sensitivity	Reference with Cook Sensitivity	Cook Unit 1 and Unit 2 License Extensions
7	Scenario	Rapid Technology Advancement	Low Renewable, Storage and EE/DR Costs
8	Scenario	Enhanced Regulation	High Commodity Prices, such as Gas, Coal and CO2

Step 3B: Screen Candidate Portfolios



Step 4: Analyze Candidate Portfolios

Candidate Portfolios are then subjected to **Probabilistic Simulations** (stochastic risk analysis) to measure performance across many future scenarios. The stochastic process will produce hundreds of internally consistent simulations that can provide a more realistic understanding of the potential variation in future scenarios.



Step 5: Develop Balanced Scorecard

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Detailed portfolio results will be included for each **Candidate Portfolio** in the report write-up filed with the Commission. The **Candidate Portfolios** will be summarized in terms of each **Objective** and **Metric** through a balanced scorecard.

Balanced Scorecard (Illustrative)

	Affordability	Rate Stability	Sustainability Impact	Market Risk Minimization	Reliability	Resource Diversity
Candidate Portfolios	NPV RR	95th Percentile Value of NPV RR	CO2 Emissions	Purchases as % of Generation	Reserve Margin	Mix of Resources
Reference Case	$92.0	$115.0	-62.0%	10.0%	15%	5
Portfolio #1	$94.0	$138.0	-39.0%	15.0%	15%	4
Portfolio #2	$108.0	$145.0	-50.0%	18.0%	15%	6
Portfolio #3	$81.0	$123.0	-38.0%	24.0%	15%	4
Portfolio #4	$97.0	$146.0	-42.0%	42.0%	15%	4
Portfolio #5	$101.0	$167.0	-54.0%	34.0%	15%	5
Portfolio #6	$87.0	$113.0	-64.0%	41.0%	15%	3
Portfolio #8	$102.0	$172.0	-40.0%	34.0%	15%	5
Portfolio #9	$120.0	$198.0	-90.0%	24.0%	15%	6
Portfolio #10	$99.0	$210.0	-84.0%	12.0%	15%	5

FEEDBACK AND DISCUSSION

INFORMATIONAL RFP’S

All-Source Informational RFP Process

Issue All-Source Informational RFP

- March 26, 2021: Draft RFP available to Stakeholders
- April 9, 2021: Stakeholder review meeting
- April 23, 2021: Issue RFP

Collect and Analyze Responses

- May 21, 2021: collect Responses
- Siemens' evaluation incl. Q/A with respondents
- Receive I&M 2020 Renewables RFP
- RFP results review with I&M

Evaluate how will the information will Inform the IRP

- Create price curves for all technologies based on Siemens internal forecasts
- Discuss feedback on the use of All-Source data and confirm approach

Provide resource options to Siemens IRP Modeling team

- Provide resource options to Siemens IRP Modeling team

Responses Visualization

- All responses for the All-Source Informational RFP are for projects located in Indiana or Michigan, interconnected to PJM with a COD between 2024-2025
- The pricing range between the 2021 All-Source Informational RFP and the I&M 2020 Renewables RFP are similar.
- Both RFPs responses were utilized as a key input for I&M's 2021 IRP process.
- Total data points analyzed 66.

Project Type	2021 All-Source Informational RFP	2020 Renewables RFP
Solar PPA	10	13
Solar BOT	8	10
Solar + Storage PPA	4	4
Solar + Storage BOT	3	7
Wind PPA	1	2
Wind BOT	-	2
CCGT/CT Capacity PPA	1	-
CT Energy PPA	1	-
Stand-alone Storage PPA	2	-
Demand Response	1	-
Not compliant	4	-
Total Data Points Analyzed (excluding not compliant)	**31**	**35**

All-Source Informational RFP Results

RFP Responses Summary

Plant Parameters

Plant Parameters	Renewables									Dispatchable				Demand Response
Technology	Medium Solar 20-yr PPA	Medium Solar 30-yr PPA	Large Solar 20-yr PPA	Large Solar 30-yr PPA	Solar + Storage	Wind	Solar	Solar + Storage	Wind	CCGT/ CT Capacity	CT Energy	Stand-alone Storage 2-hr	Stand-alone Storage 4-hr	Demand Response
Commercial Structure	PPA	PPA	PPA	PPA	PPA	PPA	BOT	BOT	BOT	PPA	PPA	PPA	PPA	PPA
Capacity Range (MW)	50-200	60	300-600	245-350	10-100	200-300	100-350	100/ 20-50	200	100-200	236	200	200	5 MW first year (+3MW/yr)
Storage Hours (hrs)	NA	NA	NA	NA	4 hr	NA	NA	4 hr	NA	NA	NA	2-hr	4-hr	NA
Capacity Factor Average (%)	24%	24%	24%	24%	24%	38%	24%	24%	38%	NA	NA	NA	NA	NA
Capacity Factor Min-Max (%)	23%-25%	21%-25%	24%-24%	24%-25%	23%-25%	34%-43%	21%-25%	24%-25%	34%-43%	NA	NA	NA	NA	NA
COD Range	2024-2025	2024-2025	2024-2025	2024-2025	2024-2025	2024-2025	2024-2025	2024-2025	2024-2025	Operational	Operational	2023	2023	2022
PPA Term	15-25	30	15-25	30	15-30	12	NA	NA	NA	10	10	15	15	20

All-in Capex/ PPA Price, Nominal$/kW	Medium Solar 20-yr PPA	Medium Solar 30-yr PPA	Large Solar 20-yr PPA	Large Solar 30-yr PPA	Solar + Storage PPA ($/kW-m)	Wind PPA	Solar BOT	Solar + Storage BOT	Wind BOT	CCGT/CT Capacity ($/kW-m)	CT Energy ($/kW-m)	Stand-alone Storage 2-hr	Stand-alone Storage 4-hr	Demand Response (Real 2021$/kW-m)
Min	43	43	33	45	6.5	48	1,245	1,674						
Average	48	43	37	46	7.3	48	1,475	1,914		3.95	1.75	5.98	8.96	3.53
Max	54	43	41	47	8.5	48	1,600	2,310						
Data Points	5	1	2	2	4	1	8	3	0	1	1	1	1	1

Renewable RFP Results

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Renewable RFP Responses Summary

Plant Parameters

Plant Parameters	Renewables						
Technology	Medium Solar	Large Solar	Solar + Storage	Wind	Solar	Solar + Storage	Wind
Commercial Structure	PPA	PPA	PPA	PPA	BOT	BOT	BOT
Capacity Range (MW)	85-163	200-353	120-183/ 24-32	200	100-353	100-163/ 20-32	200
Storage Hours (hrs)	NA	NA	4 hr	NA	NA	4 hr	NA
COD Range	2023	2023	2023	2023	2023	2023	2023
PPA Term	30	30	15-30	12-30	NA	NA	NA

All-in Capex/ PPA Price, Nominal$/kW	Medium Solar 30-yr PPA	Large Solar 30-yr PPA	Solar + Storage PPA ($/kW-m)	Wind PPA	Solar BOT	Solar + Storage BOT	Wind BOT
Min	43	41	8.6	45	1,431	1,666	1,953
Average	50	44	8.7	45	1,525	1,781	2,060
Max	59	50	9.0	46	1,592	1,842	2,168
Data Points	10	3	4	2	10	7	2

FEEDBACK AND DISCUSSION

I&M 2021 IRP REFERENCE CASE

Reference Scenario Inputs

I&M and Siemens PTI developed a set of base case assumptions. In Stakeholder Workshop #1, the team presented illustrative inputs. The inputs included herein are meant to represent the planned reference case inputs being used to construct the Reference Case, including the following key drivers:

Key Market Drivers:

- I&M and PJM energy and demand
- Henry Hub natural gas prices
- PRB Coal Prices
- Capital Costs for various generation technologies

Fundamentals Forecast

- Base Case: Reflects EIA Reference scenario
- Base Carbon Case: Includes a $15/metric ton carbon price beginning in 2028, escalating at 3.5% annually thereafter

AURORAxmp and other model and tools

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AURORAxmp (AURORA) is an industry standard model for electricity production costing, resource valuations, market risk analysis and market simulations.

- AURORA is licensed by hundreds of clients in North America, ranging from consultants to utilities to regulatory bodies
- AURORA is accepted in many regulatory jurisdictions
- AEP I&M and Siemens PTI will use the AURORA model in the IRP to provide the following analysis:
  - Commodity forecasts and base case assumption development
  - Least cost optimization of different portfolios
  - Simulation of the performance of different portfolios under a variety of market conditions
  - Production cost modeling to provide market prices for energy
  - Emissions tracking based on unit dispatch
  - An analysis of various regulatory structures such as reserve margins, RPS requirements, others
  - Risk analysis based on stochastic simulation of key inputs

Reference Case: Fuel Prices

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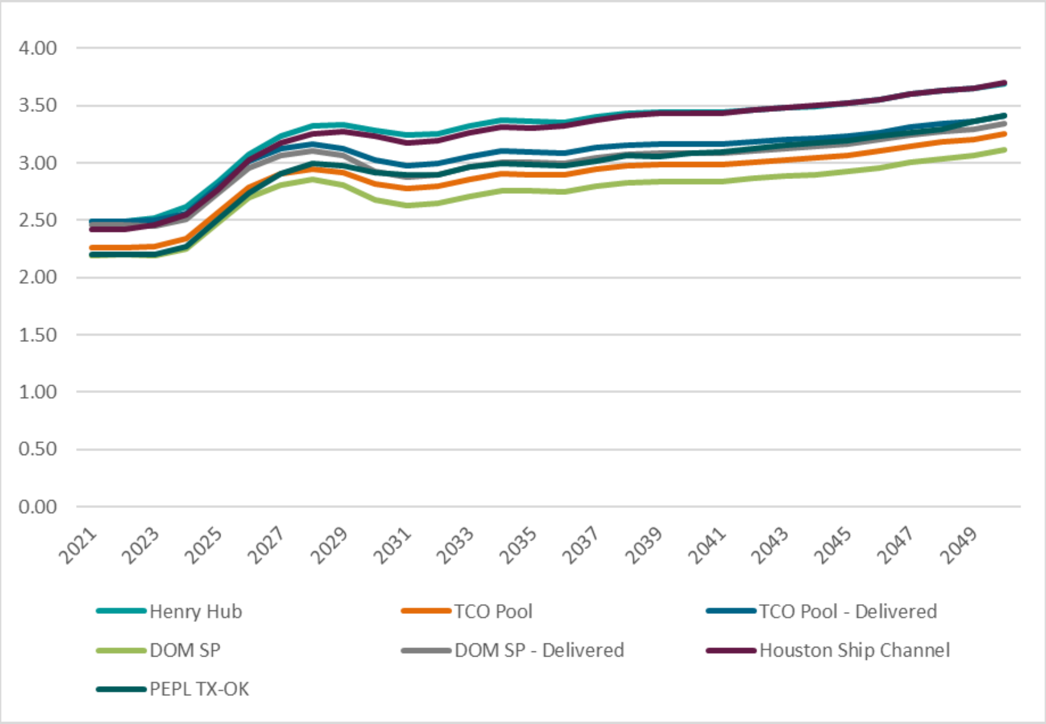
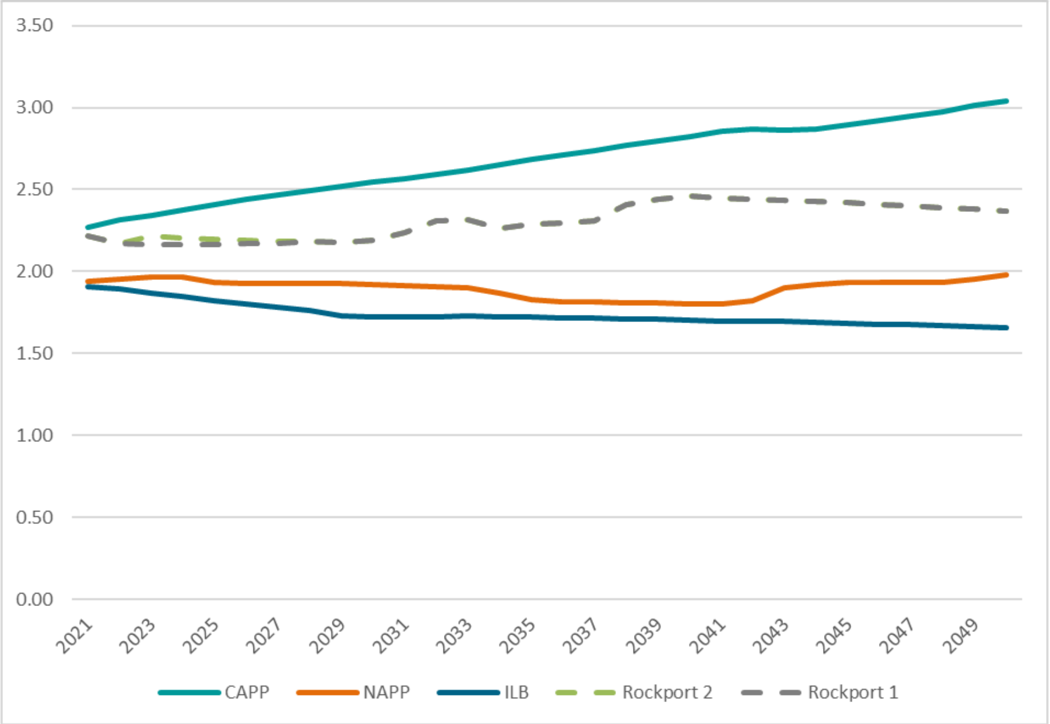
Natural Gas Forecast (2019$/MMBtu)

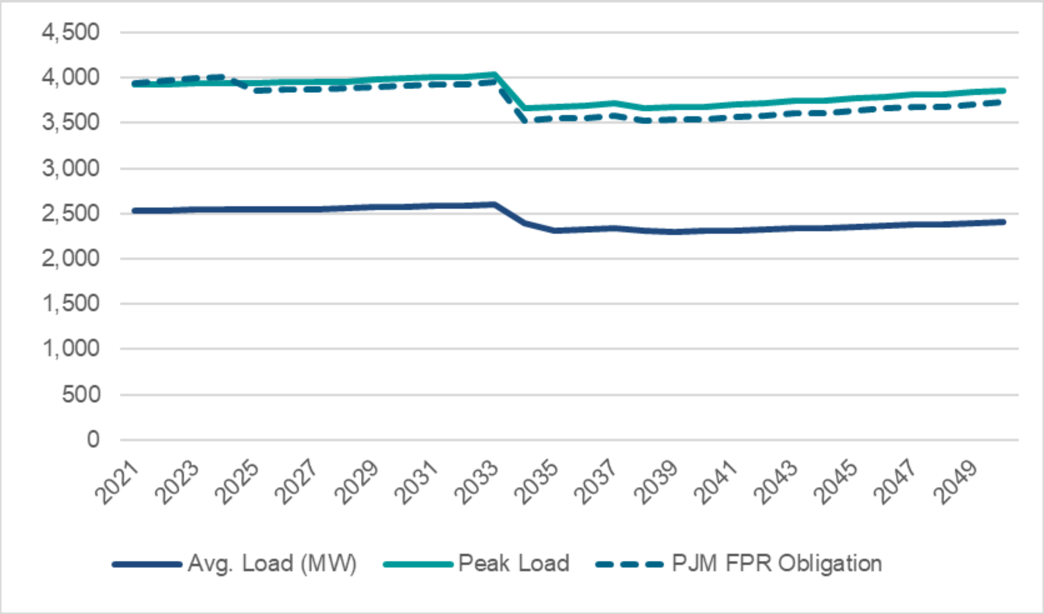


Coal Basin Price Forecast (2019$/MMBtu)

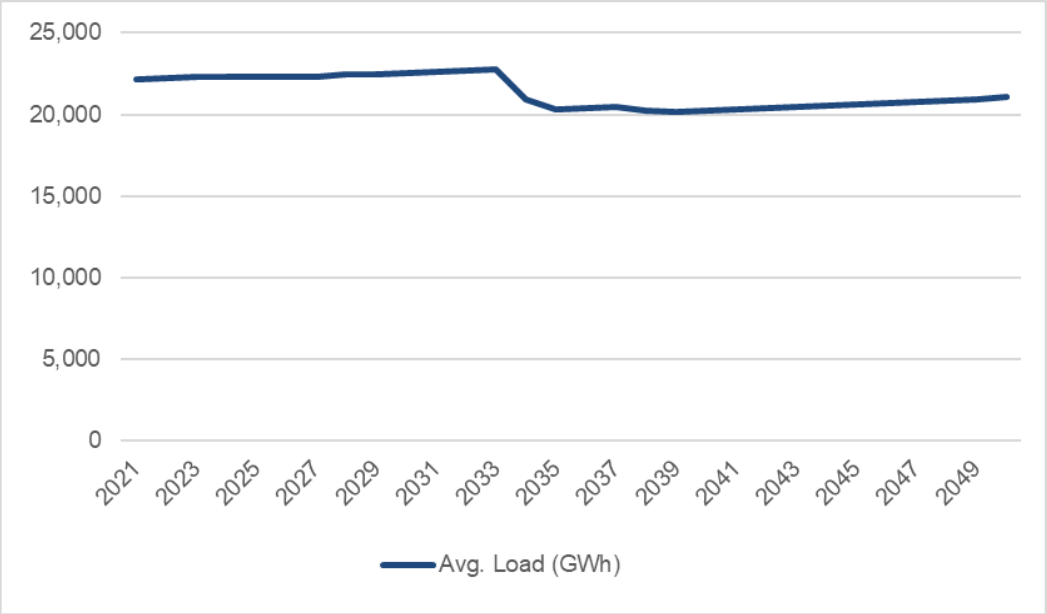


Reference Case: Load Forecast

I&M Load (MW)

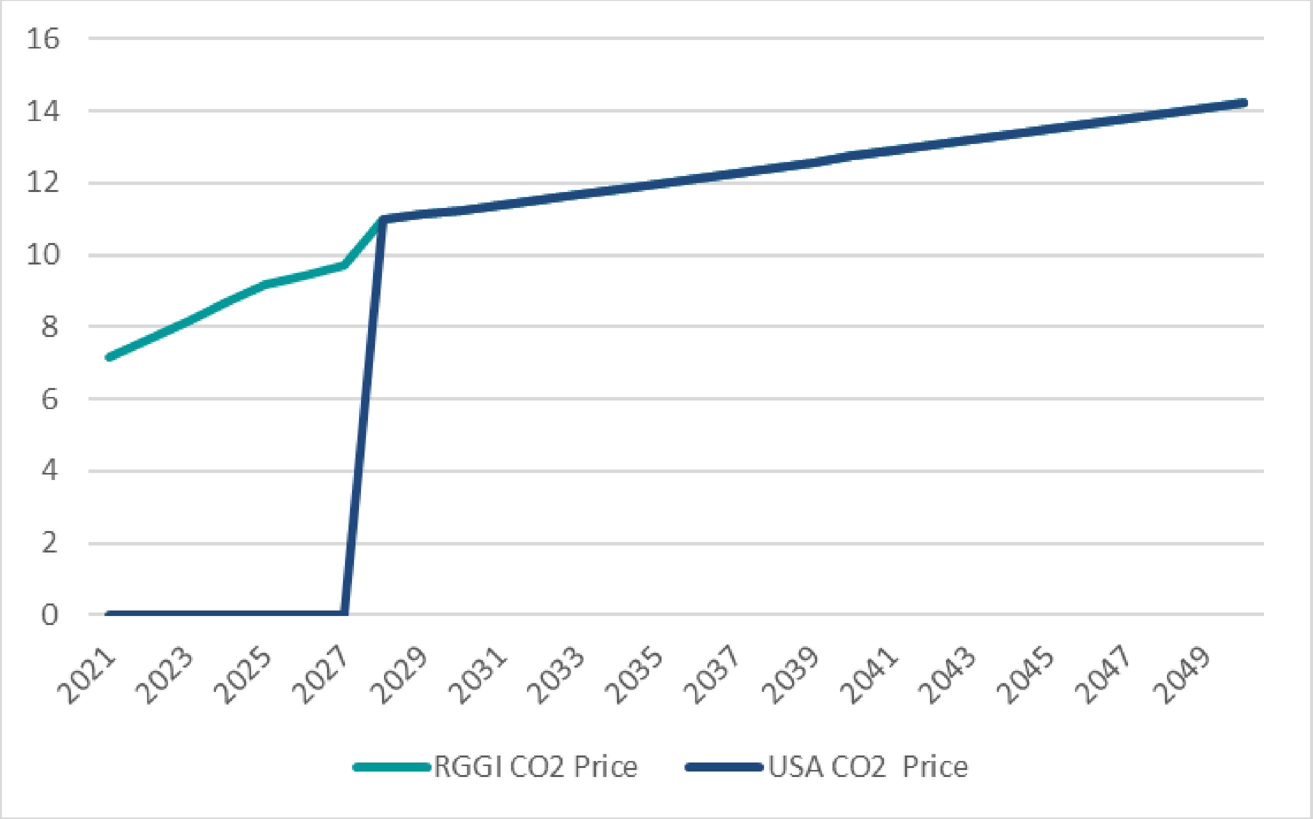


I&M Energy (GWh)



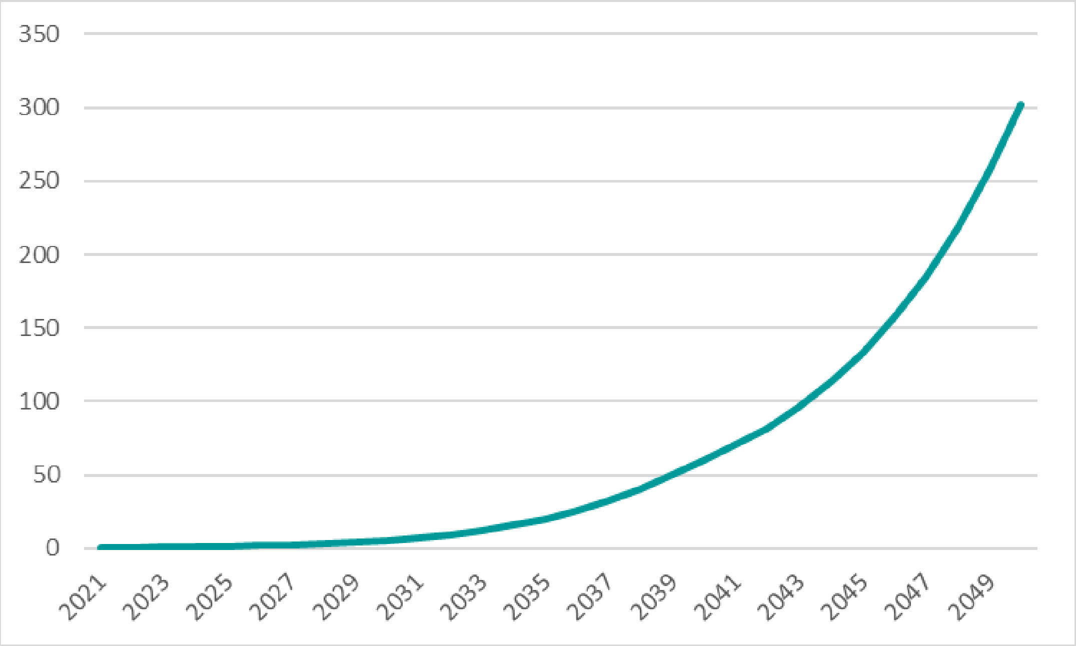
Reference Case: Emissions Price Forecast

CO2 Price Forecast (2019$/Ton)

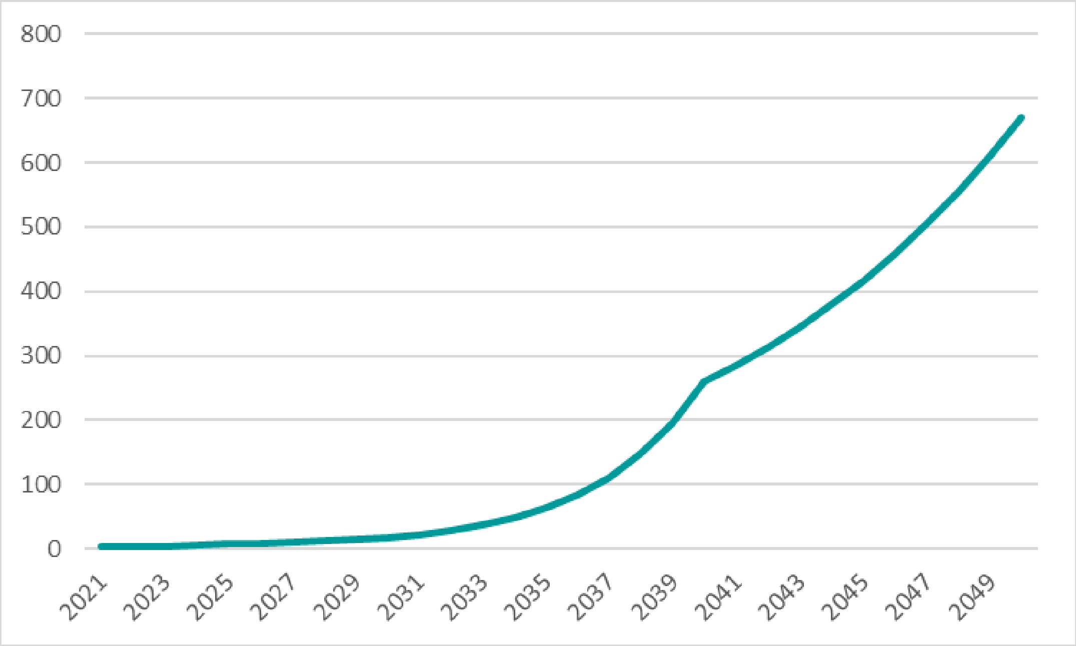


Reference Case: Solar & EV

I&M DG Solar Capacity (MW)



I&M Electric Vehicle Demand (MW)



Reference Case: Transmission Topology

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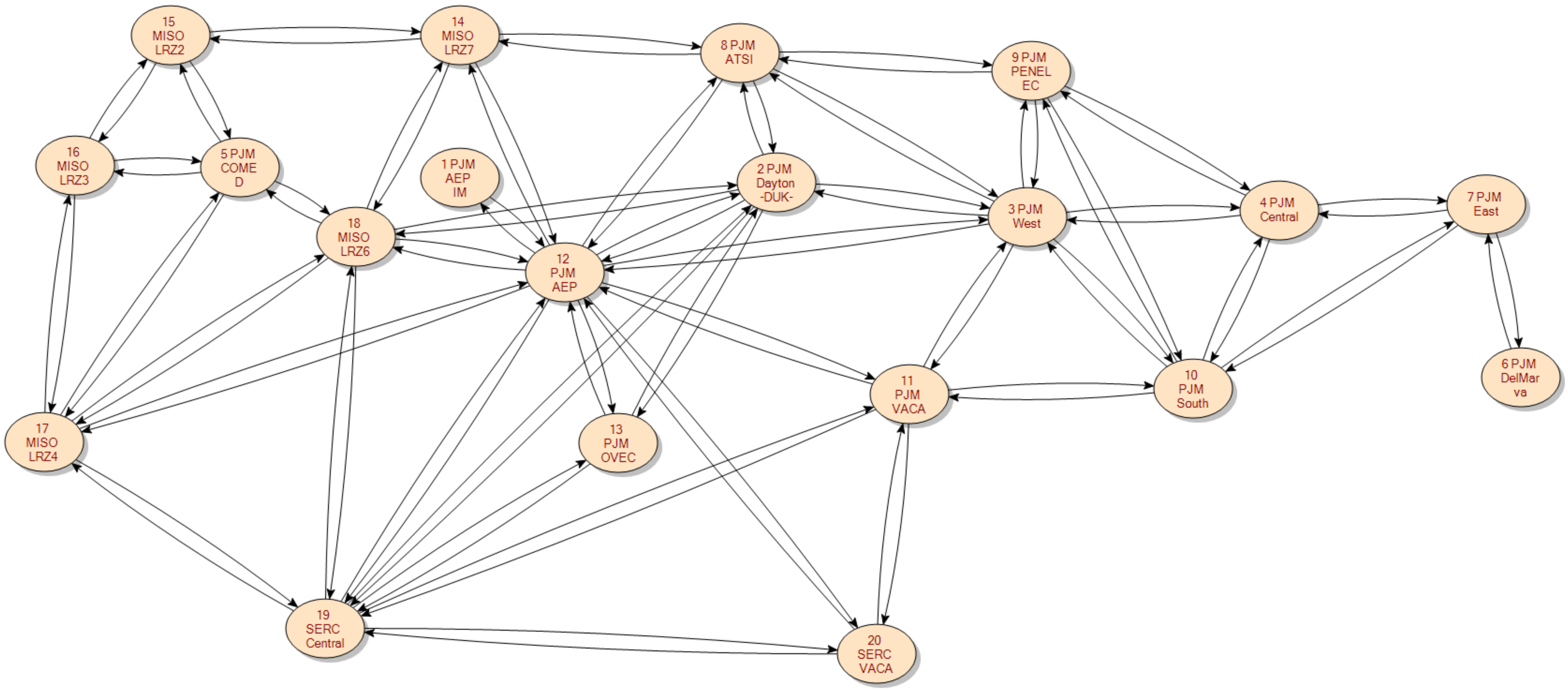

FEEDBACK AND DISCUSSION

RESOURCE OPTIONS – SUPPLY SIDE

Resource Overview – Self-Build Baseload and Peaking Options

Sources: EIA, Siemens

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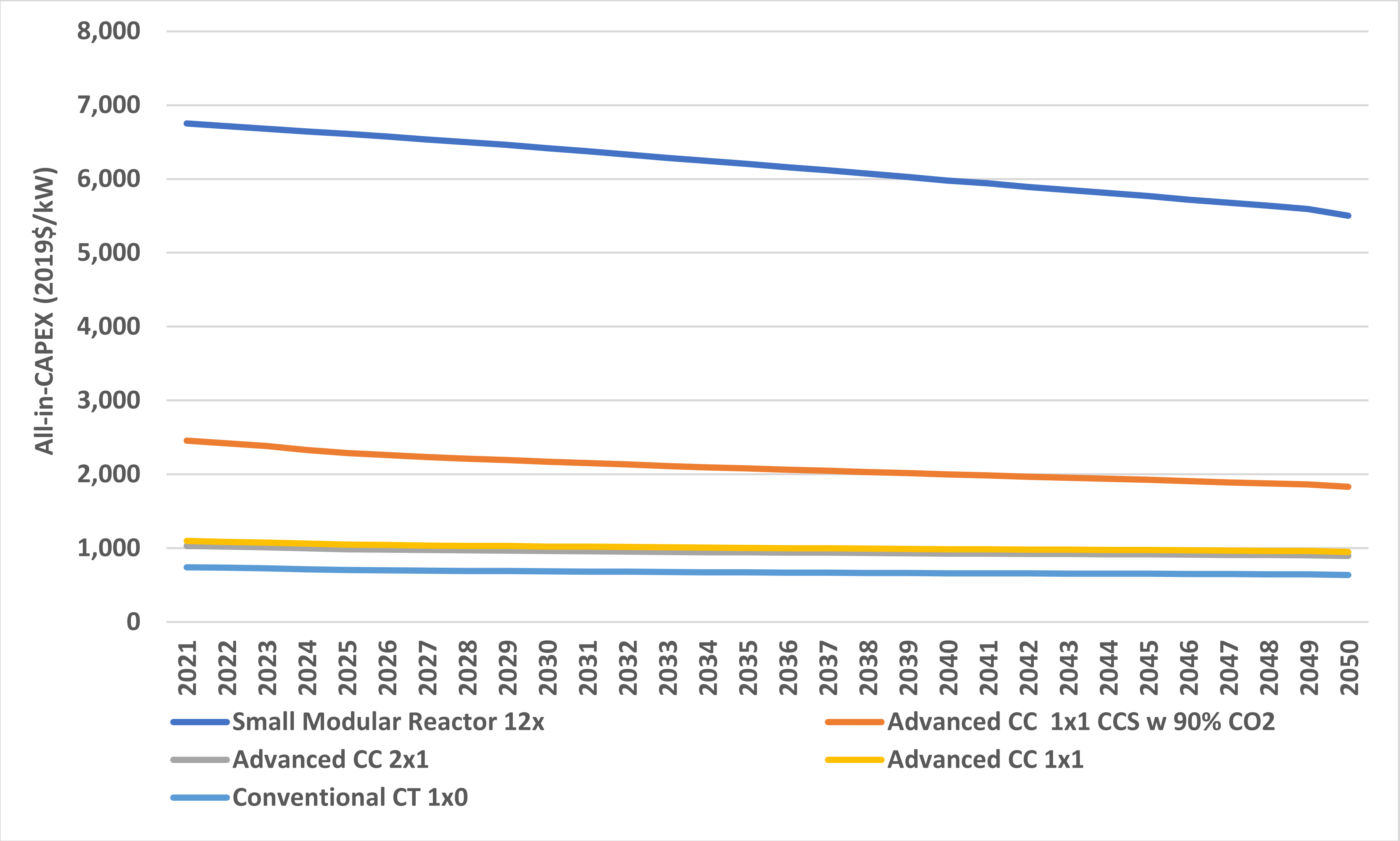
Technology	Small Modular Reactor	Advanced CC	Advanced CC	Advanced CC	Conventional CT
	12x	1x1 CCS w 90% CO2	2x1	1x1	1x0
Fuel	Uranium	Nat. Gas.	Nat. Gas.	Nat. Gas.	Nat. Gas.
Construction Time (Yrs)	10	7	6	5	5
Book Life (Yrs)	40	40	30	30	30
Size (MW)	600	380	1030 *	420	230
Average Heat Rate (Btu/kWh), HHV	10,046	6,431	6,370	6,431	9,905
VOM (2019$/MWh)	3.03	5.84	1.87	2.55	0.60
FOM (2019$/kW-yr)	96.14	27.58	11.26	14.10	6.99

* The Optimization routine can select the Gas CC 2x1 Configuration in smaller increments

Resource Overview – Self-Build Baseload and Peaking Options

Sources: EIA, Siemens



Resource Overview – Renewable and Storage Options

Sources: EIA, Siemens, AEP

Technology	BESS 50MW/ 200 MWh	Onshore Wind with PTC	Solar Tier 1 w ITC	Solar Tier 2 w ITC	Solar + Storage 20MW/80MWh w ITC
Fuel	NA	Wind	Sun	Sun	Sun
Construction Time (Yrs)	1	2	2	2	2
Book Life (Yrs)	30	10	35	35	35
Size (MW)	50	200	50	50	100
Average Heat Rate (Btu/kWh), HHV					
VOM (2019$/MWh)	0.00	0.00	0.00	0.00	0.00
FOM (2019$/kW-yr) *	20.67	31.72	16.70	16.70	37.55

* The FOM costs are based on levelized FOM assumptions provided by AEP IM

Resource Overview – Renewable and Storage Options – ITC and PTC

Siemens included Investment Tax Credit (ITC) and Production Tax Credits (PTC) for solar and wind resources, respectively.

- The ITC is assumed to be available for solar resources coming online through the forecast horizon according to the following schedule:
  - 26% for resources coming online before the end of 2025
  - 10% for resources coming online after January 1st, 2026

- The PTC is assumed to be available for wind resources coming online before the end of 2025.

*AEP I&M solar and wind tax credits assumes ability to leverage safe harbor clause for projects

Resource Overview – Renewable and Storage Options

Sources: EIA, Siemens, AEP

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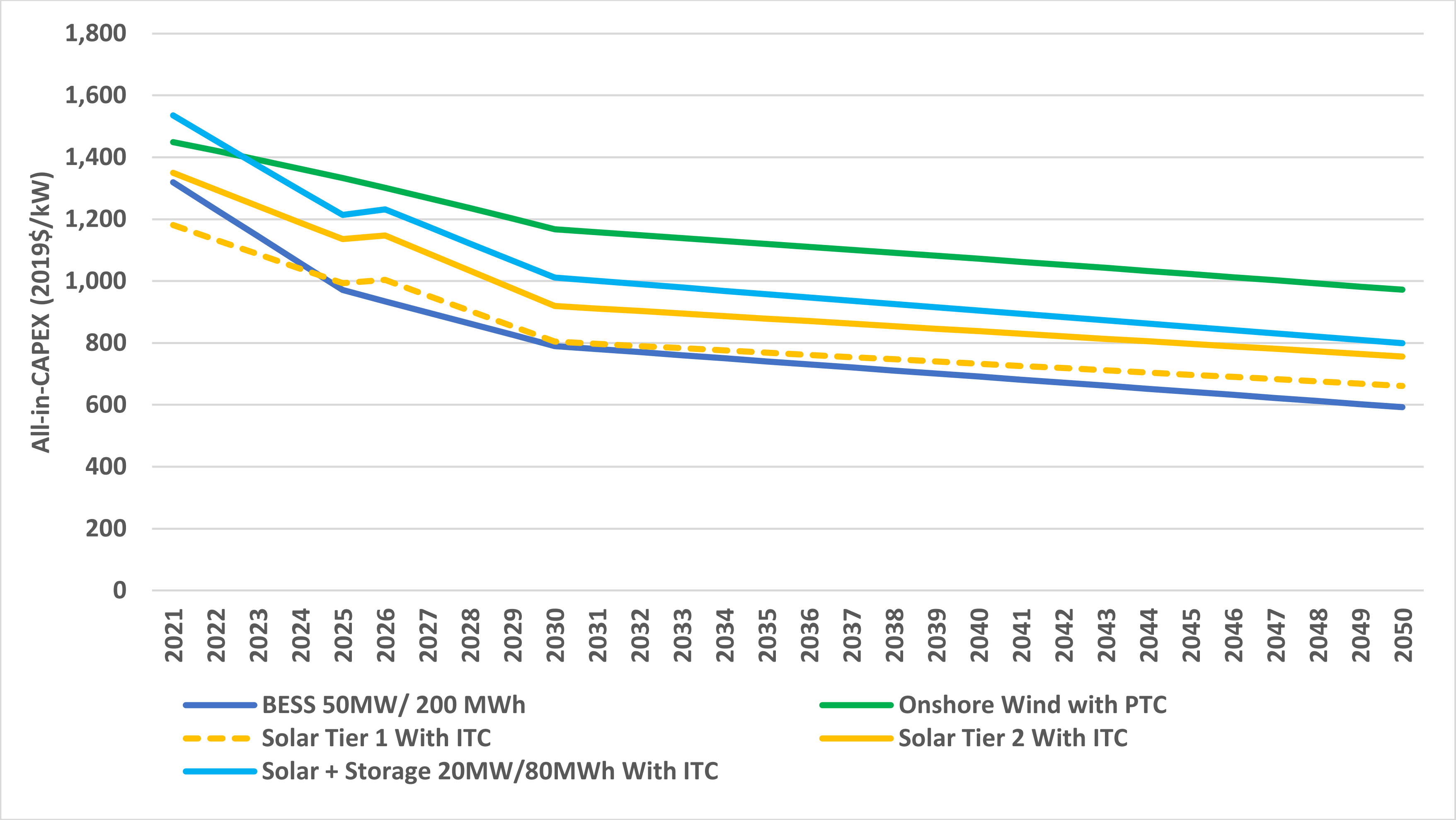


Feedback and Discussion

RESOURCE OPTIONS – DSM/EWR

Demand Side Management Resource Options

Siemens PTI, GDS and the I&M IRP team collaborated on the development of the forecasted inputs needed to include Demand Side Management (DSM) Resources in the analysis.

The AEP I&M IRP included the following DSM options:

- Energy Efficiency (EE)
- Demand Response (DR)
- Distributed Energy Resources (DER)

Resource Overview

DSM resources act as a load reducing resource and decrease the need for capacity and/or generation from new resource options

- **Energy Efficiency** has become an increasingly important measure in Integrated Resource Planning since it reduces the generation needs and can be an effective tool in carbon reduction strategies.

- **Demand Response** provides a reduction in Peak Capacity needs which can act as a carbon reduction strategy decreasing the operating time of less efficient Peaking resources.

- **Distributed Energy Resources** are drastically increasing in the US as renewable energy, specifically solar, has significantly decreased in costs due to policy incentives and learning curves. This allows homeowners or commercial and industrial entities to generate their own energy, decreasing the need for energy generation from utilities.

DSM Resource Treatment

Measure	Program	Treatment	# of Programs
Energy Efficiency	Conservation Voltage Reduction (CVR)	Going-In	4
	Low Income Qualified (IQW)	Going-In	3
	Long-Term Vintages	Optimized	39
Demand Response	Residential	Non-Optimized	1
	Commercial & Industrial	Non-Optimized	1
Distributed Energy Generation	Rooftop Solar (DG)	Going-In	2
	Combined Heat & Power (CHP)	Going-In	1

Optimized: These programs will be exposed to the optimization routine, and the capacity and generation impact will be determined by the economic need for these programs.

Non-Optimized: The capacity included in the analysis; however, the actual impact to each Portfolio may depend on the economic dispatch of the program.

EE Bundle Development For IRP

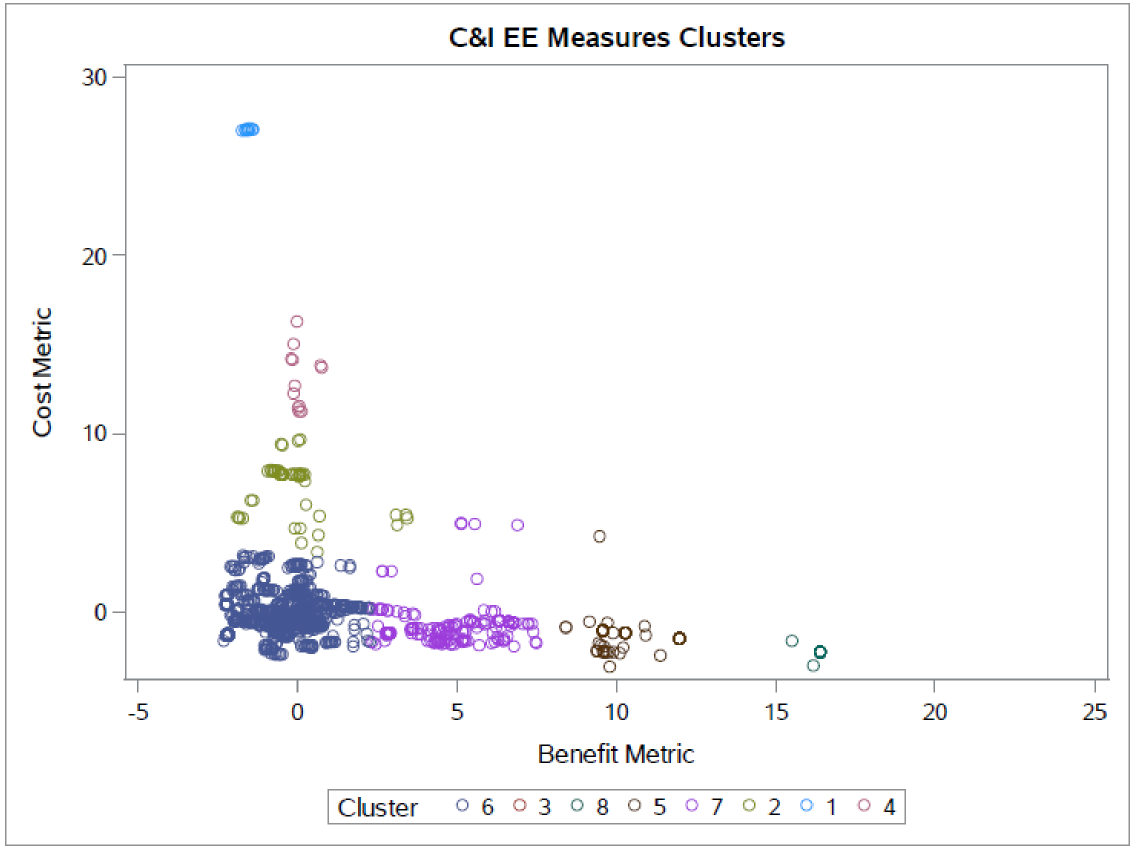
GDS produced value-based bundles based on statistical cluster technique

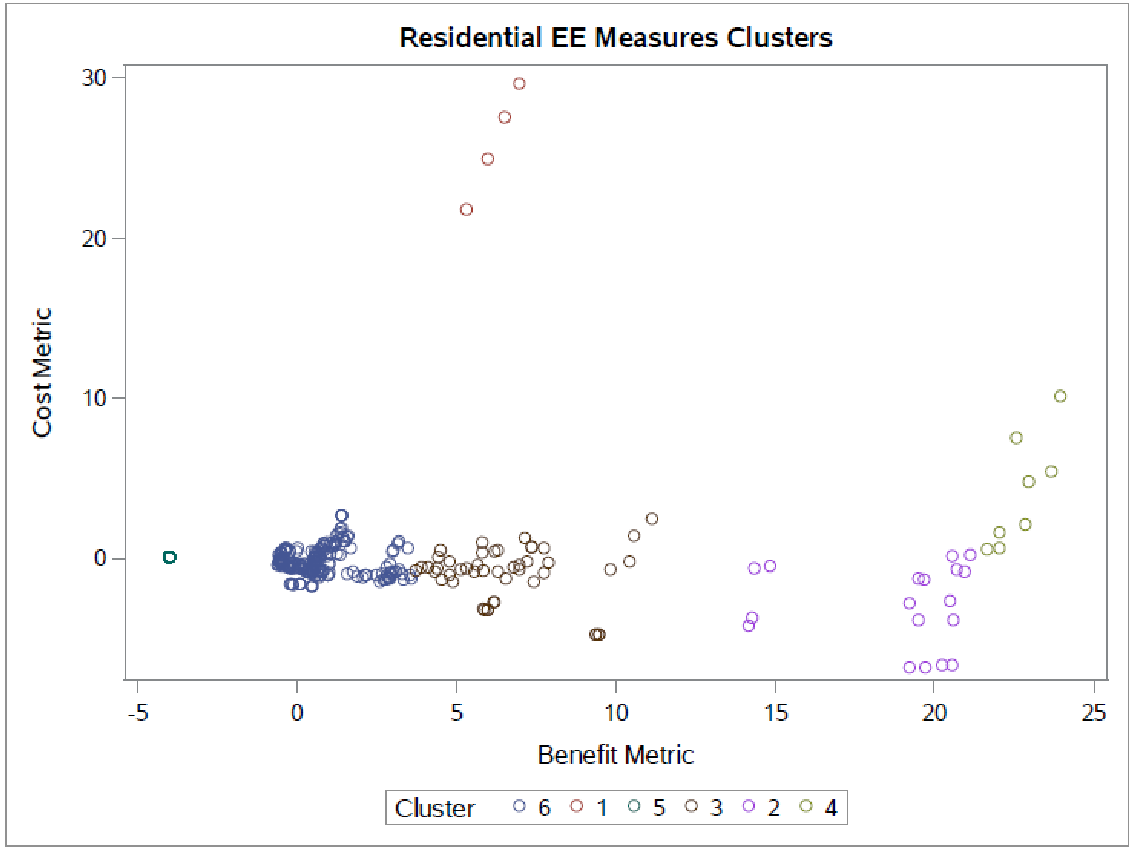
- k-means clustering is a way to group data points together based on some user defined metric(s)
- Data is grouped together by minimizing the Euclidean distance between data points and a randomly selected centroid (single point) within the data
  - Of course, but what does that mean??
- Essentially, data points that are the most similar are grouped together within a cluster
  - The number of clusters affects the groupings
  - Iterative process to get the closest/most similar group of data points in each cluster

EE Measures clustering

- **Residential and Non-Residential measures were kept separate**
  - Cluster process was developed separately for each
- **NPV $ Benefits (and costs)/lifetime kWh were used as the metrics to determine clusters**
  - Both metrics were used to determine cluster groupings
- **Clustering process was analyzed using 2 through 20 clusters**
  - There is no “correct” answer, rather a range of clusters that provide the best results based on the various metrics the analysis provides

EE Measures clustering





EE Measure BUNDLES

- Measure cluster assignment was used to create bundles
- EE bundles are based on the *gross* Realistic Program Potential Determined from the IRP
- Bundles are *not* equal in total savings
- Costs were adjusted to reflect the T&D benefits of each bundle
- Each bundle has unique 8,760 hourly shape

Residential

Five bundles

1 bundle represents ~ 85% of savings

Income-Qualified

Single bundle (non-optimized)

Savings modified from MPS to align with historical spending

C&I

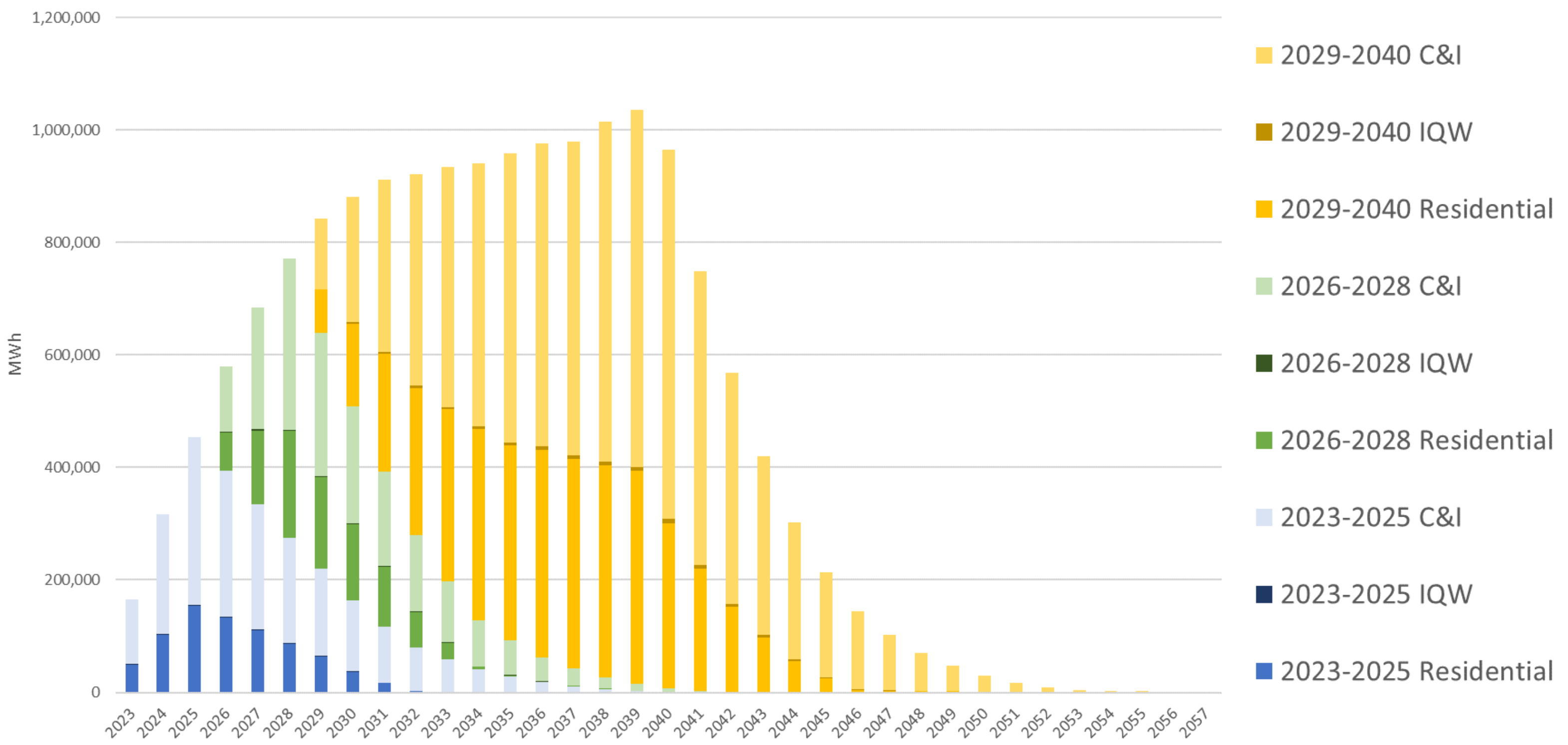
8 bundles

1 bundle ~ 55% of savings

2 additional bundles ~ 30% of savings

EE Measure BUNDLES

Annual costs and savings (inclusive of line losses) are incorporated
Shown below are sector level impacts only ***(actual sectors had additional bundles as indicated on the prior slide)***



Levelized Cost ($/MWh)

Range	Mean	
$13-$155	$34	*Vintage #3*
$298	$298	
$36-$798	$43	
$12-$154	$29	*Vintage #2*
$267	$267	
$35-$793	$42	
$10-$155	$24	*Vintage #1*
$258	$258	
$36-$792	$42	

EE Measure Bundles

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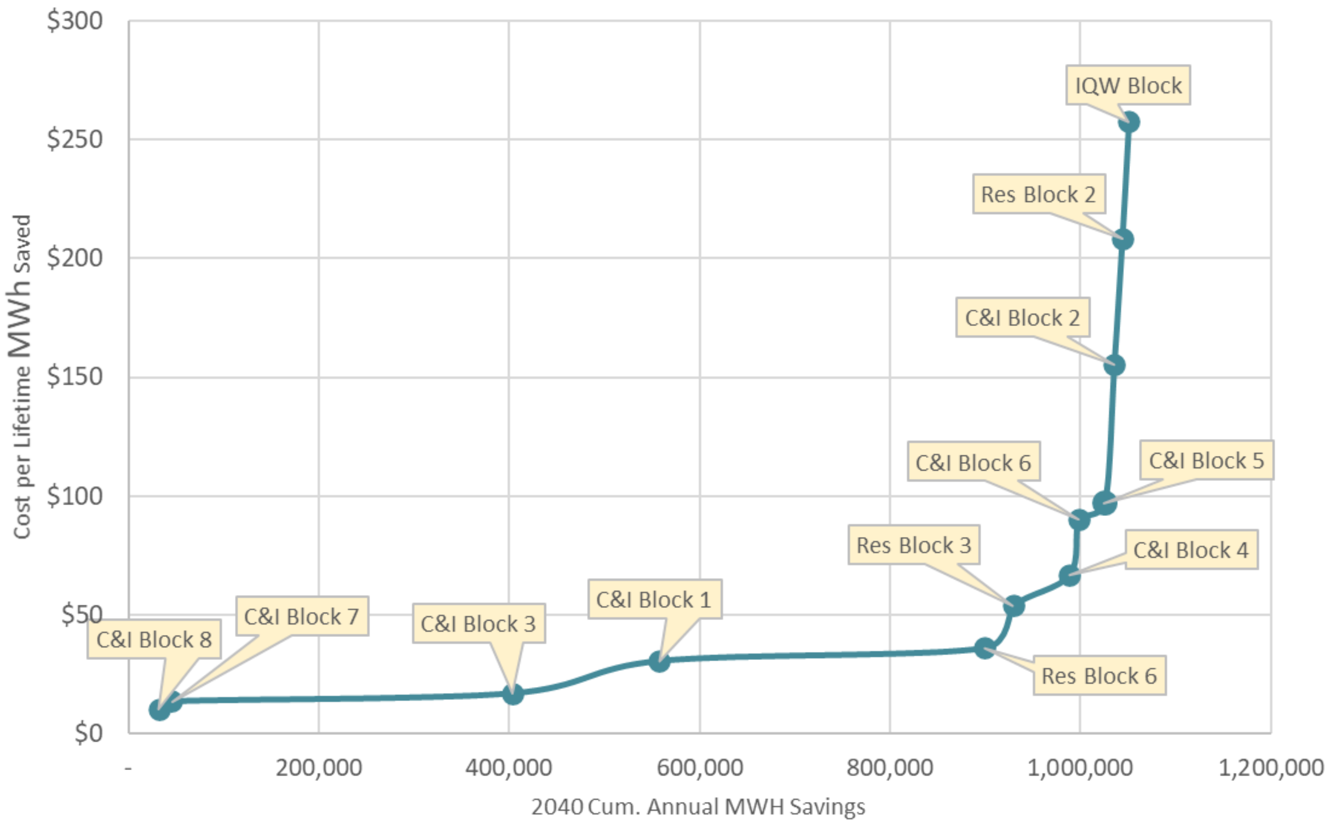
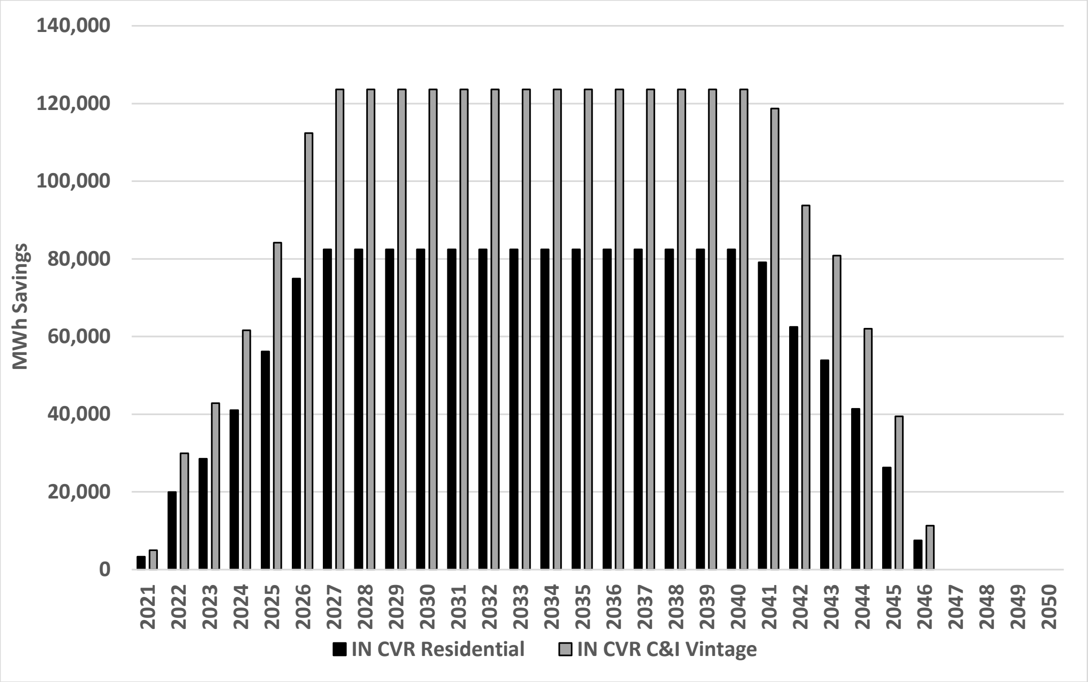
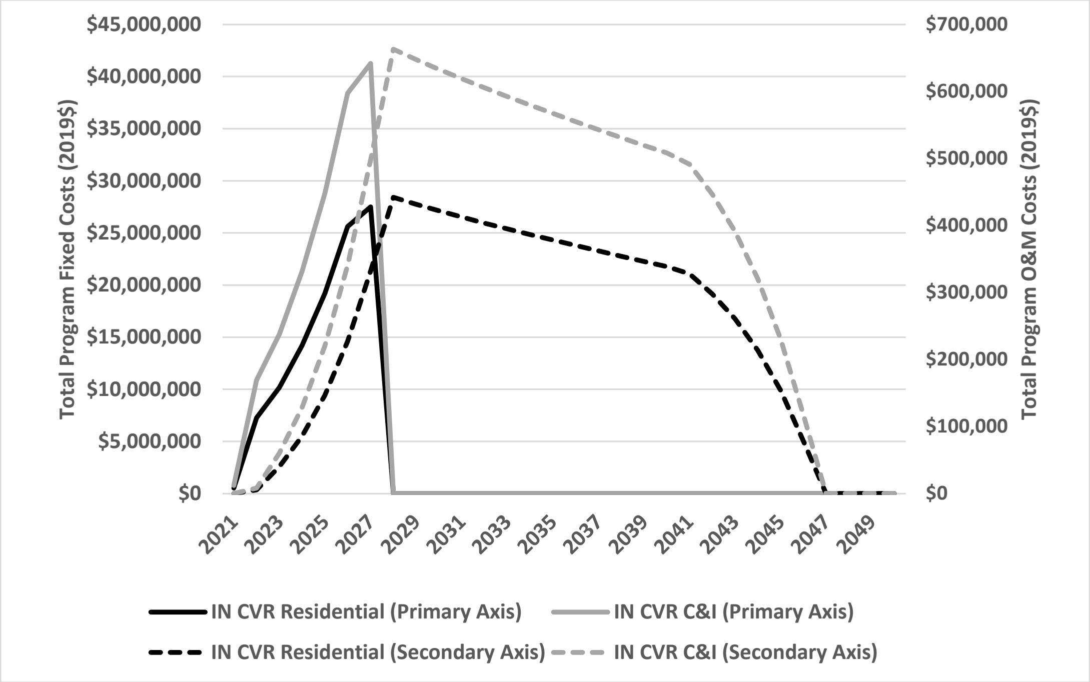
- Supply Curve demonstrates the breakout of the individual DSM bundles and their relative contribution to the cumulative annual impacts in 2040.
- The largest C&I block is 3rd on the supply curve (~$18/lifetime MWh).
- The largest residential block is 5th on the supply curve (~$36/MWh)



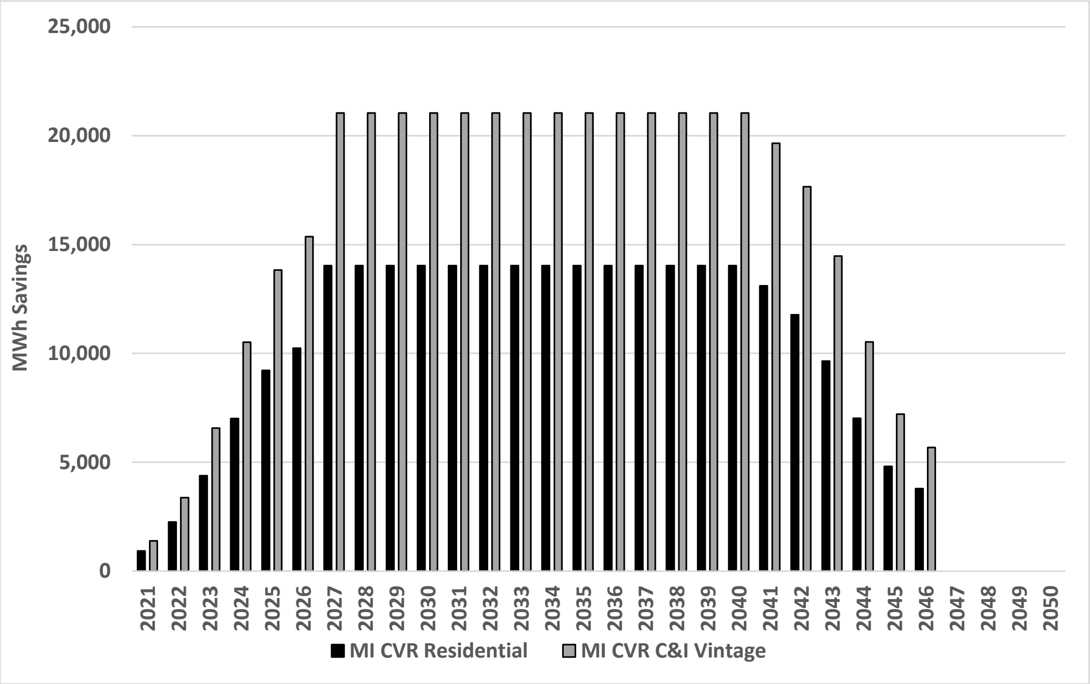
** Two additional residential blocks, with a cost per lifetime MWh saved $300 were omitted from the supply chart. They represent less than 0.1% of the 2040 Cumulative Annual MWh savings in 2040.*

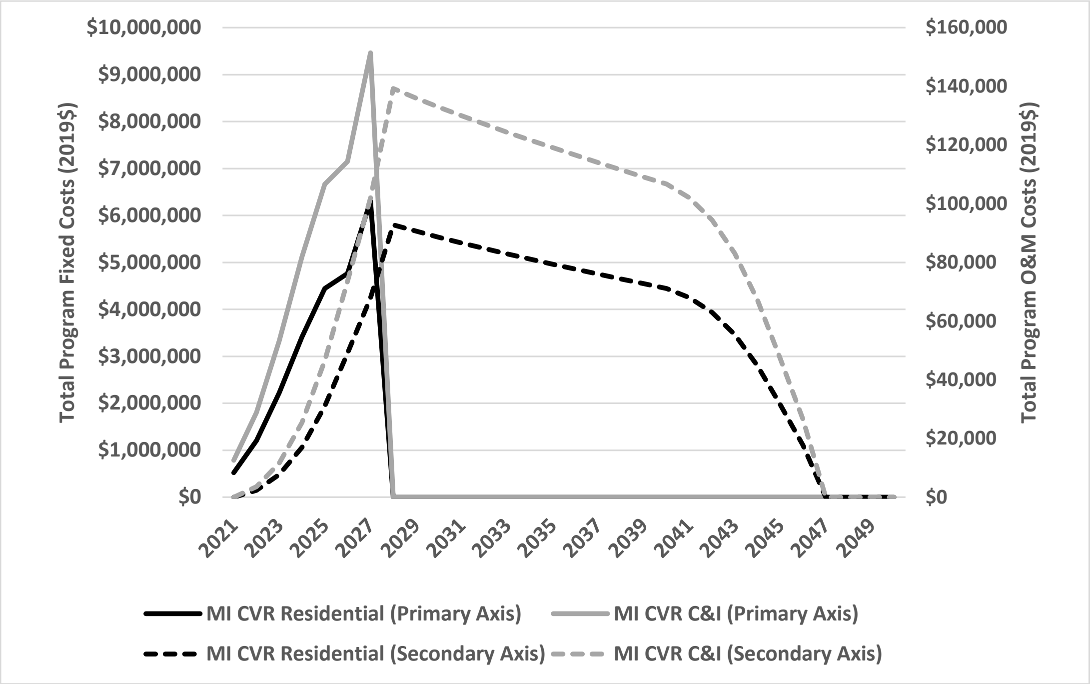
Siemens Parametrization of EE "Going-in" Data
Indiana CVR



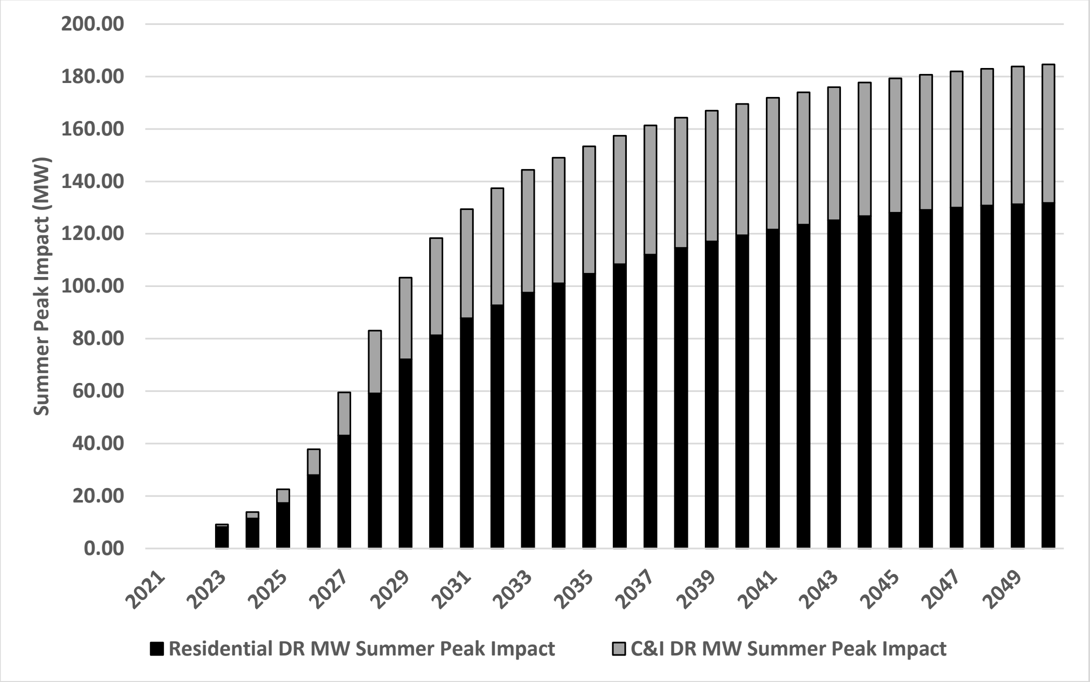


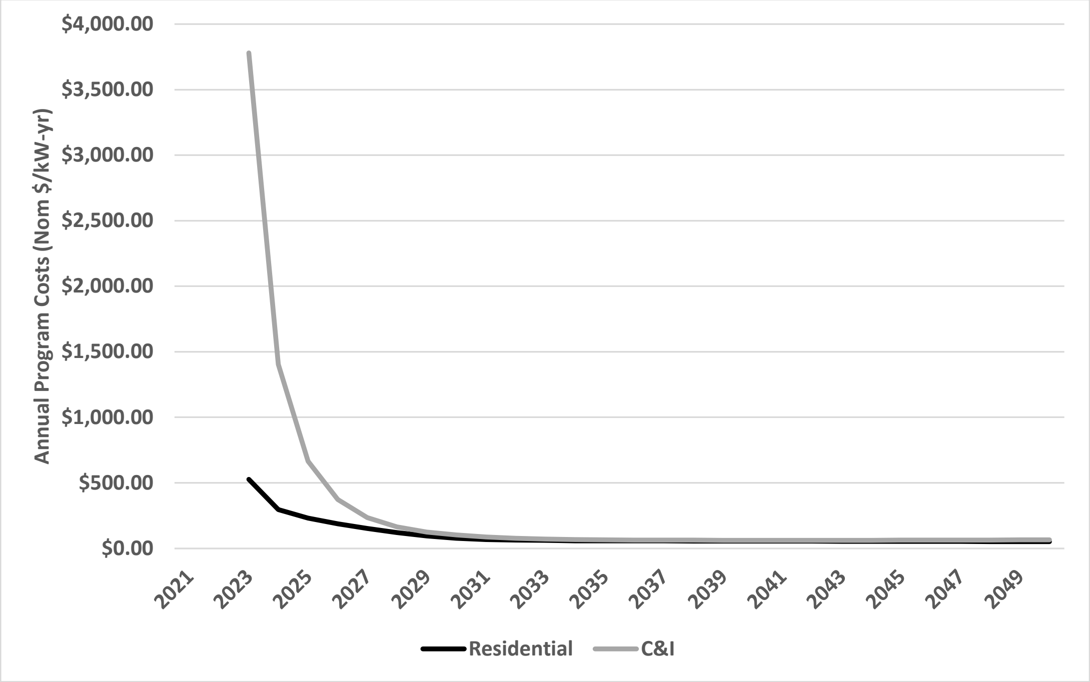
Siemens Parametrization of EE "Going-in" Data
Michigan CVR





Reference Case: Realistic Achievable Potential Demand Response Data





Peer Utility Review

In response to Stakeholder comments after the 2nd Stakeholder meeting, I&M reached out to multiple Investor-Owned Utility (IOU) in the states of Indiana and Michigan to see how they were accounting for energy efficiency in their IRPs and load forecast models.

I&M also reached out to Itron (the developer of the SAE models) to review I&M's approach to modeling energy efficiency in the SAE load forecast models.

Utilities Surveyed

Indiana Utilities	Michigan Utilities
AES (IP&L)	Consumers Energy
Centerpoint (Vectren)	DTE Electric
Duke Energy	
NIPSCO	

Benchmark to Other Utilities in IN & MI

	I&M	Utility A	Utility B	Utility C	Utility D	Utility E	Utility F
Itron SAE Models?	Yes	Yes	Yes (use Itron)	No (traditional econometric model)	No (Use External Consultant)	Yes	Yes
DSM Optimized?	Optimized	Target	Optimized	Target	Optimized	Optimized	Target
DSM Model Approach	Supplemental Efficiency Adjustment Matrix based on measure life	Regress DSM as independent variable	Regress DSM as independent variable	Model programs base on measure life. Assume no savings after measure life expires	Use Add-back method with Aurora	Regress DSM as independent variable	Use Add-back method with MPS EE targets
Adjusting DSM savings in Load Forecast?	Supplemental Efficiency Adjustment used in conjunction with SAE model to prevent double counting EE	DSM coefficient used to discount future DSM savings in forecast	DSM coefficient used to discount future DSM savings in forecast	Load forecast is standard econometric model that doesn't attempt to account for future EE. As a result, no adjustment needed for future DSM savings.	Load forecast is standard econometric model that doesn't attempt to account for future EE. As a result, no adjustment needed for future DSM savings.	DSM coefficient used to discount future DSM savings in forecast	Add back historical savings, and assume MPS savings for future EE savings.

Benchmarking Observations

- 5 out of the 7 IOUs surveyed in IN and MI use Itron's SAE model.
- Utilities that operate exclusively in MI are assuming a target for DSM/EWR whereas most IN and multi-state utilities are optimizing DSM as a supply side resource.
- The majority of IOU's using Itron's SAE model are modeling the DSM series as an independent variable in the regression.
- I&M's Supplemental Efficiency Adjustment (SEA) gets to the same levels as using DSM variable as a independent variable in the regression. In future IRP cycles, I&M will replace the SEA approach by modeling DSM series as an independent variable in the regression equation.
- Many IOU's are using a different load forecast methodologies for their IRP than they use in base rate case, fuel, and/or rider filings. This is not the case for I&M.

SEA vs DSM as an Independent Variable

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I&M Indiana												
	Residential Lighting											
5 / 10	900,000	19,899,654	15,515,989	15,306,274	19,651,372	15,067,351	15,169,832	11,939,913	1,070,007	609,626	-	-
	2008	2015	2016	2017	2018	2019	2020	2021	2022	2023	2024	2025
2008	900,000											
2009	688,574											
2010	440,204											
2011	207,749											
2012	49,670											
2013												
2014												
2015		19,899,654										
2016		15,224,867	15,515,989									
2017		9,733,237	13,818,033	15,306,274								
2018		4,593,477	11,871,004	13,631,267	19,651,372							
2019		1,098,246	9,759,036	11,710,554	17,500,870	15,067,351						
2020			7,589,116	9,627,132	15,034,911	13,418,490	15,169,832					
2021			5,485,731	7,486,541	12,360,053	11,527,759	13,509,757	11,939,913				
2022			3,581,587	5,411,585	9,611,798	9,476,858	11,606,165	10,633,296	1,070,007			
2023			2,003,944	3,533,178	6,947,809	7,369,680	9,541,315	9,135,012	952,914	609,626		
2024			856,315	1,976,859	4,536,165	5,327,113	7,419,806	7,509,804	818,643	542,913	-	
2025			195,335	844,741	2,538,043	3,478,027	5,363,346	5,840,001	672,999	466,414	-	-
2026				192,695	1,084,543	1,946,001	3,501,682	4,221,397	523,358	383,434	-	-
2027					247,396	831,555	1,959,237	2,756,114	378,305	298,178	-	-
2028						189,687	837,211	1,542,081	246,992	215,535	-	-
2029							190,977	658,954	138,195	140,721	-	-
2030								150,315	59,053	78,735	-	-
2031						Total to Subtract from LF	69,099,327		13,471	33,645	-	-
2032						Total Savings w/ no adjustment	151,698,321			7,675	-	-
						Supplemental Efficiency Adjustment Impact	46%				-	-

JURIS	CLASS	DSM Variable Coefficient	T-Stat	P-Value
IM-IN	Residential	-0.51	(2.88)	0.43%
	Commercial	-0.47	(5.70)	0.00001%
I&M-MI	Residential	-0.52	(4.42)	0.0018%
	Commercial	-0.39	(1.88)	6.12%
	Average	-0.47		

FEEDBACK AND DISCUSSION

SCENARIOS

Overview of Proposed Scenarios

I&M will use a scenario- and sensitivity-based approach to construct future market and regulatory environments. The Reference scenario is the most expected future scenario and includes the base case inputs provided by AEP I&M. The changes in the alternative scenarios are shown relative to the Reference scenario.

All Portfolios in each proposed scenario will achieve a Net Zero by 2050 Carbon Reduction goal which aligns with the AEP Corporate Goal.

Scenario	Load	Gas Price	Coal Price	CO2	Renewable and Storage Costs	EE / DR Cost
Reference	Base	Base	Base	Base	Base	Base
Rapid Technology Advancement	Base	Base	Base	Base	Low	Low
Enhanced Regulation	Base	High	High	High	Base	Base

The directional basis of the Scenario drivers are as compared to the Reference scenario.

Scenario Narrative: Reference Scenario

Scenario	Load	Gas Price	Coal Price	CO2	Renewable and Storage Costs	EE / DR Cost
Reference Scenario	Base	Base	Base	Base	Base	Base

The Reference Scenario

The Reference scenario is the most expected future scenario that is designed to include a consensus view of key drivers in power and fuel markets. The existing generation fleet is largely unchanged apart from new units planned with firm certainty or under construction. An increased carbon reduction is assumed to achieve net zero in the electric sector.

In the Reference scenario, major drivers include:

- Coal prices remain relatively flat over the forecast horizon in constant dollars consistent with EIA reference
- Natural gas prices move upward in real dollars to 2050 consistent with EIA reference
- Capital costs are downward sloping for fossil and wind resources, and decline significantly for solar and storage resources
- Carbon regulations limiting CO2 emissions will commence in 2028 and remain in effect throughout the forecast horizon
- Portfolio achieves Net Zero by 2050 without any incremental goals and assuming an $100/ton (nominal) offset is available

Scenario Narrative: Rapid Technology Advancement

Scenario	Load	Gas Price	Coal Price	CO2	Renewable and Storage Costs	EE / DR Cost
Rapid Technology Advancement	Base	Base	Base	Base	Low	Low

Rapid Technology Advancement

The Rapid Technology Advancement scenario assumes technological advancements, favorable regulation and overall economies of scale that impact renewable resources. The scenario assumes technology costs for supply- and demand-side renewable resources decline over time, resulting in up to 35% reductions in technology costs; significantly faster than in the Reference scenario.

In the Rapid Technology Advancement scenario, major drivers include:

- Technology cost reductions for renewables and storage result in lower capital costs
- Technological advancement and economies of scale contribute to greater potential for energy efficiency and demand response
- Carbon regulations limiting CO2 emissions will commence in 2028 and remain in effect throughout the forecast horizon
- Thermal generation retirements are driven by unit age-limits and announced retirements, consistent with Reference scenario
- Fundamental drivers (load, commodity prices, net zero requirement by 2050) remain constant to the Reference scenario

Scenario Narrative: Enhanced Regulation

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Scenario	Load	Gas Price	Coal Price	CO2	Renewable and Storage Costs	EE / DR Cost
Enhanced Regulation	Base	High	High	High	Base	Base

Enhanced Regulation

The Enhanced Regulation scenario assumes increased environmental regulations covering natural gas, coal and CO2. Illustrative examples include a potential fracking ban and increases of carbon reduction targets.

In the Enhanced Regulation scenario, major drivers include:

- Natural gas, coal prices and CO2 prices are increased to reflect enhanced regulation
- Technology costs for thermal and renewable units remain consistent with the Reference scenario
- Thermal generation retirements are driven by unit age-limits and announced retirements, consistent with Reference scenario
- Carbon regulations limiting CO2 emissions will commence in 2025 and remain in effect throughout the forecast horizon
- Portfolios achieves Net Zero by 2050 without any incremental goals and assuming an $100/ton (nominal) offset is available

FEEDBACK AND DISCUSSION

STAKEHOLDER SESSION

Stakeholder Session

- The purpose of this session is to allow stakeholders to discuss and propose different strategies to meet load obligations over the next 20 years.
- We won't be able to run a least-cost portfolio run for each strategy, but we will optimize several different strategies.

Process:

1. Open Discussion
2. Poll – based upon the discussion, what additional strategy would you like to see included in the IRP process.
3. In the next meeting, strategies will be defined as model structures
4. Structures will be consolidated into several portfolios for further evaluation

Questions to Facilitate the Discussion

1. When you consider our IRP objectives of Affordability, Sustainability, and Reliability, is there an alternative strategy that would emphasize a particular objective?

2. In the short-term, what alternative option would you like to see added to the analysis?

3. Over the long-term, should a different strategy be introduced into the analysis?

STAKEHOLDER PROCESS

Stakeholder Timelines

March 9, 2021 ✓	April 14, 2021 ✓	June 24, 2021 ✓	July 27, 2021 (this session)	August 24, 2021	September 21, 2021
2021 IRP Process	DSM IRP Inputs and Modeling	AURORA Technical Workshop	IRP Process – Inputs, Scenarios and Sensitivities	Candidate Portfolio Review	Probabilistic Modeling Results
Objectives and Metrics	EE/EWR, DR and DER Results		All-Source RFP Results	Stochastic Modeling Approach and Assumptions	Review of Preferred Portfolio
Proposed Scenarios	2021 IRP Update			Stochastic Modeling	Other(s)
Base Case Inputs					

All-Source RFP Timeline

- **March 26:** Draft RFP Available ✓
- **April 9:** RFP Stakeholder Meeting ✓
- **April 23:** Issue RFP ✓
- **May 21:** Responses Due ✓

AURORA Licensing and Data Provision

Licensing of Aurora Application

- As part of the Stakeholder engagement, I&M executed an agreement to extend licenses of Energy Exemplar's AURORA application to the parties in Case No. U-20591 and to the stakeholders in Indiana that are highly involved in the technical aspects of the IRP.
- As of this meeting, licenses have been issued. Any licensing issues should be reported to Jay Boggs (jay.boggs@siemens.com) or Christen Blend (cmblend@aep.com)
- Online help manuals are available within the Aurora application - the model's Help menu features material like a user manual.

AURORA Licensing and Data Provision (continued)

Data Provision

- Consistent with prior I&M Integrated Resource Planning processes, we will continue to provide access to data to support stakeholder review of the IRP process.
- Siemens will host a confidential and secure site for stakeholders to access the information.
- IRP databases would include input and output tables used in the modeling and will require an NDA with Siemens.
- The model database will be available for review, but Siemens will not provide any review support beyond clearly-defined naming conventions (data key).
- Process for signing up to access the data will be shared by the Stakeholder Meeting #3B in August.

FEEDBACK AND DISCUSSION

CLOSING REMARKS

Indiana Michigan Power Company

2021 Integrated Resource Plan

Stakeholder Workshop #3B Meeting Minutes

October 14, 2021

1. Welcome and Safety Moment – Andrew Williamson

Andrew kicked off the meeting at 9:30 and covered slides 3-4.

Andrew kicked off the meeting and welcomed participants to the 2021 I&M Integrated Resource Plan (IRP) stakeholder workshop. Andrew reviewed a safety moment for autumn safety.

Andrew announced the Stakeholder Meeting #4 date has been set to November 18, 2021, pending confirmation with the regulating authorities.

Andrew also explained that the Reference Case that will be presented today has been updated to remove the Rockport Unit #2 after 5/31/2024, as a result of the recent settlement agreement IURC Cause No. 45546.

2. Meeting Guidelines – Jay Boggs, Siemens PTI

Jay covered slides 5-8

Jay introduced the Meeting Guidelines section and its content and established the role of Moderator for the Stakeholder Meeting.

Meeting guidelines and agenda were discussed.

Jay also provided an overview of the Questions and Feedback process, including directing stakeholders to submit comments and stay informed at the I&M IRP Website: http://www.indianamichiganpower.com/info/projects/IntegratedResourcePlan.

In addition, stakeholders are encouraged to submit questions via email to I&MIRP@aep.com

3. Candidate Portfolio Development – Peter Berini, Siemens PTI

Peter covered slides 9-16

Peter covered the candidate portfolio development process (Step 3 of the 5-step process.)

Peter covered the IRP process overview (slide 10), explaining that the IRP is a roadmap of where the organization (AEP I&M) is going and how AEP I&M is going to get there. I&M partnered with Siemens to create the **Reference portfolio** and a set of **Candidate Portfolios** with the incorporation of stakeholder feedback. Reference and candidate portfolios will be analyzed to identify the preferred portfolio.

Peter reviewed each of the following slides, which outline the key inputs and assumptions used in the development of the Reference Portfolio:

Slide	Description
11	Reference Case Fundamental Drivers and Resource Options
12	Generating Resources

13	Demand Side Management Resources
14	Resource Limitations

Peter then reviewed slide 15, which outlines the **Reference Portfolio** (referred to as "Reference Case" on slide 15), as well as the 8 sensitivities and 5 additional scenarios performed.

Peter indicated that there may be additional sensitivities and scenarios performed as part of the analysis. Once the preferred portfolio is selected, additional sensitivities will be performed to further analyze the portfolio.

Finally, Peter noted that while the results of all of the sensitivities and scenarios are included in the PowerPoint presentation materials, those designated as "Appendix" in the Details column have been included in the Appendix at the end of the presentation materials and will not be covered in the presentation.

Feedback and Discussion

As part of the oral questions from the audience not captured in the Appendix, there were two topics discussed:

- The initial discussion was around the treatment of tax credits, particularly the PTC and ITC. The Siemens team confirmed the PTC is assumed to be available for wind resources coming online before the end of 2025 and that the ITC is assumed to be available for solar resources coming online through the forecast horizon, starting at 26% and reaching 10% in 2026 and beyond.
- There was also a discussion around the constraint of resources used in the analysis. Siemens noted that the limits, which were informed by the all-source RFP, were discussed on Slide 14, and that two additional sensitivities were developed to test the impact the limits had on the portfolio selection.

4. <u>Reference Case Portfolio Results - Peter Berini, Siemens PTI</u>

Peter covers slides 17-25

Peter provided an introduction to the Reference Case Results, highlighting the following two important points:

1. The Reference Case Portfolio is the optimized portfolio, based on existing resources and the expected conditions (as outlined in the previous section.) It is intended to be used as the basis for comparing other strategic choices.
2. The Reference Case Portfolio does **not** represent I&M's preferred portfolio, but provides a basis to conduct sensitivities and portfolio comparisons

Key details about the Reference Case Portfolio:

1. The Reference Case portfolio has approximately 7 GW of new nameplate capacity (mostly renewable) through the forecast horizon
2. Energy Efficiency resources are selected with total Energy Efficiency generation as compared to retail load growing to 5% in 2030
3. Wind resources selected in 2025 and 2026 take advantage of the Production Tax Credit[1]

4. Solar and Solar Hybrid resources selected in 2025 and 2026 take advantage of the Investment Tax Credit[1]
5. Gas resources are selected with Rockport and Cook Retirements to support portfolio needs for capacity and energy. The resources selected are a combination of hydrogen convertible simple cycle and combined cycle
6. The carbon free generation declines after the retirement of the Cook Nuclear facilities and would require market offsets to meet targets thereafter

Peter then explained Slides 19-21, which provide a visualization of Reference Case Results of the I&M Total Portfolio Capacity, Cumulative Capacity Expansion, and Capacity Additions of Renewables and Gas CT/CC resources.

Peter then reviewed slides 22-23, which introduce the calculation of Key Metrics for the Reference Case Portfolio. The metrics calculated for each portfolio are as follows, with their calculation formula:

Metric	Calculation Formula
Capacity Position against FPR	(UCAP of resources/PJM Capacity Obligation with Reserve)-1
Energy Balance	I&M energy generation / energy demand
Imports I&M	imported energy / energy demand
Exports I&M	exported energy / energy demand
Carbon Free Generation	carbon free generation / total generation
Energy Efficiency (EE)	all EE generation / retail energy demand

Peter also pointed out that the color coding on the metrics values is intended as a visual aid only and should not be used to compare portfolios.

On slide 23, Peter presented the results of the metrics for the Reference Case Portfolio, highlighting the following:

Metric	Notes related to the Reference Case Results
Capacity Position against FPR	Short-term capacity contracts are required in 2024 to account for shortage in capacity. Capacity position maintains healthy margins through forecast period.
Energy Balance	Energy Balance is high in the early years as renewable energy is being selected to meet capacity position.
Imports I&M	Imports maintain reasonable balance without any years exceeding +30%
Exports I&M	Exports maintain reasonable balance without many years exceeding +30%
Carbon Free Generation	Carbon free generation meets targets until the retirement of Cook Nuclear facilities.
Energy Efficiency (EE)	EE Penetration for new and existing programs reaches ~5% of retail load obligation by 2030

5. Sensitivity Based Candidate Portfolios, Siemens PTI IRP Team

The Siemens PTI IRP Team covered slides 26-40

Peter kicks off this section by reviewing the listing of scenarios and sensitivities listed on slide 27 that will be reviewed in this section of the meeting. A summary of the results is as follows:

Slides	Alternative Scenario/Sensitivity
28-29	Rockport Unit 1 Early Retirement (2024)
30-31	Rockport Unit 1 Early Retirement (2025)
32-33	Cook Unit 1 and Unit 2 License Extensions
34-35	Cook Unit 1 and Unit 2 License Extensions and No Conventional Gas
36-37	35% Reduction in Renewable, Storage and EE Costs
38-39	Increased Environmental Regulations Leading to High Gas, Coal and CO2 Prices

Feedback and Discussion:

Oral questions from the audience

As part of the oral questions from the audience not captured in the Appendix, there was a lengthy discussion on how the analysis considers federal policy that is currently being debated. The IRP process is meant to develop future states of the world that capture the impacts of future policy changes in the energy space. Both the enhanced regulation and the rapid technology advancement scenarios capture potential states that allow us to draw conclusions about the impact of pending policy changes.

6. IRP Alignment Discussion – Art Holland and Peter Berini, Siemens PTI

Art covers slides 41-48

The Siemens PTI team introduced this section of the meeting as an opportunity for all stakeholders to post questions and provide their feedback related to any part of the 2021 I&M IRP process. To provide a guide to the discussion, the Siemens PTI will walk through each step of the IRP process, soliciting feedback at each step along the way.

Slide	Process Step
43	Step 1: Determine Objectives
44	Step 2: Assign Metrics
45	Step 3: Create Reference Case and Candidate Portfolios
46	Step 4: Analyze Candidate Portfolios
47	Step 5: Develop Balanced Scorecard

Feedback and Discussion:

All questions discussed in this section are recorded in the following Questions Section of the minutes.

7. Stakeholder Next Steps and Data Provision Plans – Jay Boggs, Siemens PTI

Jay covered slides 50-51

Jay reviewed the timeline for stakeholder meetings.

Jay also explained that we continue to work with the Technical Stakeholders to provide data in accordance with the original email to the technical stakeholders. While we have experienced delays in the schedule, the original intent for data provision remains the same.

8. Closing Remarks, Andrew Williamson

Andrew concluded the meeting expressing thanks on behalf of the I&M leadership for the active participation in today's meeting.

9. Appendix A: List of Questions Answered on Call

List of questions addressed on the call:

Question Asked Date/Time	Question Asked	Answer Given
09:51:35 AM EDT	As a number of us articulated in the last meeting, we feel like I&M/Siemens has utilized very little of our feedback so far. If you are legitimately interested in what we have to say for the rest of the process it would be very helpful to know what about this presentation you consider finalized and will not change and what can change.	As answered by Andrew
10:01:18 AM EDT	I may have misheard but did I&M earlier say its preferred plan may be a combination of portfolios?	As answered by Andrew
10:04:25 AM EDT	Hi Andrew, so anything about the Reference Case is final and all of the input assumptions are final as well? So what can we provide feedback on as it relates to the non-Reference Case scenarios?	As answered by Andrew
10:04:34 AM EDT	On slide 11, Candidate Portfolio Development, it shows DG solar as 0 in 2021, 1.1 in 2023 and so on. I believe these estimates are on the very low side for what can and probably will be developed. As of right now, my company, Lakeshore Die Cast has ~1.4MW of generation (150kW currently up and 1.4MW waiting on some interconnection paperwork with I&M). I'm certainly not the only person in the territory with solar so this number just strike me as off.	As answered by Andrew
10:05:30 AM EDT	And not to be a broken record, but it's really difficult to provide feedback on modeling choices and results without seeing the modeling files.	As answered by Peter Berini and Jay Boggs
10:07:22 AM EDT	What did you use as the basis for UCAP values for resources (especially renewable resources)? Also, did	As answered by Peter Berini

	you model impose any limits as to net reliance on the PJM energy market by hour?	
10:10:09 AM EDT	Regarding my earlier question about how preferred plan can be a combo of portfolios, how can you avoid concerns about I&M cherry picking?	As answered by Andrew
10:13:44 AM EDT	I get flexibility but I'm sure you can understand our concern and would appreciate you all considering that.	As answered by Jay Boggs
10:14:56 AM EDT	Is it also likely that an optimized portfolio may not be buildable as the model constructs it because there is not an ability to build a certain level of particular resources overnight? Therefore there may be a need to adjust the portfolio to address what can actually be installed in certain timeframes?	As answered by Andrew
10:15:58 AM EDT	What kind of analysis have you done as to the capital cost for relicensing Cook? Will those numbers/analysis be available for review?	As answered by Andrew
10:16:01 AM EDT	Hi, Sameer Doshi of Earthjustice here, on behalf of Citizens Action Coalition of Indiana. The September 2020 settlement in the Michigan PSC required that "I&M will work with stakeholders to define the modeling inputs for the IRP" -- including on several specific areas. What is I&M's plan to work with stakeholders and incorporate their advice on defining modeling inputs?	As answered by Andrew
10:16:08 AM EDT	I raised my hand Jay, but you may not have seen it.	Anna posed several observations and a question that were addressed by the IRP Team.
10:21:40 AM EDT	To follow up, if you did not do an analysis of the cost of relicensing Cook, what did you use in the "Cook Senstitivity" model runs?	As answered by Andrew
10:23:51 AM EDT	Has I&M's consulted with other utilities and taken into account industry accepted methods and siting constraints for consideration of capital costs, tax credits, resource build and siting limitations per year, etc?	As answered by Art Holland and Greg Soller and Andrew
10:28:03 AM EDT	Does the Company plan to conduct a full Cook relicensing analysis in another IRP in some future filing?	As answered by Andrew
10:34:36 AM EDT	Yes, sorry!	No problem! :)
10:38:56 AM EDT	Peter, the ITC isn't sunsetting, it's declining to 10% indefinitely. Is there a reason you all didn't reflect that?	As answered by Peter Berini
10:46:38 AM EDT	Since the cumulative totals for wind, hybrid storage, hybrid solar, and solar don't change after 2026, does	As answered by Peter Berini

	that mean that the max resource constraint(s) is/are binding?	
10:48:32 AM EDT	Is Aurora able to recognize the ITC and post ITC period for the solar hybrid resources or is the assumption that the solar and storage would be paired together for the entire planning period?	As answered by Peter Berini
10:50:45 AM EDT	Are the gas peaker and gas cc units new units that are going to be built (if so when?) or is that generation going to come from PPAs?	As answered by Peter Berini
11:02:06 AM EDT	Given the high energy balance and export numbers from 2026-2034, is there any concern that the model is adding resources primarily to sell energy on the market?	As answered by Art Holland
11:02:11 AM EDT	Peter, since you aren't dispatching to price, but rather are simulating load and gen in I&M's territory and in neighboring BAs why would I&M's system preferentially overbuild for purposes of selling energy?	As answered by Art Holland
11:02:19 AM EDT	Do you plan to add somewhere what the upstream gas emissions are?	As answered by Peter Berini
11:09:31 AM EDT	Is there any concerns that gas units that are built in the late 2030s early 2040s might lose out on running for their lifespan given that we are likely looking for carbon neutrality around 2050? Does the model look at how storage might be able to replace those gas units or is it to far out for the model to see how that technology might progress?	As answered by Art Holland
11:09:42 AM EDT	Can you describe how you add a constraint to the model secifically to keep imports and exports within "bounds"?	As answered by Art Holland
11:09:48 AM EDT	Yes, I understand why you are trying to fix this, but I wonder if there is a deeper issue. If the neighboring BAs have access to the same resource choices as I&M then it seems like I&M wouldn't have some special arbitrage opportunity. Does that make sense?	As answered by Art Holland
11:09:55 AM EDT	specifically...	As answered by Art Holland
11:10:35 AM EDT	MISO is in the process of proposing a seasonal construct. It seems potentially important to wonder whether PJM will be led to the same approach and the extent to which such an approach might affect your optimal portfolio. Have you thought about that and/or plan to do any modeling on that?	As answered by Art Holland
11:37:31 AM EDT	To follow up on Anna's questions, you are modeling PJM energy market prices based on your assumptions about resource builds in neighboring utilities by hour?	As answered by Art Holland

11:59:08 AM EDT	There seems to be a consistent cliff between 2034 and 2035 where the energy balance drops by about a third. However, it's not clear why that's happening in 2035 because the first loss of Cook capacity happens in 2034. Do you have any thoughts about why that is happening?	As answered by Peter Berini
12:00:04 PM EDT	Why would you not model for zero carbon by 2050 or 2040 given the dire threat posed by climate change?	As answered by Andrew
12:00:24 PM EDT	And do you have any thoughts about why the cumulative limits on the renewables and storage through 2035 seem to hold for the entire planning period even though the limits are relaxed after 2035?	As answered by Peter Berini
12:23:57 PM EDT	In looking at the sensitivity that removed the max build constraints on renewables (last slide of the Appendix), the energy balance and exports blow up up. Is this indicative of a bigger modeling issue where the model is building to export, similar to the discussion earlier with Anna? It seems like the max build constraint in the reference case may be hiding a problem.	As answered by Art Holland - will provide additional discussion during the alignment session of the meeting.
12:25:43 PM EDT	Thanks for the answer on net zero. If you can't extend Cook or do lock into gas CC, wouldn't that create policy risk and stranded asset risk for customers to reach your goal of 100% by 2050?	As answered by Andrew
01:38:54 PM EDT	Would like to reinforce the need for actual rate analysis, not based on NPV but actual rates. This is critical to evaluating both affordability and rate stabilty.	As answered by Art Holland
01:46:37 PM EDT	Have you considered using the HHI approach used in market power analysis to better measure resource diversity? Just measuring the number of resource types doesn't capture how much you are relying on specific resources.	As answered by Art Holland
01:49:28 PM EDT	HHI = Herfindahl-Hirschman Index	As answered by Art Holland
02:07:02 PM EDT	Did you remove the constraints on wind and solar or did you impose a higher constraint, which is still binding? The numbers look like the latter.	As answered by Art H and Peter B
02:17:18 PM EDT	Is the increased gas price volatility being incorporated into the analysis? Also concerns related to the ability to build new pipelines.	As answered by Peter Berini
02:20:17 PM EDT	I wonder if reliability would be better modeled as related to the peak hours for imports or exports for energy from the I&M system in that these are they hours in which the transmission system (and potential issues with transmission) could be most important to maintaining reliability..	As answered by Art Holland

02:47:43 PM EDT	Thanks, Anna and Jay. Yes, the more we can weigh in now and get changes to modeling, the fewer controversies in the years to come. We appreciate it.	You are very welcome!
02:49:49 PM EDT	Thanks folks!	

INDIANA MICHIGAN POWER
An AEP Company

Indiana Michigan Power:
2021 Integrated Resource Plan
Public Stakeholder Meeting #3B

October 14, 2021

Presented via GoToWebinar --> https://attendee.gotowebinar.com/register/1321120812922892812

BOUNDLESS ENERGY℠

Agenda

Time		
9:30 a.m.	WELCOME AND SAFETY MOMENT	**Andrew Williamson**, I&M Director Regulatory Services
9:35 a.m.	MEETING GUIDELINES AND AGENDA	**Jay Boggs**, Siemens PTI
9:40 a.m.	CANDIDATE PORTFOLIO DEVELOPMENT	**Art Holland,** Siemens PTI & **Peter Berini**, Siemens PTI
10:00 a.m.	REFERENCE CASE RESULTS	**Art Holland,** Siemens PTI & **Peter Berini**, Siemens PTI
11:00 a.m.	BREAK	
11:15 a.m.	SENSITIVITY RESULTS	**Art Holland,** Siemens PTI & **Peter Berini**, Siemens PTI
12:30 p.m.	LUNCH	
1:30 p.m.	ALIGNMENT DISCUSSION	**Art Holland,** Siemens PTI
2:15 p.m.	STAKEHOLDER NEXT STEPS	**Jay Boggs,** Siemens PTI
2:30 p.m.	CLOSING DISCUSSION	**Andrew Williamson**, I&M Director Regulatory Services
3:00 p.m.	ADJOURN	

WELCOME AND SAFETY MOMENT

Andrew Williamson | I&M Director Regulatory Services

Safety Moment

MEETING GUIDELINES AND TIMELINE

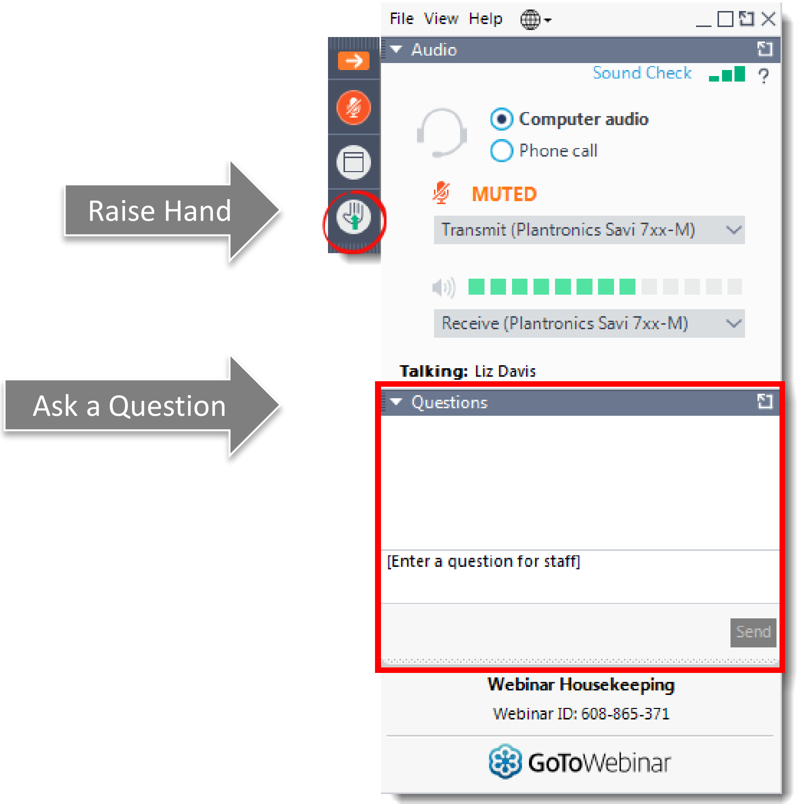
Jay Boggs | Siemens PTI

Questions and Feedback

One purpose of today's presentation is to explain the IRP process and collect feedback from stakeholders. Stakeholder feedback will be posted on the I&M website IRP portal and will be considered as part of the Final IRP.

If you have a question about the IRP process during this presentation:

- Type your question in the Questions area of the GoToWebinar panel
- During the feedback and discussion portions of the presentations, please raise your hand via the GoToMeeting tool to be recognized. We plan to hear form all who wish to be heard and address all questions
- Any questions that cannot be answered during the call will be addressed and posted on the website above



If you would like to make a comment or ask a question about the IRP process after the presentation has concluded:

- Please send an email to I&MIRP@aep.com
- Stay informed about future events by visiting the I&M IRP Portal located at www.indianamichiganpower.com/info/projects/IntegratedResourcePlan

Guidelines

1. Due to the number of participants scheduled to join today's meeting, all will be in a "listen-only" mode by default.

2. Please enter questions at any time into the GoToWebinar portal. This is the best to way to ensure your question is answered. We will attempt to answer all questions during the session, time permitting.

3. Time has been allotted during the session to answer questions related to the materials presented. Unanswered questions will be addressed after the presentation and posted in accordance with the Questions and Feedback slide.

4. At the end of the presentation, we will open-up the floor for "clarifying questions," thoughts, ideas, and suggestions.

5. Please provide your feedback or any additional questions on the Stakeholder Meeting #3B presentation within ten business days of the conclusion of this meeting.

Stakeholder Timelines

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March 9, 2021 ✓	April 14, 2021 ✓	June 24, 2021 ✓	July 27, 2021 ✓	October 14, 2021 (this session) ✓	November, 2021 (Nov 18, 2021)
2021 IRP Process	DSM IRP Inputs and Modeling	AURORA Technical Workshop	IRP Process – Inputs, Scenarios and Sensitivities	Finalized Reference Case Inputs and Key Assumptions	Stochastic Modeling
Objectives and Metrics	EE/EWR, DR and DER Results		All-Source RFP Results	Candidate Portfolio Review	Review of Preferred Portfolio
Proposed Scenarios	2021 IRP Update				Other(s)
Base Case Inputs					

All-Source RFP Timeline (completed)

- **March 26:** Draft RFP Available ✓
- **April 9:** RFP Stakeholder Meeting ✓
- **April 23:** Issue RFP ✓
- **May 21:** Responses Due ✓

Art Holland, Peter Berini, Siemens PTI

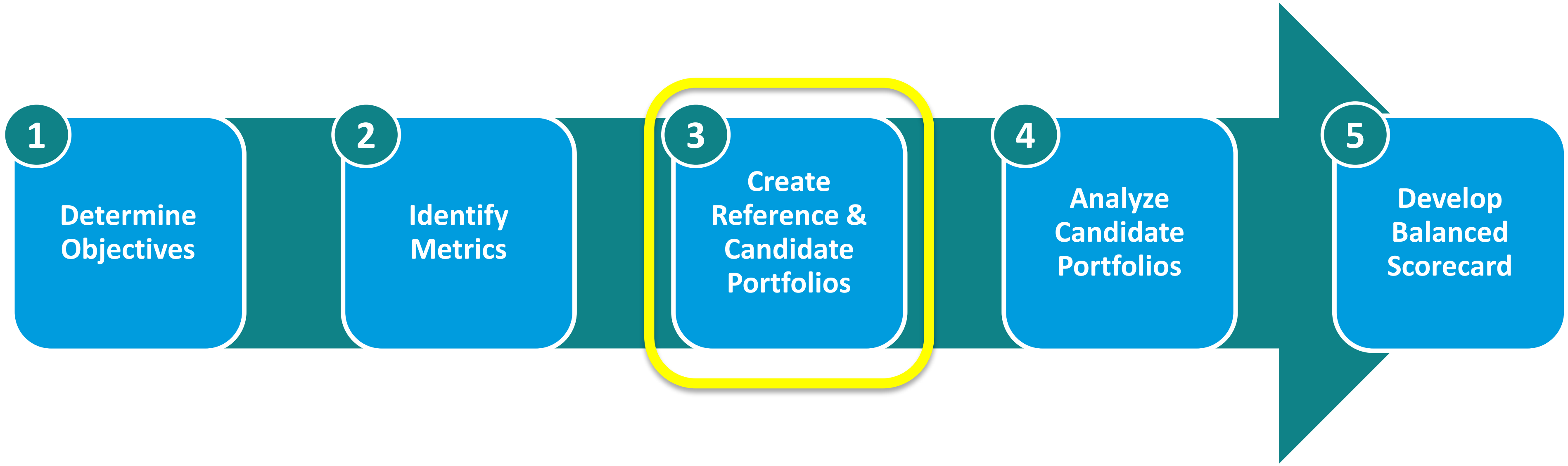
CANDIDATE PORTFOLIO DEVELOPMENT

Candidate Portfolio Development

Important Considerations

Siemens PTI applies the following 5-Step process for modeling, analyzing, and reporting the **Reference Portfolio** and **Candidate Portfolios** related to the AEP I&M IRP. The focus of Stakeholder Meeting 3B will be on results from **Step 3: Create Reference & Candidate Portfolios** of the process.

Siemens PTI: Approach to Integrated Resource Plan Modeling



Candidate Portfolio Development

Reference Case Fundamental Drivers and Resource Options

Input	Unit	2021	2023	2025	2027	2029	2031	2033	2035	2037	2039	2041
Coal (PRB)	2019$/MMBtu	0.68	0.67	0.68	0.68	0.68	0.68	0.68	0.69	0.70	0.70	0.70
CO2	2019$/ton	0.00	0.00	0.00	0.00	11.12	11.38	11.67	11.98	12.28	12.58	12.89
Gas (Henry Hub)	2019$/MMBtu	2.49	2.52	2.84	3.23	3.33	3.24	3.32	3.36	3.40	3.44	3.44
I&M PJM Obligation	MW	3,939	3,994	3,864	3,876	3,904	3,928	3,960	3,548	3,580	3,540	3,573
DG Solar	MW	0.0	1.1	1.7	2.7	4.4	7.3	12.2	20.2	32.7	50.2	71.1
EV Peak Load	MW	2	4	7	10	14	22	37	64	111	196	285
Wind (200 MW)	2019$/kW	1,449	1,393	1,333	1,269	1,202	1,158	1,139	1,120	1,101	1,082	1,062
Solar Tier 1 (50 MW)	2019$/kW	1,181	1,087	993	954	854	797	783	769	754	740	726
Solar Tier 2 (50 MW)	2019$/kW	1,350	1,243	1,135	1,090	977	911	895	879	862	846	830
Solar + Storage (100MW/ 20MW)	2019$/kW	1,535	1,373	1,214	1,177	1,066	1,000	979	958	937	915	894
Li-Ion Battery (50MW)	2019$/kW	1,319	1,145	971	898	826	780	760	741	721	701	681
Gas CC (1,070 MW)	2019$/kW	1,031	1,009	985	973	965	957	948	942	936	930	925
Gas CC (440 MW)	2019$/kW	1,097	1,073	1,048	1,035	1,027	1,018	1,009	1,003	996	990	984
Gas CT (250 MW)	2019$/kW	738	726	705	694	688	681	675	670	666	662	658

Note: The costs represent installed cost of resources in $2019. Renewable and conventional resources are informed by the Renewable RfP, the All-Source RfP and EIA Reports.

Candidate Portfolio Development

Generating Resources

Unit	Fuel	Installed Capacity (MW)	2024	2028	2034	2037	2041
Cook 1	Nuclear	1,084			Retirement		
Cook 2	Nuclear	1,204				Retirement	
Rockport 1	Coal	1,320		Retirement			
Rockport 2	Coal	650	Retirement				
Berrien Springs 1-12	Hydro	7.2					Owned Resource for 7.2 MW through 2041
Buchanan 1 - 10	Hydro	4.1					Owned Resource for 4.1 MW through 2041
Constantine 1 - 4	Hydro	1.0					Owned Resource for 1.0 MW through 2041
Elkhart 1 - 3	Hydro	1.8					Owned Resource for 1.8 MW through 2041
Mottville 1 - 4	Hydro	1.7					Owned Resource for 1.7 MW through 2041
Twin Branch 1 - 8	Hydro	4.8					Owned Resource for 4.8 MW through 2041
Deer Creek	Solar	3					Owned Resource for 2.5 MW through 2041
Olive	Solar	5					Owned Resource for 5 MW through 2041
Twin Branch Solar	Solar	3					Owned Resource for 2.6 MW through 2041
Watervliet	Solar	5					Owned Resource for 4.6 MW through 2041
St. Joseph Solar	Solar	20					Owned Resource for 20 MW through 2041
OVEC ICPA	Coal	187					ICPA Obligation ending in 2040
Fowler Ridge 1	Wind	100					PPA Obligation ending in 2029
Fowler Ridge 2	Wind	50					PPA Obligation ending in 2029
Headwaters	Wind	200					PPA Obligation ending in 2034
Wildcat	Wind	100					PPA Obligation ending in 2032

Candidate Portfolio Development

Demand Side Management Resources

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Measure	Program	Customer Class	State	Source
Energy Efficiency	Conservation Voltage Reduction	Residential	MI	AEP I&M
Energy Efficiency	Conservation Voltage Reduction	Commercial & Industrial	MI	AEP I&M
Energy Efficiency	Conservation Voltage Reduction	Residential	IN	AEP I&M
Energy Efficiency	Conservation Voltage Reduction	Commercial & Industrial	IN	AEP I&M
Energy Efficiency	Low Income Qualified	N/A	MI/IN	MPS
Energy Efficiency	MI Existing EWR Plan (2021)	Residential and C&I	MI	AEP I&M
Energy Efficiency	MI Pending 2022-2023 EWR Plan (2022)	Residential and C&I	MI	AEP I&M
Energy Efficiency	IN Existing DSM Plan (2021-2022)	Residential and C&I	IN	AEP I&M
Demand Response	Residential Demand Response	Residential	MI/IN	MPS
Demand Response	C&I Demand Response	Commercial & Industrial	MI/IN	MPS
Distributed Energy Resources	Rooftop Solar DER	Rooftop Solar	MI/IN	MPS
Distributed Energy Resources	Combined Heat & Power DER	Combined Heat & Power	MI/IN	MPS

Candidate Portfolio Development

Resource Limitations

Resource	Limit (MW) Annual/Cumulative		
	2025-2034	2035-2037	2038-2050
Solar T1	250 / 1,800	250 / 2,400	250 / 3,500
Solar T2	250 / 1,800	250 / 2,400	250 / 3,500
Solar Hybrid	500 / 1,800	500 / 2,400	500 / 3,500
Wind	800 / 1,600	800 / 3,200	800 / 5,800
Gas CC 2x1	1,070 / 1,070	1,070 / 1,070	1,070 / 1,070
Gas CC 1x1	440 / 880	440 / 880	440 / 880
Gas CT Advanced	500 / 4,000	500 / 4,000	500 / 4,000

[1]Resource Limits are informed by the RFP/RFI.

Candidate Portfolio Development

Reference Case and Sensitivities

Portfolio	Description	Details
Reference Case	Rockport Unit 1 (2028) Rockport Unit 2 (2024) and Cook (2034, 2037)	
Reference with Rockport Sensitivity	Rockport Unit 1 Early Retirement (2024)	
Reference with Rockport Sensitivity	Rockport Unit 1 Early Retirement (2025)	
Reference with Rockport Sensitivity	Rockport Unit 1 Early Retirement (2026)	Appendix
Reference with Cook Sensitivity	Cook Unit 1 and Unit 2 License Extensions (beyond 2034 and 2037)	
Reference with Cook Sensitivity #2	Cook Unit 1 and Unit 2 License Extensions and No Conventional Gas Allowed	
Reference with Relaxed Renewable Limits	Expanded Cumulative Build Limits on Renewable Energy and Storage	Appendix
Reference with 30% Import / Export Limit	Import and Export Limit at ~30% of I&M Load	Appendix
Reference with No Renewable Limits	Removed Cumulative and Annual Build Limits on Renewable Energy and Storage	Appendix
Rapid Technology Advancement	35% Reduction in Renewable, Storage and EE Costs	
Enhanced Regulation	Increased Environmental Regulations Leading to High Gas, Coal and CO_2 Prices	
Net Savings Sensitivity 1	Rockport Unit 1 Early Retirement (2024) Replacing SEA with Net to Gross EE Bundle Savings	Appendix
Net Savings Sensitivity 2	Rockport Unit 1 Early Retirement (2026) Replacing SEA with Net to Gross EE Bundle Savings	Appendix
Net Savings Sensitivity 3	Rapid Technology Advancement (RTA) Replacing SEA with Net to Gross EE Bundle Savings	Appendix

Note: Not all sensitivities are represented above. Additional sensitivities will be conducted on the Preferred Portfolio once selected.

FEEDBACK AND DISCUSSION

Art Holland, Peter Berini, Siemens PTI

REFERENCE CASE PORTFOLIO RESULTS

Reference Case Results

Introduction

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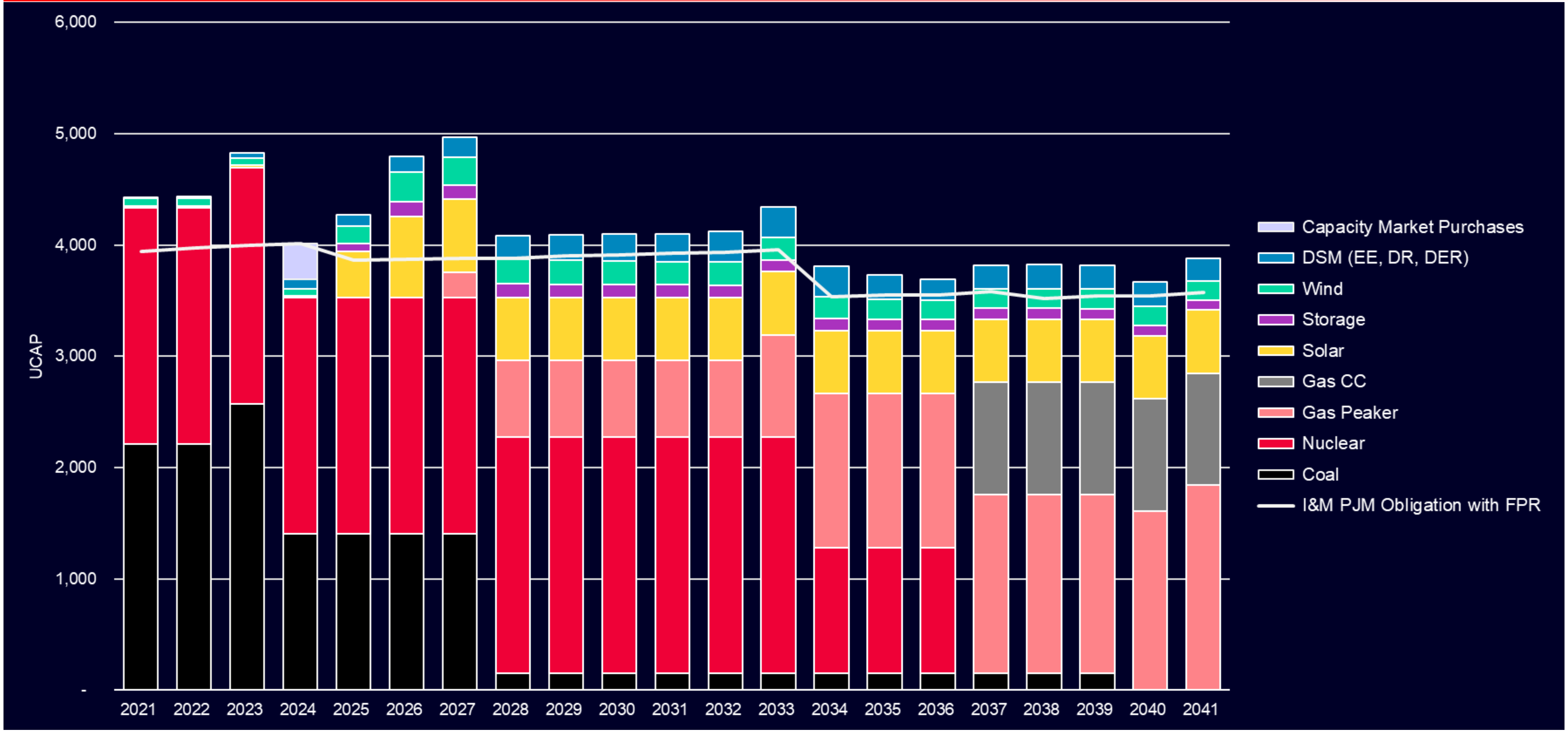
The Reference Case portfolio is the optimized portfolio based on existing resources and expected conditions as a basis for comparing other strategic choices.

- The Reference case does not represent I&M's preferred portfolio but provides a basis to conduct sensitivities and portfolio comparisons
- The Reference Case portfolio has approximately 7 GW of new nameplate capacity (mostly renewable) through the forecast horizon
- Energy Efficiency resources are selected with total Energy Efficiency generation as compared to retail load growing to 5% in 2030
- Wind resources selected in 2025 and 2026 take advantage of the Production Tax Credit[1]
- Solar and Solar Hybrid resources selected in 2025 and 2026 take advantage of the Investment Tax Credit[1]
- Gas resources are selected with Rockport and Cook Retirements to support portfolio needs for capacity and energy. The resources selected are a combination of hydrogen convertible simple cycle and combined cycle
- The carbon free generation declines after the retirement of the Cook Nuclear facilities and would require market offsets to meet targets thereafter

[1]Renewable Resources are expected to come online by December 31st of the previous year in order to capitalize on PTC and ITC benefits

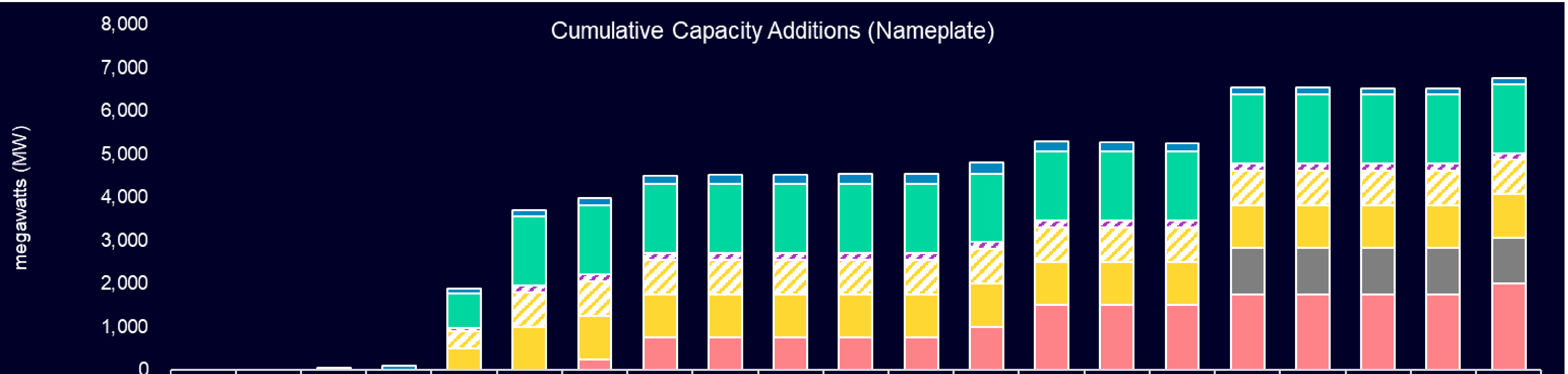
Reference Case Results, I&M Total Portfolio Capacity (MW)

Optimized for Minimum Cost



Reference Case Results

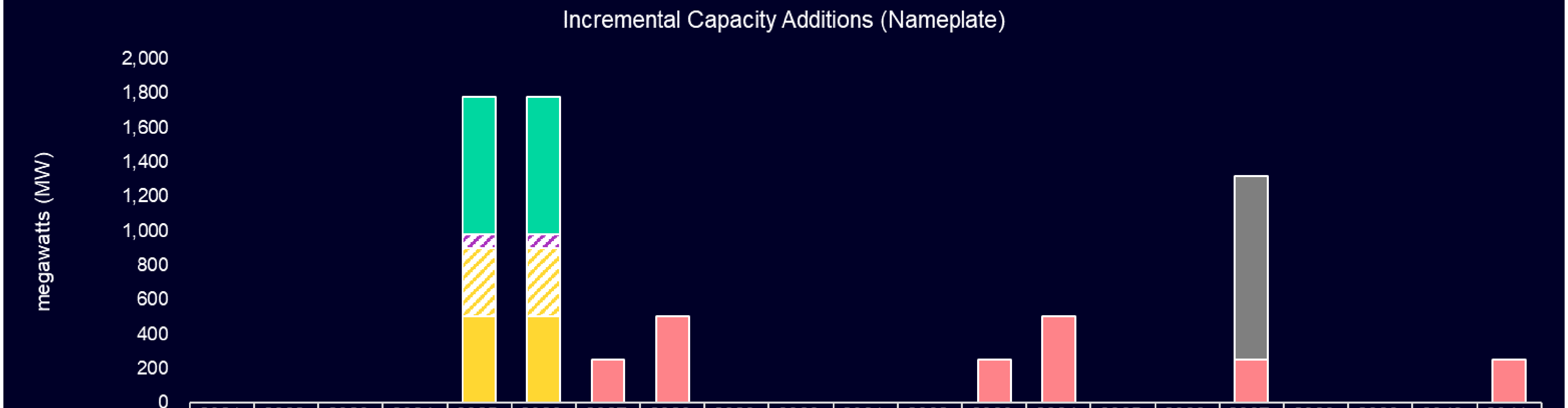
Cumulative Capacity Expansion (Nameplate)



	2021	2022	2023	2024	2025	2026	2027	2028	2029	2030	2031	2032	2033	2034	2035	2036	2037	2038	2039	2040	2041
EE	0	0	50	96	112	144	172	189	210	223	234	241	247	235	213	197	182	168	157	149	124
Wind	0	0	0	0	800	1,600	1,600	1,600	1,600	1,600	1,600	1,600	1,600	1,600	1,600	1,600	1,600	1,600	1,600	1,600	1,600
Storage	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Hybrid Storage	0	0	0	0	80	160	160	160	160	160	160	160	160	160	160	160	160	160	160	160	160
Hybrid Solar	0	0	0	0	400	800	800	800	800	800	800	800	800	800	800	800	800	800	800	800	800
Solar	0	0	0	0	500	1,000	1,000	1,000	1,000	1,000	1,000	1,000	1,000	1,000	1,000	1,000	1,000	1,000	1,000	1,000	1,000
Gas CC	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	1,070	1,070	1,070	1,070	1,070
Gas Peaker	0	0	0	0	0	0	250	750	750	750	750	750	1,000	1,500	1,500	1,500	1,750	1,750	1,750	1,750	2,000
Total	0	0	50	96	1,892	3,704	3,982	4,499	4,520	4,533	4,544	4,551	4,807	5,295	5,273	5,257	6,562	6,548	6,537	6,529	6,754

Reference Case Results

Selection of Renewables and Gas CT/CC



	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	800	800	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Storage	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Hybrid Storage	0	0	0	0	80	80	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Hybrid Solar	0	0	0	0	400	400	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Solar	0	0	0	0	500	500	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
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	250	500	0	0	0	0	250	500	0	0	250	0	0	0	250

Note: Incremental EE Capacity Additions are not show in the above graphic.

Reference Case Results

Objectives and Design Requirements (1/2)

Reference						
Year	Capacity Position	Energy Balance	Imports I&M	Exports I&M	Carbon Free Generation	EE Penetration
2021	12%	103%	12%	6%	85%	0.06%
2022	12%	92%	25%	7%	83%	0.46%
2023	21%	98%	16%	4%	91%	0.79%
2024	0%	104%	10%	3%	91%	2.31%
2025	11%	120%	3%	12%	92%	2.79%
2026	24%	145%	1%	31%	94%	3.66%
2027	28%	146%	1%	34%	93%	4.08%
2028	5%	135%	1%	25%	96%	2.82%
2029	5%	138%	1%	27%	96%	3.79%
2030	5%	143%	0%	32%	96%	4.89%
2031	4%	134%	1%	24%	96%	4.95%
2032	5%	139%	1%	27%	97%	4.88%
2033	10%	135%	1%	25%	96%	4.66%
2034	8%	151%	0%	41%	95%	3.01%
2035	5%	108%	8%	8%	93%	4.02%
2036	4%	105%	11%	7%	93%	4.78%
2037	7%	146%	0%	38%	69%	4.64%
2038	9%	97%	14%	3%	52%	4.21%
2039	8%	95%	15%	2%	52%	3.80%
2040	3%	92%	16%	2%	53%	2.82%
2041	9%	90%	16%	2%	55%	3.47%

Metrics Calculations and Notes

Capacity Position against FPR:
(UCAP of resources/PJM Capacity Obligation with Reserve)-1

Energy Balance:
I&M energy generation / energy demand

Imports I&M:
imported energy / energy demand

Exports I&M:
exported energy / energy demand

Carbon Free Generation:
carbon free generation / total generation

Energy Efficiency (EE)
all EE generation / retail energy demand

Color designations – color coding is intended as a visual aid only and should not be used to compare portfolios. Coloring differentiates between threshold values.

Energy Efficiency represents the amount of EE in a mathematically optimized portfolio, subject to further evaluation.

Reference Case Results

Objectives and Design Requirements (2/2)

Reference						
Year	Capacity Position	Energy Balance	Imports I&M	Exports I&M	Carbon Free Generation	EE Penetration
2021	12%	103%	12%	6%	85%	0.06%
2022	12%	92%	25%	7%	83%	0.46%
2023	21%	98%	16%	4%	91%	0.79%
2024	0%	104%	10%	3%	91%	2.31%
2025	11%	120%	3%	12%	92%	2.79%
2026	24%	145%	1%	31%	94%	3.66%
2027	28%	146%	1%	34%	93%	4.08%
2028	5%	135%	1%	25%	96%	2.82%
2029	5%	138%	1%	27%	96%	3.79%
2030	5%	143%	0%	32%	96%	4.89%
2031	4%	134%	1%	24%	96%	4.95%
2032	5%	139%	1%	27%	97%	4.88%
2033	10%	135%	1%	25%	96%	4.66%
2034	8%	151%	0%	41%	95%	3.01%
2035	5%	108%	8%	8%	93%	4.02%
2036	4%	105%	11%	7%	93%	4.78%
2037	7%	146%	0%	38%	69%	4.64%
2038	9%	97%	14%	3%	52%	4.21%
2039	8%	95%	15%	2%	52%	3.80%
2040	3%	92%	16%	2%	53%	2.82%
2041	9%	90%	16%	2%	55%	3.47%

Metrics Calculations and Notes

Capacity Position against FPR:

Short-term capacity contracts are required in 2024 to account for shortage in capacity. Capacity position maintains healthy margins through forecast period.

Energy Balance:

Energy Balance is high in the early years as renewable energy is being selected to meet capacity position.

Imports I&M:

Imports maintain reasonable balance without any years exceeding +30%

Exports I&M:

Exports maintain reasonable balance without many years exceeding +30%

Carbon Free Generation:

Carbon free generation meets targets until the retirement of Cook Nuclear facilities.

Energy Efficiency (EE)

EE Penetration for new and existing programs reaches ~5% of retail load obligation by 2030

FEEDBACK AND DISCUSSION

BREAK

PLEASE PLAN A RETURN BY 11:15AM

Siemens PTI IRP Team

SENSITIVITY BASED CANDIDATE PORTFOLIOS

Reference and Candidate Portfolios

I&M and Siemens have developed **a Reference Case**, two alternative **Scenarios**, and a handful of **Sensitivities** to implement a scenario- and sensitivity-based approach to inform **Candidate Portfolios**. Each **Candidate Portfolio** will be developed from the **Scenarios** and/or the **Sensitivities** below.

Portfolio	Description	Details
Reference Case	Rockport Unit 1 (2028) Rockport Unit 2 (2024) and Cook (2034, 2037)	
Reference with Rockport Sensitivity	Rockport Unit 1 Early Retirement (2024)	
Reference with Rockport Sensitivity	Rockport Unit 1 Early Retirement (2025)	
Reference with Rockport Sensitivity	Rockport Unit 1 Early Retirement (2026)	Appendix
Reference with Cook Sensitivity	Cook Unit 1 and Unit 2 License Extensions (beyond 2034 and 2037)	
Reference with Cook Sensitivity #2	Cook Unit 1 and Unit 2 License Extensions and No Conventional Gas Allowed	
Reference with Relaxed Renewable Limits	Expanded Cumulative Build Limits on Renewable Energy and Storage	Appendix
Reference with 30% Import / Export Limit	Import and Export Limit at ~30% of I&M Load	Appendix
Reference with No Renewable Limits	Removed Cumulative and Annual Build Limits on Renewable Energy and Storage	Appendix
Rapid Technology Advancement	35% Reduction in Renewable, Storage and EE Costs	
Enhanced Regulation	Increased Environmental Regulations Leading to High Gas, Coal and CO2 Prices	
Net Savings Sensitivity 1	Rockport Unit 1 Early Retirement (2024) Replacing SEA with Net to Gross EE Bundle Savings	Appendix
Net Savings Sensitivity 2	Rockport Unit 1 Early Retirement (2026) Replacing SEA with Net to Gross EE Bundle Savings	Appendix
Net Savings Sensitivity 3	Rapid Technology Advancement (RTA) Replacing SEA with Net to Gross EE Bundle Savings	Appendix

Note: Not all sensitivities are represented above. Additional sensitivities will be conducted on the Preferred Portfolio once selected.

Reference Case Sensitivity

Rockport Unit 1 Early Retirement (2024)

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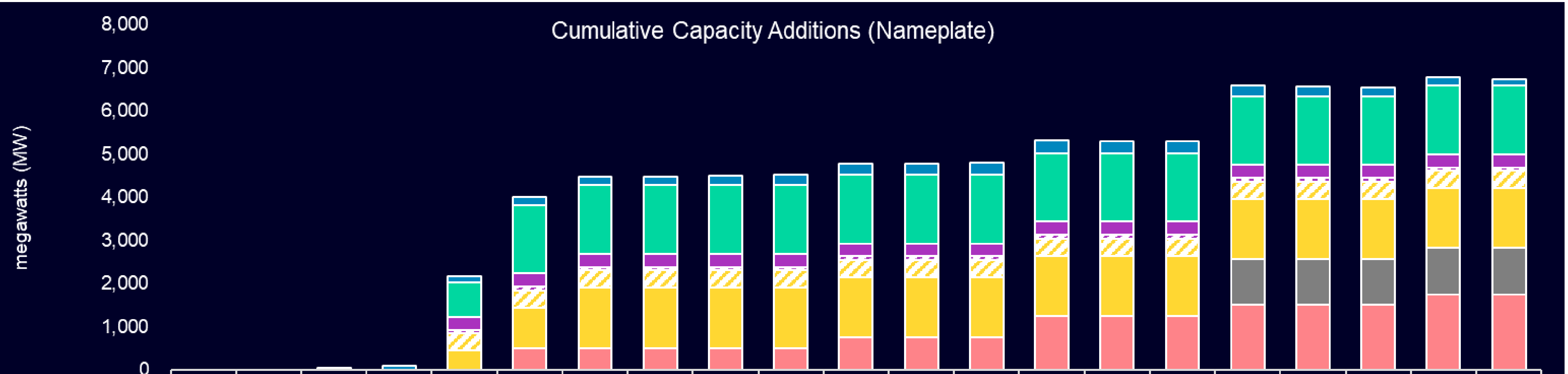


	2021	2022	2023	2024	2025	2026	2027	2028	2029	2030	2031	2032	2033	2034	2035	2036	2037	2038	2039	2040	2041
EE	0	0	50	96	139	168	193	208	226	242	256	262	276	286	282	281	253	229	208	177	140
Wind	0	0	0	0	800	1,600	1,600	1,600	1,600	1,600	1,600	1,600	1,600	1,600	1,600	1,600	1,600	1,600	1,600	1,600	1,600
Storage	0	0	0	0	300	300	300	300	300	300	300	300	300	300	300	300	300	300	300	300	300
Hybrid Storage	0	0	0	0	80	80	80	80	80	80	80	80	80	80	80	80	80	80	80	80	80
Hybrid Solar	0	0	0	0	400	400	400	400	400	400	400	400	400	400	400	400	400	400	400	400	400
Solar	0	0	0	0	450	950	1,400	1,400	1,400	1,400	1,400	1,400	1,400	1,400	1,400	1,400	1,400	1,400	1,400	1,400	1,400
Gas CC	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	1,070	1,070	1,070	1,070	1,070
Gas Peaker	0	0	0	0	0	500	500	500	500	500	750	750	750	1,250	1,250	1,250	1,500	1,500	1,500	1,750	1,750
Total	0	0	50	96	2,169	3,998	4,473	4,488	4,506	4,522	4,786	4,792	4,806	5,316	5,312	5,311	6,603	6,579	6,558	6,777	6,740

Reference Case Sensitivity KPI

Rockport Unit 1 Early Retirement (2024)

Rockport 1 2024 Retirement						
Year	Capacity Position	Energy Balance	Imports I&M	Exports I&M	Carbon Free Generation	EE Penetration
2021	12%	103%	12%	6%	85%	0.06%
2022	12%	92%	25%	7%	83%	0.46%
2023	21%	98%	16%	4%	91%	0.79%
2024	0%	105%	11%	5%	90%	2.31%
2025	0%	114%	5%	8%	97%	3.20%
2026	4%	137%	1%	23%	96%	4.00%
2027	7%	140%	1%	28%	97%	4.35%
2028	4%	135%	1%	25%	97%	2.99%
2029	3%	138%	1%	27%	97%	3.93%
2030	3%	142%	1%	31%	97%	5.04%
2031	9%	135%	1%	24%	96%	5.11%
2032	9%	139%	0%	27%	97%	4.98%
2033	8%	135%	1%	25%	96%	4.85%
2034	6%	151%	0%	41%	96%	3.45%
2035	4%	109%	8%	8%	94%	4.81%
2036	2%	106%	11%	7%	94%	5.86%
2037	4%	148%	0%	39%	69%	5.49%
2038	6%	98%	14%	3%	52%	4.91%
2039	5%	95%	15%	2%	52%	4.36%
2040	7%	93%	15%	3%	53%	3.11%
2041	6%	90%	16%	2%	55%	3.60%

Metrics Calculations and Notes

Capacity Position against FPR:

Short-term capacity contracts are required in years 2024 and 2025 to account for early Rockport retirement. Post 2025 capacity position maintains healthy margin.

Energy Balance:

Energy Balance is high in the early years as energy rich renewable energy is being selected to meet capacity position.

Imports I&M:

Imports maintain reasonable balance without any years exceeding +30%

Exports I&M:

Exports maintain reasonable balance without many years exceeding +30%

Carbon Free Generation:

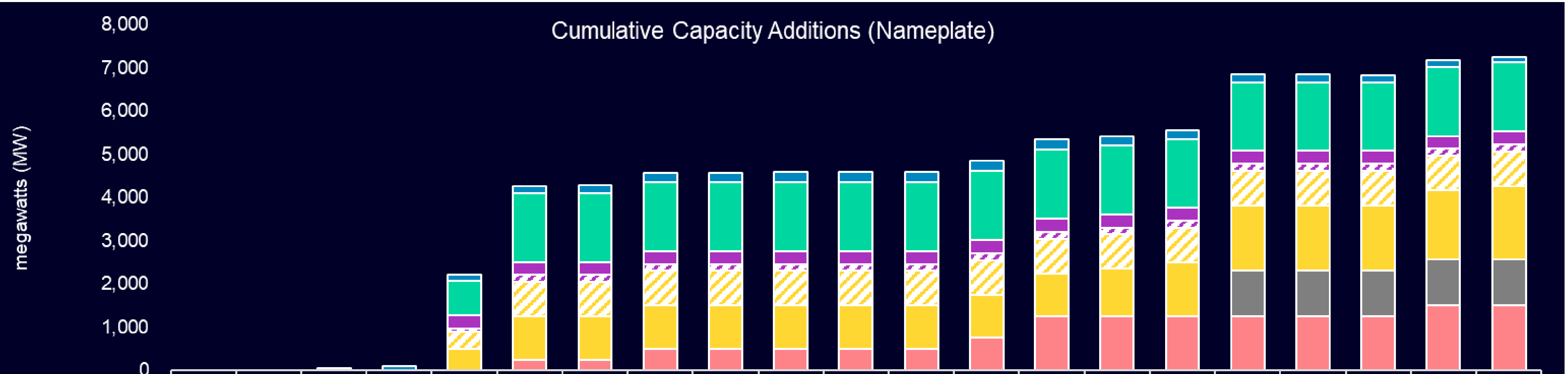
Carbon free generation meets targets until the retirement of Cook Nuclear facilities.

Energy Efficiency (EE)

EE Penetration for new and existing programs reaches ~5% of retail load obligation by 2030

Reference Case Sensitivity

Rockport Unit 1 Early Retirement (2025)



	2021	2022	2023	2024	2025	2026	2027	2028	2029	2030	2031	2032	2033	2034	2035	2036	2037	2038	2039	2040	2041
EE	0	0	50	96	139	167	191	204	221	231	241	243	248	235	213	197	182	169	157	149	124
Wind	0	0	0	0	800	1,600	1,600	1,600	1,600	1,600	1,600	1,600	1,600	1,600	1,600	1,600	1,600	1,600	1,600	1,600	1,600
Storage	0	0	0	0	300	300	300	300	300	300	300	300	300	300	300	300	300	300	300	300	300
Hybrid Storage	0	0	0	0	80	160	160	160	160	160	160	160	160	160	160	160	160	160	160	160	160
Hybrid Solar	0	0	0	0	400	800	800	800	800	800	800	800	800	800	800	800	800	800	800	800	800
Solar	0	0	0	0	500	1,000	1,000	1,000	1,000	1,000	1,000	1,000	1,000	1,000	1,100	1,250	1,500	1,500	1,500	1,600	1,700
Gas CC	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	1,070	1,070	1,070	1,070	1,070
Gas Peaker	0	0	0	0	0	250	250	500	500	500	500	500	750	1,250	1,250	1,250	1,250	1,250	1,250	1,500	1,500
Total	0	0	50	96	2,219	4,277	4,301	4,564	4,581	4,591	4,601	4,603	4,858	5,345	5,423	5,557	6,862	6,849	6,837	7,179	7,254

Reference Case Sensitivity KPI

Rockport Unit 1 Early Retirement (2025)

Rockport 1 2025 Retirement						
Year	Capacity Position	Energy Balance	Imports I&M	Exports I&M	Carbon Free Generation	EE Penetration
2021	12%	103%	12%	6%	85%	0.06%
2022	12%	92%	25%	7%	83%	0.46%
2023	21%	98%	16%	4%	91%	0.79%
2024	0%	104%	10%	3%	91%	2.31%
2025	0%	121%	4%	14%	92%	3.20%
2026	4%	140%	1%	27%	97%	4.00%
2027	2%	139%	2%	27%	97%	4.34%
2028	5%	135%	1%	25%	97%	2.98%
2029	5%	138%	1%	27%	97%	3.92%
2030	5%	142%	1%	31%	97%	5.00%
2031	4%	134%	2%	23%	96%	5.03%
2032	4%	138%	1%	27%	97%	4.89%
2033	9%	135%	1%	24%	96%	4.67%
2034	7%	150%	0%	40%	96%	3.01%
2035	5%	108%	8%	9%	94%	4.02%
2036	5%	106%	10%	8%	94%	4.78%
2037	3%	150%	0%	42%	70%	4.64%
2038	5%	101%	13%	5%	55%	4.21%
2039	4%	98%	13%	4%	55%	3.80%
2040	7%	97%	13%	5%	56%	2.82%
2041	6%	97%	13%	5%	58%	3.47%

Metrics Calculations and Notes

Capacity Position against FPR:

Short-term capacity contracts are required in years 2024 and 2025 to account for early Rockport retirement. Post 2025 capacity position maintains healthy margin.

Energy Balance:

Energy Balance is high in the middle years as energy rich renewable energy is being selected to meet capacity position.

Imports I&M:

Imports maintain reasonable balance without any years exceeding +30%

Exports I&M:

Exports maintain reasonable balance without many years exceeding +30%

Carbon Free Generation:

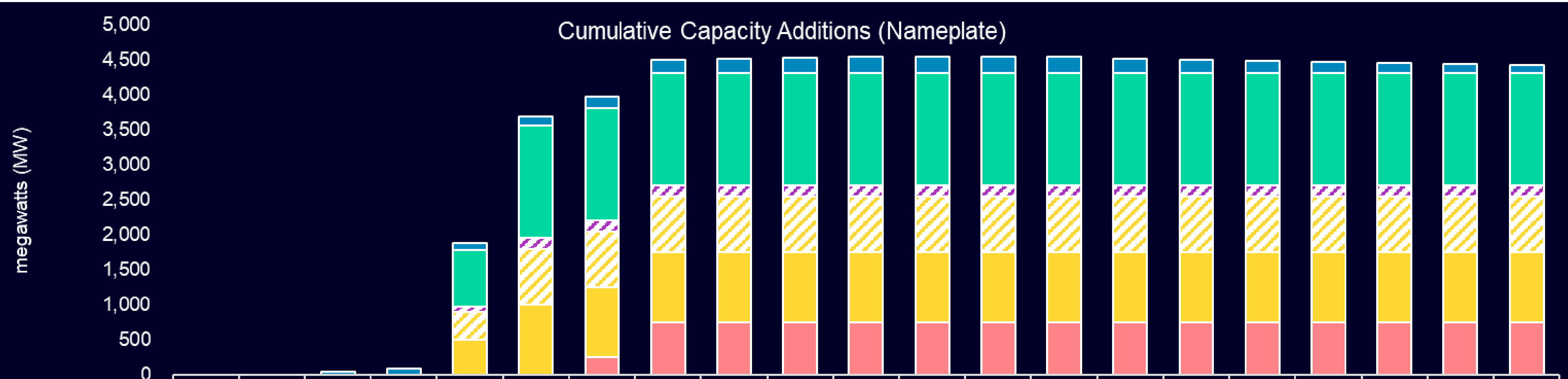
Carbon free generation meets targets until the retirement of Cook Nuclear facilities.

Energy Efficiency (EE)

EE Penetration for new and existing programs reaches ~5% of retail load obligation by 2030

Reference Case Sensitivity

Cook Unit 1 and Unit 2 License Extensions



	2021	2022	2023	2024	2025	2026	2027	2028	2029	2030	2031	2032	2033	2034	2035	2036	2037	2038	2039	2040	2041
EE	0	0	50	96	112	144	172	189	210	223	234	241	247	235	213	197	182	168	149	141	117
Wind	0	0	0	0	800	1,600	1,600	1,600	1,600	1,600	1,600	1,600	1,600	1,600	1,600	1,600	1,600	1,600	1,600	1,600	1,600
Storage	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Hybrid Storage	0	0	0	0	80	160	160	160	160	160	160	160	160	160	160	160	160	160	160	160	160
Hybrid Solar	0	0	0	0	400	800	800	800	800	800	800	800	800	800	800	800	800	800	800	800	800
Solar	0	0	0	0	500	1,000	1,000	1,000	1,000	1,000	1,000	1,000	1,000	1,000	1,000	1,000	1,000	1,000	1,000	1,000	1,000
Gas CC	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Gas Peaker	0	0	0	0	0	0	250	750	750	750	750	750	750	750	750	750	750	750	750	750	750
Total	0	0	50	96	1,892	3,704	3,982	4,499	4,520	4,533	4,544	4,551	4,557	4,545	4,523	4,507	4,492	4,478	4,459	4,451	4,427

Reference Case Sensitivity KPI

Cook Unit 1 and Unit 2 License Extensions

INDIANA MICHIGAN POWER
An AEP Company

Cook Extension						
Year	Capacity Position	Energy Balance	Imports I&M	Exports I&M	Carbon Free Generation	EE Penetration
2021	12%	103%	12%	6%	85%	0.06%
2022	12%	92%	25%	7%	83%	0.46%
2023	21%	98%	16%	4%	91%	0.79%
2024	0%	104%	10%	3%	91%	2.31%
2025	11%	120%	3%	12%	92%	2.79%
2026	24%	139%	1%	26%	98%	3.66%
2027	28%	139%	2%	27%	97%	4.08%
2028	5%	135%	1%	25%	96%	2.82%
2029	5%	138%	1%	27%	96%	3.79%
2030	5%	142%	0%	30%	97%	4.89%
2031	4%	134%	1%	24%	96%	4.95%
2032	5%	139%	1%	27%	97%	4.88%
2033	4%	135%	1%	24%	96%	4.66%
2034	16%	145%	0%	35%	97%	3.01%
2035	14%	145%	0%	38%	97%	4.02%
2036	12%	144%	1%	36%	97%	4.78%
2037	12%	146%	0%	37%	97%	4.64%
2038	14%	147%	0%	39%	97%	4.21%
2039	13%	145%	0%	38%	97%	3.65%
2040	9%	143%	0%	38%	98%	2.70%
2041	8%	142%	0%	38%	100%	3.32%

Metrics Calculations and Notes

Capacity Position against FPR:

Short-term capacity contracts are required in 2024 to account for shortage in capacity. Post 2024 capacity position maintains healthy margin.

Energy Balance:

Energy Balance is high in the middle years and is maintained through the forecast as energy rich renewable energy is being selected to meet capacity position.

Imports I&M:

Imports maintain reasonable balance without any years exceeding +30%.

Exports I&M:

Exports are slightly higher than in other portfolios due to the extension of nuclear resources. However, in many years the levels do not exceed 30%.

Carbon Free Generation:

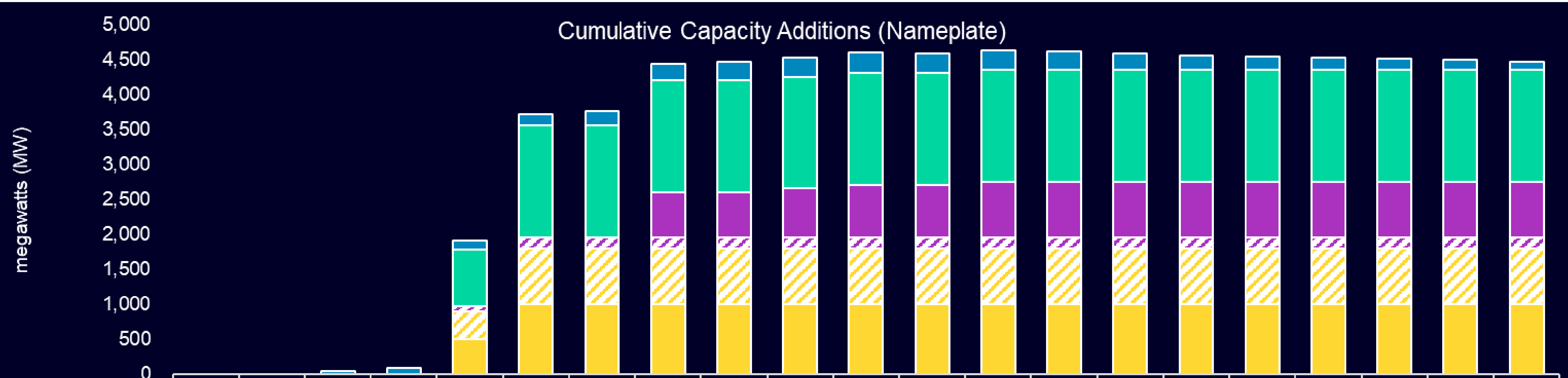
Carbon free generation meets targets for entire forecast period.

Energy Efficiency (EE)

EE Penetration for new and existing programs reaches ~5% of retail load obligation by 2030

Reference Case Sensitivity

Cook Unit 1 and Unit 2 License Extensions and No Conventional Gas



	2021	2022	2023	2024	2025	2026	2027	2028	2029	2030	2031	2032	2033	2034	2035	2036	2037	2038	2039	2040	2041
EE	0	0	50	96	136	170	204	234	260	278	293	286	280	258	230	208	190	174	155	145	121
Wind	0	0	0	0	800	1,600	1,600	1,600	1,600	1,600	1,600	1,600	1,600	1,600	1,600	1,600	1,600	1,600	1,600	1,600	1,600
Storage	0	0	0	0	0	0	0	650	650	700	750	750	800	800	800	800	800	800	800	800	800
Hybrid Storage	0	0	0	0	80	160	160	160	160	160	160	160	160	160	160	160	160	160	160	160	160
Hybrid Solar	0	0	0	0	400	800	800	800	800	800	800	800	800	800	800	800	800	800	800	800	800
Solar	0	0	0	0	500	1,000	1,000	1,000	1,000	1,000	1,000	1,000	1,000	1,000	1,000	1,000	1,000	1,000	1,000	1,000	1,000
Gas CC	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Gas Peaker	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Total	0	0	50	96	1,916	3,730	3,764	4,444	4,470	4,538	4,603	4,596	4,640	4,618	4,590	4,568	4,550	4,534	4,515	4,505	4,481

Reference Case Sensitivity KPI

Cook Unit 1 and Unit 2 License Extensions and No Conventional Gas

INDIANA MICHIGAN POWER
An AEP Company

Cook Extension No Gas						
Year	Capacity Position	Energy Balance	Imports I&M	Exports I&M	Carbon Free Generation	EE Penetration
2021	12%	103%	12%	6%	85%	0.06%
2022	12%	92%	25%	8%	83%	0.46%
2023	21%	98%	16%	4%	91%	0.79%
2024	0%	104%	10%	3%	91%	2.31%
2025	11%	121%	3%	12%	92%	3.14%
2026	25%	145%	1%	32%	94%	3.99%
2027	23%	146%	1%	34%	93%	4.44%
2028	2%	134%	2%	24%	98%	3.16%
2029	1%	137%	1%	26%	98%	4.28%
2030	2%	142%	1%	31%	98%	5.54%
2031	2%	133%	2%	23%	98%	5.63%
2032	2%	138%	1%	26%	98%	5.35%
2033	2%	134%	2%	24%	98%	4.95%
2034	13%	147%	0%	38%	98%	3.14%
2035	10%	149%	1%	42%	98%	4.12%
2036	8%	147%	1%	39%	98%	4.84%
2037	8%	149%	0%	41%	98%	4.67%
2038	9%	150%	0%	43%	98%	4.23%
2039	8%	148%	0%	41%	98%	3.66%
2040	3%	146%	1%	41%	99%	2.71%
2041	2%	145%	1%	42%	100%	3.33%

Metrics Calculations and Notes

Capacity Position against FPR:

Short-term capacity contracts are required in 2024 to account for shortage in capacity. Post 2024 capacity position maintains above obligation.

Energy Balance:

Energy Balance is high in the middle years and is maintained through the forecast as energy rich renewable energy is being selected to meet capacity position.

Imports I&M:

Imports maintain reasonable balance without any years exceeding +30%.

Exports I&M:

Exports are slightly higher than in other portfolios due to the extension of nuclear resources. However, in many years the levels do not exceed 30%.

Carbon Free Generation:

Carbon free generation meets targets for entire forecast period.

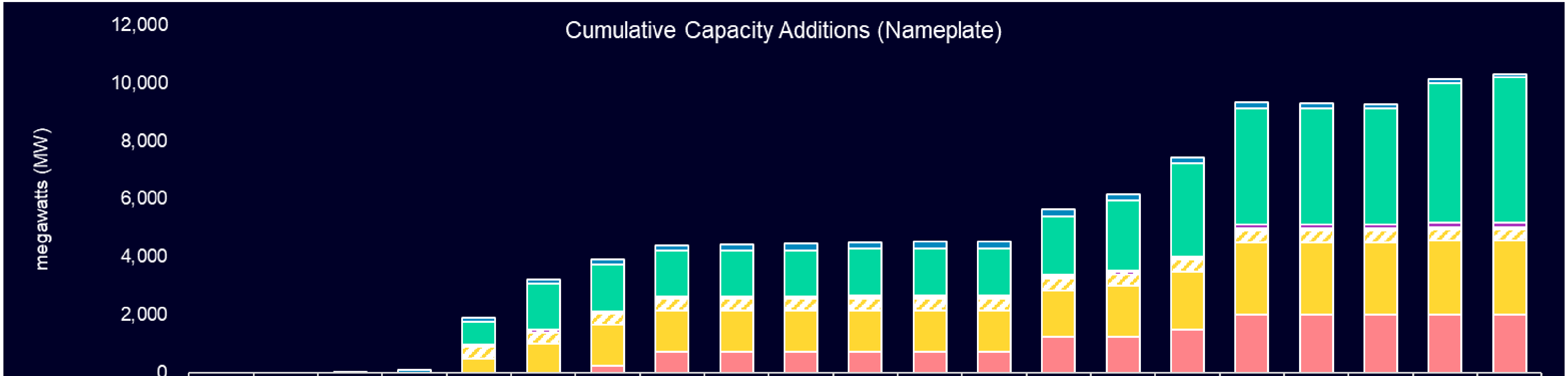
Energy Efficiency (EE)

EE Penetration for new and existing programs reaches ~5% of retail load obligation by 2030

Rapid Technology Advancement

35% Reduction in Renewable, Storage and EE Costs

INDIANA MICHIGAN POWER
An AEP Company



	2021	2022	2023	2024	2025	2026	2027	2028	2029	2030	2031	2032	2033	2034	2035	2036	2037	2038	2039	2040	2041
EE	0	0	51	99	115	147	177	179	203	220	234	241	250	245	225	206	185	164	144	136	113
Wind	0	0	0	0	800	1,600	1,600	1,600	1,600	1,600	1,600	1,600	1,600	2,000	2,400	3,200	4,000	4,000	4,000	4,800	5,000
Storage	0	0	0	0	0	0	0	0	0	0	50	50	50	50	50	50	150	150	150	150	150
Hybrid Storage	0	0	0	0	80	80	80	80	80	80	80	80	80	80	80	80	80	80	80	80	80
Hybrid Solar	0	0	0	0	400	400	400	400	400	400	400	400	400	400	400	400	400	400	400	400	400
Solar	0	0	0	0	500	1,000	1,400	1,400	1,400	1,400	1,400	1,400	1,400	1,600	1,750	2,000	2,500	2,500	2,500	2,550	2,550
Gas CC	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Gas Peaker	0	0	0	0	0	0	250	750	750	750	750	750	750	1,250	1,250	1,500	2,000	2,000	2,000	2,000	2,000
Total	0	0	51	99	1,895	3,227	3,907	4,409	4,433	4,450	4,514	4,521	4,530	5,625	6,155	7,436	9,315	9,294	9,274	10,116	10,293

Rapid Technology Advancement KPI

35% Reduction in Renewable, Storage and EE Costs

RTA							
Year	Capacity Position	Energy Balance	Imports I&M	Exports I&M	Carbon Free Generation	Adj. Carbon Free Generation	EE Penetration
2021	12%	103%	11%	5%	85%	77%	0.06%
2022	12%	93%	22%	5%	82%	62%	0.46%
2023	6%	100%	14%	4%	90%	76%	0.80%
2024	0%	105%	9%	3%	90%	82%	2.35%
2025	11%	119%	3%	11%	92%	92%	2.85%
2026	18%	136%	1%	23%	97%	97%	3.72%
2027	27%	141%	1%	28%	96%	96%	4.18%
2028	4%	135%	1%	24%	96%	96%	2.62%
2029	4%	138%	1%	27%	96%	96%	3.66%
2030	3%	142%	0%	30%	97%	97%	4.87%
2031	4%	134%	1%	23%	96%	96%	4.96%
2032	4%	139%	0%	27%	97%	97%	4.91%
2033	4%	135%	1%	24%	97%	97%	4.74%
2034	4%	152%	0%	42%	98%	98%	3.09%
2035	4%	125%	3%	20%	95%	95%	4.20%
2036	14%	142%	0%	34%	95%	95%	4.97%
2037	4%	158%	0%	50%	97%	97%	4.72%
2038	6%	116%	10%	17%	94%	94%	4.12%
2039	5%	114%	10%	16%	94%	94%	3.55%
2040	3%	129%	5%	29%	95%	95%	2.61%
2041	3%	133%	3%	32%	97%	97%	3.21%

Metrics Calculations and Notes

Capacity Position against FPR:

Short-term capacity contracts are required in 2024 to account for shortage in capacity. Post 2024 capacity position maintains above obligation.

Energy Balance:

Energy Balance is high in the middle years and is maintained through the forecast as energy rich renewable energy is being selected to meet capacity position.

Imports I&M:

Imports maintain reasonable balance without any years exceeding +30%.

Exports I&M:

Exports maintain higher levels than in other portfolios. However, there are not many years where exports exceeds 30%

Carbon Free Generation:

Carbon free generation meets targets for entire forecast period.

Energy Efficiency (EE)

EE Penetration for new and existing programs reaches ~5% of retail load obligation by 2030

Enhanced Regulation

Increased Environmental Regulations Leading to High Gas, Coal and CO2 Prices

INDIANA MICHIGAN POWER
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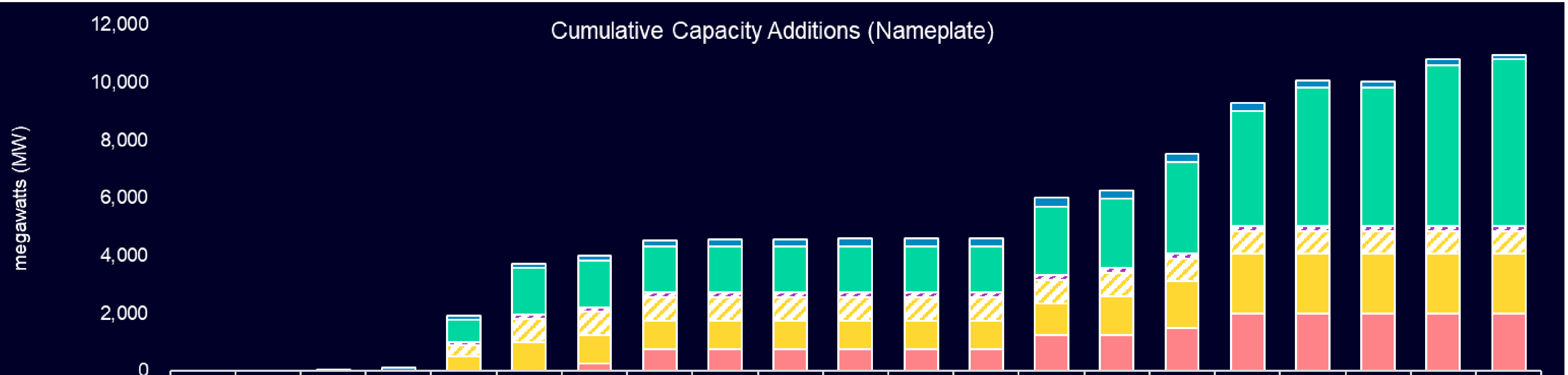

	2021	2022	2023	2024	2025	2026	2027	2028	2029	2030	2031	2032	2033	2034	2035	2036	2037	2038	2039	2040	2041
EE	0	0	50	96	131	171	201	223	250	268	277	280	282	287	282	278	272	251	228	199	156
Wind	0	0	0	0	800	1,600	1,600	1,600	1,600	1,600	1,600	1,600	1,600	2,400	2,400	3,200	4,000	4,800	4,800	5,600	5,800
Storage	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Hybrid Storage	0	0	0	0	80	160	160	160	160	160	160	160	160	160	160	160	160	160	160	160	160
Hybrid Solar	0	0	0	0	400	800	800	800	800	800	800	800	800	800	800	800	800	800	800	800	800
Solar	0	0	0	0	500	1,000	1,000	1,000	1,000	1,000	1,000	1,000	1,000	1,100	1,350	1,600	2,050	2,050	2,050	2,050	2,050
Gas CC	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Gas Peaker	0	0	0	0	0	0	250	750	750	750	750	750	750	1,250	1,250	1,500	2,000	2,000	2,000	2,000	2,000
Total	0	0	50	96	1,911	3,731	4,011	4,533	4,560	4,578	4,587	4,590	4,592	5,997	6,242	7,538	9,282	10,061	10,038	10,809	10,966

Enhanced Regulation KPI

Increased Environmental Regulations Leading to High Gas, Coal and CO2 Prices

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Enhanced Regulation						
Year	Capacity Position	Energy Balance	Imports I&M	Exports I&M	Carbon Free Generation	EE Penetration
2021	12%	104%	11%	5%	84%	0.06%
2022	12%	94%	21%	5%	81%	0.46%
2023	6%	100%	13%	3%	89%	0.79%
2024	0%	105%	9%	3%	90%	2.31%
2025	11%	117%	3%	9%	95%	3.11%
2026	24%	140%	1%	27%	97%	4.04%
2027	28%	140%	1%	28%	97%	4.42%
2028	5%	136%	1%	25%	96%	3.09%
2029	5%	139%	0%	27%	96%	4.17%
2030	5%	143%	0%	31%	97%	5.40%
2031	4%	134%	1%	23%	96%	5.38%
2032	5%	139%	0%	27%	97%	5.22%
2033	4%	135%	1%	25%	97%	4.90%
2034	5%	157%	0%	47%	98%	3.45%
2035	5%	127%	3%	21%	95%	4.80%
2036	14%	144%	0%	35%	95%	5.82%
2037	1%	160%	0%	51%	97%	5.78%
2038	6%	135%	5%	30%	95%	5.26%
2039	5%	132%	5%	28%	95%	4.65%
2040	3%	147%	0%	41%	96%	3.43%
2041	2%	149%	0%	45%	97%	3.89%

Metrics Calculations and Notes

Capacity Position against FPR:

Short-term capacity contracts are required in 2024 to account for shortage in capacity. Post 2024 capacity position maintains above obligation.

Energy Balance:

Energy Balance is high in the middle years and is maintained through the forecast as energy rich renewable energy is being selected to meet capacity position.

Imports I&M:

Imports maintain reasonable balance without any years exceeding +30%.

Exports I&M:

Exports maintain higher levels than in other portfolios. However, there are not many years where exports exceeds 30%

Carbon Free Generation:

Carbon free generation meets targets for entire forecast period.

Energy Efficiency (EE)

EE Penetration for new and existing programs reaches ~5% of retail load obligation by 2030

Key Takeaways and Next Steps

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- Each **Sensitivity Based Candidate Portfolio** should be thought of as a strategic option that the company may want to evaluate
- Strategic Options
  - Unit retirement timing
  - Cost and performance of gas vs. non-fossil technologies
  - Small changes in timing and additions of solar, storage and wind
- **Candidate Portfolios** are variations in these strategies that will be taken to **Step 4** to compare against similar metrics

Art Holland, Siemens PTI

IRP ALIGNMENT DISCUSSION

Alignment Discussion

Opportunities for Additional Feedback in each Area of the IRP Process

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The purpose of this session is to provide the opportunity for additional feedback and discussion with Stakeholders.

Siemens PTI will facilitate discussion in each of the five steps of the IRP process.

Members of the I&M Leadership, as well as the IRP Working Team will be available to answer questions and respond to your feedback.

Alignment Discussion

IRP Process Step 1: Determine Objectives

The purpose of the IRP is to evaluate I&M's current energy resource portfolio and a range of alternative future portfolios to meet customers' electrical energy needs in an affordable and holistic manner. The process evaluates **Candidate Portfolios** in terms of environmental stewardship, market and price risk, reliability, and resource diversity.

IRP Objectives
Affordability
Rate Stability
Sustainability Impact
Market Risk Minimization
Reliability
Resource Diversity

Alignment Discussion

IRP Process Step 2: Assign Metrics

For each **Candidate Portfolio**, the **Objectives** are tracked and measured through **Metrics** which evaluate portfolio performance across a wide range of possible future market conditions. All measures of portfolio performance are based on probabilistic modeling of 200 futures and addressed in Step 4: Analyze Candidate Portfolios.

IRP Objectives	Proposed IRP Metric	Unit
Affordability	NPV-RR	$
Rate Stability	95^{th} percentile value of NPV-RR	$
Sustainability Impact	CO_2 Emissions	tons
Market Risk Minimization	Spot Energy Market Exposure (Purchases/Sales)	%
Reliability	Reserve Margin	%
Resource Diversity	Number of Unique Resources	#

Alignment Discussion

IRP Process Step 3: Create Reference and Candidate Portfolios

I&M and Siemens have developed **a Reference Case**, two alternative **Scenarios**, and a handful of **Sensitivities** to implement a scenario- and sensitivity-based approach to inform **Candidate Portfolios**. Each **Candidate Portfolio** will be developed from the **Scenarios** and/or the **Sensitivities** below.

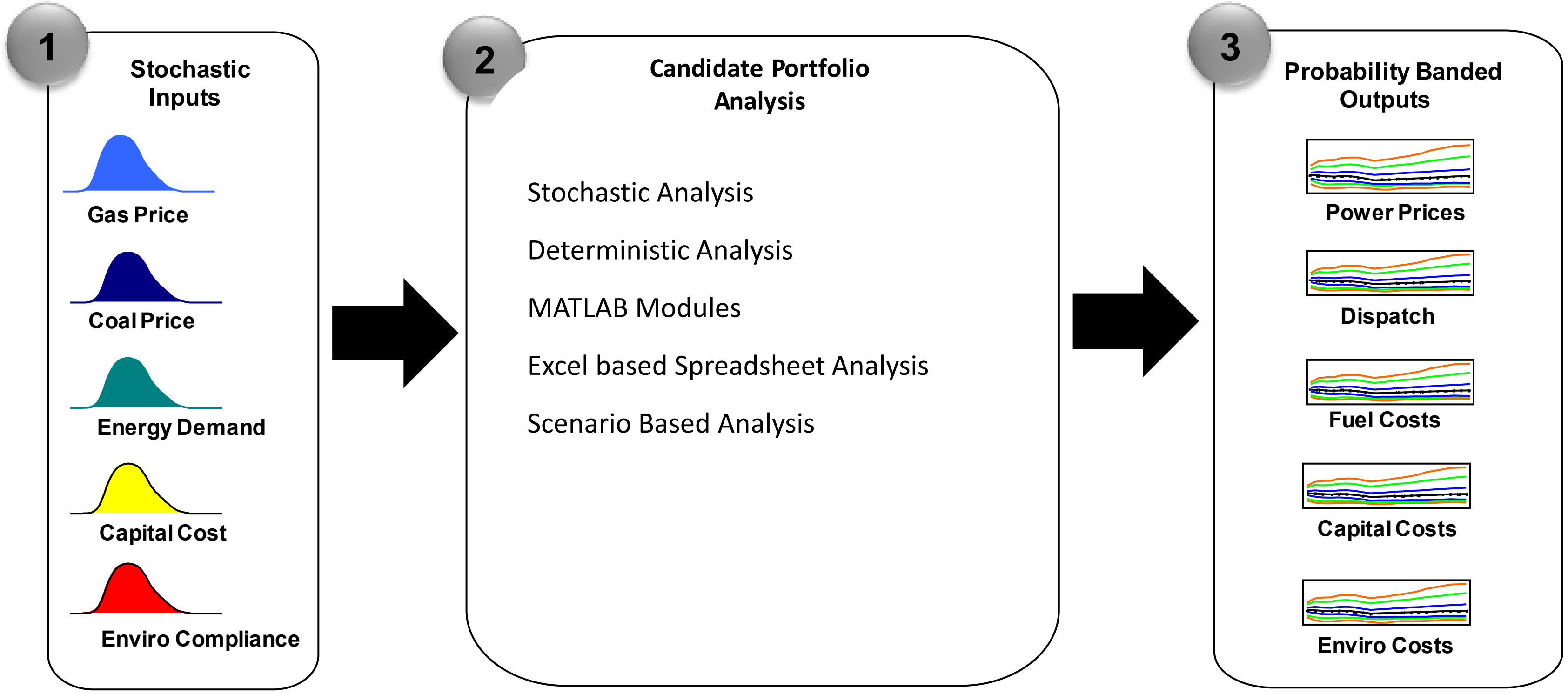
Portfolio	Description	Details
Reference Case	Rockport Unit 1 (2028) Rockport Unit 2 (2024) and Cook (2034, 2037)	
Reference with Rockport Sensitivity	Rockport Unit 1 Early Retirement (2024)	
Reference with Rockport Sensitivity	Rockport Unit 1 Early Retirement (2025)	
Reference with Rockport Sensitivity	Rockport Unit 1 Early Retirement (2026)	Appendix
Reference with Cook Sensitivity	Cook Unit 1 and Unit 2 License Extensions (beyond 2034 and 2037)	
Reference with Cook Sensitivity #2	Cook Unit 1 and Unit 2 License Extensions and No Conventional Gas Allowed	
Reference with Relaxed Renewable Limits	Expanded Cumulative Build Limits on Renewable Energy and Storage	Appendix
Reference with 30% Import / Export Limit	Import and Export Limit at ~30% of I&M Load	Appendix
Reference with No Renewable Limits	Removed Cumulative and Annual Build Limits on Renewable Energy and Storage	Appendix
Rapid Technology Advancement	35% Reduction in Renewable, Storage and EE Costs	
Enhanced Regulation	Increased Environmental Regulations Leading to High Gas, Coal and CO2 Prices	
Net Savings Sensitivity 1	Rockport Unit 1 Early Retirement (2024) Replacing SEA with Net to Gross EE Bundle Savings	Appendix
Net Savings Sensitivity 2	Rockport Unit 1 Early Retirement (2026) Replacing SEA with Net to Gross EE Bundle Savings	Appendix
Net Savings Sensitivity 3	Rapid Technology Advancement (RTA) Replacing SEA with Net to Gross EE Bundle Savings	Appendix

Note: Not all sensitivities are represented above. Additional sensitivities will be conducted on the Preferred Portfolio once selected.

Alignment Discussion

IRP Process Step 4: Analyze Candidate Portfolios

Candidate Portfolios are then subjected to **Portfolio Analysis** (including stochastic risk analysis) to measure performance across many future scenarios. The stochastic process will produce hundreds of internally consistent simulations that can provide a more realistic understanding of the potential variation in future scenarios.



Alignment Discussion

IRP Process Step 5: Develop Balanced Scorecard

Detailed portfolio results will be included for each **Candidate Portfolio** in the report write-up filed with the Commission. The **Candidate Portfolios** will be summarized in terms of each **Objective** and **Metric** through a color-coded balanced scorecard.

Balanced Scorecard (Illustrative)

	Affordability	Rate Stability	Sustainability Impact	Market Risk Minimization	Reliability	Resource Diversity
Candidate Portfolios	NPV RR	95th Percentile Value of NPV RR	CO2 Emissions	Purchases as % of Generation	Reserve Margin	Mix of Resources
Reference Case	$92.0	$115.0	-62.0%	10.0%	15%	5
Portfolio #1	$94.0	$138.0	-39.0%	15.0%	15%	4
Portfolio #2	$108.0	$145.0	-50.0%	18.0%	15%	6
Portfolio #3	$81.0	$123.0	-38.0%	24.0%	15%	4
Portfolio #4	$97.0	$146.0	-42.0%	42.0%	15%	4
Portfolio #5	$101.0	$167.0	-54.0%	34.0%	15%	5
Portfolio #6	$87.0	$113.0	-64.0%	41.0%	15%	3
Portfolio #8	$102.0	$172.0	-40.0%	34.0%	15%	5
Portfolio #9	$120.0	$198.0	-90.0%	24.0%	15%	6
Portfolio #10	$99.0	$210.0	-84.0%	12.0%	15%	5

(illustrative)

ALIGNMENT DISCUSSION

CONCLUSION

STAKEHOLDER NEXT STEPS AND DATA PROVISION PLANS

Jay Boggs | Siemens PTI

Stakeholder Timelines

March 9, 2021 ✓
- 2021 IRP Process
- Objectives and Metrics
- Proposed Scenarios
- Base Case Inputs

April 14, 2021 ✓
- DSM IRP Inputs and Modeling
- EE/EWR, DR and DER Results
- 2021 IRP Update

June 24, 2021 ✓
- AURORA Technical Workshop

July 27, 2021 ✓
- IRP Process – Inputs, Scenarios and Sensitivities
- All-Source RFP Results

October 14, 2021 (this session) ✓
- Finalized Reference Case Inputs and Key Assumptions
- Candidate Portfolio Review

November, 2021 (Nov 18, 2021)
- Stochastic Modeling
- Review of Preferred Portfolio
- Other(s)

All-Source RFP Timeline (completed)

- **March 26:** Draft RFP Available ✓
- **April 9:** RFP Stakeholder Meeting ✓
- **April 23:** Issue RFP ✓
- **May 21:** Responses Due ✓

FEEDBACK AND DISCUSSION

CLOSING DISCUSSION

Andrew Williamson | I&M Director Regulatory Services

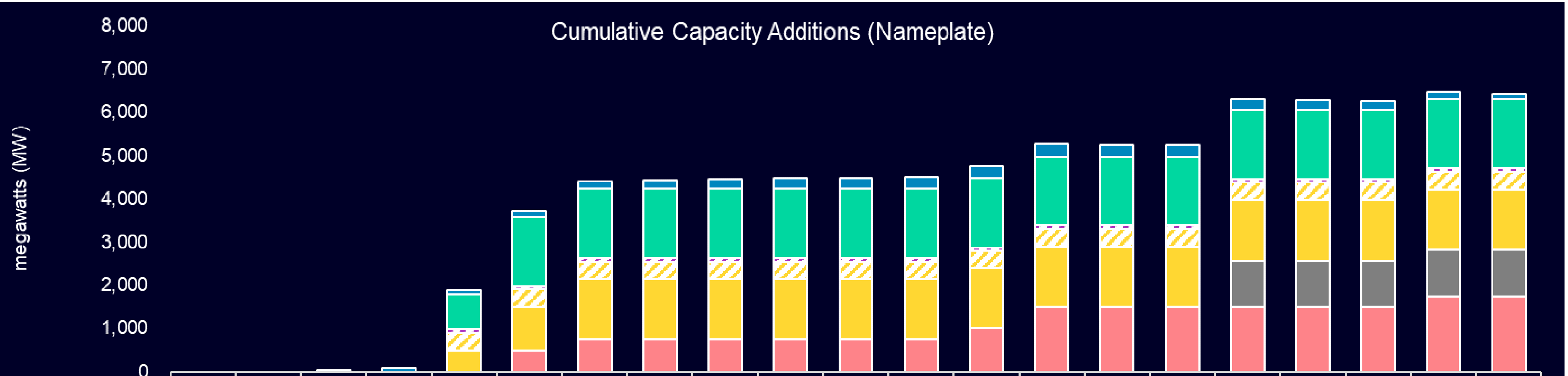
THANK YOU!

Definitions

Term	Definition
AURORAxmp	Electric modeling forecasting and analysis software. Used for capacity expansion, chronological dispatch, and stochastic functions
Condition	A unique combination of a Scenario and a Sensitivity that is used to inform Candidate Portfolio development
Deterministic Modeling	Simulated dispatch of a portfolio in a pre-determined future
Renewable Portfolio Standards	Renewable Portfolio Standards (RPS) are policies designed to increase the use of renewable energy sources for electricity generation
Portfolio	A group of resources to meet customer load
Preferred Portfolio	The portfolio that management determines will perform the best, with consideration for cost, risk, reliability, and sustainability
Probabilistic modeling	Simulate dispatch of portfolios for several randomly generated potential future states
Reference Scenario	The most expected future scenario that is designed to include a current consensus view of key drivers in power and fuel markets (reference case, consensus case)
Scenario	Potential future State-of-the-World designed to test portfolio performance in key risk areas important to management and stakeholders alike
Sensitivity Analysis	Analysis to determine the impact of early retirements and other inputs portfolios are most sensitive to

Reference Case Sensitivity

Rockport Unit 1 Early Retirement (2026)



	2021	2022	2023	2024	2025	2026	2027	2028	2029	2030	2031	2032	2033	2034	2035	2036	2037	2038	2039	2040	2041
EE	0	0	50	96	113	146	175	194	216	235	251	261	276	286	282	281	253	229	208	176	140
Wind	0	0	0	0	800	1,600	1,600	1,600	1,600	1,600	1,600	1,600	1,600	1,600	1,600	1,600	1,600	1,600	1,600	1,600	1,600
Storage	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Hybrid Storage	0	0	0	0	80	80	80	80	80	80	80	80	80	80	80	80	80	80	80	80	80
Hybrid Solar	0	0	0	0	400	400	400	400	400	400	400	400	400	400	400	400	400	400	400	400	400
Solar	0	0	0	0	500	1,000	1,400	1,400	1,400	1,400	1,400	1,400	1,400	1,400	1,400	1,400	1,400	1,400	1,400	1,400	1,400
Gas CC	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	1,070	1,070	1,070	1,070	1,070
Gas Peaker	0	0	0	0	0	500	750	750	750	750	750	750	1,000	1,500	1,500	1,500	1,500	1,500	1,500	1,750	1,750
Total	0	0	50	96	1,893	3,726	4,405	4,424	4,446	4,465	4,481	4,491	4,756	5,266	5,262	5,261	6,303	6,279	6,258	6,476	6,440

Reference Case Sensitivity KPI

Rockport Unit 1 Early Retirement (2026)

Rockport 1 2026 Retirement						
Year	Capacity Position	Energy Balance	Imports I&M	Exports I&M	Carbon Free Generation	EE Penetration
2021	12%	103%	12%	6%	85%	0.06%
2022	12%	92%	25%	7%	83%	0.46%
2023	6%	98%	16%	4%	91%	0.79%
2024	0%	104%	10%	3%	91%	2.31%
2025	11%	120%	3%	12%	92%	2.80%
2026	0%	144%	1%	30%	92%	3.67%
2027	6%	139%	1%	27%	97%	4.08%
2028	4%	135%	1%	25%	96%	2.83%
2029	4%	138%	1%	27%	96%	3.80%
2030	4%	143%	0%	32%	96%	4.93%
2031	3%	134%	1%	24%	96%	5.02%
2032	4%	139%	1%	27%	97%	4.97%
2033	9%	136%	1%	25%	96%	4.85%
2034	7%	152%	0%	41%	95%	3.45%
2035	5%	110%	8%	9%	93%	4.81%
2036	3%	107%	10%	8%	93%	5.86%
2037	0%	148%	0%	39%	69%	5.49%
2038	1%	98%	14%	3%	52%	4.91%
2039	1%	95%	15%	2%	52%	4.36%
2040	3%	93%	15%	3%	53%	3.11%
2041	1%	90%	16%	2%	55%	3.59%

Metrics Calculations and Notes

Capacity Position against FPR:

Short-term capacity contracts are required in 2024 and 2026 to account for early Rockport retirement. Post 2026 capacity position maintains healthy margin.

Energy Balance:

Energy Balance is high in the middle years as energy rich renewable energy is being selected to meet capacity position.

Imports I&M:

Imports maintain reasonable balance without any years exceeding +30%

Exports I&M:

Exports maintain reasonable balance without many years exceeding +30%

Carbon Free Generation:

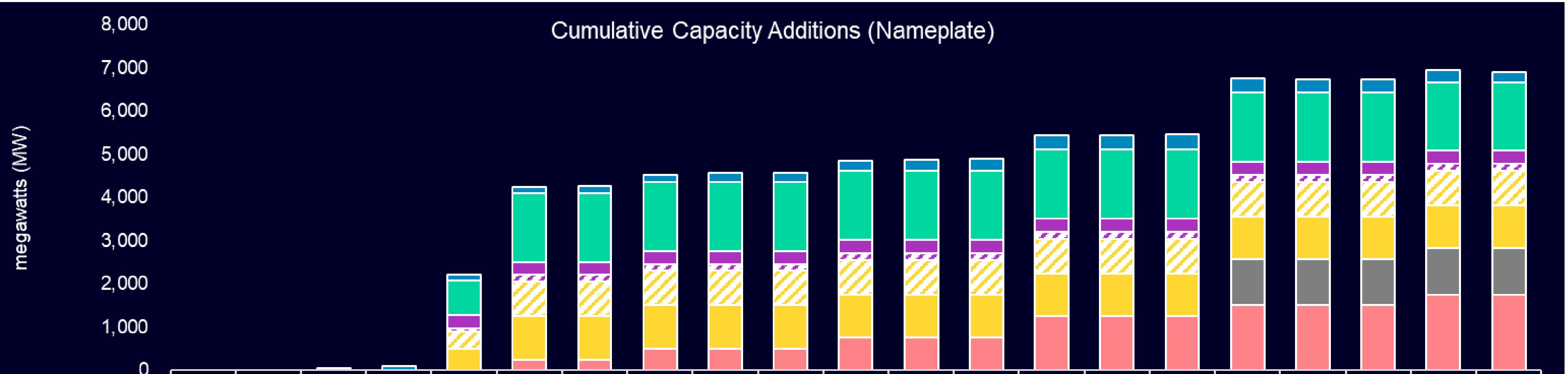
Carbon free generation meets targets until the retirement of Cook Nuclear facilities.

Energy Efficiency (EE)

EE Penetration for new and existing programs reaches ~5% of retail load obligation by 2030

Net Savings Sensitivity 1

Rockport Unit 1 Early Retirement (2024) Replacing SEA with Net to Gross EE Bundle Savings



	2021	2022	2023	2024	2025	2026	2027	2028	2029	2030	2031	2032	2033	2034	2035	2036	2037	2038	2039	2040	2041
EE	0	0	46	88	129	138	157	174	220	221	246	272	303	330	339	352	344	318	299	282	231
Wind	0	0	0	0	800	1,600	1,600	1,600	1,600	1,600	1,600	1,600	1,600	1,600	1,600	1,600	1,600	1,600	1,600	1,600	1,600
Storage	0	0	0	0	300	300	300	300	300	300	300	300	300	300	300	300	300	300	300	300	300
Hybrid Storage	0	0	0	0	80	160	160	160	160	160	160	160	160	160	160	160	160	160	160	160	160
Hybrid Solar	0	0	0	0	400	800	800	800	800	800	800	800	800	800	800	800	800	800	800	800	800
Solar	0	0	0	0	500	1,000	1,000	1,000	1,000	1,000	1,000	1,000	1,000	1,000	1,000	1,000	1,000	1,000	1,000	1,000	1,000
Gas CC	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	1,070	1,070	1,070	1,070	1,070
Gas Peaker	0	0	0	0	0	250	250	500	500	500	750	750	750	1,250	1,250	1,250	1,500	1,500	1,500	1,750	1,750
Total	0	0	46	88	2,209	4,248	4,267	4,534	4,580	4,581	4,856	4,882	4,913	5,440	5,449	5,462	6,774	6,748	6,729	6,962	6,911

Net Savings Sensitivity 1 KPI

Rockport Unit 1 Early Retirement (2024) Replacing SEA with Net to Gross EE Bundle Savings

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NSA 1 - Rockport 1 2024 N2G EE						
Year	Capacity Position	Energy Balance	Imports I&M	Exports I&M	Carbon Free Generation	EE Penetration
2021	12%	103%	12%	6%	85%	0.06%
2022	12%	92%	25%	7%	83%	0.46%
2023	21%	98%	16%	4%	91%	0.72%
2024	0%	104%	11%	5%	90%	2.07%
2025	0%	114%	5%	8%	97%	2.89%
2026	4%	139%	1%	26%	97%	3.45%
2027	2%	138%	2%	27%	97%	3.72%
2028	5%	133%	2%	24%	97%	2.28%
2029	5%	137%	1%	27%	97%	3.60%
2030	4%	142%	1%	31%	97%	4.72%
2031	10%	134%	1%	24%	96%	4.90%
2032	10%	139%	0%	27%	97%	5.05%
2033	9%	136%	1%	25%	96%	5.07%
2034	7%	150%	0%	40%	96%	3.21%
2035	5%	110%	8%	9%	94%	5.35%
2036	3%	109%	10%	8%	94%	6.96%
2037	6%	152%	0%	41%	69%	7.04%
2038	8%	101%	13%	3%	53%	6.39%
2039	7%	98%	14%	2%	53%	5.87%
2040	9%	95%	15%	3%	54%	4.58%
2041	7%	94%	15%	3%	56%	5.51%

Metrics Calculations and Notes

Capacity Position against FPR:

Short-term capacity contracts are required in years 2024 and 2025 to account for early Rockport retirement. Post 2025 capacity position maintains healthy margin.

Energy Balance:

Energy Balance is high in the early years as energy rich renewable energy is being selected to meet capacity position.

Imports I&M:

Imports maintain reasonable balance without any years exceeding +30%

Exports I&M:

Exports maintain reasonable balance without many years exceeding +30%

Carbon Free Generation:

Carbon free generation meets targets until the retirement of Cook Nuclear facilities.

Energy Efficiency (EE)

EE Penetration for new and existing programs is slightly less than ~5% of retail load obligation by 2030.

Net Savings Sensitivity 2

Rockport Unit 1 Early Retirement (2026) Replacing SEA with Net to Gross EE Bundle Savings

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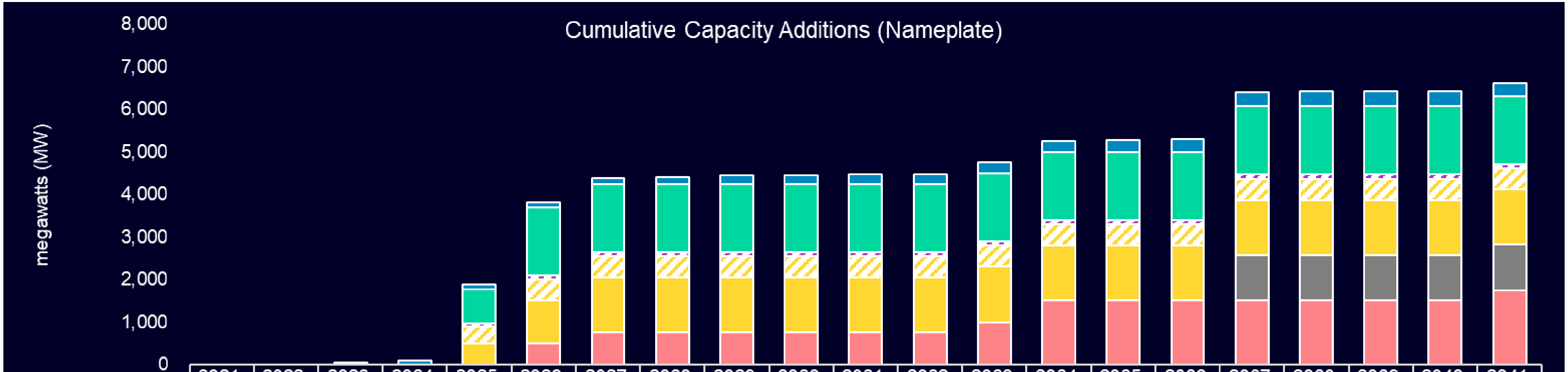

	2021	2022	2023	2024	2025	2026	2027	2028	2029	2030	2031	2032	2033	2034	2035	2036	2037	2038	2039	2040	2041
EE	0	0	46	88	110	125	145	165	215	215	222	236	251	266	280	307	341	352	367	371	306
Wind	0	0	0	0	800	1,600	1,600	1,600	1,600	1,600	1,600	1,600	1,600	1,600	1,600	1,600	1,600	1,600	1,600	1,600	1,600
Storage	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Hybrid Storage	0	0	0	0	80	100	100	100	100	100	100	100	100	100	100	100	100	100	100	100	100
Hybrid Solar	0	0	0	0	400	500	500	500	500	500	500	500	500	500	500	500	500	500	500	500	500
Solar	0	0	0	0	500	1,000	1,300	1,300	1,300	1,300	1,300	1,300	1,300	1,300	1,300	1,300	1,300	1,300	1,300	1,300	1,300
Gas CC	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	1,070	1,070	1,070	1,070	1,070
Gas Peaker	0	0	0	0	0	500	750	750	750	750	750	750	1,000	1,500	1,500	1,500	1,500	1,500	1,500	1,500	1,750
Total	0	0	46	88	1,890	3,825	4,395	4,415	4,465	4,465	4,472	4,486	4,751	5,266	5,280	5,307	6,411	6,422	6,437	6,441	6,626

Net Savings Sensitivity 2 KPI

Rockport Unit 1 Early Retirement (2026) Replacing SEA with Net to Gross EE Bundle Savings

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An AEP Company

NSA 2 - Rockport 1 2026 N2G EE						
Year	Capacity Position	Energy Balance	Imports I&M	Exports I&M	Carbon Free Generation	EE Penetration
2021	12%	103%	12%	6%	85%	0.06%
2022	12%	92%	25%	7%	83%	0.46%
2023	6%	98%	16%	4%	91%	0.72%
2024	0%	103%	11%	3%	92%	2.07%
2025	11%	120%	3%	12%	92%	2.66%
2026	0%	144%	1%	30%	92%	3.29%
2027	6%	138%	1%	27%	97%	3.58%
2028	4%	134%	1%	24%	96%	2.18%
2029	4%	138%	1%	27%	96%	3.51%
2030	4%	142%	0%	31%	96%	4.62%
2031	3%	133%	1%	23%	96%	4.61%
2032	4%	138%	1%	27%	97%	4.73%
2033	8%	135%	1%	25%	96%	4.63%
2034	7%	149%	0%	40%	95%	2.55%
2035	4%	109%	8%	9%	93%	4.65%
2036	3%	108%	10%	8%	93%	6.33%
2037	0%	152%	0%	41%	69%	6.91%
2038	2%	101%	13%	4%	53%	6.62%
2039	1%	99%	13%	2%	53%	6.38%
2040	0%	96%	14%	3%	54%	5.35%
2041	2%	95%	15%	3%	56%	6.20%

Metrics Calculations and Notes

Capacity Position against FPR:

Short-term capacity contracts are required in 2024 and 2026 to account for early Rockport retirement. Post 2026 capacity position maintains healthy margin.

Energy Balance:

Energy Balance is high in the middle years as energy rich renewable energy is being selected to meet capacity position.

Imports I&M:

Imports maintain reasonable balance without any years exceeding +30%

Exports I&M:

Exports maintain reasonable balance without many years exceeding +30%

Carbon Free Generation:

Carbon free generation meets targets until the retirement of Cook Nuclear facilities.

Energy Efficiency (EE)

EE Penetration for new and existing programs is slightly less than ~5% of retail load obligation by 2030.

Net Savings Sensitivity 3

Rapid Technology Advancement Replacing SEA with Net to Gross EE Bundle Savings

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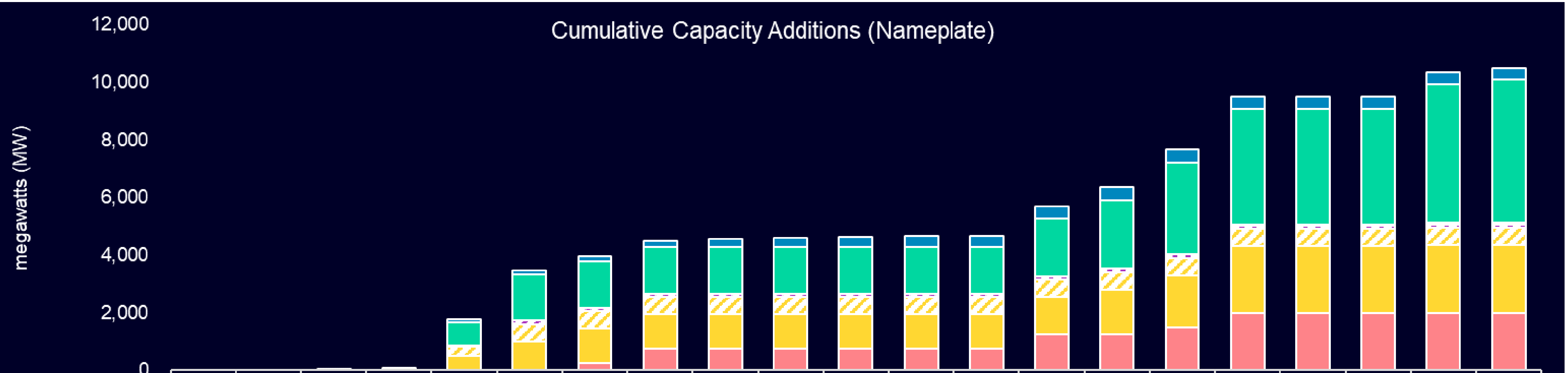

	2021	2022	2023	2024	2025	2026	2027	2028	2029	2030	2031	2032	2033	2034	2035	2036	2037	2038	2039	2040	2041
EE	0	0	46	89	125	163	200	236	281	323	361	385	407	430	446	448	451	448	445	437	386
Wind	0	0	0	0	800	1,600	1,600	1,600	1,600	1,600	1,600	1,600	1,600	2,000	2,400	3,200	4,000	4,000	4,000	4,800	5,000
Storage	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	50	50	50	50	50
Hybrid Storage	0	0	0	0	60	120	120	120	120	120	120	120	120	120	120	120	120	120	120	120	120
Hybrid Solar	0	0	0	0	300	600	600	600	600	600	600	600	600	600	600	600	600	600	600	600	600
Solar	0	0	0	0	500	1,000	1,200	1,200	1,200	1,200	1,200	1,200	1,200	1,300	1,550	1,800	2,300	2,300	2,300	2,350	2,350
Gas CC	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Gas Peaker	0	0	0	0	0	0	250	750	750	750	750	750	750	1,250	1,250	1,500	2,000	2,000	2,000	2,000	2,000
Total	0	0	46	89	1,785	3,483	3,970	4,506	4,551	4,593	4,631	4,655	4,677	5,700	6,366	7,668	9,521	9,518	9,515	10,357	10,506

Net Savings Sensitivity 3 KPI

Rapid Technology Advancement Replacing SEA with Net to Gross EE Bundle Savings

NSA 3 - RTA N2G EE						
Year	Capacity Position	Energy Balance	Imports I&M	Exports I&M	Carbon Free Generation	EE Penetration
2021	12%	103%	11%	5%	85%	0.06%
2022	12%	93%	22%	5%	82%	0.45%
2023	6%	99%	14%	4%	90%	0.72%
2024	0%	104%	9%	3%	90%	2.08%
2025	9%	119%	3%	11%	92%	2.83%
2026	21%	138%	1%	25%	97%	3.68%
2027	28%	141%	1%	28%	96%	4.13%
2028	5%	135%	1%	25%	96%	2.85%
2029	4%	139%	1%	28%	96%	4.21%
2030	4%	144%	0%	31%	97%	5.88%
2031	4%	137%	1%	25%	96%	6.24%
2032	4%	142%	0%	29%	97%	6.26%
2033	3%	138%	1%	26%	97%	6.15%
2034	3%	153%	0%	42%	98%	4.04%
2035	4%	131%	2%	23%	95%	6.59%
2036	14%	150%	0%	37%	95%	8.27%
2037	2%	167%	0%	54%	98%	8.36%
2038	4%	125%	9%	21%	94%	7.99%
2039	4%	122%	9%	20%	94%	7.54%
2040	2%	138%	3%	33%	96%	6.17%
2041	1%	142%	3%	37%	98%	7.50%

Metrics Calculations and Notes

Capacity Position against FPR:

Short-term capacity contracts are required in 2024 to account for shortage in capacity. Post 2024 capacity position maintains above obligation.

Energy Balance:

Energy Balance is high in the middle years and is maintained through the forecast as energy rich renewable energy is being selected to meet capacity position.

Imports I&M:

Imports maintain reasonable balance without any years exceeding +30%.

Exports I&M:

Exports maintain higher levels than in other portfolios. However, there are not many years where exports exceeds 30%

Carbon Free Generation:

Carbon free generation meets targets for entire forecast period.

Energy Efficiency (EE)

EE Penetration for new and existing programs reaches ~5% of retail load obligation by 2030 but is slightly higher than the SEA Portfolio.

Reference Case Sensitivity

Expanded Cumulative Build Limits on Renewable Energy and Storage

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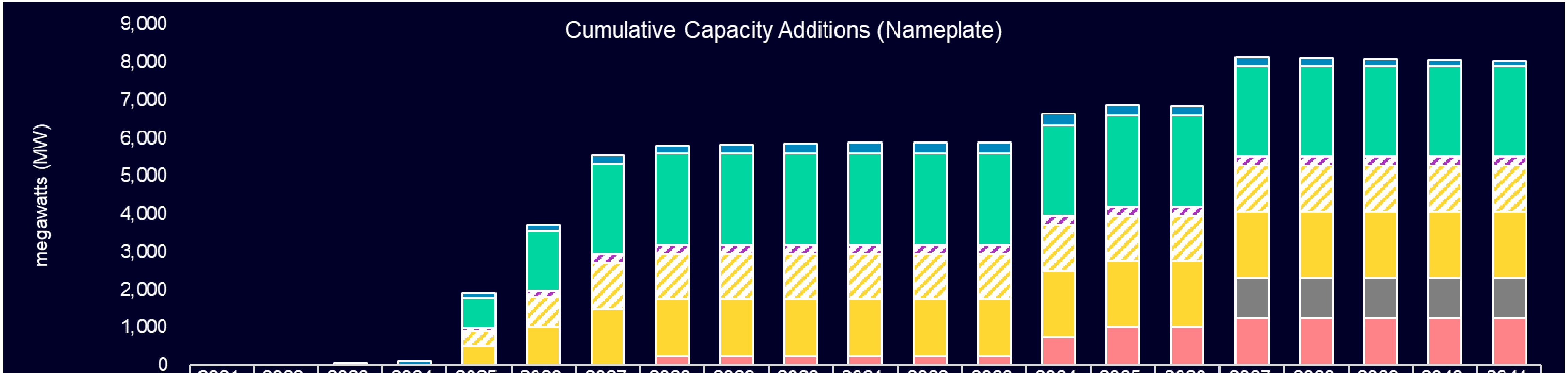


	2021	2022	2023	2024	2025	2026	2027	2028	2029	2030	2031	2032	2033	2034	2035	2036	2037	2038	2039	2040	2041
EE	0	0	50	96	121	157	189	217	246	267	284	294	299	303	269	240	216	195	180	157	131
Wind	0	0	0	0	800	1,600	2,400	2,400	2,400	2,400	2,400	2,400	2,400	2,400	2,400	2,400	2,400	2,400	2,400	2,400	2,400
Storage	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Hybrid Storage	0	0	0	0	80	160	240	240	240	240	240	240	240	240	240	240	240	240	240	240	240
Hybrid Solar	0	0	0	0	400	800	1,200	1,200	1,200	1,200	1,200	1,200	1,200	1,200	1,200	1,200	1,200	1,200	1,200	1,200	1,200
Solar	0	0	0	0	500	1,000	1,500	1,500	1,500	1,500	1,500	1,500	1,500	1,750	1,750	1,750	1,750	1,750	1,750	1,750	1,750
Gas CC	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	1,070	1,070	1,070	1,070	1,070
Gas Peaker	0	0	0	0	0	0	0	250	250	250	250	250	250	750	1,000	1,000	1,250	1,250	1,250	1,250	1,250
Total	0	0	50	96	1,901	3,717	5,529	5,807	5,836	5,857	5,874	5,884	5,889	6,643	6,859	6,830	8,126	8,105	8,090	8,067	8,041

Reference Case Sensitivity KPI

Expanded Cumulative Build Limits on Renewable Energy and Storage

INDIANA MICHIGAN POWER
An AEP Company

Reference Renewable Limts Adjusted						
Year	Capacity Position	Energy Balance	Imports I&M	Exports I&M	Carbon Free Generation	EE Penetratio n
2021	12%	103%	11%	5%	85%	0.06%
2022	12%	93%	23%	5%	83%	0.46%
2023	6%	100%	14%	4%	90%	0.79%
2024	0%	104%	9%	2%	91%	2.31%
2025	11%	120%	3%	11%	92%	2.91%
2026	24%	140%	1%	26%	97%	3.79%
2027	35%	154%	0%	41%	97%	4.22%
2028	5%	150%	0%	38%	97%	3.02%
2029	4%	153%	0%	41%	98%	4.09%
2030	4%	157%	0%	45%	98%	5.33%
2031	4%	150%	0%	38%	98%	5.48%
2032	4%	154%	0%	42%	98%	5.43%
2033	3%	151%	0%	39%	97%	5.15%
2034	2%	164%	0%	53%	98%	3.56%
2035	7%	133%	3%	28%	95%	4.62%
2036	5%	130%	5%	25%	95%	5.26%
2037	8%	136%	1%	28%	93%	4.97%
2038	10%	121%	5%	17%	63%	4.45%
2039	9%	117%	6%	15%	63%	3.99%
2040	4%	115%	6%	16%	64%	2.85%
2041	3%	113%	6%	15%	65%	3.49%

Metrics Calculations and Notes

Capacity Position against FPR:

Short-term capacity contracts are required in 2024 to account for shortage in capacity. Capacity position maintains healthy margins through forecast period with slight overbuild in advance of Rockport.

Energy Balance:

Energy Balance is high in the middle years as renewable energy is being selected to meet capacity position.

Imports I&M:

Imports maintain reasonable balance without any years exceeding +30%

Exports I&M:

Exports maintain higher levels than in other portfolios. However, there are not many years where exports exceeds 30%

Carbon Free Generation:

Carbon free generation meets targets until the retirement of Cook Nuclear facilities.

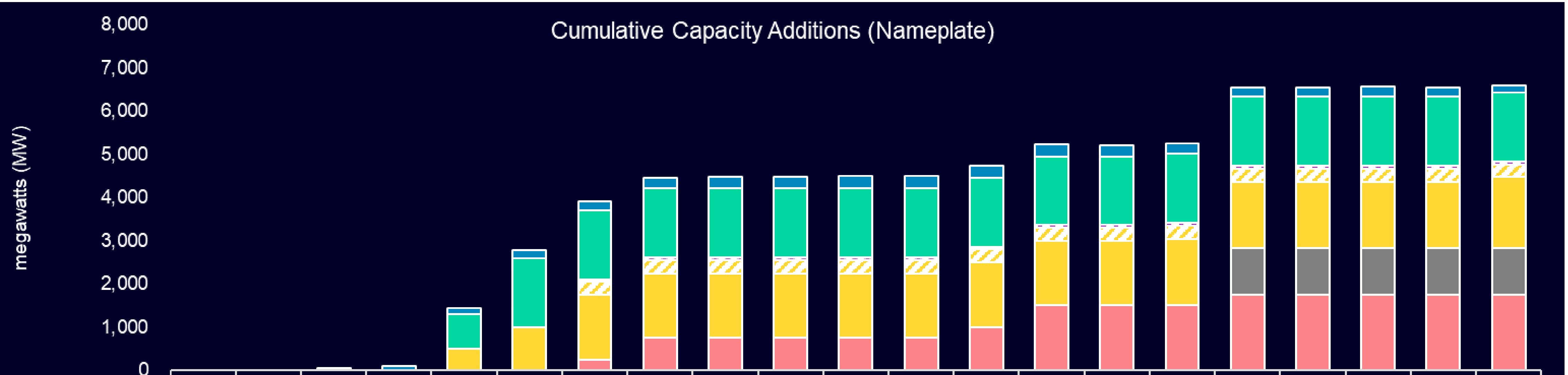
Energy Efficiency (EE)

EE Penetration for new and existing programs reaches ~5% of retail load obligation by 2030

Reference Case Sensitivity

Import and Export Limit at ~30% of I&M Load

INDIANA MICHIGAN POWER
An AEP Company



	2021	2022	2023	2024	2025	2026	2027	2028	2029	2030	2031	2032	2033	2034	2035	2036	2037	2038	2039	2040	2041
EE	0	0	50	96	136	170	204	234	260	278	293	288	283	263	239	234	229	231	234	220	180
Wind	0	0	0	0	800	1,600	1,600	1,600	1,600	1,600	1,600	1,600	1,600	1,600	1,600	1,600	1,600	1,600	1,600	1,600	1,600
Storage	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Hybrid Storage	0	0	0	0	0	0	60	60	60	60	60	60	60	60	60	60	60	60	60	60	60
Hybrid Solar	0	0	0	0	0	0	300	300	300	300	300	300	300	300	300	300	300	300	300	300	300
Solar	0	0	0	0	500	1,000	1,500	1,500	1,500	1,500	1,500	1,500	1,500	1,500	1,500	1,550	1,550	1,550	1,550	1,550	1,650
Gas CC	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	1,070	1,070	1,070	1,070	1,070
Gas Peaker	0	0	0	0	0	0	250	750	750	750	750	750	1,000	1,500	1,500	1,500	1,750	1,750	1,750	1,750	1,750
Total	0	0	50	96	1,436	2,770	3,914	4,444	4,470	4,488	4,503	4,498	4,743	5,223	5,199	5,244	6,559	6,561	6,564	6,550	6,610

Reference Case Sensitivity KPI

Import and Export Limit at ~30% of I&M Load

Reference 30% Import / Export						
Year	Capacity Position	Energy Balance	Imports I&M	Exports I&M	Carbon Free Generation	EE Penetration
2021	12%	103%	11%	5%	85%	0.06%
2022	12%	93%	23%	5%	83%	0.46%
2023	6%	100%	14%	4%	90%	0.79%
2024	0%	104%	9%	2%	91%	2.31%
2025	5%	117%	4%	9%	92%	3.14%
2026	13%	133%	1%	20%	97%	3.99%
2027	27%	141%	1%	28%	96%	4.44%
2028	4%	136%	1%	25%	96%	3.16%
2029	4%	140%	1%	28%	96%	4.28%
2030	4%	143%	0%	31%	97%	5.54%
2031	4%	136%	1%	24%	96%	5.63%
2032	4%	140%	0%	28%	97%	5.36%
2033	9%	136%	1%	25%	96%	4.96%
2034	7%	146%	0%	35%	97%	3.15%
2035	4%	109%	8%	8%	93%	4.16%
2036	3%	106%	10%	7%	93%	5.12%
2037	6%	136%	0%	28%	75%	5.11%
2038	8%	100%	13%	4%	52%	4.95%
2039	8%	97%	14%	2%	52%	4.72%
2040	3%	95%	14%	3%	53%	3.68%
2041	3%	94%	14%	3%	56%	4.26%

Metrics Calculations and Notes

Capacity Position against FPR:

Short-term capacity contracts are required in 2024 to account for shortage in capacity. Capacity position maintains healthy margins through forecast period.

Energy Balance:

Energy Balance is high in the early and middle years as renewable energy is being selected to meet capacity position.

Imports I&M:

Imports maintain reasonable balance without any years exceeding +30%

Exports I&M:

Exports maintain reasonable balance without many years exceeding +30%

Carbon Free Generation:

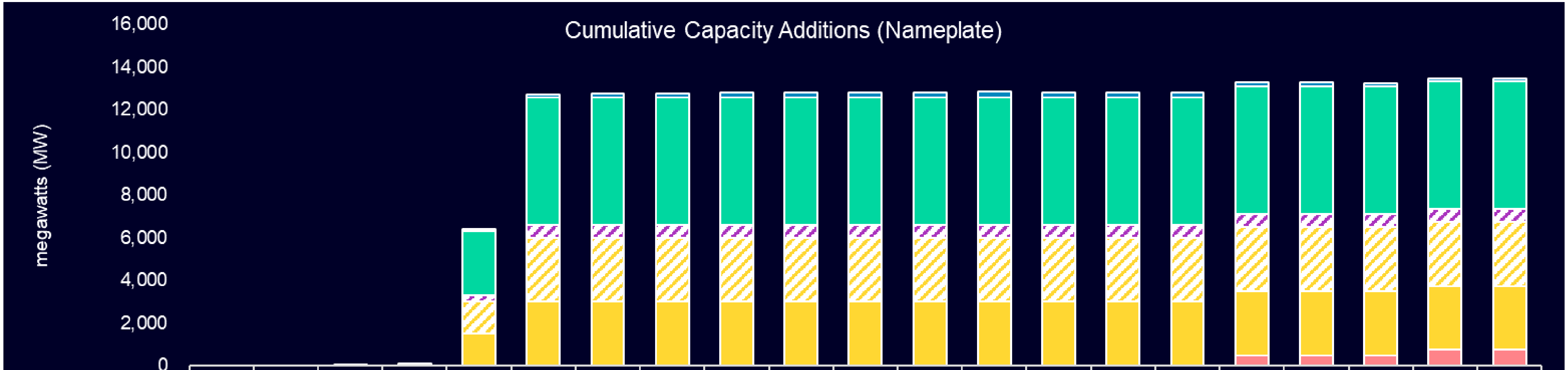
Carbon free generation meets targets until the retirement of Cook Nuclear facilities.

Energy Efficiency (EE)

EE Penetration for new and existing programs reaches ~5% of retail load obligation by 2030

Reference Case Sensitivity

Removed Cumulative and Annual Build Limits on Renewable Energy and Storage



	2021	2022	2023	2024	2025	2026	2027	2028	2029	2030	2031	2032	2033	2034	2035	2036	2037	2038	2039	2040	2041
EE	0	0	50	96	112	144	172	189	210	223	234	241	247	235	213	197	182	168	157	149	124
Wind	0	0	0	0	3,000	6,000	6,000	6,000	6,000	6,000	6,000	6,000	6,000	6,000	6,000	6,000	6,000	6,000	6,000	6,000	6,000
Storage	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Hybrid Storage	0	0	0	0	300	600	600	600	600	600	600	600	600	600	600	600	600	600	600	600	600
Hybrid Solar	0	0	0	0	1,500	3,000	3,000	3,000	3,000	3,000	3,000	3,000	3,000	3,000	3,000	3,000	3,000	3,000	3,000	3,000	3,000
Solar	0	0	0	0	1,500	3,000	3,000	3,000	3,000	3,000	3,000	3,000	3,000	3,000	3,000	3,000	3,000	3,000	3,000	3,000	3,000
Gas CC	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Gas Peaker	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	500	500	500	750	750
Total	0	0	50	96	6,412	12,744	12,772	12,789	12,810	12,823	12,834	12,841	12,847	12,835	12,813	12,797	13,282	13,268	13,257	13,499	13,474

Reference Case Sensitivity KPI

Removed Cumulative and Annual Build Limits on Renewable Energy and Storage

INDIANA MICHIGAN POWER
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Reference Unlimited Renewables						
Year	Capacity Position	Energy Balance	Imports I&M	Exports I&M	Carbon Free Generation	EE Penetration
2021	12%	103%	11%	5%	85%	0.06%
2022	12%	93%	22%	5%	83%	0.46%
2023	6%	100%	14%	4%	90%	0.79%
2024	0%	103%	10%	2%	91%	2.31%
2025	47%	159%	0%	47%	98%	2.79%
2026	91%	228%	0%	114%	99%	3.66%
2027	84%	229%	0%	116%	99%	4.08%
2028	42%	221%	0%	109%	99%	2.82%
2029	41%	226%	0%	115%	99%	3.79%
2030	41%	231%	0%	119%	99%	4.89%
2031	40%	223%	0%	111%	99%	4.95%
2032	40%	228%	0%	116%	99%	4.88%
2033	39%	223%	0%	111%	99%	4.66%
2034	28%	243%	0%	133%	99%	3.01%
2035	25%	210%	0%	102%	98%	4.02%
2036	23%	208%	0%	100%	98%	4.78%
2037	4%	210%	0%	101%	98%	4.64%
2038	6%	173%	2%	67%	96%	4.21%
2039	5%	170%	2%	65%	96%	3.80%
2040	6%	170%	1%	66%	97%	2.82%
2041	5%	169%	1%	66%	98%	3.47%

Metrics Calculations and Notes

Capacity Position against FPR:

Short-term capacity contracts are required in 2024 to account for shortage in capacity. Capacity position maintains high margins through forecast period with overbuild in advance of Rockport.

Energy Balance:

Energy Balance is throughout the forecast period

Imports I&M:

Imports maintain reasonable balance without any years exceeding +30% and with little need after 2025.

Exports I&M:

Exports are very high compared to other portfolios with many years exceeding 30%.

Carbon Free Generation:

Carbon free generation meets targets for entire forecast period, despite the retirement of Cook Nuclear facilities.

Energy Efficiency (EE)

EE Penetration for new and existing programs reaches ~5% of retail load obligation by 2030

Indiana Michigan Power Company

2021 Integrated Resource Plan

Stakeholder Workshop #4 Meeting Minutes

November 30, 2021

1. Welcome and Safety Moment – Andrew

Jay kicked off the meeting at 9:30 and covered slides 3-4.

Jay kicked off the meeting and welcomed participants to the 2021 I&M Integrated Resource Plan (IRP) stakeholder workshop. Greg reviewed a safety moment for season lights safety.

Greg introduced Steve Baker, Steve introduced himself to stakeholders as he took over I&M President role in August 2021 and explains his role and involvement in IRP so far.

2. Meeting Guidelines – Jay Boggs, Siemens PTI

Jay covered slides 5-8

Jay introduced the Meeting Guidelines section and its content and established the role of Moderator for the Stakeholder Meeting.

Meeting guidelines and agenda were discussed.

Jay also provided an overview of the Questions and Feedback process, including directing stakeholders to submit comments and stay informed at the I&M IRP Website: http://www.indianamichiganpower.com/info/projects/IntegratedResourcePlan.

In addition, stakeholders are encouraged to submit questions via email to I&MIRP@aep.com

3. Recap of Previous Meetings – Jay Boggs & Peter Berini, Siemens PTI

Peter covered slides 9

Peter reviews the general IRP 5 stage process that was used throughout the I&M IRP process. He goes into brief detail on each of the 5 steps in the approach which has been covered in deeper detail in previous stakeholder meetings:

1. *Determine Objectives*
2. *Identify Metrics*
3. *Create Candidate Portfolios*
4. *Analyze candidate portfolios*
    a. *Explains this involves stochastic analysis which will be covered further in next section by Mike*
5. *Balanced Scorecard and Report*

Jay covered slide 10

Jay reviews the stakeholder timeline and engagement including working with stakeholders to create assumptions and key inputs over the last 6-8 months, pointing out that the I&M IRP process has had multiple stakeholder meetings and taken a lot of stakeholder inputs into account, showing the 4 previous meetings that have been completed since March 2021. Jay reviewed the topics that were covered at each individual stakeholder meeting, as shown in the slide.

4. Portfolio Analysis - Michael Korschek, Siemens PTI

Michael covers slides 12-23

Mike overviews the stochastic process which includes specifying the major market drivers that were varied in the stochastic analysis and emphasized the benefit of this including risk of the 95th percentile.

Mike goes over the balanced scorecard and describes the benefit of using the "mean" of the stochastic iteration's vs using the "median" or "deterministic approach". He then outlines the factors that are varied and the multiple drivers that would vary each specific factor (Ex. Load can vary in the future due to weather/EV/Solar DG, etc.).

Mike goes through the stochastic input graphs, points out how the range of uncertainty grows over time, as we have a better estimate what these factors will be in the short term but there is a much wider range of uncertainty out in 2041.

Feedback and Discussion Oral Questions:
John Decuman – "In regard to the stochastic modeling you mentioned 5 drivers, for 200 iterations was the model able to vary each driver or only 1 driver per iteration?" Mike responds that each iteration has a different path in each driver.

5. Balanced Scorecard, Art Holland, Siemens PTI

Art covered slides 26-33

Art reviews the latest version of the balanced scorecard, specifying that it has gone through various stages and incorporated stakeholder feedback. He goes into detail of each of the metrics under each of the 6 classifications (Affordability, Rate Stability, Sustainability, Market Risk Minimization, Reliability, Resource Diversity). He then goes into the various portfolio summaries.

Art reviewed and compared the various slides of populated scorecards, specifying important differences between the portfolios. He then goes into detail regarding the various portfolios, and which were maintained as viable portfolios/or refined and those that were just used as an informative portfolio.

Andrew covers the OVEC analysis slide.

Alex Vaughn goes into detail on the costs included with the OVEC analysis including the model capturing energy cost changes and an out of model calculation to take the capacity costs into consideration for the analysis as well.

6. Metrics Deep dive – Peter Berini, Siemens PTI

Peter covers slides 36-43

Peter opens discussion with plan to go into more detail around the various metrics that are being focused on in analyzing the list of "focused portfolios". In the NPV CTSL, various costs taken into account including generation related costs. Specified the cook 2050+ portfolios came out with the lowest NPV for 20 year NPV but reminded all that cook license extension costs are not included. He *gives a brief overview of the box & whisker plot and how to interpret. Notes that reference prime has different selection of near term resources, giving the cheapest option.*

For rate stability objective, primary objective is 95th percentile NPV CTSL and 5 year net rate increase CAGR.

Regarding sustainability goals, all portfolios surpass the 32% objective and most are very close (if not below) the 80% reduction goal by 2040. Cook portfolios are continuously low as a gas resource is not needed to replace cook capacity.

Peter reviews the spot market sales and purchases and the risk associated with some of the portfolios on energy balance, largely for cook portfolios as well as the scenario portfolios with high renewable generation.

Peter then puts it all together with the view of the fully populated scorecard with all focused portfolios.

ORAL Questions:

Emily: looking at 10 yr. NPV, would you consider any of those cases within the margin of error in your forecast? Andrew responds that he cannot give definitive answer, but that we do our best to capture that in stochastics.

Emily: how has supply chain problems affected some assumptions associated with deliverability of new technology. Andrew responds that they are aware of supply chain issues, and they will have to continuously evaluate going forward.

Art adds to Emily questions that uncertainty is integral part of the decision-making process with resource planning and that is why we spend so much time on stochastics inputs as well as the percentile bands.

Anna Sommer: are these overnight costs? Jim responds that yes these are just day 1 spend.

Anna Sommer: do these costs include any profit component? Jim responds that yes, all components are in there.

Feedback and Discussion:

7. Path to Preferred Portfolio – I&M Management

I&M Covered slides 46-50

Dave Lucas kicks off the preferred portfolio discussion. Dave echoes comments expressing appreciation for the stakeholder engagement, all engagement has been integral to determining the preferred path. Reinforces that no decisions have been made regarding Cook extensions and that no analysis has been started on looking at the cost associated with the Cook extensions. A key consideration in the development of I&M's preferred plan is to keep optionality around the Cook extensions once the necessary studies have been performed. When considering Cook optionality, we took into consideration feedback from previous stakeholder meetings regarding the level of spot market sales in the portfolios that modeled Cook extensions and the risk associated with those sales.

To maintain future optionality at Cook and address the long term energy position, I&M set up the preferred portfolio in a way that allows short term resource decisions to be made while maintaining the Cook extension as a viable option in the future.

Dave goes into specific detail around preferred portfolio adjustments, including the reduction of early year renewable build to allow I&M to make significant progress in I&M's generation transition plan, yet still allow the flexibility for the option to extend Cook when the time comes. In the preferred plan, gas resource additions all consolidated into 2028. I&M recognizes there will be further analysis in adding these gas resources but given current assumptions and weighing options around Cook and future market exposure, I&M feels that some level of gas resources will likely be necessary to replace Rockport. Long term renewable additions will be re-evaluated in the future as those are currently assumptions that are replacements of Cook energy/capacity.

Dave reviews the scorecard metrics for the preferred portfolio along with other focused portfolios for comparison and then turns it over to Art to go into further detail of these metrics.

8. <u>Preferred Portfolio – Art Holland</u>

Art Covered slides 52-57

Art goes into greater detail on the cumulative additions in the preferred portfolio graph on an annual basis.

9. <u>Closing Remarks, Andrew Williamson</u>

Andrew concluded the meeting expressing thanks on behalf of the I&M leadership for the active participation in today's meeting. Andrew gives next steps about filing IRP.

10. <u>Appendix A: List of Questions Answered on Call</u>

List of questions addressed on the call:

Question Asked	Answer Given
The battery forecasts that you show are based on what hour duration?	As answered by Mike Korschek
It does not make sense to me that the reference prime case would have a lower NPVRR if all you are doing is removing the i/o limit. could you give some thoughts on this?	As answered by Art Holland
Could you give a description of the difference between NPVCTSL and NPVRR as that term is commonly used, if any?	As answered by Peter B
Did you assume any penalty or other opt-out cost for OVEC?	As answered by Alex V (AEP)
Have you calculated an estimate of the capital costs (the capital costs that you have not included in the Cook portfolios)related to relicensing Cook the last time (in present	As answered by Andrew

dollars)? I realize these costs are yet to be estimated, but just to give some sense of these costs.	
Using average annual purchases as a measure of risk would seem to potentially mask issues with "stressed" hours during which I&M might be relying on purchases at the same time that other utilities will also be expecting to rely on imports. Have you looked at that? Any thoughts on your ability to look at that using your modeling of resource expansion for neighboring/PJM/MISO utilities?	As answered by Art and Peter
Are you expecting to be able to give more consideration to the 2028 gas expansion as part of your next IRP?	As answered by Dave Lucas
Do the generation related O&M and fuel costs for natural gas combustion turbines include the additional maintenance and fuel consumption costs associated with unit start-up and cycling?	As answered by Peter B
Do all portfolios include the continued operation of the OVEC units? Are you doing any new portfolios in light of the recent decision from the MI commission?	As answered by Andrew and further commented by Alex Vaughan (AEP)
Did you assume customers would be have to pay all the ICPA costs in these scenarios?	As answered by Andrew
Has I&M had any conversations with the co-owners about amending the ICPA?	As answered by Andrew
Have you considered retirement as a compliance method with CCR/ELGs?	As answered by Andrew
I know that you evaluated 2030 but that would include the CCR/ELG costs. Did you look at whether it was better for ratepayers to retire and not incur those costs?	As answered by Andrew
Please remind us what you assumed about the relicensing/continuation or retirement of your hydro plants.	As answered by Peter Berini
Please explain whether the OVEC analyses assume the continuation or discontinuation of the Ohio SB 6 subsidies to OVEC	As answered by Alex V (AEP)
To confirm, IMP unlike DEI is not going to attempt to determine a rate impact using traditional rate-making methodology as opposed to using revenue requirements of levelized cost?	As answered by Andrew, we will address is more detail later in today's presentation
Please explain how sunk costs are included in the economic analysis?	As answered by Andrew, we will address is more detail later in today's presentation
Please define CTSL	Cost to Serve Load. See Footnote #2.

Is it based upon revenue requirements of levelized costs? Does it include costs related to retired plants that have not been fully depreciated?	As answered by Art
How about revenue requirements of levelized costs?	We will address in the metric deep dive section.
How were the proposed changes at Rockport 2 considered?	As answered by Peter B and Andrew W
Just wondering how the market changes in 2021 resulted into any changes in assumptions. Not sure if this is the right to raise.	As answered by Andrew
To ask again, is it levelized costs or costs based upon the undepreciated capital.	Invited Emily To come off mute and further refine questions for Art, Peter, Andrew and the team responded to.
And no residual costs related to plant retirements.	As answered by Andrew - if further clarification is needed, please raise your hand - thank you
Just confirming upstream emissions are not included for gas	As answered by Art
Mike, could you talk about how changes in peak and average load in Aurora relate to changes in energy?	As answered by Mike. Please raise hand at the end of the session if you would like to follow up on the topic. Thank you!
In Siemens' view, what is the impact of stochastically varying capital costs just for areas outside of I&M's service territory on the costs experienced by I&M customers?	As answered by Michael Korschek
And CTSL is net of sales and purchases?	We will address in the metric deep dive section.
On the reserve margin metric, I think you mean over and above the Forecast Pool Requirement (not Reserve) right? But doesn't that include the reserve margin requirement? So that metric isn't really the reserve margin but the capacity in excess of the coincident peak load + reserve margin, right? Can you change the name of that metric to reflect that?	As Answered by Art. Will consider a revision to the name of the metric. Thank you.
I'm disappointed that you didn't advance one of the N2G portfolios given how important the modeling of EE is to CAC.	Comments provided by Greg Soller
Did you consider limiting sales in some of these of focused portfolios to get a better indication of NPV?	As answered by Art
Did I mishear what Peter said? The Cook life extension portfolios don't assume any additional cost (over current costs?) for life extension? So why do they "provide valuable strategic insights into...cost estimates for the asset life extension"?	As answered by Andrew
Are the dispatch costs of these portfolios based on Zonal or LTCE runs?	As answered by Peter B

Does the capital investment metric refer just to investment for new resources that will be capitalized or does it refer to any capitalized costs including maintenance or does it refer to any costs for new resources whether capitalized or not (but not maintenance) or does it mean something else entirely?	As answered by Andrew and Jim
Given that 2025 is three years out are you intending to start the all-source RFP process soon because you would consider advancing the online date for new capacity? Or is there some other factor at play?	As answered by Dave Lucas
This spot sales graph is really helpful because it shows much higher the average sales are in the years prior to the one - 2041 - that is reported in the scorecard. In at least one other IRP you've reported sales over most of the planning period instead of in one year, would you consider doing that here too?	As answered by Art and Greg

Indiana Michigan Power:

2021 Integrated Resource Plan

Public Stakeholder Meeting #4

November 30, 2021

Presented via GoToWebinar (register here) → https://attendee.gotowebinar.com/register/4716544662590273296

BOUNDLESS ENERGY℠

WELCOME AND SAFETY MOMENT

Andrew Williamson | I&M Director Regulatory Services

Safety Moment

INDIANA MICHIGAN POWER
An AEP Company

MEETING GUIDELINES AND AGENDA

Jay Boggs | Siemens PTI

Agenda

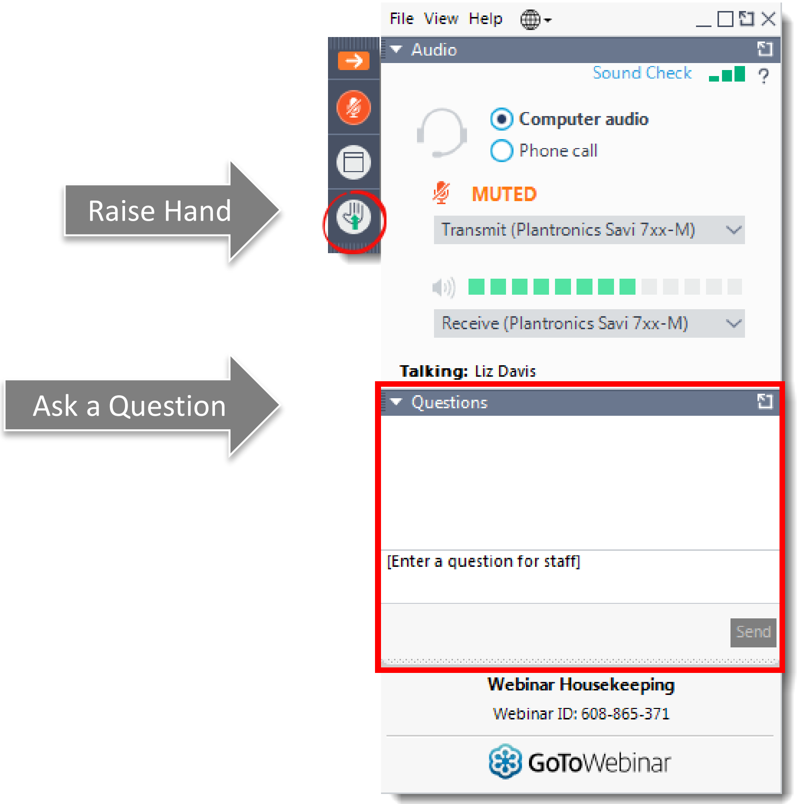
Time		
9:30 a.m.	WELCOME AND SAFETY MOMENT	**Andrew Williamson**, I&M Director Regulatory Services
9:35 a.m.	MEETING GUIDELINES AND AGENDA	**Jay Boggs**, Siemens PTI
9:40 a.m.	RECAP OF PREVIOUS MEETINGS	**Jay Boggs**, Siemens PTI
10:00 a.m.	PORTFOLIO ANALYSIS	**Michael Korschek,** Siemens PTI
10:30 a.m.	BREAK	
10:45 a.m.	BALANCED SCORECARD	**Art Holland,** Siemens PTI
11:30 a.m.	METRICS DEEPDIVE	**Peter Berini**, Siemens PTI
12:15 p.m.	LUNCH	
1:00 p.m.	PATH TO PREFERRED PORTFOLIO	**I&M Management**
1:30 p.m.	PREFERRED PORTFOLIO	**Art Holland,** Siemens PTI
2:00 p.m.	CLOSING DISCUSSION	**Andrew Williamson**, I&M Director Regulatory Services
2:30 p.m.	ADJOURN	

Questions and Feedback

One purpose of today's presentation is to explain the IRP process and collect feedback from stakeholders. Stakeholder feedback will be posted on the I&M website IRP portal and will be considered as part of the Final IRP.

If you have a question about the IRP process during this presentation:

- Type your question in the Questions area of the GoToWebinar panel
- During the feedback and discussion portions of the presentations, please raise your hand via the GoToMeeting tool to be recognized. We plan to hear form all who wish to be heard and address all questions
- Any questions that cannot be answered during the call will be addressed and posted on the website above



If you would like to make a comment or ask a question about the IRP process after the presentation has concluded:

- Please send an email to I&MIRP@aep.com
- Stay informed about future events by visiting the I&M IRP Portal located at www.indianamichiganpower.com/info/projects/IntegratedResourcePlan

Guidelines

1. Due to the number of participants scheduled to join today's meeting, all will be in a "listen-only" mode by default.

2. Please enter questions at any time into the GoToWebinar portal. This is the best to way to ensure your question is answered. We will attempt to answer all questions during the session, time permitting.

3. Time has been allotted during the session to answer questions related to the materials presented. Unanswered questions will be addressed after the presentation and posted in accordance with the Questions and Feedback slide.

4. At the end of the presentation, we will open-up the floor for "clarifying questions," thoughts, ideas, and suggestions.

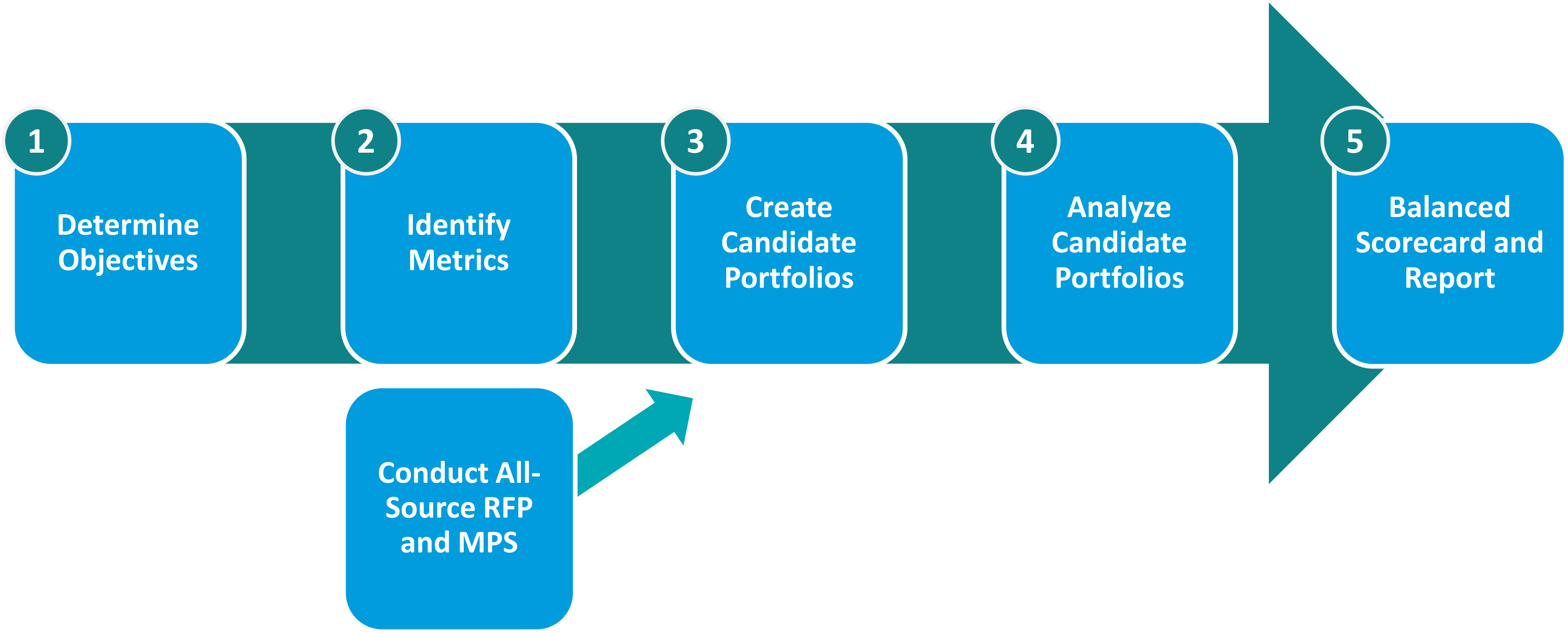
5. Please provide your feedback or any additional questions on the Stakeholder Meeting #4 presentation **within ten business days of the conclusion of this meeting.**

Peter Berini, Siemens PTI

RECAP OF THE PREVIOUS STAKEHOLDER MEETINGS

2021 IRP Process and Current State

Siemens PTI: Approach to Integrated Resource Plan Modeling



Stakeholder Timelines and Engagement

I&M established a stakeholder engagement process to encourage questions, make suggestions and provide data. As part of the IRP process, I&M has now conducted a total of five IRP Workshops and one Technical AURORA Workshop.

✓March 9, 2021	✓April 14, 2021	✓June 24, 2021	✓July 27, 2021	✓Oct. 14, 2021	✓Nov. 30, 2021	Pre- / Post Filing
2021 IRP Process	DSM IRP Inputs and Modeling	AURORA Technical Workshop	IRP Process – Inputs, Scenarios and Sensitivities	Finalized Reference Case Inputs and Key Assumptions	Stochastic Modeling	Stakeholder Feedback solicited and responded to until IRP Finalization
Objectives and Metrics	EE/EWR, DR and DER Results		All-Source RFP Results	Candidate Portfolio Review	Review of Preferred Portfolio	Continued Release of Model Inputs and Outputs
Proposed Scenarios	2021 IRP Update				Other(s)	
Base Case Inputs						

Michael Korschek, Siemens PTI

STEP 4: ANALYZE CANDIDATE PORTFOLIOS

Probabilistic Framework Applied to Candidate Portfolios

Candidate Portfolios were subjected to Probabilistic Simulations (stochastic risk analysis) to measure performance across many future scenarios. The stochastic process produces hundreds of internally consistent simulations that can provide a more realistic understanding of the potential variation in future states of the world.

Probabilistic Modeling is the basis for Step 4: Analyze Candidate Portfolios and informs the Step 5: Balanced Scorecard and Report

Advantages

- Exhaustive potential futures can be analyzed
- Uses impartial statistical rules and correlations

Disadvantages

- Link between statistical realizations and the real world can be difficult to understand

Market Driver	Varied Stochastically
Load	✓
Natural Gas Prices	✓
Coal Prices	✓
CO2 Prices	✓
Capital Costs for New Entry	✓

Stochastic Portfolio Results Inform Scorecard Metrics

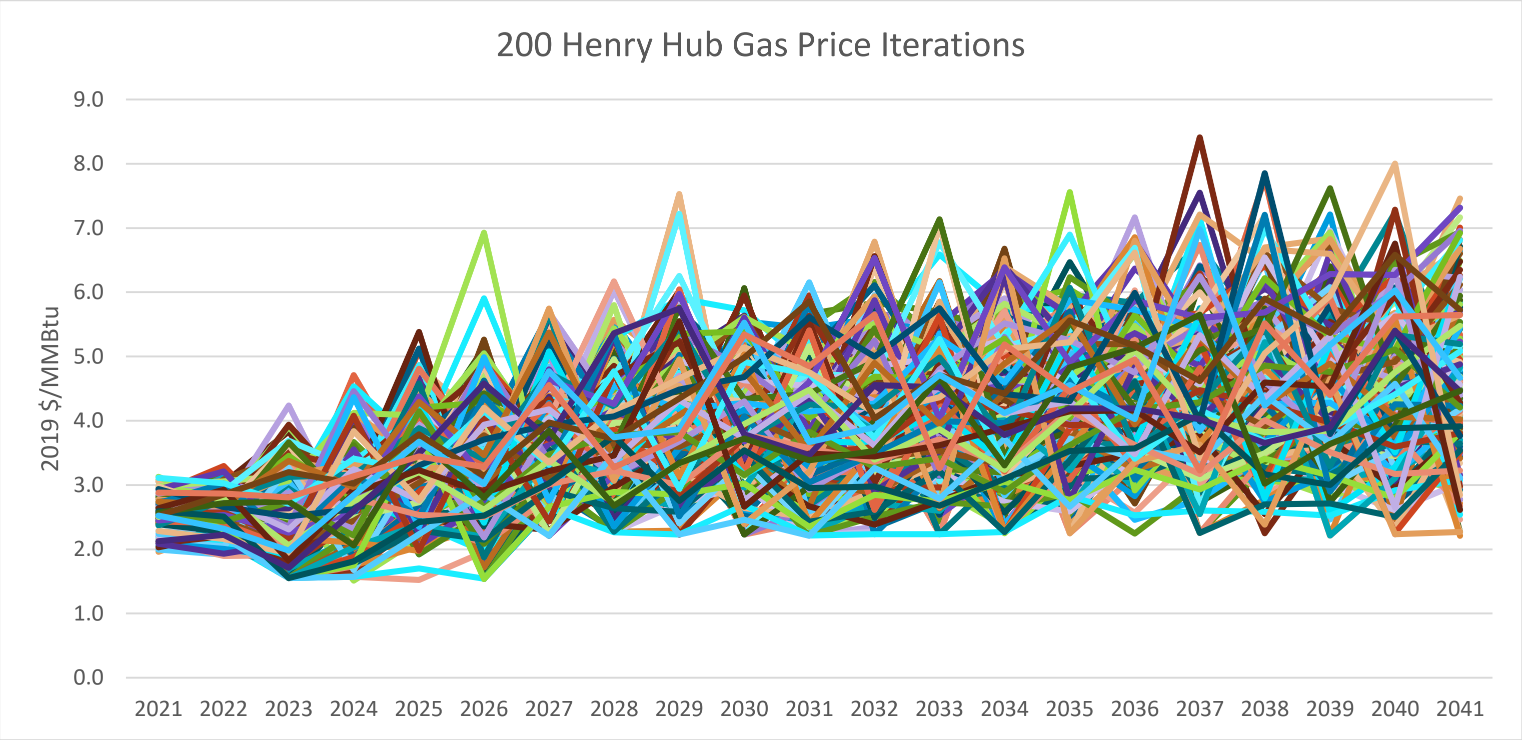
In measuring each portfolio's performance across 200 iterations, we can quantify each of the measures associated with IRP objectives. This provides a direct comparison of portfolio performance that will be summarized in the Balanced Scorecard.

IRP Objectives	Proposed IRP Metric	Unit
Affordability	20-Year NPV Cost to Serve Load 10-Year NPV Cost to Serve Load	$ $
Rate Stability	95th percentile value of NPV Cost to Serve Load CAGR of Rate Increase (2025-2029)	$ %
Sustainability Impact	CO2e Emissions	Tons
Market Risk Minimization	Purchases as a % of Demand (2041) Sales as a % of Demand (2041)	% %
Reliability	Reserve Margin above Forecasted Pool Requirement	%
Resource Diversity[1]	Number of Unique Fuel Types Number of Unique Generators	# #

[1]Resource Diversity fuel type metric is driven by Step 3 results and are not varied stochastically for the I&M portfolio.

Probabilistic Modeling Approach for Henry Hub

The probabilistic modeling framework works to measure risk from 200 potential future paths for each stochastic variable. By running each portfolio through 200 iterations, each portfolio's performance and risk profile can be quantified across a wide range of potential futures.



Probabilistic Variables and Drivers for Stochastic Inputs

Each stochastic input category has several components. Siemens identified the most salient market drivers for each category and build distributions around them. These distributions are based on multiple factors for each category as outlined below.

Load

- **Peak Load**
- **Average Load**
- Driver Variables:
- EV and Solar DG
- Weather
- GDP/ Personal Income
- EIA view on low, mid & high cases

Natural Gas

- **Henry Hub**
- Modeling based on:
- Historical Volatility
- Historical Mean Reversion
- Historical Correlation
- EIA view on low, mid & high cases

Coal

- **ILB**
- **PRB**
- **CAPP**
- **NAPP**
- Modeling based on:
- Historical Volatility
- Historical Mean Reversion
- Historical Correlation
- EIA view on low, mid & high cases

CO2

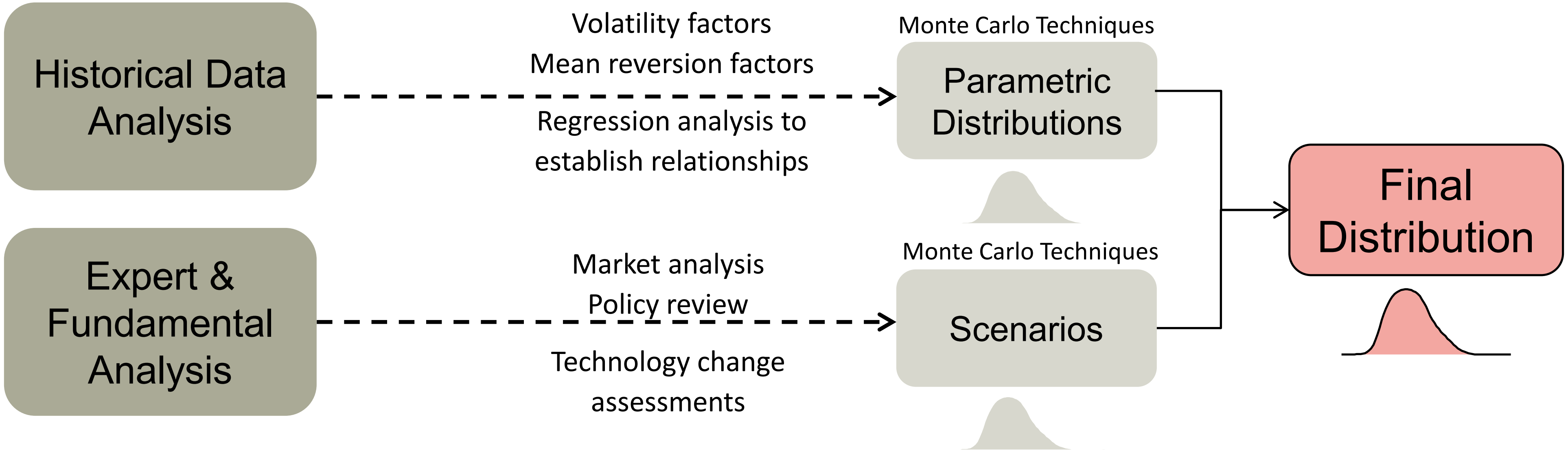
- **National CO2 price**
- Modeling based on:
- Expert view on low, mid & high cases

Capital Cost

- **Relevant technologies**
- **included**
- Modeling based on:
- EIA view on low, mid & high cases
- All Source RFP Results
- RFP Results

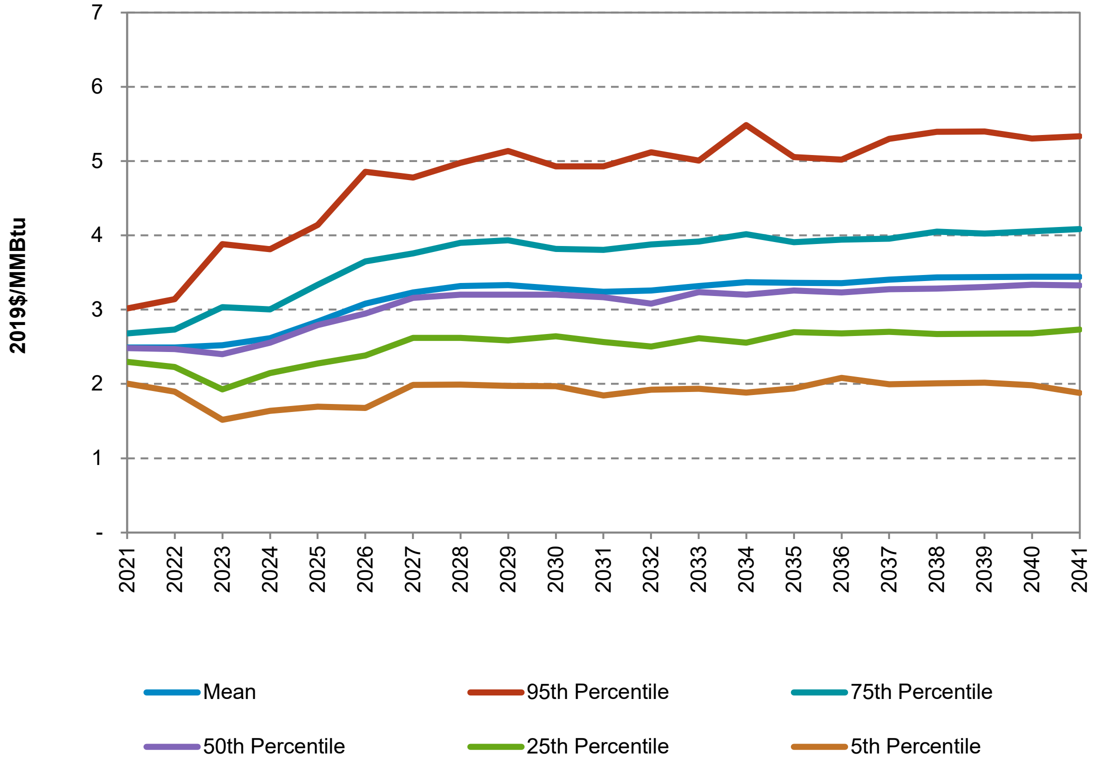
Probabilistic Modeling Approach for Stochastic Inputs

The below graphics illustrates the technical steps taken generate a full distribution for each stochastic input. This process blends historical performance and relationships coupled with market expertise to generate a distirbution that reflect historical behavior and expected future performance.

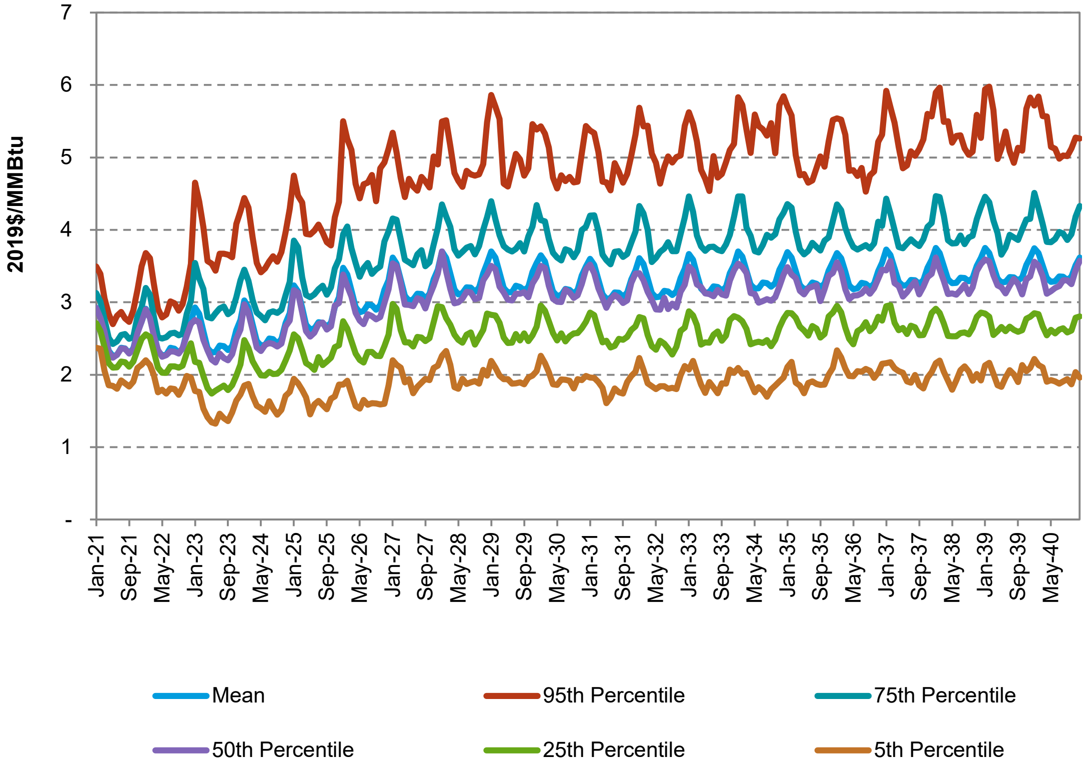


Candidate Portfolio Stochastic Inputs
Gas Prices (2019$/MMBtu)

Henry Hub, Annual

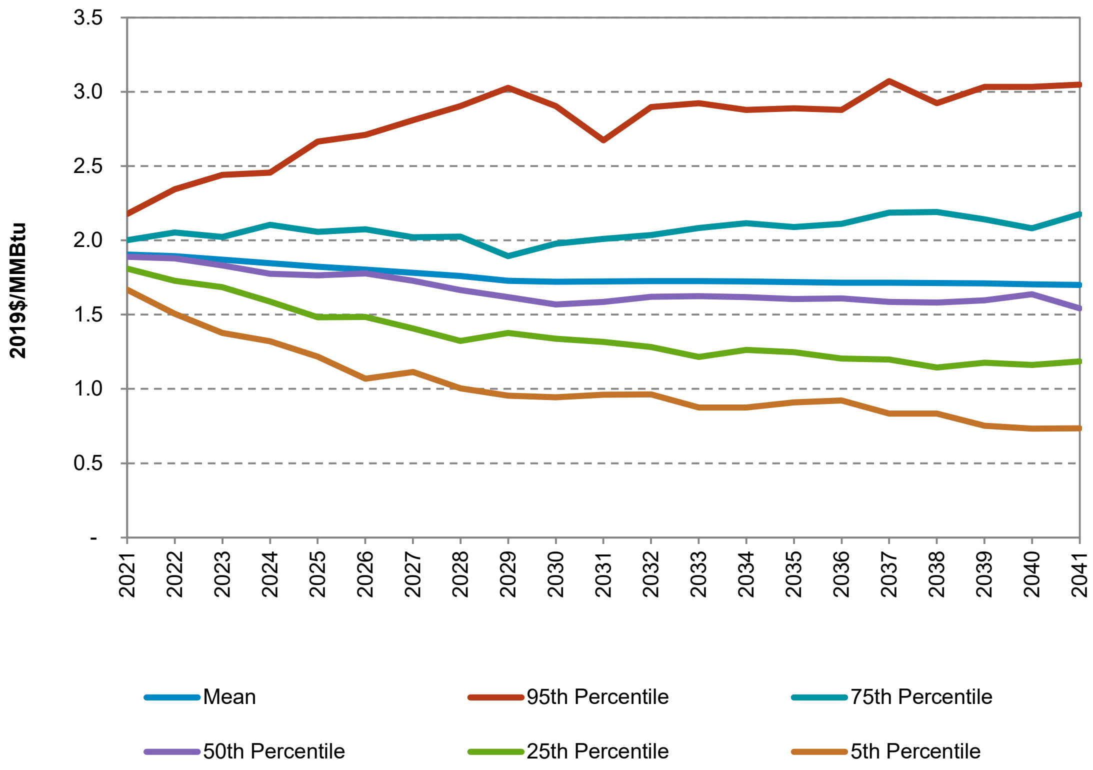


Henry Hub, Monthly

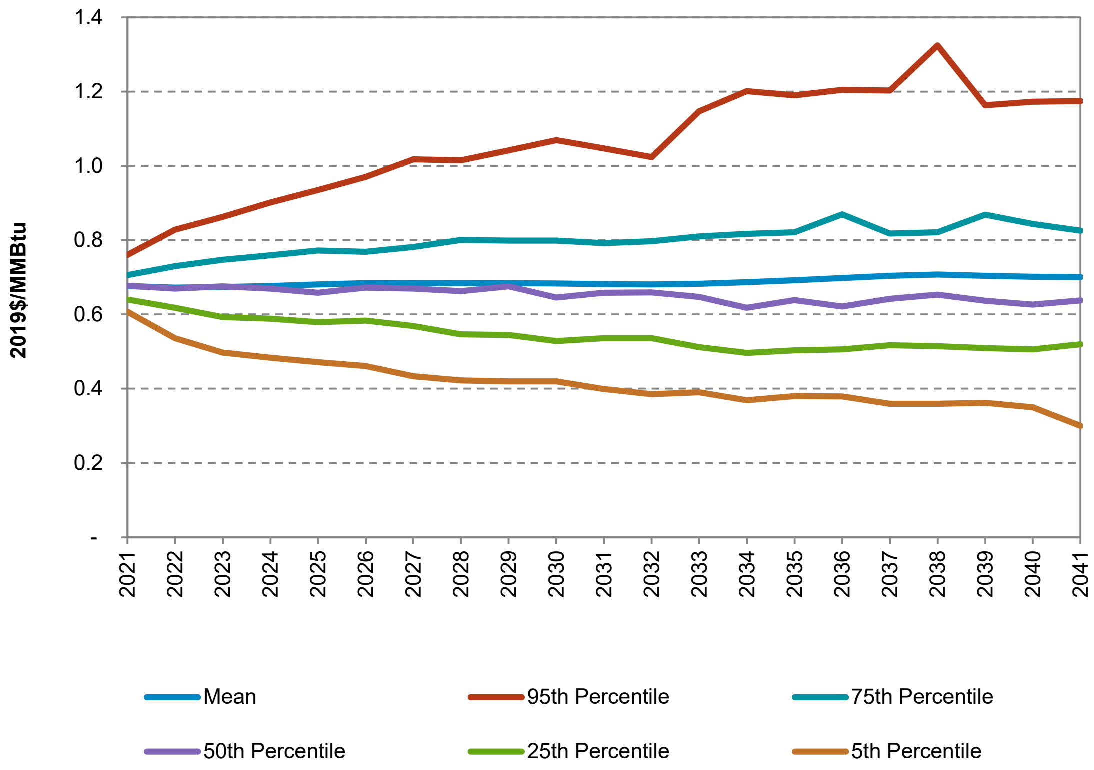


Candidate Portfolio Stochastic Inputs
Coal Prices (2019$/MMBtu)

Illinois Basin (ILB)

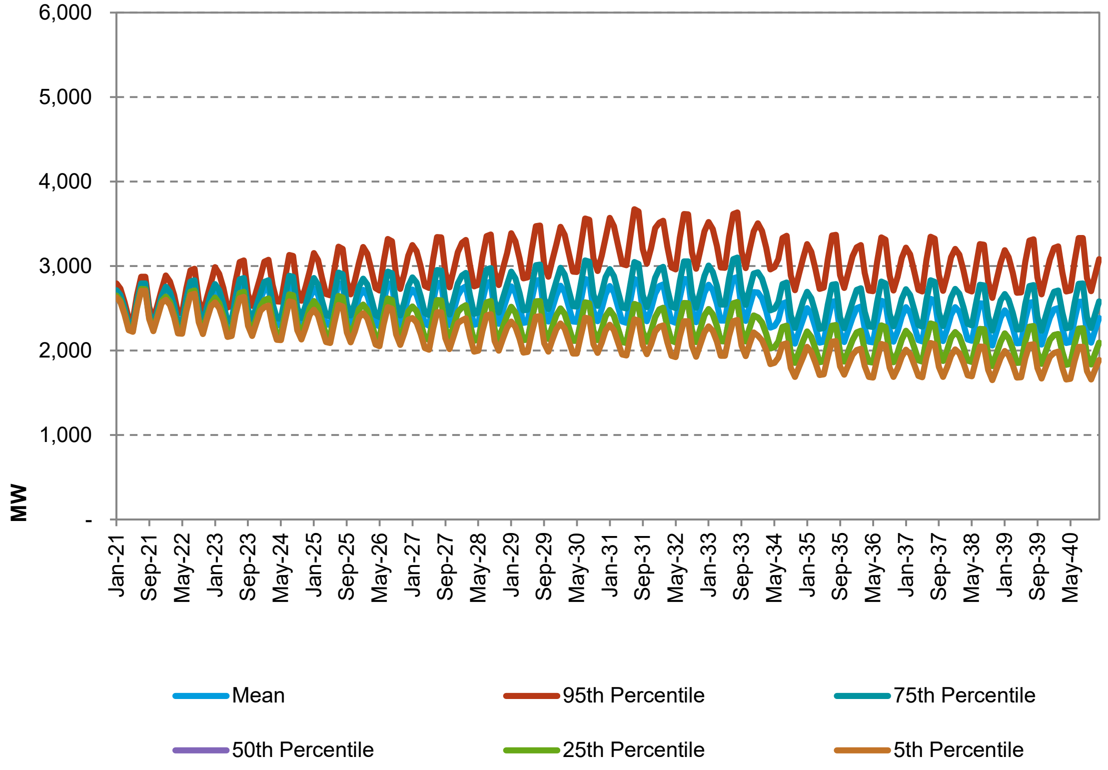


Powder River Basin (PRB)

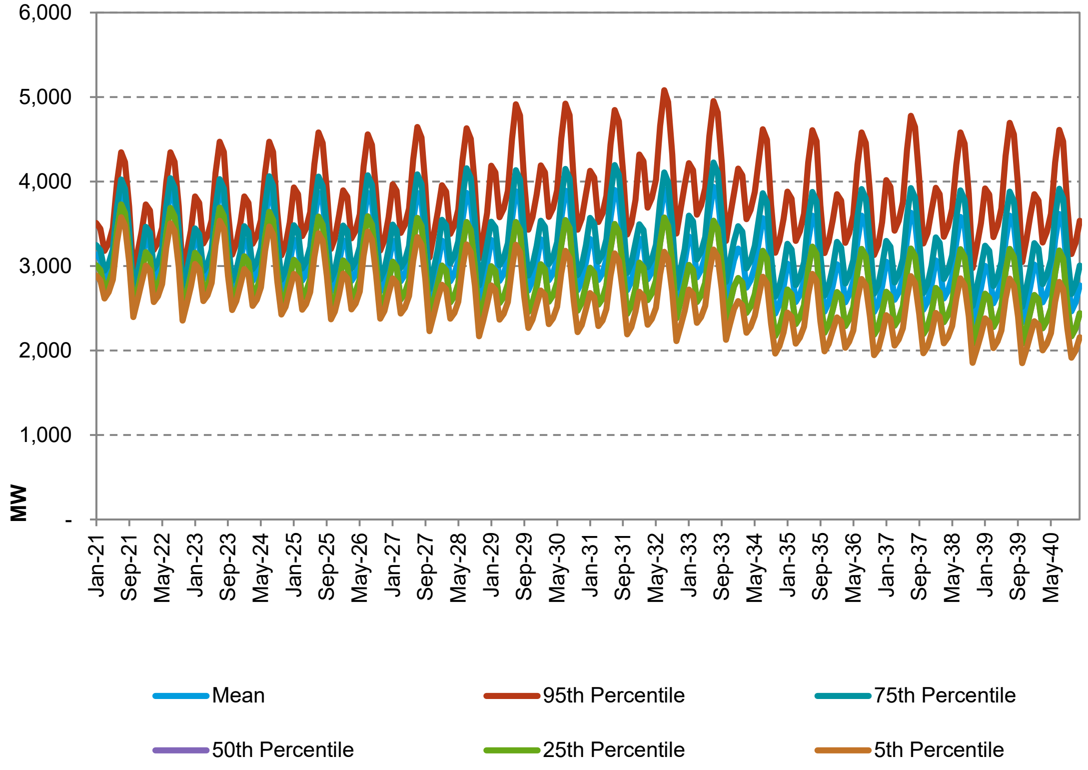


Candidate Portfolio Stochastic Inputs
Energy Demand (MW)

Average Load

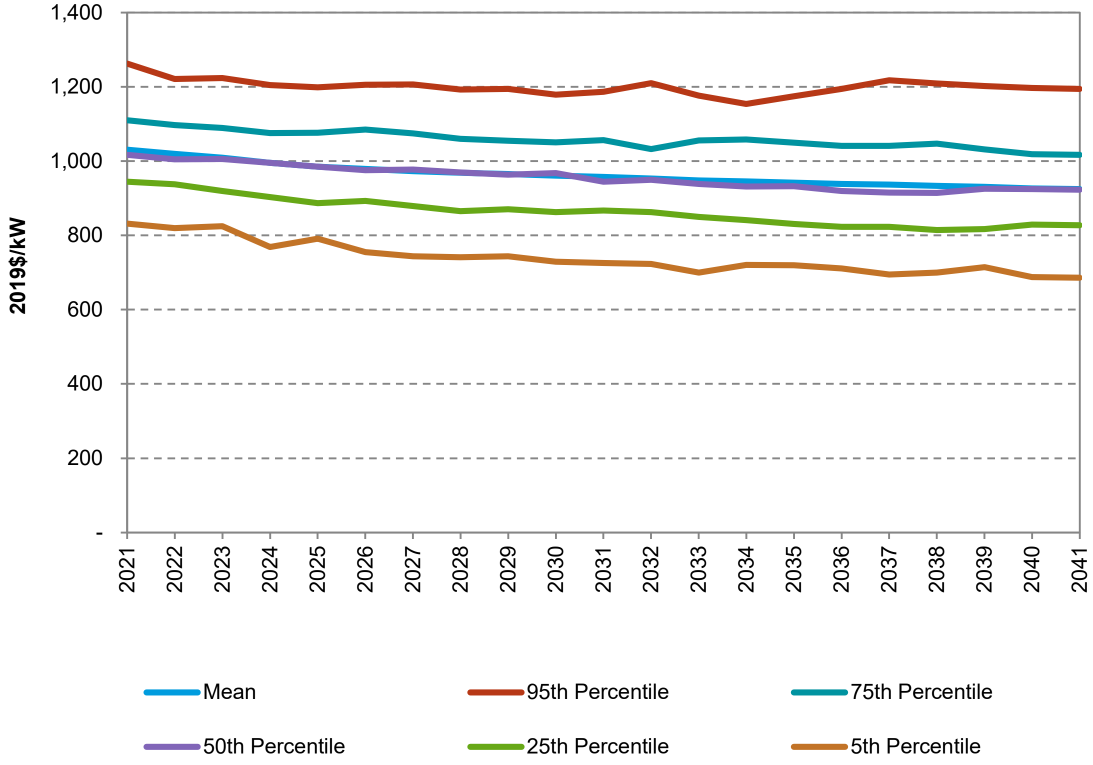


Peak Load

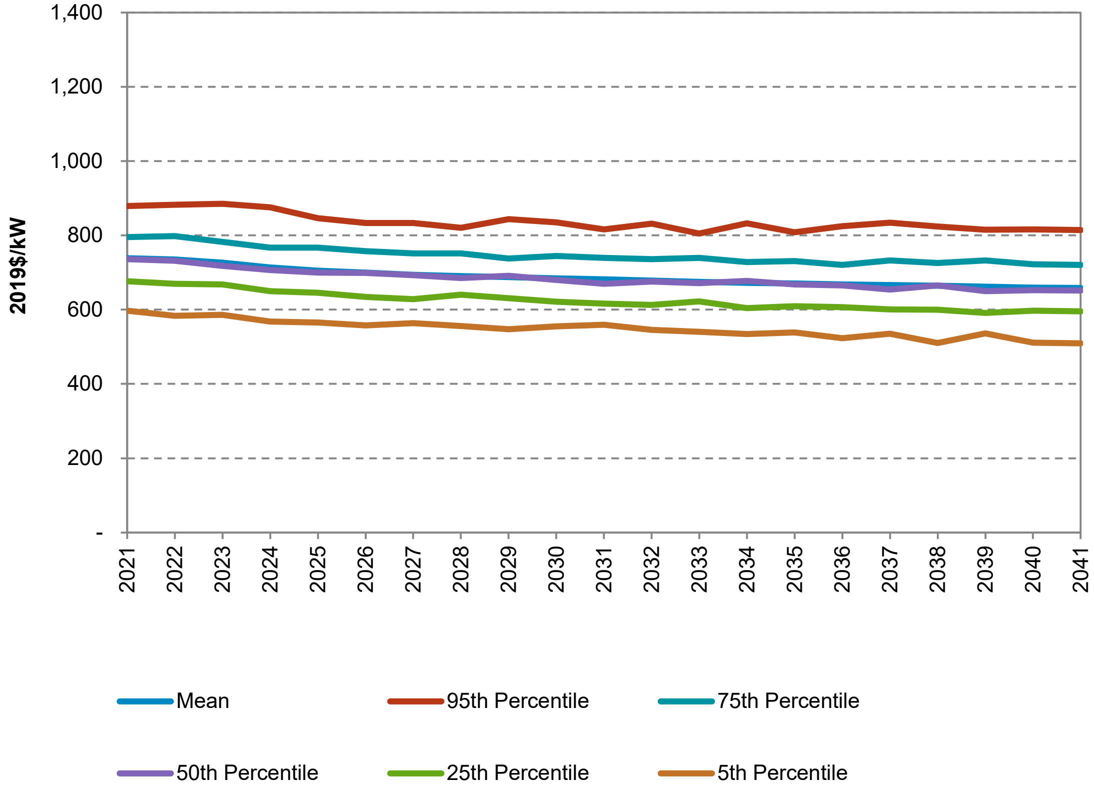


Candidate Portfolio Stochastic Inputs
Capital Costs (2019$/kW)

Advanced 2x1 Combined Cycle

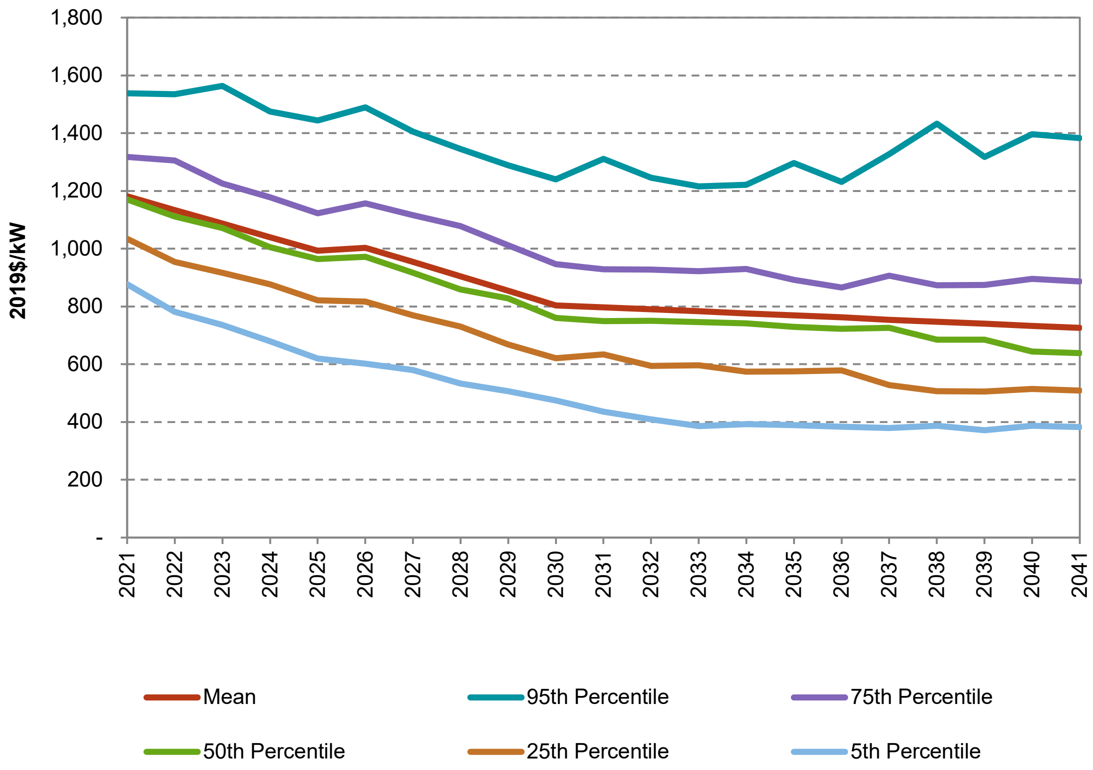


Simple frame Combustion Turbine

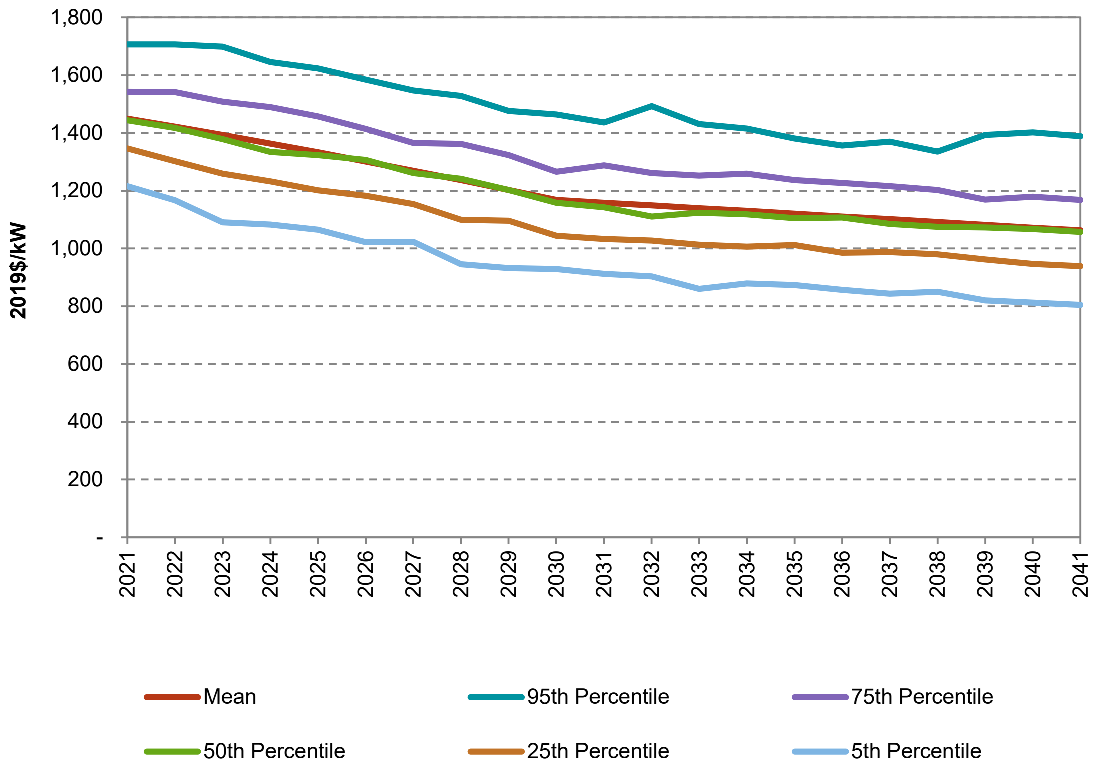


Candidate Portfolio Stochastic Inputs
Capital Costs (2019$/kW)

Solar PV – Tracking

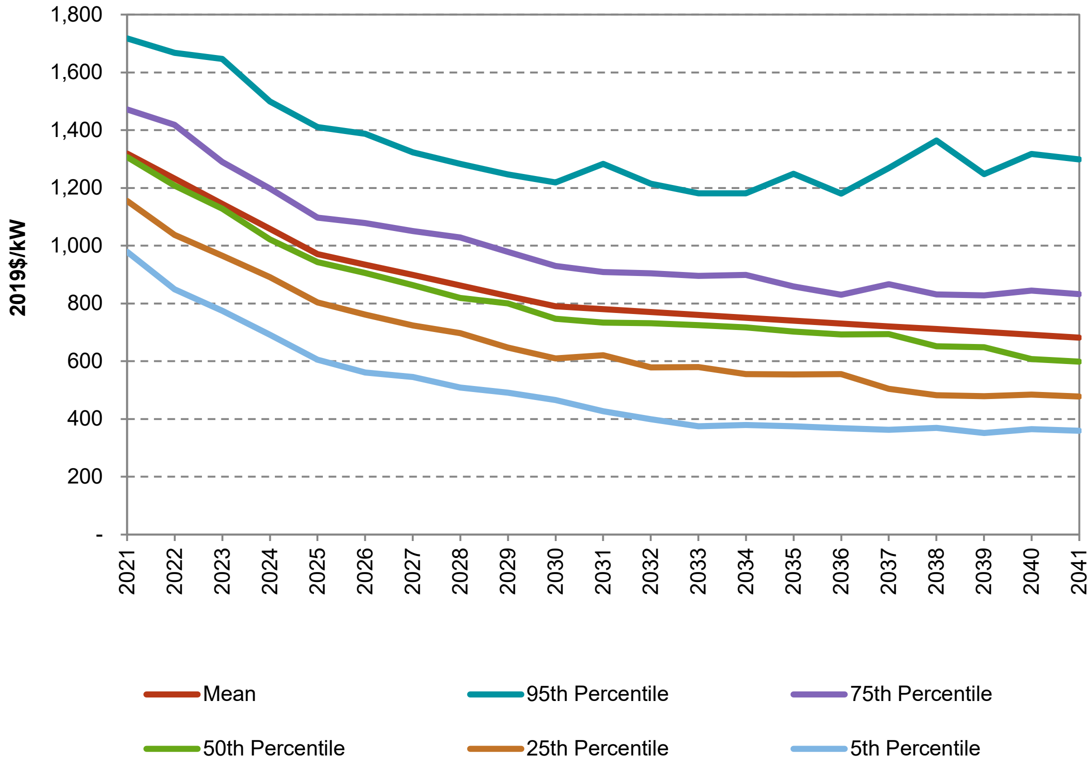


Onshore Wind



Candidate Portfolio Stochastic Inputs
Capital Costs (2019$/kW)

Batteries – Li-ion



Candidate Portfolio Stochastic Inputs Environmental Costs (2019$/ton)

INDIANA MICHIGAN POWER
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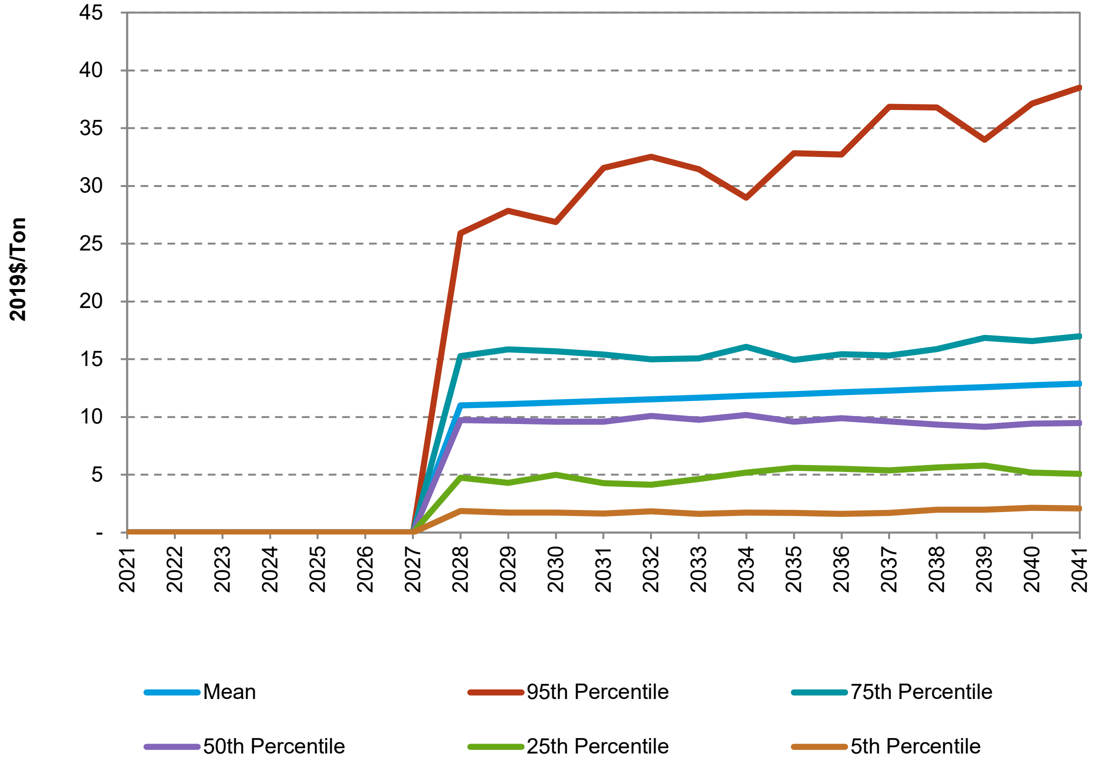
National CO2



FEEDBACK AND DISCUSSION

Art Holland , Siemens PTI

BALANCED SCORECARD

Balanced Scorecard
Illustrative

INDIANA MICHIGAN POWER
An AEP Company

Detailed portfolio results will be included for each Candidate Portfolio in the report write-up filed with the Commission. The Candidate Portfolios will be summarized in terms of each Objective and Metric through the balanced scorecard. In addition to the balanced scorecard, time-series information for portfolios will also be included in the report write-up.

Balanced Scorecard (Illustrative)

	Affordability			Rate Stability			Sustainability	Market Risk Minimization		Reliability	Resource Diversity	
Candidate Portfolios	20-Year NPV CTSL[2]	10-Year NPV CTS[2]	95th Percentile Value of NPV CTSL[2]	Difference Btw. Mean and 95th Percentile	5 Year Net Rate Increase CAGR (2025-2029)	Capital Investment Through 2028	% Reduction of CO2e (2005-2041)	Purchases as a % of Demand (2041)	Sales as a % of Demand (2041)	Reserve Margin[1] (2041)	# of Unique Generators (2041)	# of Unique Fuel Types (2041)
Reference Case												
Portfolio #1												
…												
…												
…												
Portfolio #n												

[1] Reserve Margin (2041) is a measure of I&M's capacity position above the required Forecast Pool Reserve (FPR) obligation to PJM
[2] Cost to Serve Load (CTSL)

Portfolios Summary
Portfolio Names and Descriptions

Portfolio Name, Revised	Description
Reference Case (Original)	Rockport Unit 1 (2028) Rockport Unit 2 (2024) and Cook (2034, 2037)
Rockport 1 2024	Rockport Unit 1 Early Retirement (2024)
Rockport 1 2025	Rockport Unit 1 Early Retirement (2025)
Rockport 1 2026	Rockport Unit 1 Early Retirement (2026)
Cook 2050+	Cook Unit 1 and Unit 2 License Extensions (beyond 2034 and 2037)
Cook 2050+ and No Gas	Cook Unit 1 and Unit 2 License Extensions and No Conventional Gas
Expanded Build Limits	Expanded Cumulative Build Limits on Renewable Energy and Storage
Reference‘ (“Prime”)	Reference Case (Original) with an Import and Export Limit at ~30% of I&M Load
Rapid Technology Advancement	35% Reduction in Renewable, Storage and EE Costs
Enhanced Regulation	Increased Environmental Regulations Leading to High Gas, Coal and CO2 Prices
Rockport 1 2024 N2G	Rockport Unit 1 Early Retirement (2024) Replacing SEA with Net to Gross EE Bundle Savings
Rockport 1 2026 N2G	Rockport Unit 1 Early Retirement (2026) Replacing SEA with Net to Gross EE Bundle Savings
Rapid Technology Advancement N2G	Rapid Technology Advancement (RTA) Replacing SEA with Net to Gross EE Bundle Savings

Balanced Scorecard
Reference and Scenario Portfolios

Portfolio	20-Year NPV CTSL[2]	10-Year NPV CTSL[2]	95th Percentile 20-Year NPV CTSL[2]	% Reduction of CO2e (2005-2041)	Purchases as a % of Demand (2041)	Sales as a % of Demand (2041)	Reserve Margin[1] (2041)
Reference Case (Original)	$7.30 B	$4.28 B	$8.55 B	74.8%	17.5%	8.9%	8.6%

Portfolio	20-Year NPV CTSL[2]	10-Year NPV CTSL[2]	95th Percentile 20-Year NPV CTSL[2]	% Reduction of CO2e (2005-2041)	Purchases as a % of Demand (2041)	Sales as a % of Demand (2041)	Reserve Margin[1] (2041)
Rapid Technology Advancement[3]	$7.50 B	$4.26 B	$8.81 B	94.2%	3.2%	53.7%	5.1%
Enhanced Regulation[3]	$7.49 B	$4.16 B	$8.81 B	94.1%	3.2%	54.0%	4.0%

[1] Reserve Margin (2041) is a measure of I&M's capacity position above the required Forecast Pool Reserve (FPR) obligation to PJM
[2] Cost to Serve Load (CTSL)
[3] Rapid Technology Advancement affordability metrics are based on Reference Case capital costs

- Reference and Scenario Portfolios are based on broad economic and environmental variations as a technique to develop optimized portfolios for further testing ("states of the world")

Balanced Scorecard
Reference and Company Portfolios

Portfolio	20-Year NPV CTSL[2]	10-Year NPV CTSL[2]	95th Percentile 20-Year NPV CTSL[2]	% Reduction of CO2e (2005-2041)	Purchases as a % of Demand (2041)	Sales as a % of Demand (2041)	Reserve Margin[1] (2041)
Reference Case (Original)	$7.30 B	$4.28 B	$8.55 B	74.8%	17.5%	8.9%	8.6%

Portfolio	20-Year NPV CTSL[2]	10-Year NPV CTSL[2]	95th Percentile 20-Year NPV CTSL[2]	% Reduction of CO2e (2005-2041)	Purchases as a % of Demand (2041)	Sales as a % of Demand (2041)	Reserve Margin[1] (2041)
Cook 2050+[3]	$6.20 B	$4.29 B	$7.50 B	97.9%	1.0%	49.2%	7.5%
Cook 2050+ and No Gas[3]	$6.54 B	$4.42 B	$7.87 B	99.4%	1.1%	46.3%	1.6%
Reference'	$6.98 B	$4.06 B	$8.26 B	75.4%	16.1%	10.0%	2.5%
Expanded Build Limits[4]	$7.93 B	$4.57 B	$9.23 B	80.1%	8.6%	21.8%	3.2%

[1] Reserve Margin (2041) is a measure of I&M's capacity position above the required Forecast Pool Reserve (FPR) obligation to PJM
[2] Cost to Serve Load (CTSL)
[3] The Cook portfolios include an assumption for relicensing cost but no estimate for capital expenditure required for equipment life extension
[4] The Expanded Build Limits portfolio was conducted as a test and does not represent a reasonable portfolio option

- The Company Portfolios represent I&M strategic options and/or tests of certain analysis inputs
- The Reference' Portfolio contains an import and export limit of ~30% of I&M Load in response to stakeholder feedback. The Reference' portfolio has a low cost to serve load when compared to other Candidate Portfolios
- Cook life extension portfolios (Cook 2050+ and Cook 2050+ and No Gas) test the cost and performance benefits of Cook life extension
- Cook portfolios include an assumption for relicensing cost but no estimate for CapEx required for equipment life extension
- The Cook portfolios add valuable strategic insights into near-term resource additions

Balanced Scorecard
Reference and Regulatory Required Portfolios

Portfolio	20-Year NPV CTSL[2]	10-Year NPV CTSL[2]	95th Percentile 20-Year NPV CTSL[2]	% Reduction of CO2e (2005-2041)	Purchases as a % of Demand (2041)	Sales as a % of Demand (2041)	Reserve Margin[1] (2041)
Reference Case (Original)	$7.30 B	$4.28 B	$8.55 B	74.8%	17.5%	8.9%	8.6%

Portfolio	20-Year NPV CTSL[2]	10-Year NPV CTSL[2]	95th Percentile 20-Year NPV CTSL[2]	% Reduction of CO2e (2005-2041)	Purchases as a % of Demand (2041)	Sales as a % of Demand (2041)	Reserve Margin[1] (2041)
Rockport 1 2024	$7.32 B	$4.31 B	$8.60 B	75.0%	17.0%	8.8%	5.8%
Rockport 1 2025	$7.49 B	$4.39 B	$8.76 B	76.6%	15.2%	12.3%	6.3%
Rockport 1 2026	$7.27 B	$4.28 B	$8.54 B	75.0%	17.0%	8.8%	1.2%
Rockport 1 2024 N2G	$7.44 B	$4.38 B	$8.72 B	75.7%	15.4%	10.1%	7.0%
Rockport 1 2026 N2G	$7.26 B	$4.29 B	$8.54 B	75.8%	15.3%	10.2%	1.7%
Rapid Technology Advancement N2G	$7.28 B	$4.19 B	$8.85 B	93.3%	4.9%	44.2%	1.4%

[1] Reserve Margin (2041) is a measure of I&M's capacity position above the required Forecast Pool Reserve (FPR) obligation to PJM
[2] Cost to Serve Load (CTSL)

- Several portfolios were included to meet certain regulatory requirements
- Rockport 1 2026 identified as slightly lower cost alternative to the Reference Case (Original)

Balanced Scorecard
Reference and Candidate Portfolios Initial Screening

Portfolio Name, Revised	Action	Rational
Reference Case (Original)	Refined	Retain for comparison
Rockport 1 2024	Inform	Evaluate Early Rockport Retirement, Minimal Lead Time for New Resources
Rockport 1 2025	Inform	Evaluate Early Rockport Retirement, Minimal Lead Time for New Resources
Rockport 1 2026	Maintain	Evaluate Early Rockport Retirement
Cook 2050+[1]	Maintain	Optionality to Maintain Nuclear Resources, Sustainability Goals
Cook 2050+ and No Gas[1]	Maintain	Optionality to Maintain Nuclear Resources, Sustainability Goals
Expanded Build Limits	Inform	Evaluate Build Limits, High Exports and Costs
Reference'	Maintain	Manage Export Limits
Rapid Technology Advancement	Maintain	Scenario Results
Enhanced Regulation	Maintain	Scenario Results
Rockport 1 2024 N2G	Inform	Evaluate Alternative Treatment of Energy Efficiency Resources
Rockport 1 2026 N2G	Inform	Evaluate Alternative Treatment of Energy Efficiency Resources
Rapid Technology Advancement N2G	Inform	Evaluate Alternative Treatment of Energy Efficiency Resources

[1]The Cook portfolios include an assumption for relicensing cost but no estimate for CapEx required for equipment life extension

Balanced Scorecard
Reference and Focused Portfolios

INDIANA MICHIGAN POWER
An AEP Company

Portfolio	20-Year NPV CTSL[2]	10-Year NPV CTSL[2]	95th Percentile 20-Year NPV CTSL[2]	% Reduction of CO2e (2005-2041)	Purchases as a % of Demand (2041)	Sales as a % of Demand (2041)	Reserve Margin[1] (2041)
Reference Case (Original)	$7.30 B	$4.28 B	$8.55 B	74.8%	17.5%	8.9%	8.6%

Portfolio	20-Year NPV CTSL[2]	10-Year NPV CTSL[2]	95th Percentile 20-Year NPV CTSL[2]	% Reduction of CO2e (2005-2041)	Purchases as a % of Demand (2041)	Sales as a % of Demand (2041)	Reserve Margin[1] (2041)
Cook 2050+[3]	$6.20 B	$4.29 B	$7.50 B	97.9%	1.0%	49.2%	7.5%
Cook 2050+ and No Gas[3]	$6.54 B	$4.42 B	$7.87 B	99.4%	1.1%	46.3%	1.6%
Reference‘	$6.98 B	$4.06 B	$8.26 B	75.4%	16.1%	10.0%	2.5%
Rapid Technology Advancement	$7.50 B	$4.26 B	$8.81 B	94.2%	3.2%	53.7%	5.1%
Enhanced Regulation	$7.49 B	$4.16 B	$8.81 B	94.1%	3.2%	54.0%	4.0%
Rockport 1 2026	$7.27 B	$4.28 B	$8.54 B	75.0%	17.0%	8.8%	1.2%

[1] Reserve Margin (2041) is a measure of I&M’s capacity position above the required Forecast Pool Reserve (FPR) obligation to PJM
[2] Cost to Serve Load (CTSL)
[3] The Cook portfolios include an assumption for relicensing cost but no estimate for capital expenditure required for equipment life extension

- In addition to the Reference Case, Siemens PTI and I&M focused the IRP analysis on a select list of candidate portfolios
- The Reference' portfolio was optimized in much the same manner as the original Reference Case with an added limitation on spot market imports and exports (purchases and sales) as a risk mitigation strategy

OVEC ANALYSIS

Per IURC Rockport 2 Settlement (Cause 45546) and MI IRP settlement (Case No. U-20591):

Modeled a scenario where the Preferred Plan was optimized without OVEC units after 2030

Analysis evaluated two termination alternatives

1. Only I&M exited contract
2. All owners exited contract

Analysis results showed continued operation of the OVEC units is cost-beneficial to rate payers

- Under alternative 1, estimated costs to I&M customers would increase by ~$102M NPV
- Under alternative 2, estimated costs to I&M customers would increase by ~$28M NPV

FEEDBACK AND DISCUSSION

Peter Berini, Siemens PTI

METRICS DEEPDIVE

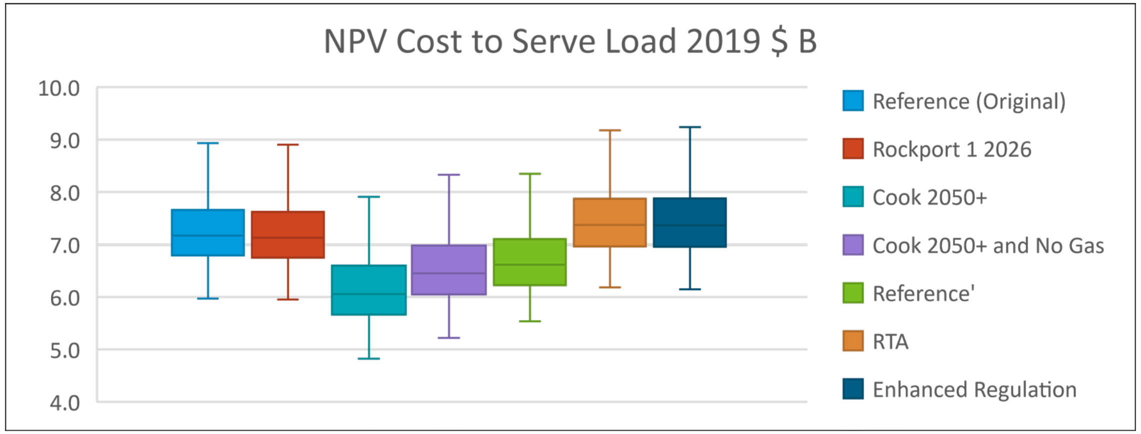
Affordability
20- and 10-Year NPV of the Cost to Serve Load

Affordability Objective

For the affordability objective, the metrics used are the 20- and 10-year Net Present Value Cost to Serve Load

- The NPV Cost to Serve Load (CTSL) is a measure of all generation related costs associated with the portfolio of assets over time
- Generation related costs include capital, O&M, fuel, related transmission costs, spot market energy purchases, and capacity purchases
- The Cook 2050+ Portfolios provide valuable strategic insights into near-term resource additions and cost estimates for the asset life extension

Portfolio	20-Year NPV CTSL	10-Year NPV CTSL
Reference Case	\$7.30 B	\$4.28 B
Cook 2050+	\$6.20 B	\$4.29 B
Cook 2050+ and No Gas	\$6.54 B	\$4.42 B
Reference’	\$6.98 B	\$4.06 B
Rapid Technology Advancement	\$7.50 B	\$4.26 B
Enhanced Regulation	\$7.49 B	\$4.16 B
Rockport 1 2026	\$7.27 B	\$4.28 B



Rate Stability
95th Percentile NPV of the Cost to Serve Load

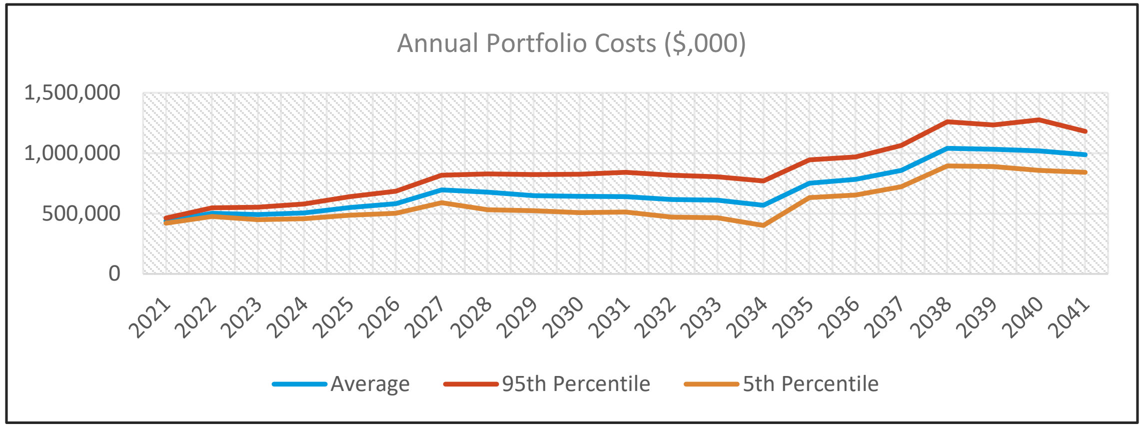
INDIANA MICHIGAN POWER
An AEP Company

Rate Stability Objective (1/2)

For the rate stability objective, the metrics used are the 95th Percentile NPV of the Cost to Serve Load and A 5-year Compound Annual Growth Rate of the Net Retail Rate Impact

- As part of the probabilistic modeling approach, once each portfolio was subjected to 200 iterations of Aurora, a distribution was created of the NPV Cost to Serve Load portfolio costs
- The 95th percentile (approximately two standard deviations above the mean value) is a commonly used benchmark to demonstrate upper threshold of cost risk under widely varying market circumstances
- The upside risk, measured as the distance between the expected (Mean) and the 95th percentile
- Excluding the Cook portfolios, the Reference' is the lowest value for the 95th Percentile NPV Cost to Serve Load

Portfolio	95th Percentile NPV CTSL	Difference Between Mean and 95th Percentile
Reference Case	$8.55 B	17.1%
Cook 2050+	$7.50 B	21.0%
Cook 2050+ and No Gas	$7.87 B	20.4%
Reference’	$8.26 B	18.3%
Rapid Technology Advancement	$8.81 B	17.5%
Enhanced Regulation	$8.81 B	17.6%
Rockport 1 2026	$8.54 B	17.5%



Rate Stability
5 Year Net Rate Increase CAGR (2025-2029)

INDIANA MICHIGAN POWER
An AEP Company

Rate Stability Objective (2/2)

For the rate stability objective, the metrics used are the 95th Percentile NPV of the Cost to Serve Load and a 5-yr the Compound Annual Growth Rate (CAGR) of the Net Retail Rate Impact

- 95th Percentile metric illustrates cost risks when exposed to volatility in various key drivers. The Enhanced Regulation and RTA portfolios exhibit the greatest cost risk
- The 5-yr CAGR metric provides near term insight to customer affordability and rate impacts of the resource additions in the Preferred Plan. I&M prepared a traditional, non-levelized, calculation of the annual cost of service and the change in revenue requirement for the period of 2025-2029 when new resources are added

Portfolio	5 Year Net Rate Increase CAGR (2025-2029)	Capital Investment Through 2028
Reference Case	1.50%	$5.69 B
Cook 2050+	0.50%	$4.82 B
Cook 2050+ and No Gas	1.50%	$5.40 B
Reference’	1.30%	$5.52 B
Rapid Technology Advancement	1.50%	$5.69 B
Enhanced Regulation	1.50%	$5.69 B
Rockport 1 2026	1.10%	$5.36 B

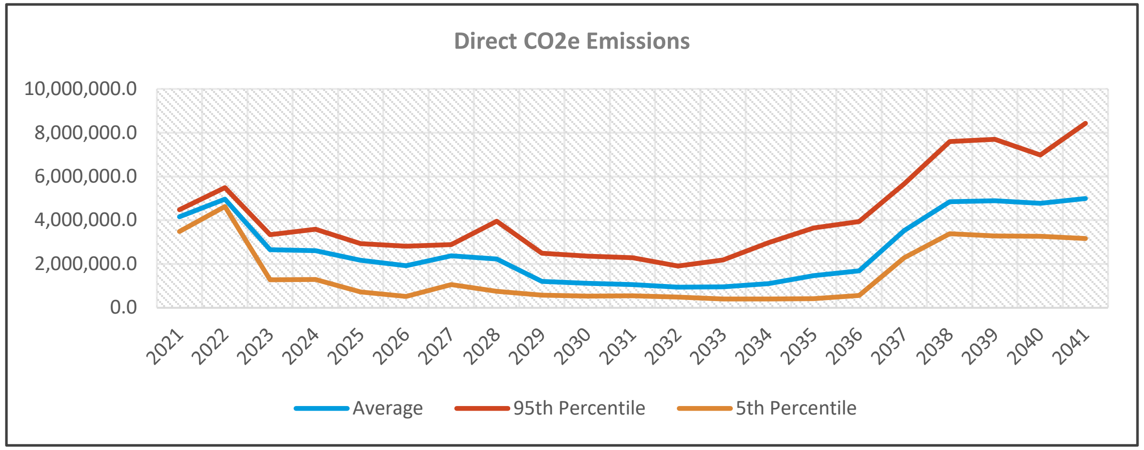
Sustainability
CO2e Emissions

Sustainability Objective

For the sustainability impact objective, the metric estimated direct GHG emissions of each generation type, measured in tons of carbon dioxide equivalent (CO2e)

- All the portfolios result in a substantial reduction of direct CO2e emissions as measured by the mean of the stochastics
- The emission profile distributions for all P-Bands except the P-95, maintain an 80% reduction from 2005 levels throughout the forecast
- The Cook 2050+ and No Gas portfolio reaches significant reductions due to the selection of resources
- Emissions reductions are similar for portfolios through 2034 with divergences occurring with the introduction of Gas CCs in select portfolios

Portfolio	% Reduction of CO2e (2005-2041)
Reference Case	74.8%
Cook 2050+	97.9%
Cook 2050+ and No Gas	99.4%
Reference'	75.4%
Rapid Technology Advancement	94.2%
Enhanced Regulation	94.1%
Rockport 1 2026	75.0%



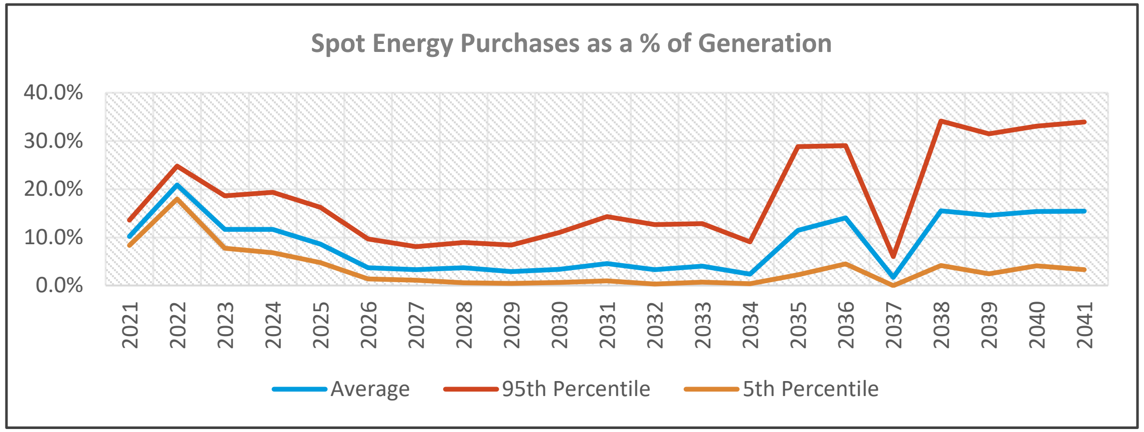
Market Risk Minimization
Spot Energy Purchases as a % of Generation

Market Risk Minimization Objective (1/2)

For the market risk minimization objective, the metrics used are the average annual energy sales and the average annual energy purchases, each divided by the average annual generation and expressed as a percentage

- The metrics show the reliance on market sales and/or purchases by the resulting portfolios
- The Spot Energy Purchases as a % of Generation for all portfolios represent a management spot market exposure The Reference Case and the Reference' result in a higher amount of spot energy purchases
- The large spikes observed in 2034 and 2037 in the graph to the right represent timing nuances between capacity retirement dates and energy retirement dates and are meant to align I&M capacity planning with the PJM capacity planning period

Portfolio	Purchases as a % of Demand (2041)	Sales as a % of Demand (2041)
Reference Case	17.5%	8.9%
Cook 2050+	1.0%	49.2%
Cook 2050+ and No Gas	1.1%	46.3%
Reference‘	16.1%	10.0%
Rapid Technology Advancement	3.2%	53.7%
Enhanced Regulation	3.2%	54.0%
Rockport 1 2026	17.0%	8.8%



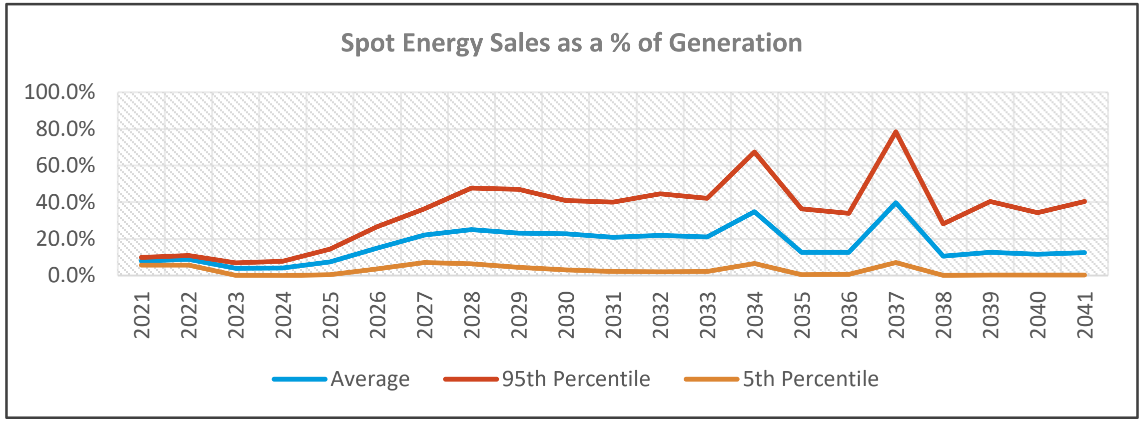
Market Risk Minimization
Spot Energy Sales as a % of Generation

Market Risk Minimization Objective (2/2)

For the market risk minimization objective, the metrics used are the average annual energy sales and the average annual energy purchases, each divided by the average annual generation and expressed as a percentage.

- The metrics show the reliance on market sales and/or purchases by the resulting portfolios
- Sales as a % of Demand are much lower in the Reference Case and in the Reference' portfolio
- The Cook Sensitivities and the Scenarios represent a large number of sales that may expose I&M to high levels of market risk through an over reliance on the spot market
- The large spikes observed in 2034 and 2037 in the graph to the right represent timing nuances between Capacity Retirement Dates and Energy Retirement dates and are meant to align I&M capacity planning with the PJM Capacity planning period

Portfolio	Purchases as a % of Demand (2041)	Sales as a % of Demand (2041)
Reference Case	17.5%	8.9%
Cook 2050+	1.0%	49.2%
Cook 2050+ and No Gas	1.1%	46.3%
Reference’	16.1%	10.0%
Rapid Technology Advancement	3.2%	53.7%
Enhanced Regulation	3.2%	54.0%
Rockport 1 2026	17.0%	8.8%



Reliability and Resource Diversity
Reserve Margin above PJM Forecasted Pool Requirement

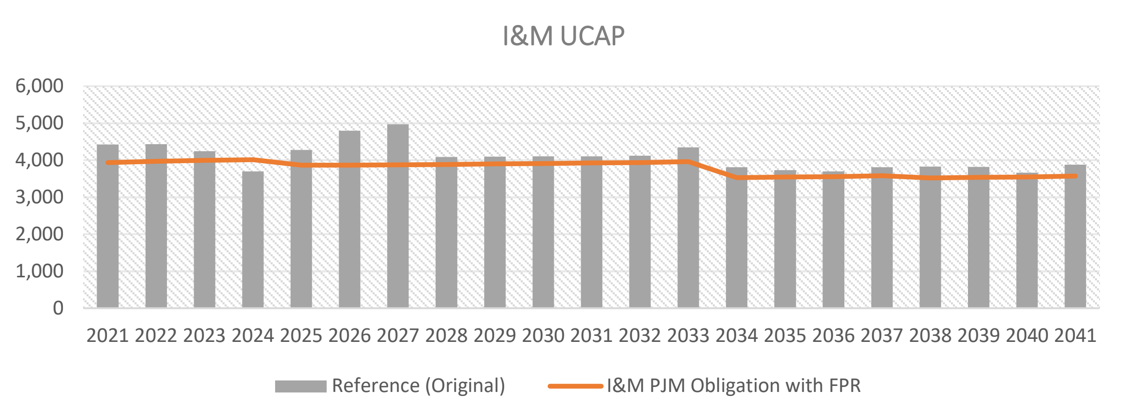
INDIANA MICHIGAN POWER
An AEP Company

Reliability and Resource Diversity Objective

For the reliability and resource diversity objective, the metrics used are the % above (below) I&M's PJM Reserve Margin Obligation (2041), Fuel Mix, and the Number of Unique Generators.

- Reliability: As new technologies are deployed and older base load units retired, there is more of a reliance on intermittent resources (i.e., renewable energy) to provide energy and capacity needs
- The analysis includes the PJM Capacity Obligation, Reserve Margin and PJM's Guidance on Effective Load Carrying Capability (ELCC) for intermittent resource capacity analysis
- Diversity: Resource generation fuel type is spread among several technologies. Firm generating assets to be developed with the opportunity to spread sites across a network of locations, limiting the impact of a single site outage
- Standard sizing for new technologies include Gas Peaker (250 MW), Gas CC 2x1 (1070 MW), Hybrid Resource (100 MW / 20 MW), Li-ion Storage (50 MW), Wind (200 MW) and Solar (50 MW). In addition, portfolios receive credit for Nuclear, EE and DR resource types

Portfolio (2041)	Reserve Margin	# of Fuel Types	# of Unique Generators
Reference Case	8.6%	8	59
Cook 2050+	7.5%	8	55
Cook 2050+ and No Gas	1.6%	8	68
Reference'	2.5%	8	61
Rapid Technology Advancement	5.1%	8	101
Enhanced Regulation	4.0%	8	100
Rockport 1 2026	1.2%	8	58



Balanced Scorecard
Reference and Focused Portfolios

Portfolio	20-Year NPV CTSL	10-Year NPV CTSL	95th Percentile Value of NPV CTSL	Difference Btw. Mean and 95th Percentile	5 Year Net Rate Increase CAGR (2025-2029)	Capital Investment Through 2028	% Reduction of CO2e (2005-2041)	Purchases as a % of Demand (2041)	Sales as a % of Demand (2041)	Reserve Margin[1] (2041)	# of Unique Generators (2041)
Reference Case (Original)	$7.30 B	$4.28 B	$8.55 B	17.1%	1.50%	$5.69 B	74.8%	17.5%	8.9%	8.6%	59

Portfolio	20-Year NPV CTSL[2]	10-Year NPV CTS[2]	95th Percentile Value of NPV CTSL[2]	Difference Btw. Mean and 95th Percentile	5 Year Net Rate Increase CAGR (2025-2029)	Capital Investment Through 2028	% Reduction of CO2e (2005-2041)	Purchases as a % of Demand (2041)	Sales as a % of Demand (2041)	Reserve Margin[1] (2041)	# of Unique Generators (2041)
Cook 2050+[3]	$6.20 B	$4.29 B	$7.50 B	21.0%	0.50%	$4.82 B	97.9%	1.0%	49.2%	7.5%	55
Cook 2050+ and No Gas[3]	$6.54 B	$4.42 B	$7.87 B	20.4%	1.50%	$5.40 B	99.4%	1.1%	46.3%	1.6%	68
Reference‘	$6.98 B	$4.06 B	$8.26 B	18.3%	1.30%	$5.52 B	75.4%	16.1%	10.0%	2.5%	61
Rapid Technology Adv.	$7.50 B	$4.26 B	$8.81 B	17.5%	1.50%	$5.69 B	94.2%	3.2%	53.7%	5.1%	101
Enhanced Regulation	$7.49 B	$4.16 B	$8.81 B	17.6%	1.50%	$5.69 B	94.1%	3.2%	54.0%	4.0%	100
Rockport 1 2026	$7.27 B	$4.28 B	$8.54 B	17.5%	1.10%	$5.36 B	75.0%	17.0%	8.8%	1.2%	58

[1] Reserve Margin (2041) is a measure of I&M's capacity position above the required Forecast Pool Reserve (FPR) obligation to PJM
[2] Cost to Serve Load (CTSL)
[3] The Cook portfolios include an assumption for relicensing cost but no estimate for capital expenditure required for equipment life extension
[4] The number of unique fuel types (2041), an additional diversity metric, is equal to eight for each portfolio above. In order to maintain adequate sizing, the metric has been removed from the above table

- Siemens PTI and I&M focused the IRP analysis on a select list of candidate portfolios

FEEDBACK AND DISCUSSION

I&M Management

PATH TO THE PREFERRED PORTFOLIO

Path to the Preferred Portfolio

In order to address concerns around Capital Intensity, Reserve Margin Length and Energy Position Length the IRP Team examined the Reference and the Reference' portfolio in further detail.

Portfolio	20-Year NPV CTSL	10-Year NPV CTSL	95th Percentile Value of NPV CTSL	Difference Btw. Mean and 95th Percentile	5 Year Net Rate Increase CAGR (2025-2029)	Capital Investment Through 2028	% Reduction of CO2e (2005-2041)	Purchases as a % of Demand (2041)	Sales as a % of Demand (2041)	Reserve Margin[1] (2041)	# of Unique Generators (2041)
Reference Case (Original)	$7.30 B	$4.28 B	$8.55 B	17.1%	1.50%	$5.69 B	74.8%	17.5%	8.9%	8.6%	59
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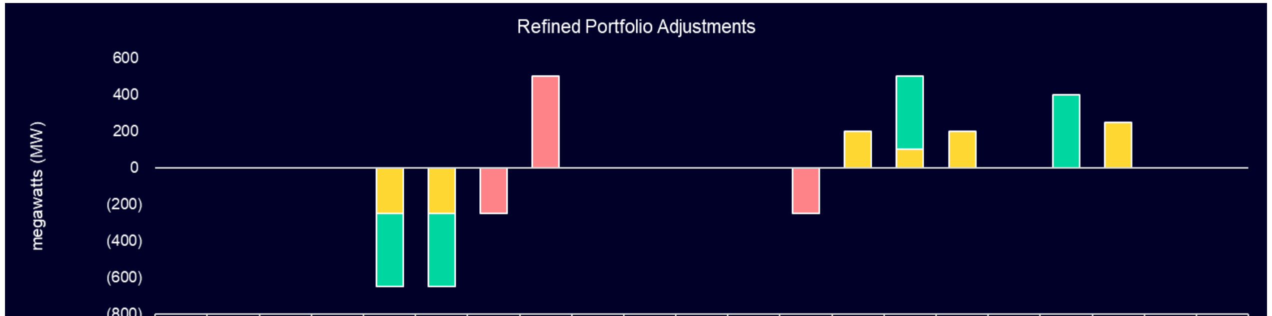
[1] Reserve Margin (2041) is a measure of I&M's capacity position above the required Forecast Pool Reserve (FPR) obligation to PJM
[2] Cost to Serve Load (CTSL)
[3] The number of unique fuel types (2041), an additional diversity metric, is equal to eight for each portfolio above. In order to maintain adequate sizing, the metric has been removed from the above table

- The Reference' portfolio is similar to the Reference Case portfolio with added limitations on spot market purchases and sales as a risk mitigation strategy.
- The Company also recognizes the positive attributes associated with the Cook 2050+ scenarios and evaluated opportunities to preserve optionality around future decision making on the potential Cook license extension.

Reference’ Adjustments to Arrive at Preferred Portfolio

INDIANA MICHIGAN POWER
An AEP Company

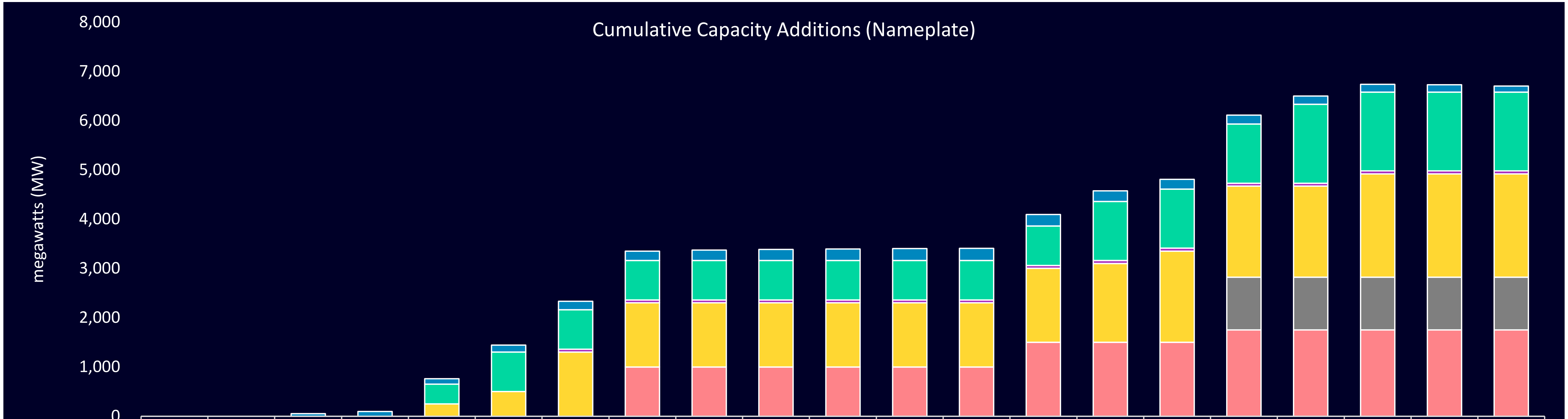
Portfolio	20-Year NPV CTSL	10-Year NPV CTSL	95th Percentile Value of NPV CTSL	Difference Btw. Mean and 95th Percentile	5 Year Net Rate Increase CAGR (2025-2029)	Capital Investment Through 2028	% Reduction of CO2e (2005-2041)	Purchases as a % of Demand (2041)	Sales as a % of Demand (2041)	Reserve Margin[1] (2041)	# of Unique Generators (2041)
Reference‘	$6.98 B	$4.06 B	$8.26 B	18.3%	1.30%	$5.52 B	75.4%	16.1%	10.0%	2.5%	61



	2021	2022	2023	2024	2025	2026	2027	2028	2029	2030	2031	2032	2033	2034	2035	2036	2037	2038	2039	2040	2041
EE	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
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	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Hybrid Storage	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Hybrid Solar	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Solar	0	0	0	0	(250)	(250)	0	0	0	0	0	0	0	200	100	200	0	0	250	0	0
Gas CC	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Gas Peaker	0	0	0	0	0	0	(250)	500	0	0	0	0	(250)	0	0	0	0	0	0	0	0

- The Reference’ Portfolio was further refined to arrive at a Preferred Portfolio that balances long- and short-term resource decisions and preserves the option to relicense Cook
- Adjustments to Reference’ Portfolio included:
- 50% Renewable builds reduction 2025-2026
  - To be shifted out to later years for cook extension flexibility
- 2027 and 2033 Gas Peaker Additions moved to 2028 for a total of 1000 MW Peaker capacity to be added in 2028 (same plan total)
- Total of 250 MW additional solar capacity in outer years to contribute to energy need after assumed cook retirement in this plan
- Short Term Market Purchase still expected in 2024 (~314 MW)

Preferred Portfolio
Cumulative Capacity Expansion



	2021	2022	2023	2024	2025	2026	2027	2028	2029	2030	2031	2032	2033	2034	2035	2036	2037	2038	2039	2040	2041
EE	0	0	50	96	112	144	172	189	210	223	234	241	247	235	213	197	182	168	157	149	124
Wind	0	0	0	0	400	800	800	800	800	800	800	800	800	800	1,200	1,200	1,200	1,600	1,600	1,600	1,600
Storage	0	0	0	0	0	0	60	60	60	60	60	60	60	60	60	60	60	60	60	60	60
Solar	0	0	0	0	250	500	1,300	1,300	1,300	1,300	1,300	1,300	1,300	1,500	1,600	1,850	1,850	1,850	2,100	2,100	2,100
Gas CC	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	1,070	1,070	1,070	1,070	1,070
Gas Peaker	0	0	0	0	0	0	0	1,000	1,000	1,000	1,000	1,000	1,000	1,500	1,500	1,500	1,750	1,750	1,750	1,750	1,750
Total	0	0	50	96	762	1,444	2,332	3,349	3,370	3,383	3,394	3,401	3,407	4,095	4,573	4,807	6,112	6,498	6,737	6,729	6,704

Balanced Scorecard
Reference and Focused Portfolios

INDIANA MICHIGAN POWER
An AEP Company

Portfolio	20-Year NPV CTSL	10-Year NPV CTSL	95th Percentile Value of NPV CTSL	Difference Btw. Mean and 95th Percentile	5 Year Net Rate Increase CAGR (2025-2029)	Capital Investment Through 2028	% Reduction of CO2e (2005-2041)	Purchases as a % of Demand (2041)	Sales as a % of Demand (2041)	Reserve Margin[1] (2041)	# of Unique Generators (2041)
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Rockport 1 2026	$7.27 B	$4.28 B	$8.54 B	17.5%	1.10%	$5.36 B	75.0%	17.0%	8.8%	1.2%	58

Portfolio	20-Year NPV CTSL	10-Year NPV CTSL	95th Percentile Value of NPV CTSL	Difference Btw. Mean and 95th Percentile	5 Year Net Rate Increase CAGR (2025-2029)	Capital Investment Through 2028	% Reduction of CO2e (2005-2041)	Purchases as a % of Demand (2041)	Sales as a % of Demand (2041)	Reserve Margin[1] (2041)	# of Unique Generators (2041)
Preferred Portfolio	$6.82 B	$3.89 B	$8.15 B	19.6%	1.40%	$3.83 B	75.2%	15.4%	11.6%	4.7%	66

[1] Reserve Margin (2041) is a measure of I&M's capacity position above the required Forecast Pool Reserve (FPR) obligation to PJM
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[3] The Cook portfolios include an assumption for relicensing cost but no estimate for capital expenditure required for equipment life extension
[4] The number of unique fuel types (2041), an additional diversity metric, is equal to eight for each portfolio above. In order to maintain adequate sizing, the metric has been removed from the above table

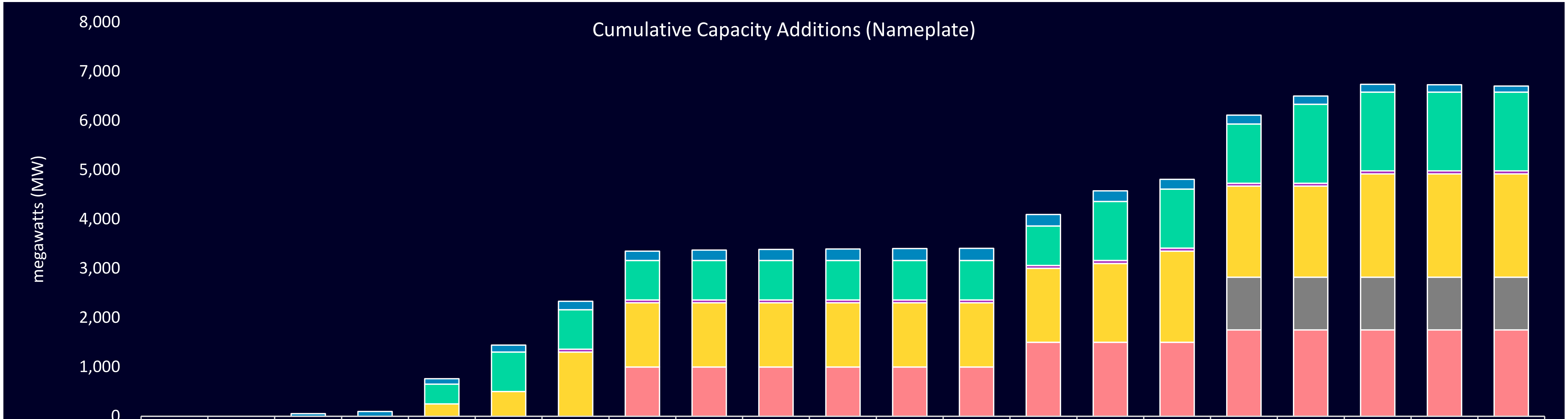
FEEDBACK AND DISCUSSION

Art Holland, Siemens PTI

PREFERRED PORTFOLIO

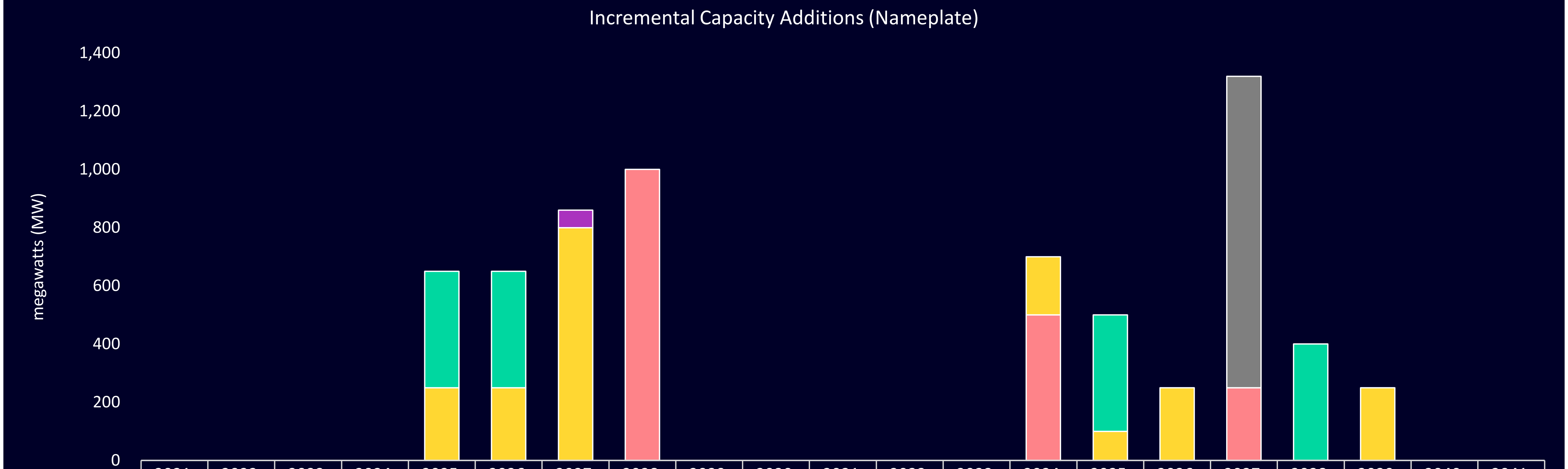
Preferred Portfolio
Cumulative Capacity Expansion

INDIANA MICHIGAN POWER
An AEP Company



	2021	2022	2023	2024	2025	2026	2027	2028	2029	2030	2031	2032	2033	2034	2035	2036	2037	2038	2039	2040	2041
EE	0	0	50	96	112	144	172	189	210	223	234	241	247	235	213	197	182	168	157	149	124
Wind	0	0	0	0	400	800	800	800	800	800	800	800	800	800	1,200	1,200	1,200	1,600	1,600	1,600	1,600
Storage	0	0	0	0	0	0	60	60	60	60	60	60	60	60	60	60	60	60	60	60	60
Solar	0	0	0	0	250	500	1,300	1,300	1,300	1,300	1,300	1,300	1,300	1,500	1,600	1,850	1,850	1,850	2,100	2,100	2,100
Gas CC	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	1,070	1,070	1,070	1,070	1,070
Gas Peaker	0	0	0	0	0	0	0	1,000	1,000	1,000	1,000	1,000	1,000	1,500	1,500	1,500	1,750	1,750	1,750	1,750	1,750
Total	0	0	50	96	762	1,444	2,332	3,349	3,370	3,383	3,394	3,401	3,407	4,095	4,573	4,807	6,112	6,498	6,737	6,729	6,704

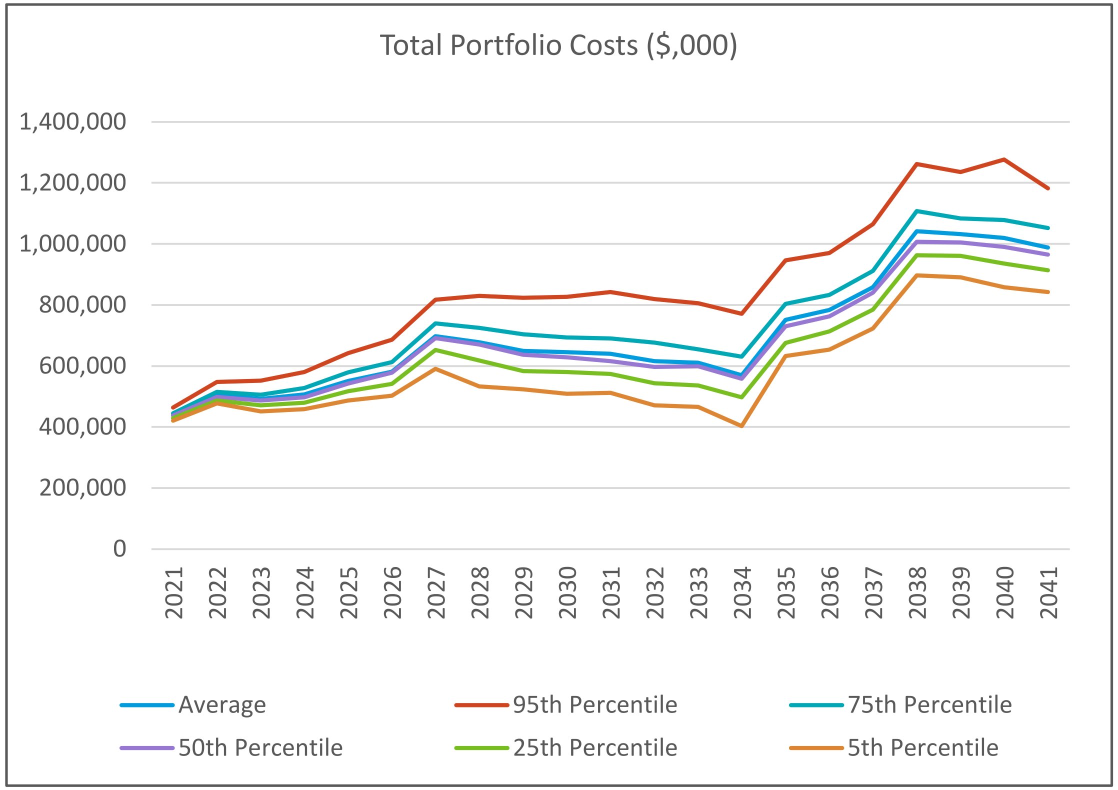
Preferred Portfolio
Incremental Capacity Expansion

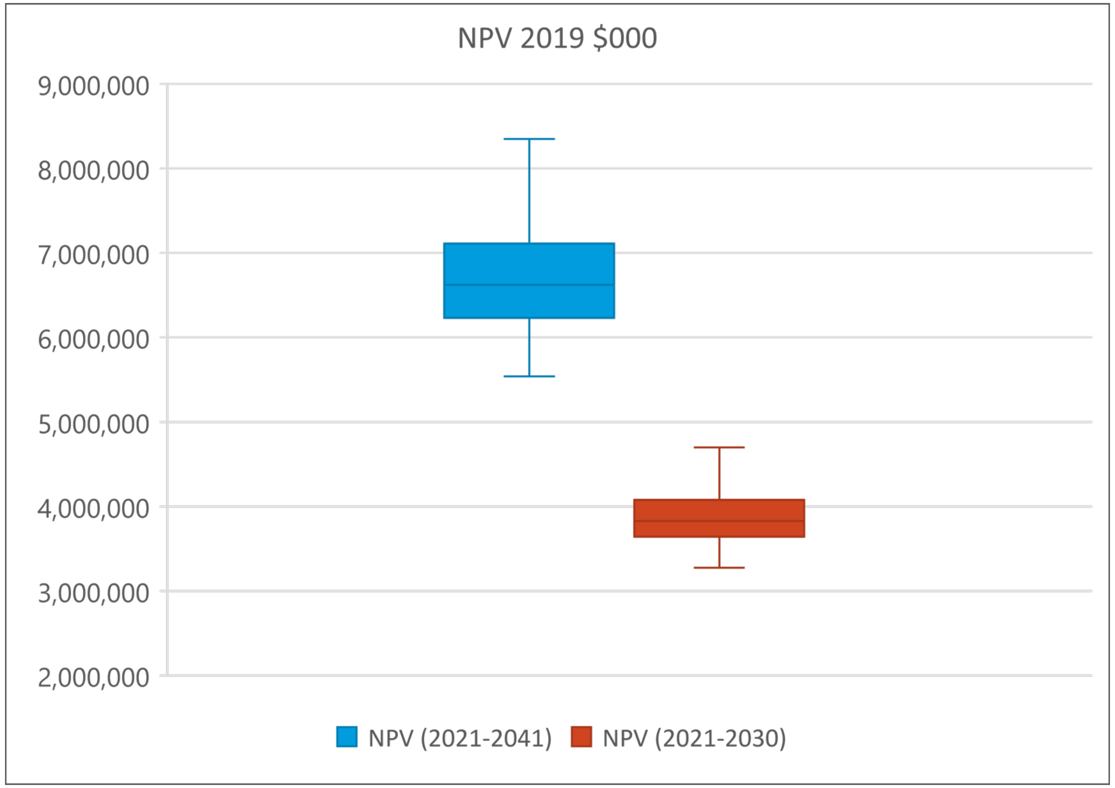


	2021	2022	2023	2024	2025	2026	2027	2028	2029	2030	2031	2032	2033	2034	2035	2036	2037	2038	2039	2040	2041
Wind	0	0	0	0	400	400	0	0	0	0	0	0	0	0	400	0	0	400	0	0	0
Storage	0	0	0	0	0	0	60	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Solar	0	0	0	0	250	250	800	0	0	0	0	0	0	200	100	250	0	0	250	0	0
Gas CC	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	1,070	0	0	0	0
Gas Peaker	0	0	0	0	0	0	0	1,000	0	0	0	0	0	500	0	0	250	0	0	0	0

Preferred Portfolio Affordability Objectives

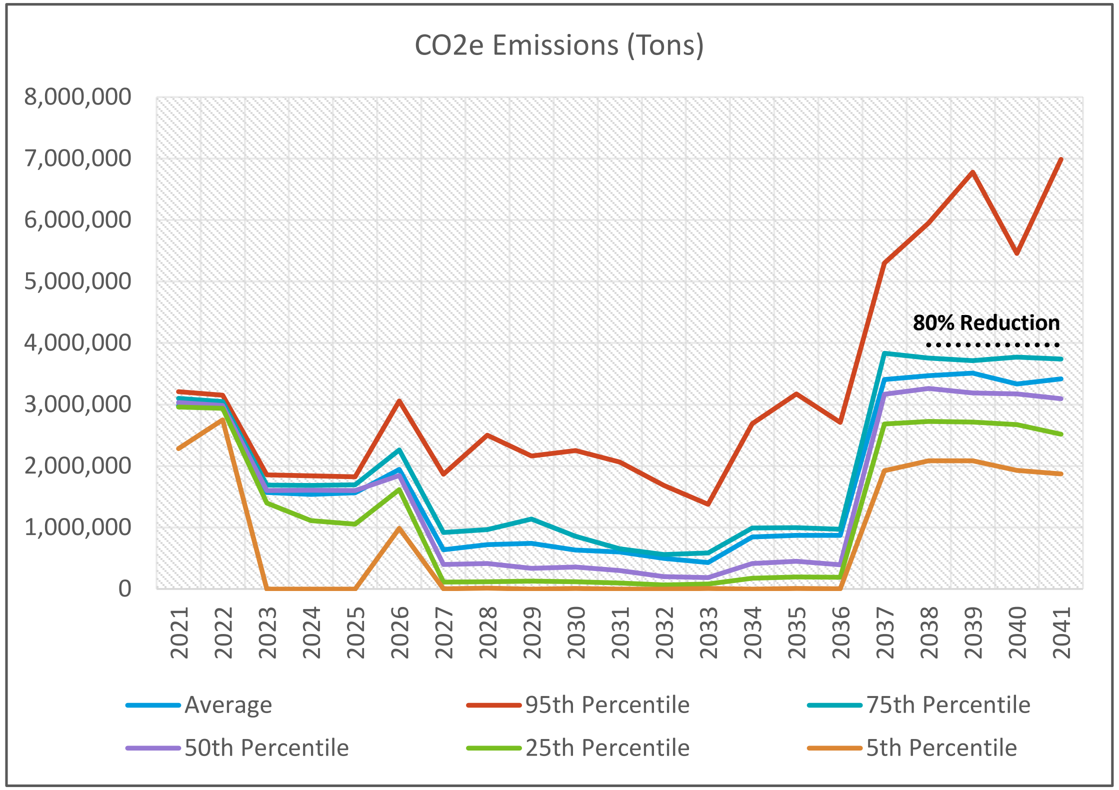
Portfolio	20-Year NPV CTSL	10-Year NPV CTSL	95th Percentile Value of NPV CTSL	Difference Btw. Mean and 95th Percentile	5 Year Net Rate Increase CAGR (2025-2029)	Capital Investment Through 2028	% Reduction of CO2e (2005-2041)	Purchases as a % of Demand (2041)	Sales as a % of Demand (2041)	Reserve Margin (2041)	# of Unique Generators (2041)
Preferred Portfolio	$6.82 B	$3.89 B	$8.15 B	19.6%	1.40%	$3.83 B	75.2%	15.4%	11.6%	4.7%	66





Preferred Portfolio Sustainability Objectives

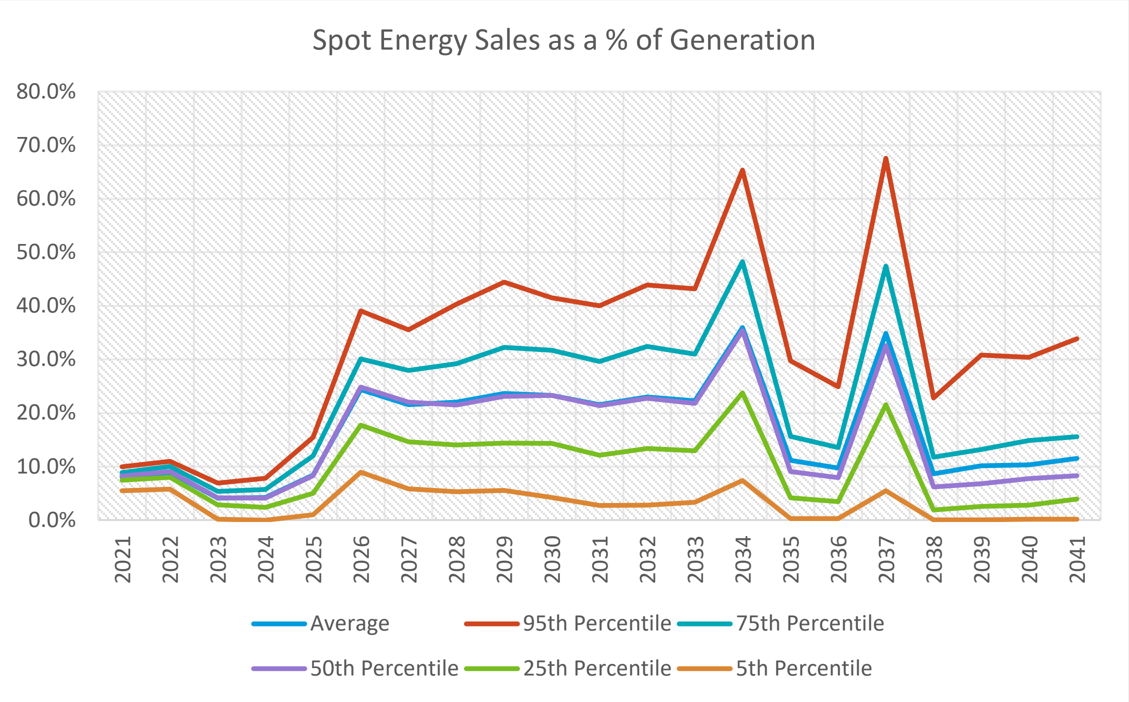
Portfolio	20-Year NPV CTSL	10-Year NPV CTSL	95th Percentile Value of NPV CTSL	Difference Btw. Mean and 95th Percentile	5 Year Net Rate Increase CAGR (2025-2029)	Capital Investment Through 2028	% Reduction of CO2e (2005-2041)	Purchases as a % of Demand (2041)	Sales as a % of Demand (2041)	Reserve Margin (2041)	# of Unique Generators (2041)
Preferred Portfolio	$6.82 B	$3.89 B	$8.15 B	19.6%	1.40%	$3.83 B	75.2%	15.4%	11.6%	4.7%	66

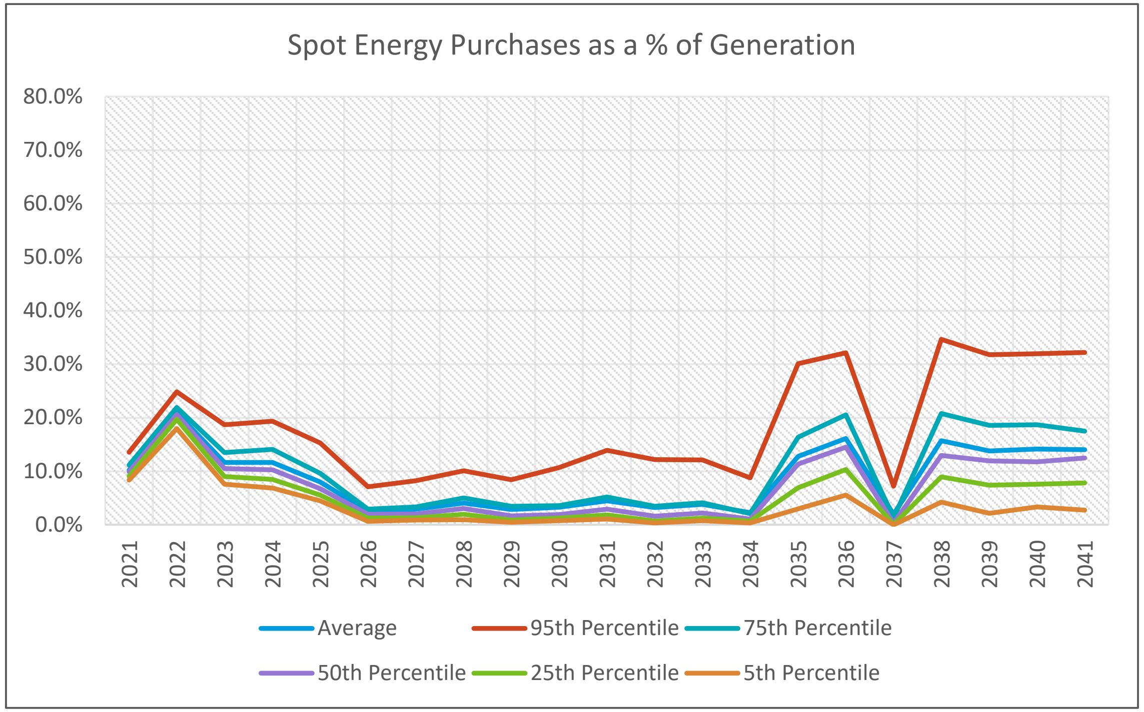


- CO_2e Emissions escalate in 2037 as a result of a CC unit addition to replace capacity and energy from Cook retirement.
- The Company will continue to monitor alternative technologies and solutions, including Hydrogen.

Preferred Portfolio
Market Risk Minimization Objectives

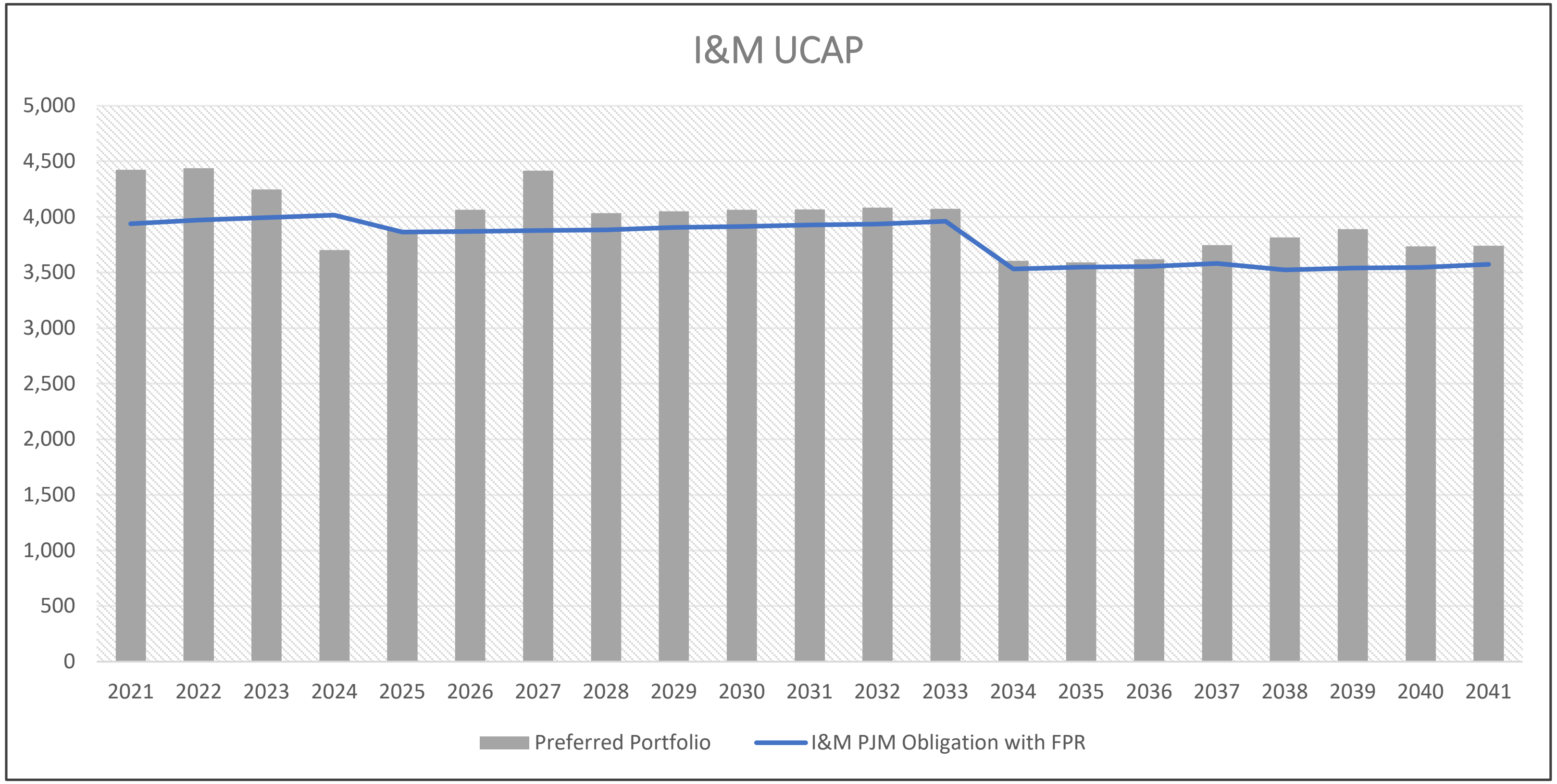
Portfolio	20-Year NPV CTSL	10-Year NPV CTSL	95th Percentile Value of NPV CTSL	Difference Btw. Mean and 95th Percentile	5 Year Net Rate Increase CAGR (2025-2029)	Capital Investment Through 2028	% Reduction of CO2e (2005-2041)	Purchases as a % of Demand (2041)	Sales as a % of Demand (2041)	Reserve Margin (2041)	# of Unique Generators (2041)
Preferred Portfolio	$6.82 B	$3.89 B	$8.15 B	19.6%	1.40%	$3.83 B	75.2%	15.4%	11.6%	4.7%	66





Preferred Portfolio
Reliability Objectives

Portfolio	20-Year NPV CTSL	10-Year NPV CTSL	95th Percentile Value of NPV CTSL	Difference Btw. Mean and 95th Percentile	5 Year Net Rate Increase CAGR (2025-2029)	Capital Investment Through 2028	% Reduction of CO2e (2005-2041)	Purchases as a % of Demand (2041)	Sales as a % of Demand (2041)	Reserve Margin (2041)	# of Unique Generators (2041)
Preferred Portfolio	$6.82 B	$3.89 B	$8.15 B	19.6%	1.40%	$3.83 B	75.2%	15.4%	11.6%	4.7%	66



CLOSING DISCUSSION

Andrew Williamson | I&M Director Regulatory Services

Definitions

Term	Definition
AURORAxmp	Electric modeling forecasting and analysis software. Used for capacity expansion, chronological dispatch, and stochastic functions
Condition	A unique combination of a Scenario and a Sensitivity that is used to inform Candidate Portfolio development
Deterministic Modeling	Simulated dispatch of a portfolio in a pre-determined future
Renewable Portfolio Standards	Renewable Portfolio Standards (RPS) are policies designed to increase the use of renewable energy sources for electricity generation
Portfolio	A group of resources to meet customer load
Preferred Portfolio	The portfolio that management determines will perform the best, with consideration for cost, risk, reliability, and sustainability
Probabilistic modeling	Simulate dispatch of portfolios for several randomly generated potential future states
Reference Scenario	The most expected future scenario that is designed to include a current consensus view of key drivers in power and fuel markets (reference case, consensus case)
Scenario	Potential future State-of-the-World designed to test portfolio performance in key risk areas important to management and stakeholders alike
Sensitivity Analysis	Analysis to determine the impact of early retirements and other inputs portfolios are most sensitive to

Data Release Schedule

Modeling Files

- Reference Case modeling inputs (November 18, 2021)
- Scenario modeling inputs (November 29, 2021)
- Probabilistic modeling inputs (November 29, 2021)
- Reference Case modeling files (confidential – available January 2022)
- Scenario modeling files (confidential – available January 2022)

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Indiana Michigan Power All-Source Informational RFP Stakeholder Review Meeting

April 9, 2021

Siemens PTI

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AGENDA

Agility in energy.
Ahead of the challenge.
Ahead of the change.

- Introductions
- Scope & Objectives
- Generation Resource Qualifications
- Submittal Contents
- Schedule and Submission Instructions
- Q/A

On the Call Today

Siemens

Angelina Martinez | Project Manager

Jay Boggs | Managing Director

Holt Bradshaw | Managing Director

I&M IRP Planning Team

Scott Fisher | Manager, Resource Planning and Grid Solutions

Greg Soller | Staff, Resource Planning and Grid Solutions

Questions and Feedback

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The purpose of today's presentation is to explain the All-source Informational RFP process, answer your questions and collect feedback from stakeholders.

If you have a question during this presentation:

- Type your question in the Questions area of the GoToWebinar panel
- At any time, please raise your hand via the GoToMeeting tool to be recognized
- Time permitting, we will address all questions and hear from all who wish to be heard
- Any questions that cannot be answered during the call will be addressed by Siemens directly.

If you would like to make a comment or ask a question about the IRP process after the presentation has concluded, please email the Siemens team via imallsourcerfp.us@siemens.com

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AGENDA

Agility in energy.
Ahead of the challenge.
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- Introductions
- **Scope & Objectives**
- Generation Resource Qualifications
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- Q/A

Scope and Objectives

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Scope	I&M is issuing an Informational Request for Proposal ("RFP") notice soliciting input from the marketplace to inform its next Indiana Integrated Resource Plan ("IRP") and evaluate how it will meet customers' energy needs using a diverse mix of power generation resources.
Objective	Review the RFP document and its corresponding Appendices provided to the Stakeholders, which are a DRAFT of the anticipated version that will be published on April 23, 2021.

Generation Resource Qualifications

Project Type	• In Development • In Operation
Resource type	• Dispatchable • Intermittent • DER (>1-MW)
Location	• PJM or MISO • Resource with physical deliverability to PJM
Pricing Structure	• PPA • Asset Purchase
Timing	• EOY 2022 for PJM Planning Year 2023/24 (no Renewables) • EOY 2023 for PJM Planning Year 2024/25 (no Renewables) • EOY 2024 for PJM Planning Year 2025/26 • EOY 2025 for PJM Planning Year 2026/27 • EOY 2026 for PJM Planning Year 2027/28 • EOY 2027 for PJM Planning Year 2028/29

Submittal Contents

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1 Informational Term Sheet	2 NDA	3 Excel Response Data
• Project type • Resource type • Size • Pricing structure • Interconnection status • Proof that resource qualifies as a PJM internal resource • Experience in proposed resource	• Non-Disclosure Agreement (NDA) as included	• PPA – Dispatchable Form • PPA – Renewable Form • BOT_AP Form • DER Form

Submission Instructions and Schedule

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- All respondents will directly interface with Siemens PTI for all communications including questions, RFP clarification issues, and submittal of a response. All correspondence concerning this RFP should be sent via e-mail to imallsourcerfp.us@siemens.com

	26-Mar	2-Apr	9-Apr	16-Apr	23-Apr	30-Apr	7-May	14-May	21-May	28-May	4-Jun	11-Jun
DRAFT RFP Available to Stakeholders	■											
RFP Stakeholder Meeting			■									
Issue RFP					■							
Responses Due									■			
Provide Resource Options to the Siemens IRP Modeling team												■

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Questions & Feedback

Email the Siemens team anytime via imallsourcerfp.us@siemens.com

Siemens Primary Contacts

SIEMENS
Ingenuity for life

Angelina Martinez
Consulting Manager
Phone: +1 (713) 673-9037
E-mail: angelina.martinez@siemens.com

Jay Boggs
Managing Director
Phone: +1 (443) 510-6230
E-mail: jay.boggs@siemens.com

AURORA Technical Conference AGENDA

June 24, 2021

Instructors:

Deborah Austin-Smith, Energy Exemplar
Michael Korschek, Siemens
Siemens Panel (Part 11)

1. **Aurora Overview**
    - File Management
    - Interface Overview
    - Input Database
    - Transmission Topology
    - Zonal System Diagram
2. **Aurora Zonal Navigation**
    - Project Settings
        - Run Setup
        - Logic Options
    - Database Management
3. **Scenario Management**
    - Change Sets
        - Creating change sets
        - Display change set differences
        - Importing, copying and merging change sets
        - Managing change sets in projects and change set files
    - Parameter Sets
4. **Custom Quick Views**
    - Managing Quick View files
        - Input & Output
5. **Aurora Model Logic / Algorithms**
    - Commitment & Dispatch Logic
        - Traditional
        - Commitment Optimization
6. **Modeling Resources**
    - Commitment (Non-Cycling) and Must Run Resources
    - Hydro Resources
    - Renewables
        - Solar, Wind, Geothermal
    - Energy Storage Resources (Batteries)
    - Conservation and Demand Response Programs
        - Load Shifting
        - Electric Vehicles

AURORA Technical Conference AGENDA

June 24, 2021

7. **Long-Term Capacity Expansion**
   - Creating a Long-Term Study
     - New Resource Options
     - Long-Term Logic Settings
   - Output
     - Resource Modifier Table (RMT)
     - Capacity Price Table
     - Standard Outputs
     - LT Diagnostic Outputs
8. **Constrained Dispatch**
   - Linear Program (LP) dispatch cost solution
   - Constraint Types
   - Energy, Fuel, LT Energy and Capacity (RPS), Transmission
   - Emissions (Mass and Rate)
9. **Risk Analysis**
     - Stochastic Approach
     - Computational Data Sets
     - Dynamic Build
     - Output and Reporting
10. **Output Report**
11. **Siemens use of Aurora for the I&M 2021 Integrated Resource Plan**