COMMENTS

BY

THE ENVIRONMENTAL LAW & POLICY CENTER,
IOWA ENVIRONMENTAL COUNCIL, AND SIERRA CLUB
(COLLECTIVELLY THE ENVIRONMENTAL INTERVENORS)

ON

INTERSTATE POWER AND LIGHT COMPANY
RESOURCE EVALUATION STUDY
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I. INTRODUCTION

Interstate Power and Light's (IPL) Resource Evaluation Study (RES) is the second long-term resource planning process IPL has conducted both in general and since the 2019 settlement requiring it. Resource planning is a foundation of efficient and economic operations for any public utility, and we were optimistic that IPL would produce a robust resource plan during the RES process. However, the limitations of IPL's resource planning processes, and the resulting resource plan, are apparent. IPL's control of the current RES process and input assumptions skewed the results, and therefore, limited their usefulness for long-term planning purposes.

In IPL's 2019 rate case, the partial settlement included a resource planning term in which IPL agreed to conduct a resource planning process in an 11-month timeframe in 2020.[1] IPL agreed to use modeling software, consult with parties on modeling inputs and coal plant retirement scenarios, convene stakeholder planning meetings, and file results publicly.[2] As part of that process, IPL agreed to prioritize analysis of the Lansing Generating Station as well as hold off on major capital expenditures at the unit pending the outcome of the analysis.[3] While IPL agreed to receive feedback from stakeholders, the settlement gave IPL complete control of decision-making related to planning including modeling inputs and scenarios.[4]

MidAmerican commented on the settlement and requested the Commission limit IPL's resource planning including a request narrowing it "to IPL's ownership share of IPL-operated

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[1] RPU-2019-0001, Non-unanimous Partial Settlement Agreement and Joint Motion for Approval of Agreement, at 7-11 (filed Oct. 3, 2019) (hereafter 2019 Rate Case Settlement). MidAmerican maintained this position in sur-reply comments and post-hearing briefing as well. *See* RPU-2019-0001, MidAmerican Energy Company's Reply Brief (filed Nov. 18, 2019); RPU-2019-0001, MidAmerican Energy Company's Sur-Reply to Settlement Comment Responses (filed Oct. 13, 2019).
[2] *Id.*
[3] *Id.* at 9-10.
[4] *Id.* at 9.

generation."[5] This request would eliminate consideration of a significant portion of IPL's generation fleet – jointly owned resources operated by MidAmerican. The Commission declined "to limit the scope of IPL's analysis as requested by MidAmerican" and gave IPL discretion to conduct analysis as it saw fit consistent with the settlement.[6]

IPL completed the resource planning process and filed its Clean Energy Blueprint on November 20, 2020.[7] Throughout the process, Environmental Intervenors provided feedback about IPL's approach. This included concerns with IPL's failure to evaluate optimal retirement dates for coal plants and to evaluate MidAmerican-operated co-owned units entirely as well as issues with key modeling input assumptions.[8] Despite its flaws, the Clean Energy Blueprint identified the retirement of the Lansing coal plant, the conversion of Burlington Generation Station to natural gas, and the addition of 400 MW of solar as key conclusions of its modeling process.[9]

In 2021, IPL filed an advanced ratemaking application for solar and storage. IPL had identified the solar in the Clean Energy Blueprint but not the storage resource.[10] In that docket, IPL and OCA ultimately filed a Non-Unanimous Stipulation and Agreement that ELPC and IEC later joined.[11] The settlement supported 400 MW of solar and included the resource evaluation study (RES) term that is the basis for the current RES.[12] The RES settlement term had significantly less detail than the resource planning settlement term in IPL's 2019 rate case, but it did include a

[5] RPU-2019-0001, MidAmerican Energy Company's Comments on the Proposed Non-Unanimous Settlement Agreement, at 2 (filed Oct. 16, 2019).
[6] RPU-2019-0001, Final Order and Decision, at 59 (filed Jan. 8, 2020).
[7] RPU-2019-0001, Alliant Energy's Iowa Clean Energy Blueprint: 2020 Resource Planning (filed Nov. 20, 2020).
[8] Environmental Intervenors' comments in the resource planning process were not public until they were introduced as evidence in IPL's 2023 rate case proceeding. *See* RPU-2023-0002, Environmental Intervenors Hearing Exhibits 1-3 (filed July 15, 2024).
[9] Clean Energy Blueprint at 1.
[10] *See generally*, RPU-2021-0003.
[11] RPU-2021-0003, Non-Unanimous Stipulation and Settlement Agreement (filed August 1, 2023).
[12] *Id.* at 6.

requirement that IPL make a license to modeling software available to parties to facilitate participation in the process.[13]

This RES process repeated some of the same mistakes of IPL's last resource planning process. Despite multiple rounds of feedback from stakeholders,[14] key input assumptions continue to skew the long-term planning outlook. Furthermore, even after two resource planning processes, there is limited insight into IPL's coal plants because IPL modeled limited, pre-programmed retirement dates and continued to defer to MidAmerican on MidAmerican-operated units rather than conduct its own robust analysis.

As the RES process is concluding, IPL has an opportunity to review feedback from stakeholders and the Commission and outline commitments to improve future resource planning processes. To accomplish this goal, IPL should incorporate best practices in resource planning into future resource planning efforts. The recently updated "Best Practices in Integrated Resource Planning" by Synapse Energy Economics should guide future processes.[15] In addition, we offer several recommendations specific to this RES. IPL should pursue an aggressive near-term storage and wind strategy as a no-regrets solution – and one that modeling by IPL and stakeholders consistently selected across scenarios. Further, IPL should incorporate changes in its modeling approach and resource planning process, as discussed below.

[13] *Id.*
[14] Environmental Intervenors' previous comments in the RES are included with these comments as Attachments 1-3. A joint letter from multiple stakeholders that focused on the resource evaluation process itself is included as Attachment 4.
[15] Attachment 5, Synapse Energy Economics and Lawrence Berkeley National Laboratory, Best Practices in Integrated Resource Planning (2024).

II. SUMMARY OF RECOMMENDATIONS

A. IPL should make future Resource Evaluation Study processes more transparent and collaborative.

We appreciate that IPL facilitated model licensing for stakeholders to perform their own modeling. However, we have concerns about the modeling timeline and process. We encourage IPL to publish and follow an overall timeline for the RES, to make its modeling available earlier in the RES process, hold modeling meetings more regularly, and to provide a detailed model walkthrough for stakeholders. These changes will allow stakeholders to participate more efficiently and productively.

B. IPL should protect ratepayers from large load impacts and not build for speculative load.

IPL is obligated to serve new loads located within its service territory and provide low-cost, reliable power to its ratepayers, but IPL is not required to serve new loads on a fixed timeline or with specific resources regardless of their cost. We recommend IPL model sensitivities to optimize the timing of serving new large loads. We also find that IPL should justify its assumptions around growth in large-load customers before building to meet forecasts. And given the uncertainty in the level of large load that will materialize, IPL should focus on wind and storage as no-regrets options that are economic across a wide range of load assumptions.

C. IPL should use industry-standard resource costs and resource cost declines assumptions for new resources.

We are concerned that IPL's reference clean energy input costs are substantially higher than costs used by other utilities and leading industry sources, and that in the majority of IPL's modeled scenarios, it does not assume cost declines over time for clean energy resources. We recommend that IPL rely on either industry-standard forecasts from NREL, as many other utilities are doing, or else forecasts purchased from an industry source. Along those lines, we encourage

IPL to adopt new resource cost trajectories that incorporate reasonable technological learning curves, which should be steeper for emerging technologies such as wind, solar, and storage than for mature technologies such as combined and simple-cycle gas generators.

D. IPL should evaluate the economics of retirement relative to continued operation of its existing resources.

IPL modeled a limited number of retirement date and gas conversion options for its owned and co-owned coal plants at Ottumwa, Neal Units 3 and 4, and Louisa. The Company did not conduct modeling runs where the model was allowed to make optimized retirement decisions. We are concerned by the limited information these runs provide and the Company's deference to the retirement assumptions of MidAmerican – the co-owner of Neal and Louisa. We encourage IPL to more robustly evaluate the economics of retirement of all its coal units – including co-owned units – through optimized modeling or more extensive retirement scenario analysis.

E. IPL should model GHG scenarios that reflect the likely future carbon regulations and are aligned with its own corporate GHG commitments.

All of IPL's portfolios show at least a 50 percent reduction in carbon emissions by 2030 from a 2005 baseline, but none put the Company on track to meet its own net-zero goal. IPL acknowledges that this indicates additional technologies are needed to meet its "aspirational" 2050 net zero goals. IPL should continue to rely on the results of its scenarios with carbon regulations, as they serve as the best proxy for the level of likely future carbon regulation. Additionally, the company should model a scenario that is aligned with its net-zero goals.

F. IPL should procure as much near-term renewable and BESS capacity as possible – especially in light of near-term bottlenecks in the gas turbine market – and should only model build limits to the extent necessary.

IPL modeled build limits on solar and storage of 300 MW/year and on wind of 200 MW/year starting in 2027. But when these build limits were relaxed, the optimization model economically built at least 500 MW of new wind and 300 MW of new storage by 2028. IPL should not let its modeled limits impact near-term procurement targets and instead procure as much wind and storage in the near-term as the market can economically provide. This is especially important in light of the surge in demand for gas turbines over the next five years to serve large new load – which has lengthened lead times and limited available supply.

G. IPL should rely on regional studies and round-trip modeling to inform reliability analysis and understand the risks of market exposure.

IPL's reliability analysis and modeling relied on a number of overly-conservative and concerning assumptions. First, IPL modeled limited market purchases in the near term and no market purchases beyond 2031. This assumption is overly conservative and likely to lead to a more costly and over-built system. Instead, IPL should rely on regional studies for estimates of available energy and capacity in the market. Second, IPL relied on a simplified market exposure metric to determine if a portfolio was reliable. Instead, best practices are for the utility to conduct round-trip modeling and evaluate the reliability of an entire portfolio iteratively with its portfolio design modeling.

H. Environmental Intervenors' modeling demonstrates a clean, reliable, and low-cost future is possible.

Environmental Intervenors modeling addressed limitations in IPL's inputs, assumptions, and process, and the results demonstrate that a clean, reliable, low cost future is possible. Significant new wind and storage resources were a part of every scenario the EI modeled – regardless of resource costs, coal retirements, or resource build limits – charting a no-regrets path forward for IPL to meet its energy and capacity needs.

III. RECOMMENDATIONS

A. IPL should make future Resource Evaluation Study processes more transparent and collaborative.

The Company's approach to modeling is difficult to interpret and replicate, especially given the condensed time frame for its modeling activities during fall 2024.

We are concerned with the transparency of IPL's resource planning process. IPL's process was dormant for nearly six months and then resumed during the fall of 2024 with a rushed conclusion, resulting in meetings six weeks apart. IPL's approach to modeling was difficult to interpret and work with, which was compounded by the accelerated time frame once the resource planning process resumed. We appreciate IPL's willingness to facilitate several meetings between the EI's technical consultants and the Company's consultant to review how the portfolio model was intended to be run. These meetings were necessary to meaningfully participate in the process. Without meetings to review the setup and sequencing of the Company's model, we would not have been able to replicate IPL's modeling. It is unlikely any third-party intervenors could have successfully replicated the Company's process and benchmarked their own modeling without these dedicated one-on-one meetings.

More typically, resource planning models take the form of a long-term capacity expansion (LTCE) model followed by a production cost, or "standard zonal" in Aurora, modeling (PCM) run. In the LTCE, the Company's scenario-based assumptions about the future needs, constraints, and available candidate resources drive low-cost capacity expansion decision-making over a sampled time horizon, often representative days and weeks. The PCM run then dispatches the resulting resource plan to serve the long-term system needs on an hour-to-hour basis. PCM runs are critical because they allow for rigorous and comparative evaluation of resource plan performance. This is the approach adopted in the MidAmerican RES.

Instead, the Company adopted a portfolio optimization approach that was inscrutable to both our modeling team and Energy Exemplar technical support, resulting in confusion and delays. While the Company's consultants effectively justified their portfolio-optimization modeling approach, this is a novel method with narrow applications within the resource planning space. Namely, the portfolio-optimization approach can work more efficiently (less run time than LTCEs) for smaller utilities whose resource plans have a negligible impact on market prices.

IPL's Portfolio Optimization Approach

IPL's portfolio-optimization approach assumes the utility under study is a "price taker." This is why the Company's modeling approach began with a separate MISO LTCE market model. In the Market Model step, the Company established market prices from which portfolio optimization can be conducted. MISO market prices are taken as a fixed input with which portfolio optimization can proceed. So while this is the only LTCE model in the Company's proceeding, it serves only to develop a market price for portfolio optimization. Given this market price, provided as part of the portfolio optimization model database, users must then run a standard zonal run to populate resource performance data for optimization, followed by a portfolio optimization run, then users must manually add resources to a study portfolio according to the portfolio optimization's resource acquisition output table in a subsequent, final, standard zonal run. In combination with the portfolio optimization resource acquisition, it is this final standard zonal run that defines system performance.

We discovered this process only through discussion with the Company's consultants. The Company's atypical approach to resource planning modeling was inscrutable to both Energy Exemplar technical support and our modeling team, introducing doubts, re-work, and delays into the process.

Recommendations

- IPL should publish and follow a clear timeline for the RES, to allow stakeholders to plan accordingly, using the allowed time to ensure a collaborative, deliberate, stakeholder engagement process.
- IPL should continue to provide modeling software licenses for stakeholders at no cost to facilitate robust participation in the resource planning process including modeling.

- IPL should make its modeling available to stakeholders earlier in the RES process and hold meetings more regularly to engage stakeholders while it is conducting its modeling, especially given IPL's atypical modeling approach.

- IPL should provide a detailed walkthrough to model setup, sequencing, and basic evaluation to enable third parties to productively participate.

B. IPL should protect ratepayers from large load impacts and not build for speculative load

i. <u>IPL should optimize the timing of serving new large loads</u>

IPL has an obligation to serve new loads located within its service territory. The Company is also obligated to provide low-cost, reliable power to the rest of its ratepayers. What IPL is not obligated to do is serve that new load on a specific timeline, or with a specific set of resources regardless of cost. Historically, utilities have treated load as a somewhat static input. When the utility sees increased demand from new customers, the utility plans to meet that demand as part of its resource plan. However, as we enter an era with projections for unprecedented and unpredictable load growth, this approach no longer serves the best interest of ratepayers.

Utilities need to take a new approach that recognizes that timing, resource choice, and customer deployment of resources and flexibility can impact the portfolio costs. IPL should view a new large load not as a static input, but rather as a dynamic part of the system. If a new data center or other large-load customer wants to be online by a certain year, IPL should evaluate whether there is a substantial cost difference in serving that load in the requested year relative to delaying a year or two. This is especially important with new resource cost declines expected as the industry continues to rebound from impacts from supply chain constraints, inflation, and interconnection queue delays. IPL should also work with the new customer to evaluate the impact of load flexibility and customer-sited resources or back-up power to determine whether it is most cost effective for the customer specifically, and the system as a whole, to have IPL install all the resources or to include customer-sited resources and flexibility.

Looking at IPL's projected load and resource balance, the Company does not have sufficient capacity to meet its expected demand starting as soon as [redacted] IPL attributes this shortfall to direct loss of load (DLOL) capacity accreditation reforms and customer growth. As shown in Exhibit 22 of the RES, IPL projects its summer season capacity shortfall will be between [redacted] over the next 10 years under the flat load sensitivity. Under the mid- and high-load sensitivities, the shortfall will be even larger.[16] This shortfall means that IPL will have to rely on the market for capacity and energy purchases in [redacted] and will seek to build new capacity on an accelerated timeline to serve the new load over the next five to ten years.

Recommendation

- IPL can model sensitivities to evaluate the difference in the net present value of the portfolio with near-term data center load delayed by a year or more, and in doing so, evaluate the incremental costs of choosing the near-term timeline for serving data center load.

ii. <u>IPL must justify its assumptions around growth in large-load customers before building to meet forecasts</u>

IPL's mid-load forecast includes [redacted] representing a [redacted] increase in peak load over just the next five years. The high-load forecast, driven by data center load growth,[17] reflects even higher levels of load growth—[redacted]

[16] RPU-2021-0003, Resource Evaluation Study, at 41 (filed Feb. 13, 2025) (hereafter RES).
[17] RES at 31.
[18] RES at 19.

IPL states that the Company "refined its load forecast [redacted][19] The Company admits that, despite the guidance from prospective customers, there is uncertainty about the pace and magnitude of load growth on its system, and that the Company will continue to track new load announcements and update its resource plan accordingly.[20]

There are risks to existing customers whether or not the load actually materializes. If IPL builds for prospective customer load that doesn't fully materialize, all ratepayers will be left paying for unneeded assets. In the event that new load does materialize, building large quantities of generation (and transmission) assets can increase costs for all ratepayers under current tariff structures. This is especially true when new customers want service earlier than the Company can reasonably procure low-cost resources. This can result in cost shifting if rates and tariffs are not set up correctly to ensure new customers cover their full incremental cost of service (i.e., the cost of building new resources or maintaining reliance on existing, high cost resources). Additionally, higher energy and capacity market prices and additional transmission and gas infrastructure investments can place higher incremental costs on the system.

To avoid planning around prospective load, in the near-term, IPL should not be building resources to meet new load until it has signed an electric service agreement (ESA) and negotiated a tariff with the prospective customer. Ideally, the Iowa Utilities Commission would oversee a large-load tariff docket, where these discussions can be vetted by interested stakeholders. Over the mid- and long-term, IPL can use probability weightings and rankings in the RES to develop its load forecast. The RES should also reflect the best available information that IPL has. For example,

[19] RES at 93.
[20] RES at 95.

if the Company anticipates large customers using the Individual Customer Rate (ICR) tariff approved in the recent rate case, the resource planning should transparently reflect that.

In the face of load uncertainty, and in the interest of meeting potential future load growth, IPL should pursue adding renewables and storage as a no-regrets path forward. IPL's near term action plan calls for the addition of battery storage and wind generation. As we discuss further in Recommendation 8, the results of EI's independent modeling reveal that renewables and battery storage are the most economic resource options for IPL in the near term as well. Regardless of what the future holds, the modeling shows that additional renewables and battery storage should be part of cost-effectively meeting customer needs. IPL can focus on acquiring these resources now while continuing to refine its understanding of future load.

Recommendations

- IPL should outline for the Commission how it will ensure that residential customers are not on the hook for the cost of new resources built to serve new data center load – for example, by requiring signed ESA's with the data center customers, data center specific tariffs and agreements that commit new large customer to cover the cost of the new resources, or other measures and requirements.

- IPL should pursue renewables and storage development as a no-regrets path forward for responding to load growth uncertainty.

C. IPL should use industry-standard resource costs and resource cost declines for new clean energy resources.

IPL's reference clean energy input costs are substantially higher than costs used by other utilities and leading industry sources.

IPL states in its RES that its capital cost projections for new resources (renewables, BESS and gas resources) were based on public information from the United States Energy Information Administration (EIA) AEO 2024 and National Renewable Energy Laboratory (NREL's) 2023

ATB, "supplemented by adjustments made based on market insights and project experience."[21] However, this statement is somewhat misleading and misaligned with the capital cost projections IPL actually modeled. In the majority of its scenarios, IPL relied on high current resource cost assumptions, and [redacted] Only in the NR and AD scenarios does IPL [redacted], but even here the Company assumes [redacted]

Specifically, the cost estimates that IPL relies on for renewables and BESS are [redacted] than other utility cost data and [redacted] than leading industry cost data and projections, including from the NREL, the EIA, and Lazard. Even more concerning is that the deviation between IPL's assumptions for solar, wind, and storage costs and all other sources becomes more pronounced in the future years based on IPL's assumption that [redacted][24] These assumptions artificially inflate the costs of clean energy resources relative to conventional resources in IPL's modeling and are likely driving the minimal renewable deployment seen in IPL's portfolios.

In Figure 1 below, we compare IPL's 2024 capital cost for solar, wind, and battery energy storage systems (BESS)[25] to projections from NREL,[26] EIA, and Lazard. On average, IPL's cost estimate is [redacted] than NREL's, EIA's and Lazard's estimates for wind, [redacted] for solar, [redacted] for BESS.

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[21] RES at 43.
[22] RES at 43-44.
[23] RES at 45.
[24] RES at 43.
[25] Res at 42.
[26] The NREL ATB has three different cost projection sensitivities - conservative, moderate, and advanced. The NREL numbers reflected in this analysis are the moderate case unless otherwise specified.

Figure 1: 2024 Capital cost of solar, wind and BESS for IPL compared to other utilities and industry sources

[redacted]

In Figure 2, Figure 3, and Figure 4 below, we compare IPL's long-term reference cost estimates (now through 2043) for these same technologies to other industry forecasts. While other utilities, including Berkshire Hathaway utility Pacificorp, assume technology maturation and therefore that resource costs decline over time, [redacted] Because of this assumption, [redacted]

The combination of inflated starting costs and [redacted] results in cost inputs for wind, solar, and battery energy storage systems that are [redacted] than industry standard projections, [redacted] By 2040, IPL's reference cost estimate for solar is [redacted] IPL's alternative cost trajectory (used in its AD and NR scenarios) does assume some level of cost decline,[27] [redacted] for the entire study period and that is only a sensitivity rather than an assumption embedded

[27] RES at 29.

throughout IPL's modeling. By the early 2040s, IPL's solar costs [redacted], which even then is still [redacted] For wind, [redacted]. Only for BESS does IPL's alternative cost trajectory [redacted]

Figure 2: Solar cost trajectories for IPL compared to other utilities and industry sources

[redacted]

Figure 3: Wind cost trajectories for IPL compared to other utilities and industry sources

[redacted]

Figure 4: BESS cost trajectories for IPL compared to other utilities and industry sources

[redacted]

IPL's forecasts for solar, wind, and BESS are the highest among all utilities we reviewed, and the only ones (other than MidAmerican in its recent RES)[28] in our extensive review that only includes the effects of inflation without [redacted] IPL's failure to [redacted] is inconsistent with best practices for resource planning. Additional recent IRPs that have used lower cost estimates for solar, wind, and storage than IPL's 2024 RES include:

- Evergy Kansas 2024 IRP
- Duke Energy Indiana 2024 IRP
- PacifiCorp 2023 IRP
- Tucson Electric Power 2023 IRP
- DTE Michigan 2022 IRP

Numerous utilities, such as Nevada Energy,[29] Pacific Gas and Electric, Arizona Public Service, Xcel Minnesota, and the California Public Utilities Commission all also rely on NREL ATB cost projections (sometimes with adjustments).

IPL's assumption that new resources experience no technological learnings or cost declines specifically disadvantages clean energy resources compared to new gas resources. There is industry consensus that modeling a cost decline for new resources is a best practice; assuming no change because there is uncertainty about the pace of change is an incredibly conservative and biased assumption. IPL applied the assumption of no cost declines to all generator types, including new gas resources, but the impacts of this assumption are not uniform across all resource types. This assumption has a pronounced effect on those resources with the largest expected cost declines: clean energy resources.

[28] M-0156, Environmental Intervenors' Comments on MidAmerican Energy Company's Final Resource Evaluation Study (RES) Report, at 21-27 (filed March 3, 2025).
[29] Nevada Energy 2025 Integrated Resource Plan. Volume 8 of 20 at 90.

Gas fired-generators, particularly turbines, are well established and considered mature technologies. While incremental advancements continue—such as efficiency gains and fuel flexibility improvements—the core technology is largely developed. In recent years, the industry has seen a shift from F-class to H-class gas turbines to achieve higher efficiency and to some extent improved operational flexibility. This has resulted in an increase in upfront investment. Some cost reductions may continue through incremental technology improvements, but the impact on overall costs is expected to be marginal compared to emerging energy technologies. Despite a recent surge in demand for gas turbines, the industry has historically experienced cyclical demand, which has not justified significant expansion of manufacturing capacity beyond current levels.

Solar PV, wind, and BESS, on the other hand, are newer technologies, demand has consistently outstripped available economic supply over the past decade. There is wide industry consensus that there is still substantial room for technological advancement and efficiency improvements in the supply chain, permitting and interconnection process, and other soft costs, all of which are likely to lead to sustained future cost declines. Modeling conventional resources and clean energy resources both with flat cost decline assumptions systematically favors the conventional resources, and essentially locks clean energy resources out of the future resource mix.

Figure 5 below compares IPL, NREL, and EIA projections for both BESS and CTs. This figure shows that while CT costs are expected to remain relatively constant (using NREL and EIA cost projections as an example), BESS costs are expected to drop to around or even below the cost of CTs. With IPL's cost assumptions, BESS remains more than double the cost of CTs for the entire study period - even in the scenario with alternative renewable costs. IPL does build some new BESS before 2030, when the model is not allowed to build new gas (IPL does not allow new gas until [redacted][30]). But beyond 2030, IPL builds only 25 MW of BESS in its main flat-load portfolio,[31] and 0 MW in its main mid-load portfolio as well as all portfolios in its high-load scenario.[32] It is not surprising that the model doesn't choose BESS when CTs are available given the high cost of BESS with no declines over time. But this assumption is unjustified and inconsistent with how other utilities, and leading industry sources, model BESS resources. This results in a significant bias against BESS in favor of gas and coal resources during the latter part of the study period.

The bias in IPL's model in favor of gas is especially concerning given the current supply bottleneck for gas turbines - which is limiting availability over the next five or more years - and driving up CT and CC project costs. IPL's costs do not appear to reflect the current market trends. The IPL models a combined cycle (CC) at [redacted]. This is below the cost other utilities are currently reporting or modeling for combined cycle gas plants, specifically:

- Entergy TX: Legend Power Station is a 754 MW, $1.46 billion proposed combined cycle combustion turbine facility which is $1,936/kW (2024$) or $1,893/kW in 2023$.[33]

- Dominion: Greenfield CCs include a 1,309 MW plant with capital costs of $2,049/kW (2025$) or 1,958$/kW in 2023$ and a 665 MW plant with capital costs of $2,453/kW (2025$) or $2,344/kW in 2023$.[34]

- Indiana Michigan: new natural gas CCs include a 1,030 MW plant with overnight costs of $1,800/kW and a 420 MW plant with overnight costs of $2,000/kW (nominal dollars in the

[30] RES at 42.
[31] Portfolio 1a. RES at 52.
[32] Portfolios 2a and 3a, 3b, and 3b-i. RES at 53-55.
[33] Walton, Robert. "Entergy proposes gas-fired power plants in Southeast Texas totaling 1.2 GW, continuing the state's gas boom." Utility Dive. June 5, 2024. Available at: https://www.utilitydive.com/news/entergy-proposes-gas-fired-power-plants-1200-MW/718036/
[34] "DESC IRP Stakeholder Advisory Group Session XVII." Dominion Energy. Page 33. Available at: https://www.desc-irp-stakeholder-group.com/Portals/0/Documents/MeetingMaterials/DESC_IRP_Stakeholder_Advisory_Group_Session_XVI.pdf

first year the resource is available, which in this case is 2031) which is $1,501/kW and $1,668/kW in 2023$.[35]

Figure 5: CT and BESS cost projections

[redacted]

Table 1 below shows a comparison between IPL resource costs and NREL and EIA new resource costs for 2024 and 2040; Table 2 shows the percent by which IPL costs exceed industry projections for both 2024 and 2040. These tables show how much IPL forecasts deviate from industry standard forecasts over time. For example, IPL's forecast of CT costs are within [redacted] (plus or minus) of industry projections for the entire study period. In comparison, IPL's forecast for solar starts out [redacted] above industry projections, and by 2040, it is over [redacted] higher than industry estimates. There is a similar pattern for wind and BESS. By ignoring widely expected cost decreases associated with learning, IPL gives an advantage to gas generation over renewable energy.

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[35] "Indiana IRP Stakeholder Meeting #2." Indiana Power Michigan. September 24, 2024. Page 19. Available at: https://www.indianamichiganpower.com/lib/docs/community/projects/IM-irp/IN_Stakeholder_Meeting_2.pdf

These forecasting choices systematically bias the model against clean energy resources and help explain the minimal clean energy deployment in the Company's results. For example, in IPL's main Flat Load Scenario portfolio, the model adds over 1,500 MW of new gas (430 CC and the rest peaking) and only 275 MW of BESS. Additionally, the model adds no new solar beyond 2030, and only 250 MW of new wind after 2030.[36]

Table 1: Comparison between IPL, EIA and NREL new resource cost assumptions ($2023/kW capital cost)

Resource	2024				2040		
	IPL	EIA AEO	NREL	Lazard	IPL	EIA AEO	NREL
Solar PV	[redacted]	$1,340	$1,608	$1,099	[redacted]	$911	$855
BESS		$1,461	$2,009	$1,309		$826	$1,289
Wind		$1,381	$1,737	$1,563		$1,175	$1,307
Combustion Turbine (CT)		$801	$1,378	$904		$660	$1,215

Table 2: Percent difference between IPL and industry-standard cost estimates (IPL cost is X% > industry projection)

Resource	2024			2040	
	EIA AEO	NREL	Lazard	EIA AEO	NREL
Solar PV	[redacted]	[redacted]	[redacted]	[redacted]	[redacted]
BESS					
Wind					
Combustion Turbine (CT)					

[36] Portfolio 1a. RES at 52.

Recent trends have driven up resource costs across the market. Supply chain difficulties have increased costs for all resources - and these forces should impact all utilities similarly. Recent demand for gas turbines has driven up the cost of new CTs and CCs and limited supply over the next five years or more. Other utility and industry forecasts have reflected the impact of these trends over the near term, and also reflect the understanding that the market will adjust and cost declines for solar and wind and wind and BESS resources will resume. The Company has not explained why its assumptions deviate significantly from other sources. If IPL's costs actually are much higher than all other utilities and industry sources, that in itself is concerning, and something the Commission should be aware of. The Company should take steps to address its procurement and cost challenges and update the Commission on its progress on this front.

Overall, to obtain reasonable resource planning modeling results, IPL must use reasonable cost forecasts. IPL's modeling inputs misrepresent the future costs of renewables by omitting the cost reduction assumptions widely expected to result from the technological learning effect. A scenario that assumes a flat cost forecast for renewable technologies will have a very different resource buildout than one that assumes that the costs of technologies like solar, wind, and storage will generally continue to decrease as industry experts predict. IPL has provided no evidence to support its high starting costs and flat cost projections.

Recommendations

- The Company should rely on either industry-standard forecasts from NREL, as many other utilities are doing, or else forecasts purchased from an industry source.
- IPL should adopt new resource cost trajectories that incorporate reasonable technological learning curves. The learning effect (i.e. price declines) should be higher for emerging, modular technologies such as wind, solar, and storage than for mature technologies such as combined and simple-cycle gas generators.

D. IPL should evaluate the economics of retirement relative to continued operation of its existing resources.

IPL modeled portfolios with specific pre-programmed retirement dates and gas conversion options for Ottumwa, Neal Units 3 and 4, and Louisa. Specifically, out of its 13 portfolios, IPL evaluated:[37]

- **Early retirement of Ottumwa** (2031) in four portfolios
- **Extended operation of Ottumwa** (2045) in four portfolios
- **Early Retirement of Neal 3 (2029) and Louisa (2031)** in one of the portfolios (Note: this scenario was designed to match the retirement scenario that MidAmerican modeled)
- **Conversion of Neal 3, Neal 4, and Louisa to co-fire** in 2030 and retire in 2038 in seven portfolios

In earlier comments, we noted that IPL should allow the Aurora model to make economically optimized retirement decisions. We acknowledge the Company tested a number of retirement scenarios, but we reiterate our concerns that the retirement analysis options were ultimately limited and presented a narrow picture of the potential benefits from early coal plant retirement decisions. We suggest evaluating an early retirement scenario for Ottumwa and the Company's share of Neal 3 and Louisa no later than 2028.

While it is reasonable for a utility to model scenarios with specific retirement dates pre-programmed, it is best (and standard) practice in an IRP for a utility to also run a fully optimized scenario where the model is allowed to select economic retirement dates for its existing resources and be relatively unconstrained with its new resource additions. IPL acknowledged this request from stakeholders to complete optimized modeling, but indicated that this practice "will not necessarily lead to an actionable plan."[38] We recognize that the optimized portfolio often deviates from the Company's ultimately selected Preferred Portfolio. However, modeling an optimized

[37] RES at 40.
[38] RES at 40.

portfolio provides essential information on the resource procurement decisions the Company should be pursuing.

IPL is a minority owner of Neal 3, Neal 4, and Louisa plants, which are operated by MidAmerican Energy Company. As discussed above, IPL modeled early retirement of Neal 3 and Louisa in one of its scenarios to match the one retirement scenario that MidAmerican proposed to model. While it's reasonable for MidAmerican's data and analysis to inform IPL on Neal 3, Neal 4, and Louisa, it is concerning that IPL deferred completely to MidAmerican's retirement parameters. The single early retirement scenario for Neal 3 and Louisa provides an extremely limited view on the economics of continued reliance on the co-owned coal fleet. Additionally, MidAmerican has a different system than IPL, so the economics of the plant for MidAmerican are likely much different than the economics for IPL. IPL should examine how well the co-owned coal plants fit with its own resource mix and justify its decision to continue relying on the plants to serve its native load. If neither IPL nor MidAmerican performs comprehensive retirement analysis as part of the RES process, then there is a major gap in the analysis. This modeling is work that IPL is obligated to do as a regulated monopoly.

Another concern we highlighted in earlier comment letters is the lack of access to data for the co-owned plants. For example, ELPC, IEC, and Sierra Club requested data on forward-going costs of all the company's coal plants, including the MidAmerican operated plants. IPL responded by stating that stakeholders should [redacted][39] The utilities require protective agreements that limit access and use of information in these dockets. It is unreasonable for IPL to require stakeholders to [redacted] information necessary for modeling that IPL should have and be reviewing itself.

[39] Attachment 6, "IPL responses to IEC, ELPC, and Sierra Club questions from April 17."

While the Company and its shareholders may have an obligation to the other plant owners, IPL's ratepayers do not. IPL must model co-owned resources to understand how they fit with the rest of the Company's portfolio. If co-owned resources are uneconomic, IPL should work with the co-owners to develop a retirement or transition plan. If co-owners are unwilling to retire the plants, IPL should consider selling its shares or transferring them to an unregulated arm to remove the economic burden from ratepayers. If there are barriers to retirement, such as an undepreciated balance, IPL should work to understand if there are ways to address those barriers.

Recommendations

- IPL should model a fully optimized scenario in which the Aurora model is allowed to select plant retirement dates based on the full forward-going costs of continuing to operate each unit relative to alternatives.

- IPL should program in the full, avoidable, forward-going costs required to operate existing units, inclusive of sustaining capital costs, projected environmental capital costs, fixed O&M, variable O&M, fuel, and all other non-avoidable costs. If these costs are not available to IPL for co-owned plants, IPL should request forward-going costs from MidAmerican to incorporate into its RES modeling.

- IPL should remove annual constraints on thermal retirements in MISO, or else use an annual constraint that is justified by MISO reliability analysis.

- IPL should evaluate an early retirement scenario for Ottumwa and the Company's shares of Neal 3 and Louisa with retirement starting in 2028 and a staggered schedule as necessary to allow economic procurement of replacement resources while maintaining reliability.

E. IPL should model GHG scenarios that reflect future likely carbon regulations and are aligned with its own corporate GHG commitments

All of IPL's portfolios show at least a 50 percent reduction in carbon emissions by 2030 from a 2005 baseline.[40] Not surprisingly, the portfolios optimized and evaluated under the EPA greenhouse gas (GHG) rules generate higher levels of clean electricity and achieve greater CO_2

[40] RES at 89.

emission reductions. The portfolio optimized and evaluated under the NR scenario, which assumes a carbon price, achieve a 73 percent reduction in CO_2 emissions by 2030.[41]

Despite this, the Company's GHG policy scenarios do not put the Company on track to meet its own net-zero goal. Specifically, the GHG policies in the AD and NR scenarios do not put IPL on track to meet its net zero by 2050 GHG goals. The NR portfolio has the lowest GHG emissions of any portfolio, with 81 percent of generation from clean energy resources by 2040, but even that falls short. In the NR case, the Company includes a carbon tax priced at the lowest estimate of the social cost of carbon provided by the EPA (5 percent). IPL acknowledges this, indicating that its portfolios "require additional technologies to be developed for Alliant Energy to meet its aspirational 2050 net zero goal."[42]

Additionally, we acknowledge that IPL modeled the final regulations under Section 111 of the Clean Air Act in a number of its portfolios. Although the future of the 111 regulation is now uncertain, the constraints imposed represent the level of carbon regulation one would expect to see going forward. Therefore, IPL should still use the results of these scenarios to inform its near-term actions.

Recommendations

- IPL resource planning should include a scenario that meets the Company's adopted 2050 net-zero emissions goals.
- IPL should continue to model carbon regulations even if the exact form of the regulation is uncertain.

[41] RES at 95.
[42] RES at 95.

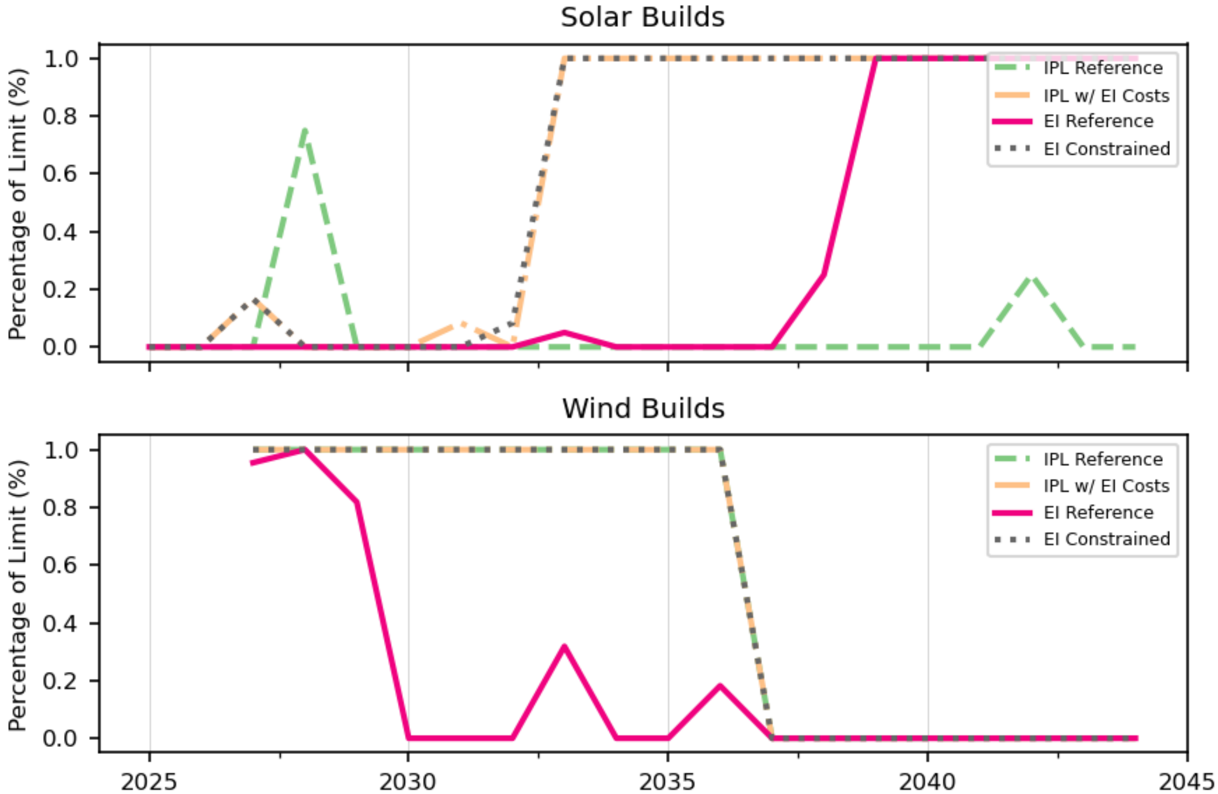
F. IPL should procure as much near-term renewable and BESS capacity as possible and should only model build limits to the extent necessary.

IPL placed annual build limits on solar, wind, and storage additions modeled in Aurora. Specifically, IPL limited solar PV builds to 300 MW/year starting in 2027, wind to 200 MW/year, and BESS to 300 MW/year.[43] However, across both the IPL Reference (HLG Mid Load) portfolio and all three EI alternative portfolios, the optimization model economically built at least 500 MW of new wind and 300 MW of new storage by 2028. IPL should focus its efforts in the near term on procuring as much wind and BESS as the market can economically provide and not limit acquisition based on the limits it imposed on the model.

While it may be reasonable to model some scenarios with build limits, those limits should be justified based on the constraints they represent in reality, especially if they are binding (as was the case in some portfolios). Additionally, IPL should model scenarios without build limits to determine the most economic resource portfolio. Figure 6 below illustrates the solar and wind builds as a percentage of annual limits realized in the IPL Reference (HLG Mid Load) and the three EI modeled scenarios. For all but the EI Reference scenario, where build limits are significantly increased, wind builds are limited by their annual build constraint in every year from 2027 to 2036. Regardless of what build limits the Company uses in its modeling, when it procures resources in the market, it should let the market decide what is possible, and not place artificial limits on procurement of economic solar, wind, or storage.

[43] RES at 42.

Figure 6. Comparison of wind and solar builds versus build limits by scenario



The results of IPL and the EI's independent modeling (discussed below) reveal that renewables and battery storage are the most economic resource options for IPL in the near term, and the model will generally be limited by build limits and not economics. Across both the IPL Reference (HLG Mid Load) portfolio and all three EI alternative portfolios, the portfolio optimization model economically built at least 500 MW of new wind and 300 MW of new storage in the first few years of the study (by 2028). These common, economic wind and storage builds are in addition to IPL's planned repowering of 200 MW of wind at Whispering Willow in 2026 and the addition of 250 MW of storage at Lansing in 2026 and 2027.[44]

[44] The modeling includes 250 MW of planned storage at Lansing while GCU-2025-0001 is an application for up to 280 MW.

The IPL system, as modeled, will benefit from additional near-term wind and storage resources beyond IPL's current procurement plans. Further, renewables and BESS are likely to be available to deploy sooner than thermal resources are available. IPL estimates that solar PV and wind will be available in 2027 and BESS will be available in 2026, while thermal CTs will not be available until 2028[45] and CCs will not be available until 2029.[46] This aligns with recent reporting about the current backlogs in the gas turbine market. Manufacturers' backlogs reveal that new turbine deliveries will start no earlier than 2028[47] and 2029.[48]

Recommendations

- IPL should seek to procure as much near-term economic solar, wind, and storage as available and cost-effective for customers.
- IPL should not limit near-term acquisition plans based on artificial RES modeling constraints that may not reflect actual availability.

G. IPL should rely on regional studies and round-trip modeling to inform reliability analysis and understand the risks of market exposure.

The Company did not conduct reliability modeling in a transparent manner. The EI are concerned that the Company did not use best practices for iteratively evaluating the reliability of the resource portfolio.

i. <u>IPL should rely on regional studies for estimates of available capacity to inform its market interaction assumptions.</u>

IPL modeled [redacted] of short-term market purchases available for the [redacted] timeframe – based on the results of its shorter term capacity RFP – but did not make market

[45] RES at 93.
[46] Res at 42.
[47] "Gas Power Won't Provide an Easy Fix for AI Boom." EnergyNow Media. January 8, 2025. Available at: https://energynow.com/2025/01/gas-power-wont-provide-an-easy-fix-for-ai-boom/.
[48] Arun, Advait. "The Natural Gas Turbine Crisis." Heatmap News. February 26, 2025. Available at: https://heatmap.news/ideas/natural-gas-turbine-crisis.

purchases available to the model beyond 2031.[49] Instead, IPL required the Aurora model to build enough new resource capacity to meet IPL's resource needs with a planning reserve margin. The Company does not allow market purchases for capacity to help meet its load and reserve margin after 2031. This reflects a subjective judgment by the Company that market capacity will not be reliably available in the future, or that MISO will require the Company to provide for its own capacity needs without relying on market purchases. IPL does say it "continues to assess the landscape for MISO capacity purchases and will make cost-effective transactions for the benefit of customers as needed."[50]

While it's reasonable to limit reliance on market capacity, this conservatism is out of line with resource planning best practices. Rather than removing all market purchases for capacity after 2031, IPL should rely on regional studies for estimates of available capacity, or else conduct its own studies, to determine a reasonable level of reliance for imports. Procuring capacity resources is expensive for customers, and the Company may be able to find lower-cost capacity on the market. IPL should not plan to supply all of its own capacity needs unless there is good reason to believe the Company will not have access to capacity from the market in the future.

Recommendation

- IPL should undertake regional analysis to evaluate the market potential for capacity and energy purchases.

ii. <u>IPL should not equate market exposure with reliability risk, and should use round-trip modeling to improve reliability in its portfolios rather than an over-simplified single metric.</u>

IPL focused on "market exposure risk" to analyze reliability. IPL developed a single forced market exposure calculation which served as a proxy for an expected unserved energy calculation.

[49] RES at 40, 93.
[50] RES at 95.

Specifically, IPL takes the expected value of the total MWh across the 1,000 simulations that the model is unable to meet with IPL's resources. The Company reports any hour where its portfolio does not include enough generation to meet load as an hour with "market exposure risk." IPL found that "Portfolios 2a and 2b have relatively negligible expected forced market exposure risk, while Portfolios 2a-NR and 2b-AD have higher levels of risk, representing 1.0 percent and 1.6 percent of IPL's total expected load obligation for the 2030 sample year."[51]

IPL reports that the AD and NR GHG policy portfolios, which have less dispatchable fossil capacity and more renewable energy than other portfolios, have substantially higher "market exposure risk" than other portfolios. We are concerned that IPL used market exposure as a shortcut for reliability when a more robust analysis was necessary to fully understand the reliability of these portfolios. Market risk does not necessarily equate to reliability risk. An hour with market exposure should not generally be viewed as an hour when reliability is at risk. Iowa utilities have regularly imported energy for years without risking reliability. What is more important is understanding the level of market reliance during times of high demand when the market itself is limited.

Rather than simply using market exposure as a proxy for reliability, the Company should conduct detailed resource adequacy modeling to understand how reliable each portfolio is. Resource adequacy modeling can and should be used in tandem with capacity expansion modeling to evaluate and improve portfolio reliability performance. If a portfolio falls short in reliability performance, incremental firm resources can be programmed in and the reliability analysis re-run to confirm portfolio performance. Due to the complexities of modeling renewable energy and storage, renewable portfolios often require more round-trip modeling iterations than portfolios with higher levels of dispatchable fossil resources. But portfolios that include renewable energy

[51] RES at 84.

coupled with battery storage and other grid resources should not be dismissed as less reliable than portfolios that rely heavily on dispatchable fossil generation simply because of the need for iterative modeling to accurately capture reliability.

Long-term planning models like Aurora are not perfect at predicting future reliability needs when presented with the complexity of variable renewable energy and storage resources. Utilities and industry experts have noted this in recent years and approached the issue using round-trip modeling. When IPL sees that a portfolio has a lower than expected reliability value, the Company can add capacity resources to that portfolio, and then re-evaluate its reliability performance. For example, the addition of 600 MW of storage capacity in 2030 would likely bring the NR and AD portfolios to a level of risk closer to that of other portfolios.

Recommendation

- IPL should undertake and integrate robust resource adequacy modeling into its resource planning modeling process. IPL should treat its capacity expansion modeling as an iterative, round-trip modeling approach that iterates between resource adequacy and cost-optimization.

H. Environmental Intervenors’ modeling demonstrates a clean, reliable, and low-cost future is possible

IPL adopted a portfolio optimization approach to model its system and develop its resource plans in the RES. As noted above in Section 1, portfolio optimization is a study-type specific to the Aurora modeling software that can be used to identify least-cost resource portfolios in place of more typical LTCE modeling approaches. Portfolio optimization is appropriate in narrow circumstances for small utilities within larger market footprints wherein the planning and operation of the utility under study is expected to have a negligible impact on market prices. The utility of interest is considered a “price-taker” within the context of the broader market footprint for imports and exports.

IPL outlined four market scenarios and thirteen portfolios in the RES to model its future system and support its resource planning approach. In the first step of its modeling, IPL executed a LTCE model for the MISO footprint to establish a forecast for market prices under each future scenario. IPL then introduced the resulting market price forecasts into its portfolio models. Here, the Aurora portfolio optimization logic selects lowest-cost new resources to support IPL loads given constraints unique to each portfolio setup.

In March 2024, IPL delivered its market LTCE models to participants. The IPL market models offered a high-level view of MISO system planning in general and implications for future market prices. Our work focused on the IPL portfolio optimization models where changes in assumptions have a direct influence on resource selection for the IPL system. In September 2024, later updated in October 2024, IPL delivered portfolio optimization models. It was unclear from the materials the company initially shared how to set up and run these models to replicate published results. We appreciate IPL's efforts to make their modeling consultants, Charles River Associates (CRA), available to answer questions. Through one-on-one conversations with CRA outside of the RES meetings, we were able to develop a working understanding of the IPL model. In November, we met with CRA to review the portfolio optimization setup, the sequence of study types required and relevant changesets. Without this meeting, and the accompanying "IPL Portfolio Aurora Study Cases" workbook, we would not have been able to proceed with modeling in this RES.

We tested IPL's high load growth (HLG) scenario as our reference case. The HLG scenario best aligns with "IPL's current best expectation for future market conditions" and IPL said that this [redacted][52] Within the HLG scenario, we began our modeling work from the Mid Load portfolio. The company's

[52] RES at 72, 93, 96.

modeling captured a diversity of market futures and portfolio sensitivities, but the model input assumptions related to renewable resources and coal retirements biased the modeling and limited the usefulness of what would otherwise be robust sensitivity analysis (as discussed in the sections above). EI modeling focused on evaluating how changes in new resource costs, annual build limits for wind and solar candidates, and early coal retirements enabled a cleaner IPL system. Our analysis aimed to correct for limitations in the original modeling by addressing overly restrictive or outdated input assumptions, thereby offering a more complete and actionable understanding of IPL's future system. EI used the following modeling approach:

1. Review IPL's model and align inputs with assumptions presented in the RES.
2. Review portfolio optimization process, study sequencing, and setup with CRA.
3. Conduct both portfolio optimization and standard zonal (production cost modeling) simulation of IPL's HLG Mid Load scenario.
4. Benchmark the results against those presented in the RES.
5. Modify input assumption(s) consistent with industry literature and best practices.
6. Conduct EI scenario portfolio optimization and standard zonal studies, review results and analyze the impact of input modifications on system build decisions and performance.

The EI Reference scenario adopts three core changes. First, we adopted EI resource cost assumptions for wind, solar, and battery storage resources benchmarked to the costs defined in the 2024 NREL Annual Technology Baseline moderate scenario.[53] This is the same source that IPL relied on, except without the substantial manual modifications that the Company applied. Second, we assume an accelerated coal retirement schedule (Neal 3 in 2027, Louisa in 2028, Ottumwa in 2029, and Neal 4 in 2030). Previous work has found these coal units to be uneconomic.[54] Removing their firm capacity in the near to mid-term allows our alternative modeling to explore how IPL may best replace the retirement of firm capacity. Third, we increase annual build limits

[53] https://atb.nrel.gov/electricity/2024/about
[54] RPU-2022-0001, MidAmerican Zero Emissions Study (ZES) (filed Feb. 17, 2023); RPU-2022-0001, Siemens, Coal Plant Economics Assessment: MidAmerican Energy Company February 2020 (filed Feb. 17, 2023) (Siemens Study).

on wind and solar resources. Wind resource builds are limited by annual build limits for ten of the twenty years in the company's HLG Mid Load portfolio. In the IPL Reference with EI Costs portfolio, where we updated resource costs, solar and wind resource builds are limited by annual build limits in eleven and ten of the twenty-year study horizon respectively. Given the regularity of these binding constraints, our EI Reference explores a future in which the system is permitted to build even more solar and wind capacity.

While developing our scenarios, we found the IPL system to be a net energy exporter. While the market sales realized from these early models remained within the bounds of IPL's default, maximum yearly sales limits in the portfolio optimization model, we recognized that the level of exports diverged significantly from IPL's Reference. Accordingly, we adopted a lower sales limit in the EI Reference that aligned with the maximum sales observed in the IPL Reference.

Beyond the EI Reference scenario, we modeled two additional scenarios. We modeled the IPL Reference scenario with the EI resource (labeled "IPL Reference with EI Costs") cost assumptions to allow for a like-for-like comparison of resource builds and total system NPV costs between the IPL Reference and the EI Reference. To further evaluate the implications of the build limits, we also evaluated a "constrained" scenario in which the EI Reference scenario is run with IPL's default solar and wind build limits. Our three core scenarios thus represent a range of views on resource costs, coal retirement schedules, and constraints on annual wind and solar deployments, as detailed in Table 3.

Table 3. Comparison of assumptions by scenario

Scenario Name	EI Costs	Early Coal	Increased Wind/Solar Build Limits
IPL Reference with EI costs	✔		
EI Reference	✔	✔	✔

EI Constrained	✔	✔	

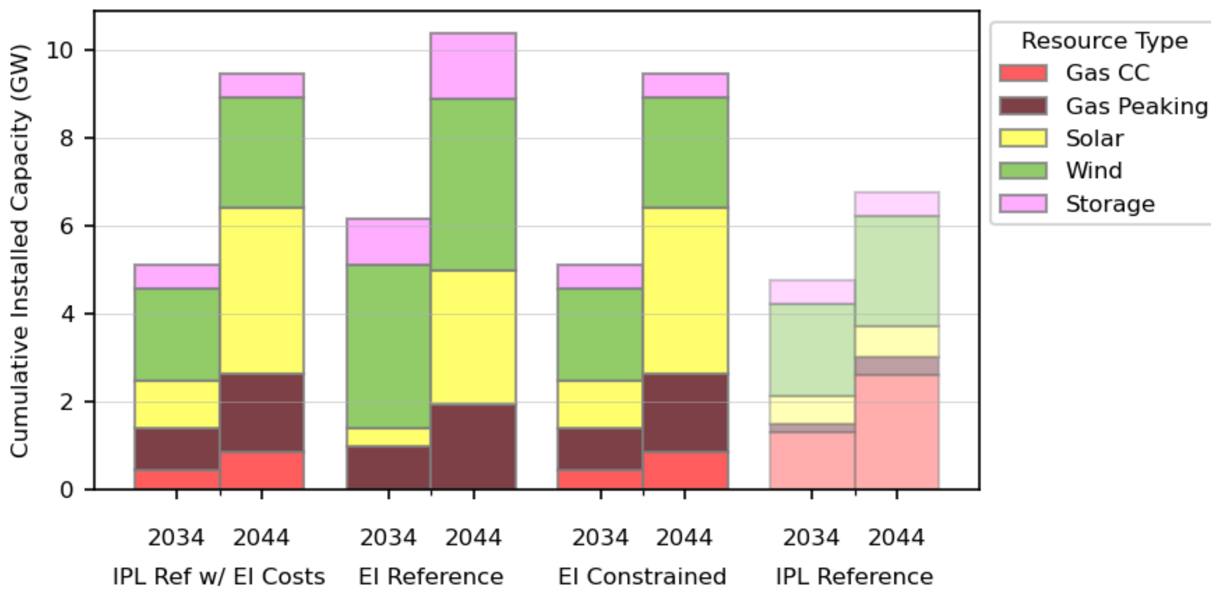
The IPL HLG Mid Load portfolio represents the starting point for our modeling. While it is not core to our analysis, it is instructive to review the new resource builds that result from this portfolio with IPL's resource cost assumptions. The IPL HLG Mid Load portfolio realizes a new resource build comprised of wind and storage in the near term followed principally by combined cycle builds in the mid to out years as firm capacity needs arise (e.g., coal, gas peaking and short-term market purchase retirements). When we introduce EI resource costs, as in the IPL Reference with EI Costs scenario, the system builds significantly more solar generation and significantly less combined cycle capacity than the IPL HLG Mid Load scenario. Wind and storage builds remain important complementary resources in the near term. In the mid-term, additional solar capacity and gas peaking resources displace much of the combined cycle generation built in the IPL HLG Mid Load scenario.

The EI Reference scenario, with early coal retirements and expanded wind and solar build limits, furthers this trend. We observe significant, near-term wind builds with storage in the EI Reference. Early builds of wind resources provide the EI Reference system with significant energy resources. The EI Reference scenario does not build any combined cycle resources over the study horizon. However, the scenario builds a mix of gas peaking and storage resources in the mid-term to serve capacity needs as resources retire. In the out years, the model adds solar generation at the build limit with some additional gas peaking capacity.

The EI Constrained scenario, with default wind and solar build limits, results in wind builds constrained by annual limits from 2027 (the first eligible build year) to 2036 and solar builds constrained by annual limits from 2033 through the end of the horizon. IPL's wind and solar build limits constrain the model from realizing the lowest cost, reliable resource plan possible. Builds in the EI Constrained scenario largely match the builds realized in the IPL Reference scenario in magnitude, resource type, and timing. Such similarity suggests that the IPL build limits strongly influence resource acquisition decisions regardless of changes in the coal retirement schedule.

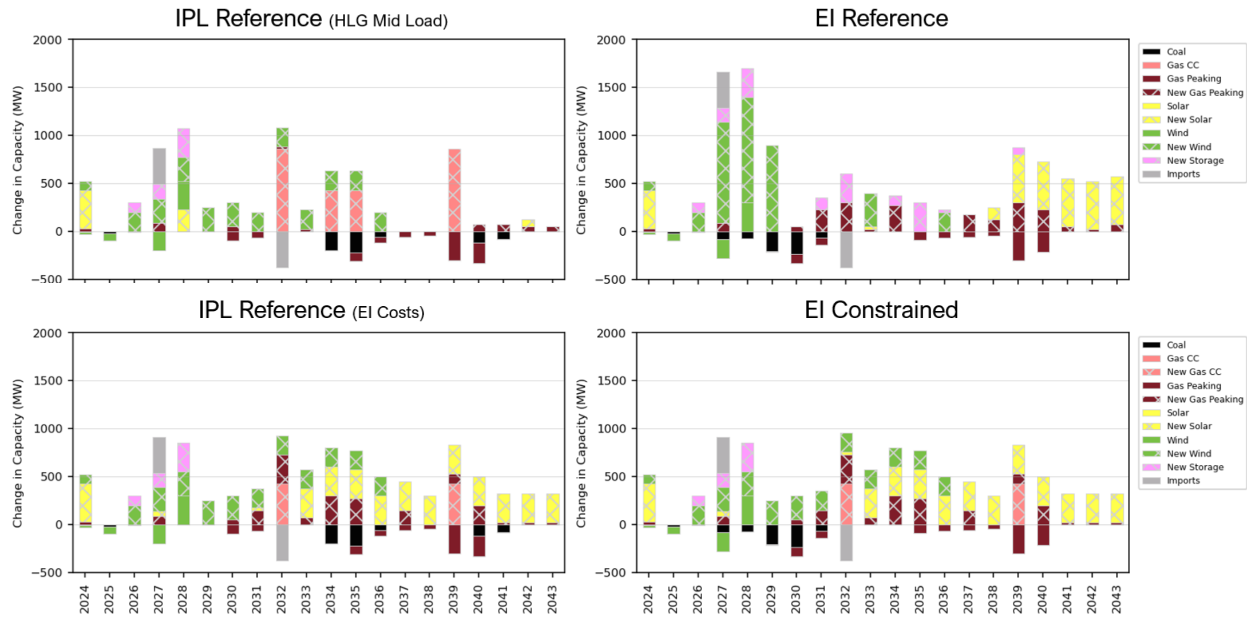
The four scenarios studied illustrate the influence of resource costs, build limits, and coal retirements on IPL's lowest-cost, reliable resource plan. The EI proposals for resource costs and build limits represent probable futures that have not been addressed in the Company's RES. Our adoption of an early coal retirement schedule offers an empirical view of an IPL system that is less dependent on coal. The cumulative portfolio builds realized in these probable and alternative scenario build outs are compared in Figure 7 below.

Figure 7. Comparison of cumulative capacity expansion results by scenario



The production cost, or dispatch, modeling results illustrate the consequences of these scenario builds. Beyond the cumulative builds realized at the end of the study horizon, the timing of resource additions and retirements significantly changes system operations, summarized in Figure 8 below.

Figure 8 Comparison of annual incremental capacity expansion results by scenario



The IPL Reference with EI Costs scenario with its later coal retirements and limited solar and wind builds emits the largest amount of CO_2 emissions among the EI scenarios. Comparatively, the EI Reference scenario cuts total CO_2 emissions by 27 percent, removing 40 mmT of CO_2 and delivering a \$186 million societal benefit to IPL ratepayers.[55] In addition to reducing emissions, the relaxed renewable resource build limits and early coal retirements in the EI Reference reduce system costs and market purchases. These two changes reduce emitting firm capacity and allow more low-cost, non-emitting energy to come onto the system. Early and significant wind builds in the EI Reference drive system costs down even as market imports fall. Limiting wind and solar builds, as in the EI Constrained scenario, results in a system that relies more heavily on market imports as coal resources are retired early without the benefit of significant additional wind and solar resources. Still, the EI Constrained scenario reduces CO_2 emissions by

[55] Technical Support Document: - Technical Update of the Social Cost of Carbon for Regulatory Impact Analysis - Under Executive Order 12866, Aug 2016. Value referenced from Table ES-1, year 2020, 3% discount rate, adjusted to 2024 dollars.

18 percent at a 4 percent cost premium when compared to the IPL Reference with EI Costs. We present production cost modeling summary results in Table 4.

Table 4. Comparison of system performance by scenario

Metric	IPL Reference w/EI Costs	EI Reference	EI Constrained
System NPV ($B)	$4.99B	$2.98B	$5.20B
Market Purchases (% of load)	4.37%	3.65%	8.75%
Total CO2 Emissions (mmT)	148.99 mmT	108.86 mmT	121.59 mmT

Together, the EI Reference and EI Constrained scenarios demonstrate how IPL can plan a system that improves environmental quality and protects ratepayers. Our modeling illustrates how IPL can achieve a clean, reliable resource plan where (1) wind and storage resources are a cornerstone resource for all future portfolios, particularly in the near term, (2) earlier coal retirement avoids significant CO_2 emissions, (3) storage and gas peaking resources can be built to provide capacity as aging thermal resources retire, and (4) costs deviate only marginally between the IPL Reference and EI Costs scenarios. The resource builds identified in EI scenarios bolster previous findings that additional renewable resources and batteries can effectively integrate with existing wind resources to reliably meet IPL's energy and capacity needs.

IV. CONCLUSION

IPL's second RES builds upon the first, but some input assumptions remained inadequate and some process steps were inaccessible. Environmental Intervenors' modeling addressed flaws in IPL's inputs, assumptions, and process. The results of Environmental Intervenors' modeling demonstrate that a clean, reliable, low cost future is possible. Significant new wind and storage resources were a part of every scenario the EI modeled – regardless of resource costs, coal retirements, or resource build limits – charting a no-regrets path forward for IPL. In the future, IPL should adopt the recommendations above focused on increasing transparency and collaboration, applying industry standard assumptions, utilizing capacity expansion and production cost modeling best practices, and using procurement of renewable energy and storage to mitigate risk. Incorporating these recommendations will improve economic decision making and protect ratepayers.

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Respectfully submitted,

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