STATE OF INDIANA

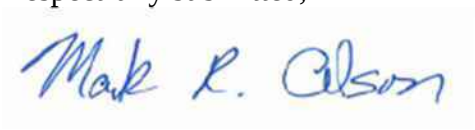
INDIANA UTILITY REGULATORY COMMISSION

VERIFIED PETITION OF INDIANAPOLIS POWER & LIGHT COMPANY D/B/A AES INDIANA ("AES INDIANA") FOR (1) ISSUANCE TO AES INDIANA OF A CERTIFICATE OF PUBLIC CONVENIENCE AND NECESSITY FOR THE ACQUISITION AND DEVELOPMENT BY A WHOLLY OWNED AES INDIANA SUBSIDIARY OF A SOLAR POWER GENERATING FACILITY AND BATTERY ENERGY STORAGE SYSTEM PROJECT TO BE KNOWN AS THE CROSSVINE PROJECT ("THE CROSSVINE PROJECT"); (2) APPROVAL OF THE CROSSVINE PROJECT, INCLUDING A JOINT VENTURE STRUCTURE BETWEEN AN AES INDIANA SUBSIDIARY AND ONE OR MORE TAX EQUITY PARTNERS AND A CONTRACT FOR DIFFERENCES BETWEEN AES INDIANA AND THE PROJECT COMPANY THAT HOLDS AND OPERATES THE SOLAR GENERATION AND STORAGE ASSETS, AS A CLEAN ENERGY PROJECT AND ASSOCIATED TIMELY COST RECOVERY UNDER IND. CODE § 8-1-8.8-11; (3) APPROVAL OF ACCOUNTING AND RATEMAKING FOR THE CROSSVINE PROJECT, INCLUDING AN ALTERNATIVE REGULATORY PLAN UNDER IND. CODE § 8-1-2.5-6 TO FACILITATE AES INDIANA'S INVESTMENT IN THE CROSSVINE PROJECT THROUGH A JOINT VENTURE; AND (4) TO THE EXTENT NECESSARY, ISSUANCE OF AN ORDER PURSUANT TO IND. CODE § 8-1-2.5-5 DECLINING TO EXERCISE JURISDICTION OVER THE JOINT VENTURE, INCLUDING THE PROJECT COMPANY, AS A PUBLIC UTILITY.	**CAUSE NO. 46113**

SUBMISSION OF DIRECT TESTIMONY OF ERIK K. MILLER

Petitioner Indianapolis Power & Light Company d/b/a AES Indiana ("Petitioner" or "AES Indiana"), by counsel, hereby submits the direct testimony and attachments of Erik K. Miller.

Respectfully submitted,



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CERTIFICATE OF SERVICE

The undersigned hereby certifies that a copy of the foregoing was served this 29th day of August 2024, by email transmission, hand delivery or United States Mail, first class, postage prepaid to:

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VERIFIED DIRECT TESTIMONY

OF

ERIK K. MILLER

ON BEHALF OF

INDIANAPOLIS POWER & LIGHT COMPANY

D/B/A AES INDIANA

SPONSORING AES INDIANA ATTACHMENTS EKM-1, EKM-2, AND EKM-3

VERIFIED DIRECT TESTIMONY OF ERIK K. MILLER
ON BEHALF OF AES INDIANA

1. INTRODUCTION

Q1. Please state your name, employer and business address.

A1. My name is Erik K. Miller. I am employed by Indianapolis Power & Light Company d/b/a AES Indiana ("AES Indiana", "Company", also "IPL"), One Monument Circle, Indianapolis, Indiana 46204.

Q2. What is your position with AES Indiana?

A2. I am Director, Resource Planning.

Q3. On whose behalf are you submitting this direct testimony?

A3. I am submitting this testimony on behalf of AES Indiana.

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

A4. I hold a bachelor's degree from Indiana University's School of Journalism and a Master of Public Affairs degree from Indiana University's School of Public and Environmental Affairs. Prior to coming to AES Indiana, I worked as a Senior Project Manager for the energy efficiency consulting company, CLEAResult from 2012 – 2015 and prior to that as an Energy Efficiency Program Coordinator at Hoosier Energy Rural Electric Cooperative from 2009 – 2012.

Q5. What are your current duties and responsibilities at AES Indiana?

A5. I am responsible for the economics and decision support analysis in the areas of resource planning, environmental planning, and other strategic level analysis.

Q6. Have you previously testified before this Commission?

A6. Yes. I have previously testified before the Commission in Cause No. 44792, which concerned AES Indiana's DSM programs offered in 2017, Cause No. 44945, which concerned AES Indiana's DSM programs offered from 2018 – 2020, Cause No. 44945, which concerned AES Indiana's DSM programs offered in 2021 -2023, Cause No. 45370, which concerned AES Indiana's DSM programs offered in 2024, and Cause No. 46081, which concerns AES Indiana's DSM programs offered in 2025 – 2026 and is currently pending before the IURC. Additionally, I testified in AES Indiana's CPCN proceedings for the Hardy Hills Solar Project, Cause No. 45493, the Petersburg Energy Center Solar + Storage Project, Cause No. 45591, the Pike County Battery Energy Storage Project, Cause No. 45920, and the Petersburg Repowering Project, Cause No. 46022 (which is pending before the IURC as of the date this testimony is being field with the Commission).

Q7. What is the purpose of your testimony in this proceeding?

A7. My testimony: 1) presents AES Indiana's Preferred Resource Portfolio and Short Term Action Plan defined in the Company's 2022 Integrated Resource Plan ("IRP") and the 2024 IRP update; and 2) demonstrates that the proposed solar plus battery energy storage system ("BESS") clean energy project ("Crossvine Project", or "Project") is consistent with AES Indiana's IRP Preferred Resource Portfolio and 3) consistent with the "Five Pillars" as defined by the 21st Century Energy Policy Development Task Force[1] and Ind. Code § 8-1-2-0.6.

[1] 21st Century Energy Policy Development Task Force, Final Report, November 19, 2020, p. 8.

Q8. Please provide an overview of how your testimony is presented.

A8. My testimony is divided into the following sections:

1. Introduction
2. AES Indiana's 2022 IRP
3. The Updated IRP Analysis
4. RFP Ranking Analysis Modeling.
5. Consistency with AES Indiana's 2022 IRP and 2024 IRP Update.
6. Levelized Cost of Energy ("LCOE")
7. Consideration of Resource Alternatives (Ind. Code § 8-1-8.5-4)
8. Final Director's Report for AES Indiana's 2022 Integrated Resource Plan
9. Statewide Analyses.
10. Ind. Code § 8-1-2-0.6 (Five Pillars).
11. Conclusion.

Q9. Are you sponsoring any attachments in this proceeding?

A9. Yes. I am sponsoring the following attachment(s):

- AES Indiana Attachment EKM-1, which is a copy of AES Indiana's 2022 IRP Volume 1, which is public.
- AES Indiana Attachment EKM-2, which is a copy of AES Indiana's 2022 IRP Volume 2, which is public.
- AES Indiana Attachment EKM-3, which is a copy of AES Indiana's 2022 IRP Volume 3, which is public.

I would note that I did not include the IRP confidential volume or the IRP confidential attachments (Sections 1-8) to control the volume of my testimony. However, this information has been filed with the Commission and provided to IRP stakeholders who have executed a non-disclosure agreement with AES Indiana.

Q10. Were these attachments prepared or assembled by you or under your direction and supervision?

A10. Yes.

Q11. Did you submit any workpapers?

A11. Yes. The table below lists and describes the workpapers submitted with my testimony.

Workpaper	File/Folder Name	Description
AES Indiana Witness EKM Confidential Workpaper 1	Commodity Updates	Summary of coal, gas, power, and NOx price updates
AES Indiana Witness EKM Confidential Workpaper 2	Existing Resource Accreditation	Summary of MISO accreditation updates for existing AES resources
AES Indiana Witness EKM Confidential Workpaper 3	Replacement Resource Cost Updates	Summary of replacement resource cost updates using 2023 all-source RFP and vendor data
AES Indiana Witness EKM Confidential Workpaper 4	Load Forecast	2024 IRP Update energy and peak forecast
AES Indiana Witness EKM Confidential Workpaper 5	2024 IRP Update Installed Capacity Summary	Summary of resource additions from the 2024 IRP Update in terms of Installed Capacity (ICAP)
AES Indiana Witness EKM Confidential Workpaper 6	PVRR Results	PVRR and annual revenue requirement results for each strategy from the 2024 IRP Update
AES Indiana Witness EKM Workpaper 7	Emissions Update	Emissions (CO2, SO2, NOx, CCP and Water Use) comparison from the 2024 IRP Update
AES Indiana Witness EKM Confidential Workpaper 8	2024 IRP Update SAC/UCAP Position	Summary of resource additions from the 2024 IRP Update in terms of Seasonal Accredited Capacity (SAC)
AES Indiana Witness EKM Confidential Workpaper 9	Crossvine and 2024 IRP Update Cost Comparisons	Comparison of the cost ($/kW) for a hybrid resource included in the 2022 IRP and 2024 IRP Update to the cost of Crossvine
AES Indiana Witness EKM Confidential Workpaper 10	LCOE Comparisons	Comparison of the levelized cost of energy (LCOE) for a hybrid resource included in the 2022 IRP and 2024 IRP Update to the LCOE of Crossvine

2. AES INDIANA'S 2022 IRP

Q12. Please provide an overview of AES Indiana's 2022 IRP and how it was developed.

A12. The objective of AES Indiana's IRP is to identify a Preferred Resource Portfolio to provide safe, reliable, sustainable, and reasonable least-cost electric service to AES Indiana customers. The study period for the 2022 IRP was 2023-2042, giving due consideration to various options, potential risks, and stakeholder input. AES Indiana submits an IRP to the IURC in accordance with Indiana Administrative Code (170 IAC 4-7) every three years. The Company's 2022 IRP was submitted to the Commission on December 1, 2022. The IRP development included input from stakeholders through what is known as a "Public Advisory" process. AES Indiana hosted five public advisory meetings and five technical meetings to discuss the IRP process with interested parties and to solicit feedback from stakeholders. A copy of AES Indiana's 2022 IRP is attached as AES Indiana Attachments EKM-1 – EKM-3.

Q13. Please describe AES Indiana's 2022 IRP Preferred Resource Portfolio and Short Term Action Plan.

A13. By definition, the "Preferred Resource Portfolio" represents AES Indiana's selected long term supply-side and demand-side resource mix that safely, reliably, efficiently, and cost-effectively meets the electric system demand, while taking cost, risk, and uncertainty into consideration.[2] The "Short Term Action Plan" is the schedule of activities and goals

[2] 170 IAC 4-7-1 (cc).

AES Indiana developed to begin efficient implementation of its Preferred Resource Portfolio.[3]

To select the Preferred Resource Portfolio and Short Term Action Plan in the IRP analysis, AES Indiana used the Five Pillars as defined by the 21st Century Energy Policy Development Task Force and subsequently codified in Indiana Code § 8-1-2-0.6 to evaluate five discrete strategies for the remaining Petersburg coal units.[4] These strategies were referred to in the 2022 IRP as the "Candidate Portfolios" and included: 1) keeping Petersburg operating on coal for its remaining useful life; 2) converting Petersburg to operate using natural gas in 2025 (Petersburg Conversion/Repowering); 3) retiring Petersburg Unit 3 in 2026 and keeping Petersburg Unit 4 operating on coal for its remaining useful life; 4) retiring both Units 3 and 4 in 2026 and 2028, respectively (this strategy selected a 270 MW combined cycle gas turbine ("CCGT") and energy storage resources as replacement for retiring the Petersburg Units); and 5) retiring Units 3 and 4 in 2026 and 2028, respectively, and replacing with only wind, solar, and storage resources.

AES Indiana first conducted a scenario analysis that evaluated how the five strategies would perform in very different potential futures. Through this analysis, AES Indiana found that the strategy that converts Petersburg Units 3 and 4 to natural gas performed the best across the scenarios and potential futures. Next, using the Five Pillars to guide a robust Scorecard evaluation across 17 unique metrics, AES Indiana determined that the

[3] 170 IAC 4-7-1(nn).

[4] 21st Century Energy Policy Development Task Force, Final Report, p.8 – The Five Pillars of Electric Service include Affordability, Reliability, Resiliency, Stability and Sustainability.

Peterburg Conversion/Repowering Candidate Portfolio performs the best overall for customers in terms of reliability, affordability, resiliency, stability, and environmental sustainability. This Scorecard analysis included a rigorous Stochastic Analysis that measured Candidate Portfolio risk across 100 different portfolio futures by varying power, gas, coal, load and renewable generation outcomes. After considering the Scorecard results, the Company selected the Petersburg Conversion/Repowering portfolio as the Preferred Resource Portfolio and Short Term Action Plan.[5]

The 2022 AES Indiana Preferred Resource Portfolio's Short Term Action Plan contains the following key elements:

1) Ceases coal-fired generation in 2025 after converting Petersburg Units 3 and 4 to natural gas.[6]

2) Adds up to 1,300 MW of installed capacity ("ICAP") of wind, solar and storage for capacity and energy value, including:

    a. Adds up to 240 MW ICAP of battery energy storage at Petersburg to fill winter capacity position in 2025.[7]

    b. Adds 550 – 1,065 MW ICAP of wind and solar as energy replacement for Petersburg.

[5] See AES Indiana Attachment EKM-1 for the Volume 1 of the IRP Report filed with the IURC on December 1, 2022. The IRP report discusses how the Company used the Five Pillars to define the metrics used to evaluate the IRP strategies.
[6] The Company's CPCN request to repower Petersburg Units 3 and 4 is currently pending Commission approval in Cause No. 46022.
[7] AES Indiana filed the Pike County Energy Storage Project with the IURC on 7/19/2023 under Cause No. 45920. This project represents approximately 200MW of capacity towards this line item in the 2022 IRP Short Term Action Plan. Pike County Energy Storage was approved by the IURC on 1/17/2024.

3) Identifies three-year annual average DSM savings targets of 130,000 – 134,000 MWhs (approximately 1.1% of 2021 sales) in 2024 - 2026.

All other existing AES Indiana owned generation continues to operate through their age-based retirement dates in AES Indiana's Preferred Resource Portfolio.

The Crossvine hybrid solar and storage project fits within the 2022 IRP Short Term Action Plan by filling the need for solar and storage resources identified and noted above.

Additionally, in 2024, AES Indiana updated the 2022 IRP with current planning assumptions. This update is referred to in my testimony as the 2024 IRP Update. The 2024 IRP Update process, assumption updates, and the results are described later in my testimony. Ultimately, this update slightly changes the Short Term Acton Plan by demonstrating a need for additional battery energy storage resources resulting from an increase in the MISO Reserve Margin between when the 2022 IRP was conducted and today. This need for additional battery energy storage resources occurs in every strategy reviewed in the 2024 IRP Update. The Crossvine hybrid solar + storage project helps to fill this identified need and aligns with the results of the 2024 IRP Update. I will discuss this alignment later in my testimony.

Q14. Please explain how the 2022 IRP analysis evaluated reliability, affordability, resiliency, stability and sustainability to determine the Company's Preferred Resource Portfolio and Short Term Action Plan.

A14. Guided by the IURC IRP rules, 170 IAC 4-7, AES Indiana strove to achieve a well-reasoned, transparent, and comprehensive 2022 IRP process with robust stakeholder engagement. The overarching purpose of the IRP is to develop a long-term plan to guide

investments that provide safe, reliable, and sustainable electric power at a reasonable, least cost.

AES Indiana selected its Preferred Resource Portfolio and Short Term Action Plan by evaluating five strategies or "Candidate Portfolios" as discussed above. The Company performed a robust IRP Scorecard process to rigorously evaluate and stress test the candidate portfolios across 17 discrete Scorecard metrics. These metrics quantified the candidate portfolios performance in the categories of Affordability, Environmental Sustainability, Reliability, Resiliency and Stability consistent with the Five Pillars of Utility Electric Service.[8] Additionally, the metrics considered Risk & Opportunity and Economic Impact of the Candidate Portfolios.

Figure 1 below provides the results from AES Indiana 2022 IRP Scorecard evaluation. The Scorecard results demonstrate that the Preferred Resource Portfolio (shown as row number 2 in Figure 1 performs the best overall across the Five Pillars and other Scorecard categories.[9]

[8] These metrics are addressed in detail later in my testimony – Q/A 53

[9] See pp. 203 - 212 of AES Indiana Attachment EKM-1, Volume 1 of AES Indiana's 2022 IRP, for more details regarding the Five Pillars and the Scorecard evaluation process used to select the Preferred Resource Portfolio and Short Term Action Plan.

Figure 1: 2022 IRP Scorecard Evaluation Results[10]

	Affordability	Environmental Sustainability						Reliability, Stability & Resiliency	Risk & Opportunity							Economic Impact	
	20-yr PVRR	*CO_2 Emissions*	*SO_2 Emissions*	*NO_x Emissions*	*Water Use*	*Coal Combustion Products (CCP)*	*Clean Energy Progress*	*Reliability Score*	*Environmental Policy Opportunity*	*Environmental Policy Risk*	*General Cost Opportunity **Stochastic Analysis** *	*General Cost Risk **Stochastic Analysis** *	*Market Exposure*	*Renewable Capital Cost Opportunity (Low Cost)*	*Renewable Capital Cost Risk (High Cost)*	*Generation Employees (+/-)*	*Property Taxes*
	Present Value of Revenue Requirements ($000,000)	Total portfolio CO2 Emissions (mmtons)	Total portfolio SO2 Emissions (tons)	Total portfolio NOx Emissions (tons)	Water Use (mmgal)	CCP (tons)	% Renewable Energy in 2032	Composite score from Reliability Analysis	Lowest PVRR across policy scenarios ($000,000)	Highest PVRR across policy scenarios ($000,000)	P5 [Mean - P5]	P95 [P95 – Mean]	20-year avg sales + purchases (GWh)	Portfolio PVRR w/ low renewable cost ($000,000)	Portfolio PVRR w/ high renewable cost ($000,000)	Total change in FTEs associated with generation 2023 - 2042	Total amount of property tax paid from AES IN assets ($000,000)
1	$ 9,572	101.9	64,991	45,605	36.7	6,611	45%	7.95	$ 8,860	$ 11,259	$ 9,271 [-$264]	$ 9,840 [$305]	5,291	$ 9,080	$ 10,157	222	$ 154
2	$ 9,330	72.5	13,513	22,146	7.9	1,417	55%	7.95	$ 8,564	$ 11,329	$ 9,030 [-$334]	$ 9,746 [$382]	5,222	$ 8,763	$ 9,999	99	$ 193
3	$ 9,773	88.1	45,544	42,042	26.7	4,813	52%	7.86	$ 9,288	$ 11,462	$ 9,608 [-$294]	$ 10,237 [$336]	5,737	$ 9,244	$ 10,406	195	$ 204
4	$ 9,618	79.5	25,649	24,932	15.0	2,700	48%	7.90	$ 9,135	$ 11,392	$ 9,295 [-$287]	$ 9,903 [$321]	5,512	$ 9,104	$ 10,249	74	$ 242
5	$ 9,711	69.8	25,383	24,881	14.8	2,676	64%	7.57	$ 9,590	$ 11,275	$ 9,447 [-$280]	$ 10,039 [$312]	6,088	$ 9,017	$ 10,442	55	$ 256
6	$ 9,262	76.1	18,622	25,645	10.9	1,970	54%	7.95	$ 8,517	$ 11,226	$ 8,952 [-$324]	$ 9,629 [$352]	5,136	$ 8,730	$ 9,909	88	$ 185

→ **Strategies**

- **1.** No Early Retirement
- **2.** Petersburg Conversion to 100% Natural Gas (est. 2025)
- **3.** One Pete Unit Retires in 2026
- **4.** Both Pete Units Retire in 2026 & 2028
- **5.** "Clean Energy Strategy" – Both Pete Units Retire and replaced with Renewables in 2026 & 2028
- **6.** Encompass Optimization without Predefined Strategy – Selects Pete 3 Refuel in 2025 & Pete 4 Refuel in 2027

[10] Note Strategy #6 – Encompass Optimization without Predefined Strategy was included in the IRP analysis to understand Encompass planning model results when left unconstrained. The results are intended to be used for comparison to and evaluation of the candidate portfolios and not for execution.

Q15. Please briefly describe the Encompass[11] capacity expansion and production cost modeling performed by AES Indiana to evaluate the cost effectiveness of the Candidate Portfolios in the 2022 IRP.

A15. In the 2022 IRP, AES Indiana performed a two-part analysis to evaluate the cost effectiveness of the Candidate Portfolios. First, the Company used the Resource Planning tool, Encompass, to conduct a capacity expansion analysis of the different Candidate Portfolios. The capacity expansion analysis optimizes AES Indiana's generation portfolio to meet the MISO Planning Reserve Margin Requirement with a least cost mix of resources. Once completed, each of the Candidate Portfolios included an optimized least cost mix of resources to meet MISO planning reserve margin requirements.

Second, AES Indiana ran the optimized Candidate Portfolios through a Production Cost Analysis using the Encompass model. The Production Cost Analysis calculates all cost, revenue, and emission components of a portfolio by analyzing production and market dispatch of the resources in the portfolio against power and fuel price forecasts. The results of the Production Cost Analysis are used to quantify the total portfolio PVRR which is the metric that AES Indiana included on the IRP Scorecard to evaluate affordability.

3. UPDATED IRP ANALYSIS

[11] Anchor Power's Encompass is a Resource Planning model used industry-wide for capacity expansion, production cost modeling, and resource planning optimization. AES Indiana used Encompass to model and evaluate its 2022 IRP.

Q16. Has AES Indiana updated the modeling to determine if the Preferred Resource Portfolio and Short Term Action Plan, which includes additional storage and hybrid resources, remain the least cost strategy and consistent with the results of the 2022 IRP?

A16. Yes.

Q17. Please provide an overview of the Updated IRP analysis.

A17. AES Indiana updated key planning assumptions to contemporary data and to include the impacts of the EPA Greenhouse Gas New Source Performance Standards (GHG Rules) [12] and then replicated the key analyses performed in the 2022 IRP and described above. To elaborate, the Company updated the planning assumptions and reran the capacity expansion analysis which optimized the resource mixes in the Candidate Portfolios.[13] The Company then ran the production cost analysis on these optimized portfolios to calculate the PVRR and compare the cost effectiveness of the strategies. The process described in this Q/A will be referred to as the 2024 IRP Update.[14]

Q18. Please describe the planning assumption updates that AES Indiana included in the 2024 IRP Update.

A18. AES Indiana included the following planning assumption updates in the 2024 IRP Update:

[12] 40 CFR 60, Subpart UUUUb.
[13] Planning assumption updates further described in the Q/A 18.
[14] This updated analysis is similar to the 2024 IRP Update with GHG Rules discussed in my Rebuttal Testimony included in the Petersburg Repowering filing (Cause No. 46022). The difference is that the analysis included in this filing includes updates to AES Indiana's existing generation fleet accreditation to be consistent with the accreditation received from MISO for the 2024/2025 MISO Planning Resource Auction.

1. Fine-tuned conversion and retirement dates – AES Indiana moved the Petersburg Conversion/Repowering from 2025 to 2026 based on the updated conversion schedule. Because there was not a specific conversion plan, in the 2022 IRP, both units were assumed in the IRP to immediately convert at the beginning of 2025. The updated analysis assumes Peterburg Unit 3 will be on outage for conversion for the first half of 2026 and Petersburg Unit 4 will be on outage for the conversion for the second half of 2026, which is consistent with the conversion dates that AES Indiana presented in Cause No. 46022. Additionally, the updated analysis assumes the retirement dates of Petersburg Units 3 and 4 in the "Retirement and Replacement" and "Clean Energy" strategies move from 2026 (Unit 3) and 2028 (Unit 4) to 2027 (Unit 3) and 2029 (Unit 4). This update was made to allow a minimally feasible time to replace these units with other replacement resources.

2. Capital Cost – The 2024 IRP Update includes the best estimate of the cost for the Petersburg Conversion/Repowering.

3. Fixed O&M ("FOM") – AES Indiana updated the estimated Fixed O&M costs over the 20-year planning horizon for each of the "Candidate Portfolios" to account for budgetary and inflationary changes. These costs have increased by approximately 16% over the planning horizon.

4. Variable O&M – AES Indiana updated the estimated Variable O&M costs over the 20-year planning horizon for Petersburg Units 3 and 4 to account for budgetary and inflationary changes. These costs have increased by approximately 42% for coal operation and decreased by approximately 54% for gas.

5. Capital Plan - AES Indiana updated the estimated Capital Plan over the 20-year planning horizon for each of the "Candidate Portfolios" to account for outage schedule and inflationary changes. This reflects the capital expenditures necessary to maintain assets.

6. Gas Prices[15] – AES Indiana updated the natural gas price forecast to Horizon's 2023 Fall Zero Carbon Additions forecast blended with natural gas forward prices for Henry Hub from 2/20/2024.[16] Natural gas prices at the time of the 2022 IRP were at a 15-year high due to the Russia/Ukraine war and European energy crisis. The gas price forecast has since decreased by approximately 11.2% over the planning period.

7. Coal Prices[17] – AES Indiana used actual contracted coal prices through 2025 and applied Horizon Spring 2023 Illinois Basin Fundamental Forecast growth rates over the planning horizon to forecast coal prices. Coal prices have decreased by 12.5% in the updated analysis based on updated coal agreement pricing.

8. On- and Off-peak Power Prices[18] – AES Indiana updated the power price forecast to Horizon's 2023 Fall Zero Carbon Additions forecast blended with forward prices for IN HUB from 2/20/2024.

9. Unit Accreditation[19] – AES Indiana updated the accreditation for all existing and replacement Schedule 53 thermal resources from MISO's UCAP-based accreditation to MISO's new Seasonal Accredited Capacity ("SAC")

[15] See AES Indiana Witness EKM Confidential Workpaper 1 for further details.
[16] The blending methodology is described on pp. 168 - 169 of AES Indiana's 2022 IRP Volume 1.
[17] See AES Indiana Witness EKM Confidential Workpaper 1 for further details.
[18] See AES Indiana Witness EKM Confidential Workpaper 1 for further details.

accreditation. The Company used the SAC accreditation provided by MISO for the 2024/2025 MISO Planning Resource Auction to make these updates. Generally, unit accreditation changes went up with this update.

10. Replacement Resource Costs[20] – AES Indiana updated the Replacement Resource Costs using the same methodology that was used in the 2022 IRP.[21] The Company used results from its 2023 All Source RFP to update the costs for the following replacement resources – solar, wind, solar + storage, storage, CCGT, and Combustion Turbine ("CT"). These costs were originally estimated in the 2022 IRP using the 2022 all source RFP. The RFP-based approach provides a first-year cost estimate for the resources. To forecast how these costs will change over the planning period, AES Indiana applied the trends by resource from Wood Mackenzie, National Renewable Energy Laboratories ("NREL") and Bloomberg New Energy Finance ("BNEF") long term capital cost forecasts to the first-year cost estimates from the 2023 RFP. The Wood Mackenzie, NREL and BNEF data was also updated for this analysis to these vendors' second half 2026 forecasts. Compared to the 2022 IRP, the replacement resource costs changed on average over the period as follows due to the updates from the noted sources:

- Solar decreased 3%
- Wind increased 26%
- Solar + Storage increased 1%
- 4-hr Storage decreased 10%

[19] See AES Indiana Witness EKM Confidential Workpaper 2 for further details.
[20] See AES Indiana Witness EKM Confidential Workpaper 3 for further details.

[21] The methodology to develop the replacement resource capital cost in the IRP is described in detail Section 6.2 Supply Side Resource Options (Capital Costs) starting on p. 95 and Section 9.3 Replacement Resource Capital Cost Sensitivity Analysis starting on p. 261 of AES Indiana's 2022 IRP.

- 6-hr Storage decreased 11%
- CCGT increased 62%
- CT increased 54%

11. Replacement Resource Fixed O&M Costs[22] – In the 2022 IRP, the wind and storage fixed O&M costs were estimated using the average of Wood Mackenzie, NREL and BNEF forecasts for fixed O&M. These forecasts were updated for this analysis to the forecasts from these vendors for the second half 2023. In the 2022 IRP, the first-year fixed O&M costs for solar were estimated using cost estimates from AES Indiana's Hardy Hills Solar Project (Cause Nos. 45493 and 45493 S1). The trends from the average of the Wood Mackenzie, NREL and BNEF fixed O&M cost forecast were applied to the first-year solar fixed cost estimates to create a forecast for the planning period. To reflect inflation and current forecasts, AES Indiana updated the replacement resource fixed O&M costs to the average of the second half of 2026 forecasts from Wood Mackenzie, NREL and BNEF fixed O&M cost forecasts for solar for this analysis. In the 2022 IRP, AES Indiana based the fixed O&M cost estimate for CCGT on the forecasted fixed O&M cost, at the time, for the CCGT at Eagle Valley Generating Station. This forecast was updated for this analysis using the current fixed O&M forecast for Eagle Valley. In the 2022 IRP, AES Indiana based the fixed O&M cost estimate for CT on the forecasted fixed O&M cost, at the time, for the CTs at Harding Street Generating Station. This forecast was updated for this analysis using the average of the forecasts from Wood Mackenzie, NREL and BNEF for CT.[23]

[22] See AES Indiana Witness EKM Confidential Workpaper 3 for further details.
[23] The replacement resource fixed O&M costs included in the IRP are described in detail Section 6.2 Supply Side Resource Options starting on p. 98.

Compared to the 2022 IRP, the fixed O&M costs for replacement resources changed on average over the period as follows due to the updates from the noted sources:

- Solar increased 53%
- Wind decreased 15%
- Solar + Storage increased 53%
- 4-hr Storage increased 43%
- 6-hr Storage increased 43%
- CCGT increased 16%
- CT decreased 18%

12. Load Forecast[24] – AES Indiana updated the load forecast for this analysis to the load forecast that was submitted to MISO for the 2024/2025 Planning Resource Auction ("PRA") held in March 2024. As in the 2022 IRP, this load forecast was developed by AES Indiana's load forecasting partner, Itron. The summer peak loads decreased on average by 6% and the winter peak loads increased on average by 1% in the updated forecast compared to the 2022 IRP forecast. Note that electric vehicle and behind the meter ("BTM") solar forecasts are included separately from the load forecast in the Resource Planning model. The base case versions of the EV and BTM solar forecasts analysis are conservative and still provide a reasonable outlook for these items and therefore were used in the 2024 IRP Update.

13. Seasonal MISO Planning Reserve Margins ("PRM") – AES Indiana updated the seasonal MISO PRMs. Figure 2 below compares the PRMs provided by MISO

[24] See AES Indiana Witness EKM Confidential Workpaper 4 for further details.

during the 2022 IRP to the PRMs updated by MISO for the 2024/2025 MISO PRA and included in the updated analysis.[25]

Figure 2. MISO Zone 6 PRM Comparison

	2022 IRP	2024 IRP Update
Winter	21.4%	27.4%
Spring	26.3%	26.7%
Summer	7.5%	9.0%
Fall	11.8%	14.2%

14. Pike County BESS Project – AES Indiana included the recently approved Pike County BESS Project[26] in this analysis.

15. Seasonal NOx[27] – AES Indiana updated the seasonal NOx forecast to the approximate current NOx price ($3,500/ton) held flat for the planning period. During the 2022 IRP, NOx prices reached unprecedented highs driven by high coal capacity factors across the industry from favorable dark spreads. The trends at that time were largely the result of high power and gas prices resulting from the Russian-Ukrainian war. Power, gas, and, in turn, NOx markets have returned to more typical pre-2022 levels. The Company has captured these trends in this analysis. NOx prices have decreased by 63.8% on average in the 2024 IRP Update.

16. Greenhouse Gas New Source Performance Standards – the Company included the impacts of the final EPA GHG Rules. In the strategy that keeps Petersburg Units

[25] See Section 2.2 Resource Adequacy on p. 41 of the IRP for more detail regarding the PRMs included in the 2022 IRP
[26] See the Commission's Order in Cause No. 45920.
[27] See AES Indiana Witness EKM Confidential Workpaper 1 for further details.

3 and 4 on coal for the planning period, the Company assumed these units would be required to convert to co-fire with 40% natural gas by Jan. 1, 2030, to comply with the GHG NSPS. The co-firing conversion cost was estimated to be about 65% of the cost to convert to 100% natural gas based on Babcock & Wilcox's experience. Adding co-firing would require Petersburg to maintain all existing material handling equipment and a portion of the coal feed and burners. Therefore, there would be little fixed O&M cost benefit. The analysis was also updated to account for the appropriate mix of fuel and variable O&M which assumes co-firing the units with 40% natural gas. The co-fired units were assumed to remain operational through the planning period or through 2042. However, per the EPA GHG NSPS, these units would be required to either retire by 2039 or install CCS by 2032. While these requirements were not captured in the analysis, either of these options would make continuing to operate Petersburg as a partly coal-fired asset less cost effective by adding cost for CCS or the cost for replacement resources upon retirement.

In the strategy that converts Petersburg Units 3 and 4 to operate on natural gas, the units were assumed to operate consistent with the operational parameters of the 2022 IRP included in my Direct Testimony. This approach was taken because this strategy will largely be unaffected operationally by the EPA GHG NSPS because the repowered units are expected to achieve the presumptively approvable emissions limitations for existing natural gas-fired steam generating electric generating units, which are based on routine methods of operation and maintenance. Lastly, the strategies that retire and replace Petersburg Units 3 and 4 with other resources were unaffected by compliance with the

GHG NSPS because both strategies replace the units with wind, solar and storage resources.

Q19. As discussed above, the capacity expansion analysis performed for the 2024 IRP Update optimizes a least cost mix of resources. Please discuss the updated resource mixes compared to the 2022 IRP.

A19. The 2024 IRP Update resource mixes are shown in Figure 3 below.[28] [29] Generally, across all strategies, the model is now picking additional battery energy storage over other resource options when capacity is needed. Figure 3 demonstrates that, after updating to the higher MISO planning reserve margin, AES Indiana now needs additional resources for capacity starting in 2025.[30] The model is picking approximately at least 80 MW of additional BESS to fill this capacity need in every strategy. Also, note that the model is still selecting a 45 MW hybrid solar + storage project in the Preferred Resource Portfolio (Petersburg Repowering) strategy shown in Figure 3. AES Indiana is using its 2023 All-Source RFP and the Crossvine Project to fill this capacity need. Also, the resource mixes for the Both Units Retire Candidate Portfolio and the Clean Energy Candidate Portfolio are now very similar. In aggregate, these strategies add similar volumes of BESS, hybrid and wind resources. They mainly differ in terms of the volume of solar added over this period.

[28] See AES Indiana Witness EKM Workpaper 5 for further details.

[29] Note that Figure 3 presents the resource mixes in terms of their full installed capacity (ICAP); resource mixes have not been adjusted for Seasonal Accredited Capacity value from MISO. The capacity values with winter SAC adjustments will be presented for the Preferred Resource Portfolio later in testimony.

[30] The higher planning reserve margin is discussed in the previous Q/A.

Figure 3. Near-term Resource Mix Comparisons: 2022 IRP vs 2024 IRP Update[31,32]

Resource Additions (MW ICAP)
Period: 2025 - 2029

		Petersburg Repowering	CCGT	Storage	Hybrid	Solar	Wind
	No Early Retirement						
1	2022 IRP			240	45		500
2	2024 IRP Update			340			
	Petersburg Repowering*						
3	2022 IRP	1,052		240	45		500
4	2024 IRP Update	1,052		320	45		
	Both Units Retire						
5	2022 IRP		325	760			600
6	2024 IRP Update			1,260	45	-	550
	Clean Energy Strategy						
7	2022 IRP			980	45	280	900
8	2024 IRP Update			1,280	45	130	450

*Preferred Resource Portfolio

Q20. Please provide the Affordability results based on the 2024 IRP Update.

A20. Figure 4 compares the Affordability results from the 2022 IRP to the Affordability results from the 2024 IRP Update using both a 20-year and 10-year PVRR period. This figure demonstrates that the Petersburg Conversion/Repowering Candidate Portfolio, which is the Preferred Resource Portfolio, remains the reasonable least cost IRP strategy for AES Indiana customers in both 20- and 10-year cases. Focusing on the 20-year PVRR comparison, the Preferred Resource Portfolio (Petersburg Conversion/Repowering Candidate Portfolio) is now lower in PVRR by $458 Million over the planning period compared to the next best strategy.[33]

[31] In Figure 4, the energy storage volumes in both the 2022 IRP and the 2024 IRP Update includes the 200 MW Pike County Energy Storage Project since this project was included in the 2022 IRP Short Term Action Plan. This project was approved by the IURC on February 17, 2024 in Cause No. 45920.

[32] Additionally, the analysis was run with and without the EPA GHG Rules discussed in Q/A18. The resource mixes presented in the Figure 4 did not materially change whether the GHG Rules were included or not in the 2024 IRP Update.

[33] See AES Indiana Witness EKM Confidential Workpaper 6 for further details.

Figure 4. 2024 IRP Update Affordability Results[34]

20-yr PVRR	2022 IRP ($M)	2024 IRP Update ($M)
No Early Retirement (Units Co-fired with 40% NG by 2030 through analysis period)*	$ 9,572	$9,186
Petersburg Conversion to Natural Gas (est. 2026)	$ 9,330	$8,728
Both Petersburg Units Retire (2027 and 2029)	$ 9,618	$ 9,255
Clean Energy Strategy - Both Petersburg Units Retire and Replaced with Wind, Solar and Storage (2027 and 2029)	$ 9,711	$ 9,228

10-yr PVRR	2022 IRP ($M)	2024 IRP Update ($M)
No Early Retirement	$ 5,815	$5,388
Petersburg Conversion to Natural Gas (est. 2026)	$ 5,750	$5,261
Both Petersburg Units Retire (2026/2027 and 2028/2029)	$ 5,914	$5,404
Clean Energy Strategy - Both Petersburg Units Retire and Replaced with Wind, Solar and Storage (2026/2027 and 2028/2029)	$ 6,037	$5,383

Q21. Please provide a comparison of the annual revenue requirements over the planning period of the strategies shown in Figure 5 and explain the results.

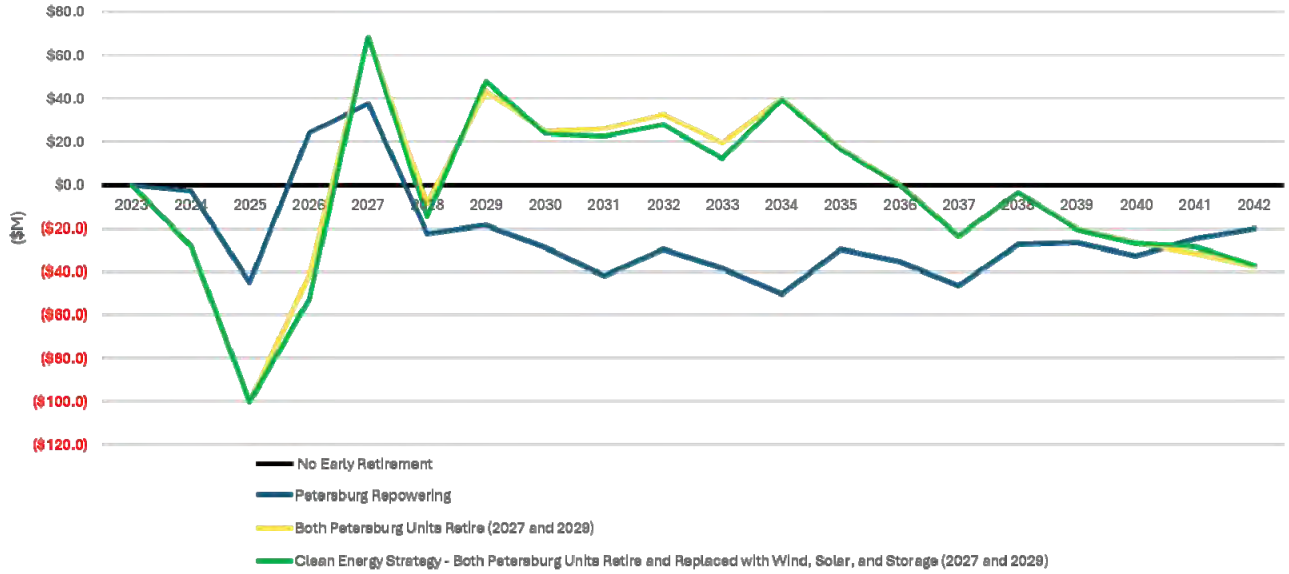
A21. Figures 5 and 6 provide another view of the Affordability pillar. They compare the difference in annual revenue requirement in the Peterburg Repowering, Both Units Retire, and Clean Energy Strategy back to the status quo or keeping the Petersburg Units as coal-fired resources, where the solid black line represents status quo. Figure 5 provides the comparison in nominal dollars and Figure 6 provides the comparison in real dollars. The annual revenue requirement displayed in these figures can be thought of as a general proxy for customer rate impact by year over the planning period. Note that the

[34] In the 2022 IRP, AES Indiana also evaluated a strategy for Petersburg that only retires and replaces one unit (Unit 3). This strategy is inherently not cost effective because when only one unit retires, a portion of the operation costs for ancillary processes from the retired unit are still necessary and remain in the economics. Thus, the strategy that retires one unit is not cost competitive with the other strategies. For this reason, AES Indiana did not review this strategy. Also, AES Indiana did not re-evaluate the Encompass Optimization analysis because the results from this analysis were nearly the same as the Petersburg Conversion strategy.

2022 IRP Preferred Portfolio (Petersburg Conversion/Repowering Preferred Portfolio) is on average approximately $30M lower annually in real dollars than the status quo after the initial cost of converting the units. Witness Stone provides a summary of the Crossvine project's annual revenue requirement in isolation in Q/A 50 of her testimony.

Figure 5. 2024 IRP Update Annual Revenue Requirement Comparison 2023 – 2042 Nominal

Figure 6. 2024 IRP Update Annual Revenue Requirement Comparison 2023 – 2042 Real



Q22. How is Reliability considered in the 2024 IRP Update?

A22. Reliability was assessed based on the Quanta IRP Reliability Analysis. The resource mixes in the Candidate Portfolios did not change significantly with the 2024 IRP Update. Thus, the results of the Quanta IRP Reliability Analysis that was performed for the 2022 IRP are a good approximation for the reliability of the Candidate Portfolios.[35] The Both Units Retire strategy, however, no longer includes a CCGT as replacement for the retiring Petersburg units in the 2024 IRP Update. Instead, the portfolio now includes inverter-based, renewable resources as replacement for the retiring units. This portfolio is now nearly identical to the Clean Energy strategy. Therefore, the 2022 IRP Reliability Analysis results for the Clean Energy strategy provide a better approximate estimate for the Both Units Retire strategy.

As part of the 2022 IRP Reliability Analysis, Quanta also calculated the cost to mitigate the reliability issues in each of the 2022 IRP "candidate portfolios". The results, provided in Figure 7, demonstrate that the portfolios with more invertor-based resources require higher costs to mitigate their reliability issues through the installation of synchronous condensers, BESS and grid forming inverters. These additional costs were not included in the Affordability (20-yr PVRR) results in the 2022 IRP or the 2024 IRP Update, but rather provide a way to further differentiate the portfolios in terms of Reliability performance and the relative cost of the strategies. These mitigation costs can still be applied to the updated 2024 IRP Update portfolios. As described above, the results for the No Early Retirement (shown as $126M), Petersburg Conversion/Repowering (shown as $136M), and the Clean Energy Strategy (shown as

$929M) still approximately apply to these updated portfolios, which did not materially change. The Both Units Retire strategy now aligns with the results from the Clean Energy Strategy (shown as $929M) since these portfolios are now nearly identical. The increased mitigation cost is driven by the inverter-based replacement resources now included in the Both Units Retire strategy. In summary, the Both Units Retire and Clean Energy Candidate Portfolio would have material mitigation costs compared to the 2022 IRP Preferred Resource Portfolio (titled Petersburg Conversion in table below).

Figure 7. Estimated mitigation costs (2022 dollars) for the "Candidate Portfolios" from 2022 IRP Reliability Analysis

	No Early Retirement	Petersburg Conversion to Natural Gas (est. 2025)	Both Petersburg Units Retire (2026 and 2028)	Clean Energy Strategy – Both Petersburg Units Retire and Replaced with Wind, Solar, and Storage (2026 and 2028)
GFM Inverter Premium ($M)	$6	$5	$2	$6
Additional BESS ($M)	$120	$131	$20	$52
Additional Synchronous Condensers ($M)	$0	$0	$135	$871
Estimated Reliability Cost ($M)	$126	$136	$157	$929

Applying the mitigation cost results from the table above to the 2024 IRP Update 20-yr PVRR results in the adjustments shown in Figure 8. The Preferred Resource Portfolio continues to be the Petersburg Conversion/Repowering strategy with a lower PVRR of $448M compared to the next best Candidate Portfolio.

[35] In the 2022 IRP, AES Indiana hired Quanta Technology to perform a Reliability Analysis. See AES Indiana's 2022 IRP, Volume 1, Section 9.4.4 Reliability, Resiliency, and Stability on p. 271.

Figure 8. Estimated mitigation costs (2022 dollars) for the "Candidate Portfolios" from 2022 IRP Reliability Analysis

20-yr PVRR	2022 IRP ($M)	2024 IRP Update ($M)	Mitigation Cost from 2022 IRP Reliability Analysis	2024 IRP Update ($M) with Mitigation Cost
No Early Retirement (Units Co-fired with 40% NG by 2030 through analysis period)*	$ 9,572	$ 9,186	$ 126	$ 9,312
Petersburg Conversion to Natural Gas (est. 2026)	$ 9,330	$ 8,728	$ 136	$ 8,864
Both Petersburg Units Retire (2027 and 2029)	$ 9,618	$ 9,255	$ 929	$ 10,184
Clean Energy Strategy - Both Petersburg Units Retire and Replaced with Wind, Solar and Storage (2027 and 2029)	$ 9,711	$ 9,228	$ 929	$ 10,157

Q23. Please discuss the Sustainability pillar based on the 2024 IRP Update.

A23. Figure 9 below provides the total CO2, NOx, SO2, water use and coal combustion products for each strategy over the planning period based on 2024 IRP Update.[36]

The results demonstrate that the Candidate Portfolio selected as the Preferred Resource Portfolio (Petersburg Repowering/Conversion portfolio) performs the best from an environmental sustainability perspective.

Figure 9 – Updated Production Cost Analysis Environmental Sustainability Results[37]

	CO2	SO2	NOx	Water Use	Coal Ash
	Total portfolio CO2 Emissions (mmtons)	Total portfolio SO2 Emissions (tons)	Total portfolio NOx Emissions (tons)	Water Use (mmgal)	CCP (tons)
No Early Retirement	94.5	54,920	40,137	31.2	5,620
Petersburg Conversion	62.1	14,955	18,175	8.6	1,555
Both Petersburg Units Retire	69.7	27,990	24,874	16.3	2,931
Clean Energy Strategy	69.7	27,990	24,871	16.3	2,931

Q24. Please provide your evaluation of the results detailed above.

A24. The results above demonstrate the Preferred Resource Portfolio selected as part of the 2022 IRP still performs the best overall for customers in terms of affordability, sustainability and reliability, resiliency & stability after making the updating the analysis in the 2024 IRP Update.

[36] See AES Indiana Witness EKM Confidential Workpaper 10 for further details.
[37] See AES Indiana Witness EKM Workpaper 7 for further details.

Q25. Are the other Candidate Portfolios a reasonable alternative to the Preferred Resource Portfolio?

A25. No. I will walk through each of the other Candidate Portfolios and explain why they are not a reasonable alternative.

1. **No Early Retirement** – As demonstrated in the 2024 IRP Update detailed above, the "No Early Retirement" portfolio is more costly for customers and produces more emissions when compared to the Preferred Resource Portfolio. Additionally, as indicated above, the EPA GHG Rules require that coal units operating after January 1, 2032 meet emissions limits based on 40% co-firing with natural gas or full carbon capture and sequestration ("CCS"). The adds significant compliance cost risk to this portfolio.

2. **Both Petersburg Units Retire (2027 & 2029) and "Clean Energy Strategy" (2027 & 2029)** – As demonstrated in the 2024 IRP Update detailed above, these strategies are more costly for customers and produce more emissions when compared to the Preferred Resource Portfolio. Additionally, these strategies would require significant costs for reliability as identified in the 2022 IRP Reliability Analysis. As shown in Figure 7, the bulk of these costs come in the form of synchronous condensers to increase the grid's short circuit strength.

Q26. Based on the 2024 IRP Update results presented above, has the Preferred Resource Portfolio and Short Term Action Plan changed from the 2022 IRP?

A26. The Preferred Resource Portfolio has not changed. The Short Term Action Plan has changed slightly primarily as a result of the increased MISO winter reserve margin. This MISO change increases the volume of resources needed for winter capacity in the Short

Term Action Plan. The Encompass capacity expansion model is selecting battery energy storage resources to fill this capacity need.

Q27. Please explain.

A27. At the time of the 2022 IRP, MISO had indicated a winter planning reserve margin of 21.4%. MISO has since updated this winter planning reserve margin to 27.4% for the 2024/2025 Planning Resource Auction. See Figure 2 above. While MISO has also increased accreditation for AES Indiana's thermal resources, this 6% increase in winter planning reserve margin has resulted in the capacity expansion model to select an additional 80 MW of BESS resources.

Q28. Can you explain how the Crossvine Project aligns with the 2024 IRP Update Preferred Resource Portfolio and Short Term Action Plan?

A28. Yes. Figure 10 below compares the Petersburg Repowering and resource additions identified in the 2024 IRP Update Preferred Resource Portfolio & Short Term Action Plan to the filings for resources made by AES Indiana in the process of executing on the Short Term Action Plan. This comparison is presented in terms of MISO's winter Seasonal Accredited Capacity (SAC)/Unforced Capacity (UCAP) and corresponds to the ICAP values in Row 4 in Figure 3 above. The comparison uses *winter* SAC/UCAP because winter is the constrained season for planning for AES Indiana. In other words, if the Company has planned for sufficient resources in the winter season, then the other seasons will also be sufficiently planned. Also, to simplify the comparison, Figure 10 combines storage and hybrid solar + storage resources because the capacity value from these resources come from only the storage portion of a hybrid solar + storage project in the winter based on MISO accreditation.

Figure 10 shows that after adding the Crossvine Project and the Pike County Storage project (approved in 45920), the Company has a remaining need of 45 MW of capacity from Storage resources.[38] This demonstrates that the Crossvine Project is crucial to filling the capacity need identified in the 2024 IRP Update.

Figure 10. Preferred Resource Portfolio (Petersburg Repowering) Winter SAC/UCAP compared to Resource Additions added by AES Indiana[39]

Preferred Resource Portfolio (Petersburg Repowering) Winter SAC 2025 -2029

	Petersburg Repowering	CCGT	Storage & Hybrid Solar	Solar	Wind	Total
2024 IRP Update - Selected Resources (a)	1,108	-	316	-	-	1,424
Petersburg Repowering (Cause No. 46022 - Pending) (b)	1,108	-	-	-	-	1,108
Pike County Storage (Cause No. 45920 - Approved) (c)	-	-	190	-	-	190
Crossvine Project* (d)	-	-	81	-	-	81
Remaining Selected Resources (a-b-c-d)	-	-	45	-	-	**45**

**Approval for Crossvine Project is being requested in this filing*

Q29. Does the Repowering of Petersburg units 3 & 4 as identified in the Short Term Action Plan change the need for the Crossvine Project?

A29. No. The Crossvine Project is needed regardless of whether Petersburg is repowered or not. As noted above, the Crossvine Project is needed to help fill the winter capacity resource need that has resulted primarily from MISO increasing the winter Planning Reserve Margin. This capacity need occurs in every strategy considered in the 2024 IRP Update and the model picks BESS and hybrid solar + storage resources to fill this need.

4. RFP RANKING ANALYSIS MODELING

Q30. Please briefly describe the RFP evaluation process and the AES Indiana Resource Planning team's responsibilities as it pertains to this process.

[38] The Company is evaluating other projects from the 2023 All Source RFP to fill this needed capacity.

A30. As explained by AES Indiana witnesses Thibodeau and Raney, AES Indiana used a three-phase process to evaluate the proposals received in the RFP.

Phase 1: Initial Screening and Qualitative/Quantitative Assessment.

Phase 2: Detailed Qualitative/Quantitative Evaluation and Selection of Proposals for Contract Negotiations.

Phase 3: Quantitative Evaluation and Pricing Refinement Due Diligence and Contract Negotiation.

For the quantitative evaluation in Phase 2, Concentric Energy Advisors, Inc. ("Concentric") along with AES Indiana's Resource Planning team conducted a Ranking Analysis of the proposals. At a high level, this analysis calculated each individual proposal's impact to AES Indiana's total portfolio PVRR – the lower a proposal's PVRR, the more cost effective the proposal is assumed to be. This metric was used by Concentric and AES Indiana in ranking the proposals.[40]

The Ranking Analysis was completed in two parts:

1) AES Indiana's Resource Planning Team performed a Production Cost analysis for each proposal included in the Phase 2 and Phase 3 evaluation.[41]

2) The outputs from the Production Cost analysis were provided to Concentric and used as inputs into their Ranking Analysis model. Concentric's analysis is described in detail in AES Indiana witness Stone's Direct Testimony.

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[39] See AES Indiana Witness EKM Confidential Workpaper 8 for further details.

[40] Concentric is a management consulting and economic advisory firm focused on the North American energy and water industries. Concentric specializes in regulatory and litigation support, transaction-related financial advisory services, energy market strategies, market assessments, energy commodity contracting and procurement, economic feasibility studies, and capital market analyses and negotiations.

[41] This analysis is described in more detail in the Q/A 33.

Q31. Describe the Production Cost analysis performed by AES Indiana's Resource Planning Team for use in Concentric's Ranking Analysis model.

A31. The Encompass Production Cost model was used to forecast the energy revenues and costs for each proposal included in the Phase 2 and Phase 3 Ranking Analysis. The model forecasts the proposal revenues and costs by dispatching resources using forward energy and fuel price curves as the key drivers to when units operate. A Production Cost analysis was performed for each individual proposal. Outputs from the Production Cost model that became inputs for Concentric's Ranking Analysis model include energy revenue, fuel costs, energy storage charging costs, and energy generation. These outputs make up the energy revenue and operation cost streams used in Concentrics's Ranking Analysis.

Q32. Was the Encompass Production Cost Model the same model used in AES Indiana's 2022 IRP and 2024 IRP Update?

A32. Yes, this is the same model that was used in the 2022 IRP and 2024 IRP Update to determine revenues and costs.[42]

Q33. Did any assumptions in the Production Cost modeling (that the Resource Planning team performed) and the Ranking Analysis (that Concentric performed) change as compared to the analysis for the 2022 IRP and 2024 IRP Update?

A33. Yes. Certain modeling inputs were appropriately updated to reflect known proposal costs and parameters. These updates included the following:

[42] See AES Indiana Attachment EKM-1, AES Indiana's 2022 IRP Volume 1, Section 8.2: Modeling Tools of for more information on the Anchor Power's Encompass model. This was also the model used in the analysis I presented in Cause No. 46022.

1) The estimated resource costs and characteristics were replaced with proposal-specific details. Updates included:

   a. Operating parameters for energy storage proposals and energy and peak forecasts for renewable proposals were updated to proposal assumptions.

   b. Fixed costs were updated to incorporate bid information provided by developers when available.

   c. Energy storage proposals were estimated to receive an additional revenue stream for participating in ancillary service markets. This was captured using a percent increase to the resource's energy revenue based on analysis done by Concentric.

   d. Proposals' generic locational marginal prices ("LMP") were updated with specific LMPs because approximate locations are known to the modelers.

2) The Production Cost modeling period was extended from twenty years to thirty-five years. This update was made to model the full useful life of specific proposals.

3) Capacity was evaluated based on MISO winter capacity accreditation and PRM from the 2024 IRP Update. As discussed above, this was done because MISO increased the PRM requirement for the winter season compared to the PRM used in the 2022 IRP. Both the 2022 IRP and 2024 IRP Update identified a need for additional winter capacity.

4) Generic renewable generation profiles were refined to reflect profiles specific to proposed locations.

5) REC values are assessed in the model using a Wood Mackenzie REC price forecast.

6) Resources were given capacity revenue to recognize the value of firm capacity contribution. See AES Indiana witness Stone Direct Testimony at Q/A 43 for additional detail regarding how capacity revenues were modeled in the Ranking Analysis.

Q34. How do the Ranking Analysis and PVRR calculations performed by Concentric differ from the PVRR calculation performed as part of the 2022 IRP and 2024 IRP Update that you discuss in Section 2 above?

A34. In the PVRR analyses performed for the 2022 IRP and 2024 IRP Update, AES Indiana estimated the total Company portfolio PVRR, which is expressed in millions of dollars. Whereas, in the Ranking Analysis, Concentric calculated the approximate incremental impact to the total Company portfolio PVRR from implementing each individual proposal which is expressed in millions of dollars. It is important to distinguish that the Ranking Analysis is estimating the PVRR impact from an incremental proposal and does not put individual proposals into the total Company portfolio PVRR.[43]

5. CONSISTENCY WITH AES INDIANA'S 2022 IRP AND 2024 IRP UPDATE

Q35. Please briefly describe the Crossvine Project.

A35. As also discussed by AES Indiana witness Raney, the Crossvine Project is a solar and BESS hybrid project located in Dubois County, Indiana. The solar component of the Crossvine Project will have a nameplate capacity of approximately 85 MW and the BESS

[43] See AES Indiana witness Stone Direct Testimony at pg. 5 for further discussion of the distinction between the two analyses.

component will have a storage capacity of approximately 85 MW /4 hours. The Project will contribute approximately 80 MW of UCAP to AES Indiana's winter capacity need as identified in AES Indiana's 2024 IRP Update.

Q36. How do the actual costs for the Crossvine Project compare to the costs for a hybrid solar + storage project included in the 2022 IRP and 2024 IRP Update?

A36. In the 2022 IRP, the Company performed a resource cost sensitivity analysis using three different levels of replacement resource costs – low, base and high.[44] Known in the 2022 IRP as the Replacement Resource Cost Sensitivity Analysis, the analysis was performed as a capacity expansion (retirement and replacement analysis) to see how the portfolio resource mixes and 20-year PVRRs changed at the different cost levels.[45] The analysis results provide AES Indiana with some planning flexibility depending on how resource costs ultimately materialize upon procurement. In the 2024 IRP Update, the Company updated the base capital costs for the resources using Wood Mackenzie, National Renewable Energy Laboratories ("NREL") and Bloomberg New Energy Finance ("BNEF").[46] Figure 11 below provides a comparison of the low, base and high capital costs included in the 2022 IRP Replacement Resource Capital Cost Sensitivity Analysis and the base capital cost included in the 2024 IRP Update to the capital cost for the Crossvine Project. Note that all capital costs presented in this figure are inclusive of the ITC benefit. The Figure demonstrates that the capital cost ($/kW) for the Crossvine Project ($[redacted]) is well within the range of costs ($/kW) considered in the 2022 IRP for

[44] Low costs were based on the average of Wood Mac, BNEF and NREL projections and substantiated by the Company's 2020 RFP results. Base Costs were based on the lower half of the bids received in the 2022 RFP and the High costs were based on the upper half of the bids received in the 2022 RFP.
[45] AES Indiana Attachment EKM-1 AES Indiana Volume 1, pg. 262-265.

hybrid solar + storage ($[redacted]) resources and close to the base capital cost ($/kW) updated in the 2024 IRP Update ($[redacted]).

Figure 11 – 2022 IRP and 2024 IRP Update with GHG Rules Replacement Resource Capital Cost ($/kW) Comparison to the Crossvine Project[47]

[redacted]

Q37. Based on this comparison, does including the Crossvine Project in AES Indiana's generation mix maintain the results of the 2022 IRP and 2024 IRP Update?

A37. Yes. As demonstrated, the cost ($/kW) for a hybrid project included in the 2024 IRP Update is close to the cost ($/kW) of the Crossvine Project. Thus, substituting the actual Crossvine Project cost into the model in place of the estimated hybrid project would give approximately the same PVRR results.

Q38. Aside from ensuring the Crossvine Project is a reasonable, least cost option that remains consistent with the 2022 IRP, please describe other benefits that demonstrate this resource is reasonable.

[46] See Q/A 20 above.
[47] See AES Indiana Witness EKM Confidential Workpaper 9 for further details.

A38. The Crossvine Project provides AES Indiana's customers with clean and sustainable energy that is sourced in Indiana. Further, the addition of solar energy and BESS resources to AES Indiana's portfolio enhances resource diversity. Additionally, solar energy does not increase AES Indiana's fuel price risk. Complementing the solar component of the Crossvine Project, the Project's BESS component can be dispatched with flexibility and provide firm capacity benefits in all seasons. For further discussion of benefits associated with the Project, see AES Indiana witness Garavaglia's Direct Testimony.

6. LEVELIZED COST OF ENERGY ("LCOE")[48]

Q39. Are there other cost metrics that can be used to compare the Crossvine Project to the cost used for hybrid solar + energy storage assumptions in the 2022 IRP and 2024 IRP Update modeling?

A39. Yes and no. A Levelized Cost of Energy ("LCOE") calculation provides a total levelized cost for the resource over the project period on a per MWh basis. As discussed below, this metric does not reflect the value of the storage component and thus has its limitations. That being said, I have provided below a comparison of the cost of the Crossvine Project to the cost of the hybrid solar and energy storage inputs used in the 2022 IRP and 2024 IRP Update modeling through the levelized cost of energy ("LCOE") calculation. Please explain the source methodology for LCOE calculation and inputs.

AES Indiana used NREL's methodology, included in AES Indiana Witness EKM Confidential Workpaper-10, to make the LCOE calculation for the Crossvine Project and the hybrid solar and storage resource in the 2022 IRP and 2024 IRP Update. NREL's

LCOE methodology is commonly used in the industry and thus provides a reasonable approach for cost comparison with important caveats identified below. The NREL calculation includes the following inputs: the capital cost of the project in dollars per installed kW (ICAP) adjusted for the tax equity contribution, AES Indiana's weighted average cost of capital ("WACC"), the expected fixed operation and maintenance costs over the project horizon, the property taxes over the project horizon and the expected generation output (levelized capacity factor) with expected degradation over the project horizon.

Q40. How does the Crossvine Project LCOE compare to the 2022 IRP and 2024 IRP Update hybrid solar + energy storage resource LCOE assumption?

A40. As an initial matter, it is important to note that the Crossvine Project includes a much larger energy storage component (85 MW ICAP) compared to the storage component of the hybrid resource reflected in the 2022 IRP and 2024 IRP Update (25 MW). I discuss this distinction and the need to consider the value of the storage component below. That being said, the Crossvine Project LCOE is higher than the LCOE for the battery energy storage included in the 2022 IRP and 2024 IRP Update. The Crossvine Project LCOE is $[redacted]/MWh compared to the 2022 IRP hybrid solar and storage LCOE of $80.11/MWh and 2024 IRP Update with GHG Rules hybrid solar and storage LCOE of $76.68/MWh.

Q41. Does the solar and energy storage LCOE calculation capture the full value of the energy storage component?

[48] See AES Indiana Witness EKM Confidential Workpaper 10 for further details.

A41. No. The LCOE calculation computes the levelized cost of *energy*. Because energy storage does not produce energy (rather it has to be charged with energy and then discharged onto the system), only the costs for the energy storage component are included in the LCOE calculation and none of the benefits. More specifically, the LCOE calculation does not capture the capacity value benefit of the energy storage component. This deficiency with using the LCOE to compare a hybrid solar + storage systems is evident in the comparison being made above. More specifically, The Crossvine project LCOE, which includes a much larger energy storage component (85 MW ICAP) compared to the storage component of the hybrid resource reflected in the 2022 IRP and 2024 IRP Update (25 MW), captures only the cost for the additional storage and none of the capacity benefits. Thus, while the Crossvine project appears higher compared to the 2022 IRP and 2024 IRP Update, the capacity value of the energy storage component from the project is completely missing from the LCOE calculation. The Capacity Expansion and Production Cost Analysis included in the IRP analyses and the Ranking Analysis performed by Concentric appropriately capture the capacity value of energy storage in a hybrid project in comparing resource options. NREL supports this conclusion in their assessment of using the LCOE calculation for hybrid project comparison:

> "While LCOSS and LCOE provide benchmarks for comparison, they do not necessarily reflect the overall competitiveness of a technology and design within the marketplace. There are other tools, such as capacity expansion models, which provide a more robust assessment of economic viability." [49]

[49] https://www.nrel.gov/news/video/lcoss-text.html

Q42. How can one appropriately compare a solar and energy storage project to other solar and energy, solar only projects or to projects that utilize other resources, e.g., natural gas?

A42. To make this comparison, one must use a metric that captures the full value of the energy storage component of a solar and energy storage project. AES Indiana accomplished this in the Ranking Analysis performed by Concentric and discussed by Witness Stone which uses a present value of revenue requirements (PVRR) calculation to rank proposals. This calculation captures the full costs and benefits associated with each proposal including the capacity benefit of energy storage that is associated with hybrid solar + energy storage projects.

7. CONSIDERATION OF RESOURCE ALTERNATIVES

Q43. Ind. Code § 8-1-8.5-4 provides that in acting upon a petition under this statute, the Commission shall take into account the utility's other resource options. Did AES Indiana consider other resource options?

A43. Yes, that is the purpose of the IRP, a copy of which is included with my testimony as AES Indiana Attachment EKM-1. I elaborate on this in the following Q/As.

Q44. Did AES Indiana consider purchase of power to fill its Short Term Action Plan capacity need in the evaluation of the 2023 All-Source RFP?

A44. Yes. The All-Source RFP explicitly invited the submission of PPA proposals. The evaluation process was deliberate in each of the phases of evaluation to ensure that all proposed contracting structures – PPA and build transfer – were included in the evaluation, including Phase 3. AES Indiana considered both quantitative and qualitative factors of both build transfers and PPAs. Upon review, there were two PPA proposals

that scored lower quantitatively in terms of PVRR than the Crossvine Project; however, these proposals had qualitative challenges that made them not viable. Witnesses Garavaglia[50], Raney[51] and Stone[52] further address these qualitative challenges and the characteristics of ownership versus PPAs.

Q45. Was the purchase of power through the spot energy market considered as an alternative to the proposed Crossvine Project?

A45. Yes. However, since the Crossvine Project is intended to serve primarily as a capacity resource from the energy storage component, there is no advantage to relying on the energy market as an alternative to implementing the asset because the energy market cannot provide the needed capacity value. Regardless, relying on the market for spot energy purchases would expose customers to price volatility without the natural hedge of generation as provided by the solar component of the Crossvine Project. Consequently, relying on the market is typically not an appropriate long-term solution in resource planning.

Q46. Please comment on the "interchange of power" or "pooling of facilities" as these phrases are used in Ind. Code § 8-1-8.5-4.

A46. These statutory references predate the development of MISO and AES Indiana's membership in MISO. The current MISO market is very effective at fully utilizing the existing capacity resources in the region. However, it does not eliminate the need for new capacity resources to address potential load growth and the retirements of older, less

[50] See AES Indiana witness Garavaglia Direct Testimony at Q/A 23.
[51] See AES Indiana witness Raney Direct Testimony at Q/A 19
[52] See AES Indiana witness Miller Direct Testimony at Q/A 18-19.

efficient coal fired units in the region. For example, as identified in MISO's 2024 OMS Survey, MISO anticipates the potential for significant future load growth from data centers, manufacturing, increased cooling demand due to climate change, electric vehicles and cryptocurrency mining.[53] The Crossvine Project is anticipated to add approximately 80 MW UCAP of dispatchable capacity to be available for dispatch on the MISO system as new loads are added.

Q47. Were wind and other solar resources considered as an alternative?

A47. Yes. In its 2022 IRP and 2024 IRP Update, AES Indiana considered other renewable resource options, like wind and solar, as alternatives to battery energy storage or hybrid resources.[54] The Preferred Resource Portfolio identified a mix of these resources to provide capacity and energy under MISO's new seasonal resource adequacy construct.[55] That being said, wind resources are challenged due to limited availability. This was evident in the 2023 RFP with only one wind proposal received through the RFP. Standalone solar resources are also challenged because they receive little to zero capacity value in the winter season which is when AES Indiana needs capacity. The Crossvine Project pairs battery energy storage with solar to capture winter capacity from the storage resource.

Q48. Is AES Indiana's target of DSM savings in 2024-2026 consistent with its 2022 IRP and 2024 IRP Update?

[53] https://cdn.misoenergy.org/20240620%20OMS%20MISO%20Survey%20Results%20Workshop%20Presentation635585.pdf

[54] See AES Indiana Attachment EKM-1, AES Indiana's 2022 IRP (Volume 1) at pp. 90-106, Section 6: Resource Options.

A48. Yes. In its 2022 IRP and 2024 IRP Update, AES Indiana included demand response and energy efficiency as viable generation alternatives. These resources were evaluated on a consistent and comparable basis with supply-side resources per the IURC rule 170 IAC 4-7-8(c)(4). Through this process, the Short Term Action Plan identified an average annual target of roughly 130,000-134,000 net MWh of DSM in 2024-2026.

AES Indiana received approval for a one-year plan in 2024 in Cause No. 45370 which is currently being implemented. Additionally, AES Indiana filed for a two-year DSM plan for programs to be delivered in 2025 - 2026 with the Commission on May 10, 2024 under Cause No. 46081. The Company anticipates receiving approval of the plan by the end of 2024.

Q49. Can DSM eliminate the need for the proposed replacement generation?

A49. No. The volume of energy efficiency and demand response selected in the IRP is not enough to fill the need for generation under the new seasonal resource adequacy construct, particularly in the winter season.

8. FINAL DIRECTOR'S REPORT FOR AES INDIANA 2022 INTEGRATED RESOURCE PLAN

Q50. Have you reviewed the Final Director's Report for AES Indiana's 2022 Integrated Resource Plan?

A50. Yes. The Final Director's Report for AES Indiana's 2022 Integrated Resource Plan was made public on August 26, 2024.

[55] See AES Indiana Attachment EKM-1, AES Indiana's 2022 IRP (Volume 1) at p. 288, Figure 10.1 – Short Term Action Plan Replacement Resource Results from the Base Replacement Resource Capital Cost Sensitivity Analysis

Q51. Can you briefly summarize the Director's overarching comments to AES Indiana's 2022 Integrated Resource Plan?

A51. Yes. The Director's comments were generally positive indicating that:

"The Director agrees with the Joint Commenters that the stakeholder process used by AES Indiana was excellent and sets a high bar for future IRP processes by AES Indiana and other Indiana utilities. Especially important was AES Indiana's commitment to making available modeling inputs, outputs, and supporting data to stakeholders in a timely manner."

Regarding the IRP Scorecard evaluation, the Director stated:

"…AES Indiana provided an excellent discussion of the modeling results and the key takeaways as the modeling progressed. The discussion of the scorecard evaluation results in section 9.4 of the IRP report (IRP pages 265-284) was informative and helped the Director to understand how AES Indiana interpreted and used the different modeling results to inform AES Indiana's selection of the preferred portfolio."

Regarding the evaluation of affordability in the context of resource planning, the Director stated:

"For resource acquisition, determination of affordability requires a comparison of different resource portfolios over a 20-year period over a range of alternative potential futures. The primary methodology is to use net present value revenue requirement to evaluate choices on a comparable basis. … Also, utility IRPs usually include the evaluation of various resource choices with a particular focus on the options for existing coal-fired units. It is in this circumstance that a useful complement to the traditional 20-year NPVRR is to show the annual incremental revenue requirement of a candidate portfolio for each year of the planning period, both in nominal dollars and real dollars."

AES Indiana's 2022 IRP and 2024 IRP Update utilized a 20-year and 10-year PVRR to compare resource candidate portfolios. Additionally, I provided the annual incremental revenue requirement of the Candidate Portfolios for each year of the planning period in both nominal and real dollars in this proceeding to complement the 20-year and 10-year PVRR comparison.[56]

in.
[56] See Q/A 21.

The Director also provided comments and posed questions regarding the load forecast, electric vehicle forecast, and demand side management ("DSM") planning included in the 2022 IRP. The Director also responded to Stakeholder comments to AES Indiana's 2022 IRP in the Report.

9. STATEWIDE ANALYSES

Q52. Has AES Indiana considered the State Utility Forecasting Group ("SUFG") Electricity Projections and the IURC's 2018 Statewide Analysis?

A52. Yes, AES Indiana reviewed the SUFG's most recent Indiana Electricity Projections report from 2023. Generally, AES Indiana's plan to proceed with the Crossvine project aligns with the SUFG's Base projections. As noted on pg. 1-6 of the SUFG 2023 Indiana Electricity Projections Report, the "forecast indicates a need for a mix of natural gas-fired combined cycle units, wind, solar and battery storage capacity."[57] As a hybrid solar and energy storage, the project is in line with SUFG's Base forecast.

AES Indiana also reviewed the IURC's 2018 Statewide Analysis. In general, I would note that with the passage of time, a number of inputs have changed – perhaps most notably in the area of increased load growth projections since 2018. I would also note that the 2018 Statewide Analysis generally aggregates the specific utility's most recent IRPs (2018 Statewide Analysis, at p. 6), which highlights the reasonableness of a utility relying on its own IRP to support a CPCN proposal. Notwithstanding the passage of time and changes in various inputs, the 2018 Statewide Analysis generally supports AES Indiana's

[57] https://www.purdue.edu/discoverypark/sufg/docs/publications/2023%20SUFG%20forecast.pdf

Crossvine Project proposal because the analysis projects the need for significant additional generation in Indiana to maintain reliability.

10. IND. CODE § 8-1-2-0.6 (FIVE PILLARS)

Q53. Has AES Indiana considered Ind. Code § 8-1-2-0.6?

A53. Yes. Indiana Code § 8-1-2-0.6 defines the "Five Pillars" of Utility Electric Service and State Energy Policy as reliability, affordability, resiliency, stability, and environmental sustainability. As discussed in the code – decisions concerning Indiana's electric generation resource mix, energy infrastructure, and electric service ratemaking constructs must consider each of these attributes. This includes Clean Energy Project filings. Additionally, the Commission adopted GAO 2023-04, which encourages utilities to include discussions around the "Five Pillars" in Clean Energy Project filings.

AES Indiana understands the importance of considering the "Five Pillars" in utility electric service and Integrated Resource Planning. As such, in the 2022 IRP, the Company modeled its IRP Scorecard for evaluating Candidate Portfolios on the "Five Pillars" of Utility Electric Service and State Energy Policy.[58] The Scorecard included metrics representing the "Five Pillars" as follows:

1) Reliability, Resiliency and Stability – As discussed above, AES Indiana hired Quanta Technology LLC to perform an in-depth analysis of the Reliability, Resiliency and Stability of the Candidate Portfolios. Composite scores from this

[58] See Q/A 13 for discussion of the Five Pillars and 2022 IRP Scorecard.

analysis were used to evaluate the candidate portfolios. I discuss this issue above.[59]

2) Affordability – The Scorecard evaluated PVRR to measure portfolio cost effectiveness to customers. Consideration of the Affordability Pillar is further shown in my discussion above of the 20-year and 10-year PVRR and the comparison of annual revenue requirements over the planning period in real and nominal dollars presented above. Consideration of this Pillar is also informed by the annual revenue requirement presentation supported by AES Indiana Witness Stone and the bill impact analysis presented by Company Witness Aliff. Company Witness Garavaglia also discusses the Company's consideration of the Affordability Pillar.

3) Sustainability – The Scorecard quantified total CO2, SO2, NOX, Water Use and Coal Combustion Products ("CPP") production by Candidate Portfolio to measure and evaluate environmental impacts of the portfolios. I discuss this subject above.[60]

Additionally, AES Indiana's IRP Scorecard included metrics that measured and evaluated the Risk & Opportunity and Economic Impacts of the Candidate Portfolios.

After careful consideration, AES Indiana found that the Preferred Resource Portfolio performed generally the best across the IRP Scorecard categories and was therefore selected as the reasonable, least cost plan. AES Indiana Attachment EKM-1, Section 9.5: Preferred Resource Portfolio and Final Scorecard of the 2022 IRP Report Volume 1 (pp.

[59] See Q/A 22.
[60] See Q/A 23.

283 – 284) evaluates the Preferred Resource Portfolio against the "Five Pillars" using the IRP Scorecard results.

As discussed earlier in my testimony, in the 2024 IRP Update, AES Indiana updated key assumptions in the 2022 IRP and reran the analysis. The Company has considered the Five Pillars in conducting and evaluating this update and concluded that the Preferred Resource Portfolio has not changed and remains consistent with the results of the 2022 IRP. [61] The update has identified an additional capacity need in the Short Term Action Plan and the Company intends to use the Crossvine Project to partly fill this need.

Q54. Are there other benefits that demonstrate the Crossvine Project is reasonable?

A54. The Crossvine Project will allow AES Indiana to add a dispatchable BESS resource to its portfolio to address the Company's winter capacity need while adding additional solar production for its energy value. As such, the Crossvine Project supports reliability by providing a firm dispatchable capacity resource in all seasons. This conclusion is supported by the findings of AES Indiana's Reliability analysis in the 2022 IRP, where AES Indiana's consultant – Quanta Technology, found that portfolios with higher amounts of firm dispatchable capacity scored higher in terms of reliability in the analysis.[62] The BESS resource associated with the Crossvine Project is forecasted to continue to provide firm dispatchable capacity near or above 90% accreditation in all four seasons of MISO's Seasonal Resource Adequacy Construct contributing to system

[61] See Q/A 20-23.
[62] AES Indiana Attachment EKM-1, AES Indiana 2022 IRP Volume 1, page 272

reliability. Further, the 2022 IRP Reliability Analysis also identified other reliability, resiliency, and stability benefits of battery energy storage. In the analysis, battery energy storage was included as a mitigation measure to achieve greater levels of reliability, resiliency and stability by providing improved frequency response and instantaneous dispatch capability.[63] Another benefit from the Crossvine Project is that it pairs battery technology with solar, facilitating an environmentally sustainable future. All of these characteristics of the Crossvine Project support its reasonableness.

11. CONCLUSION

Q55. Please summarize your recommendation.

A55. In summary, AES Indiana's decision to proceed with the hybrid resource Crossvine Project with 85 MW ICAP of solar resources and 85 ICAP MW/4 hours of BESS resources is a reasonable, least cost option to meet the Company's resource needs, including the need for additional capacity during winter. The Project will contribute to a sustainable and affordable future for AES Indiana customers and provide reliable and dispatchable capacity under MISO's seasonal resource adequacy construct. Therefore, I recommend Commission approval of the Crossvine Project as proposed by AES Indiana.

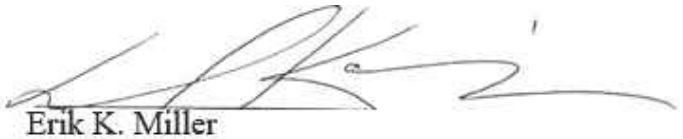
Q56. Does this conclude your verified prepared direct testimony?

A56. Yes.

[63] See AES Indiana Attachment EKM-3, AES Indiana 2022 IRP (Volume 3) – "System Reliability Assessment of AES Indiana's 2022 IRP Portfolios", Table ES-7 at pg. 264. The analysis assumes battery storage can be used to improve frequency response of insufficient portfolios.

VERIFICATION

I, Erik K. Miller, AES Indiana Director, Resource Planning, affirm under penalties of perjury that the foregoing representations are true and correct to the best of my knowledge, information and belief.



Erik K. Miller
Dated August 29, 2024

AES Indiana Attachment EKM-1

[2022 IRP Volume 1– Attached Separately]

AES Indiana Attachment EKM-2

[2022 IRP Volume 2 – Attached Separately in Two Parts]

AES Indiana Attachment EKM-3

[2022 IRP Volume 3– Attached Separately]