STATE OF INDIANA

INDIANA UTILITY REGULATORY COMMISSION

VERIFIED PETITION OF INDIANAPOLIS POWER & LIGHT COMPANY D/B/A AES INDIANA ("AES INDIANA") AND AES PIKE COUNTY ENERGY STORAGE, LLC FOR (1) APPROVAL OF A STAND-ALONE BATTERY ENERGY STORAGE SYSTEM PROJECT AT PETERSBURG STATION ("PIKE COUNTY PROJECT"), INCLUDING A JOINT VENTURE STRUCTURE BETWEEN AN AES INDIANA SUBSIDIARY AND ONE OR MORE TAX EQUITY PARTNERS AND A CAPACITY AGREEMENT AND CONTRACT FOR DIFFERENCES BETWEEN AES INDIANA AND THE AES SUBSIDIARY PROJECT COMPANY THAT HOLDS THE PIKE COUNTY PROJECT, AS A CLEAN ENERGY PROJECT AND ASSOCIATED TIMELY COST RECOVERY UNDER IND. CODE § 8-1-8.8-11; (2) APPROVAL OF ACCOUNTING AND RATEMAKING FOR THE PIKE COUNTY PROJECT, INCLUDING AN ALTERNATIVE REGULATORY PLAN UNDER IND. CODE § 8-1-2.5-6 TO FACILITATE AES INDIANA'S INVESTMENT IN THE PROJECT THROUGH A JOINT VENTURE; (3) 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 AND DECLINING TO EXERCISE JURISDICTION UNDER TO IND. CODE § 8-1-8.5-2; AND (4) TO THE EXTENT NECESSARY, ISSUANCE OF A CERTIFICATE OF PUBLIC CONVENIENCE AND NECESSITY PURSUANT TO IND. CODE § 8-1-8.5-2 FOR THE DEVELOPMENT OF THE PIKE COUNTY PROJECT BY A WHOLLY OWNED AES INDIANA SUBSIDIARY	**)**	**CAUSE NO. 45920**

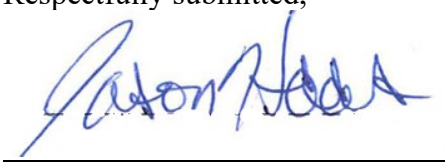
INDIANA OFFICE OF UTILITY CONSUMER COUNSELOR

PUBLIC'S EXHIBIT NO. 2

REDACTED TESTIMONY OF OUCC WITNESS ROOPALI SANKA

SEPTEMBER 15, 2023

Respectfully submitted,



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TESTIMONY OF OUCC WITNESS ROOPALI SANKA
INDIANAPOLIS POWER & LIGHT COMPANY D/B/A AES INDIANA AND AES PIKE COUNTY ENERGY STORAGE, LLC

I. INTRODUCTION

Q: Please state your name and business address.

A: My name is Roopali Sanka, and my business address is 115 West Washington Street, Suite 1500 South, Indianapolis, Indiana 46204.

Q: By whom are you employed and in what capacity?

A: I am employed as a Utility Analyst in the Indiana Office of Utility Consumer Counselor's ("OUCC") Electric Division. A summary of my educational background and experience is included in Appendix A attached to my testimony.

Q: What is the purpose of your testimony?

A: My testimony addresses Indianapolis Power & Light Company d/b/a AES Indiana's ("Petitioner") request for Indiana Utility Regulatory Commission ("Commission") approval of the development and operation of a battery energy storage system ("BESS") ("Pike County Energy Storage Project," "Pike County BESS Project" or "Pike Project"). Specifically, my testimony addresses the operation of the battery system and the Engineering, Procurement, and Construction ("EPC") agreement for the Pike Project's development. If the Commission approves Petitioner's request, I recommend that it require a decommissioning plan for the proposed

facility, proper insurance to protect ratepayers and nearby landowners, regular safety training, and a specific capacity level.

Q: Please describe the review and analysis you conducted to prepare your testimony.

A: I reviewed AES Indiana's verified petition, direct testimony, exhibits, and attachments relative to my testimony. I also reviewed AES Indiana's responses to data requests and participated in two tech-to-tech calls between AES Indiana and the OUCC on Wednesday, August 23, 2023, and Thursday, August 31, 2023.

Q: To the extent you do not address a specific item in your testimony, should it be construed to mean you agree with AES Indiana's proposal?

A: No. The exclusion from my testimony of any topics, issues, or items AES proposes does not indicate my approval of those topics, issues, or items. Rather, the scope of my testimony is limited to the specific items addressed herein.

II. BATTERY ENERGY STORAGE SYSTEM

Q: Please explain what a BESS is.

A: A BESS is a technology that stores electrical energy, taken directly or indirectly from other electric generating facilities, for later use. Batteries can play an important role in modern energy management by addressing some of the challenges associated with renewable energy sources such as solar and wind power, which are intermittent. Generation from these facilities is not always aligned with electricity demand. Batteries can act as a buffer between energy supply and demand, providing flexibility to the grid by storing energy and releasing it when demand is high, or supply is low. A BESS can respond quickly to fluctuations in demand or supply, helping to stabilize the grid and improve its overall reliability. A BESS can provide

services like peak shaving, frequency regulation, and grid balancing.[1] AES Indiana's Pike County Energy Storage Project proposal in this Cause seeks to develop this resource to meet an identified need for capacity. Doing so supports the ability of the system to reliably supply its customers' demand and energy requirements.

Q: How does a battery charge and discharge energy?

A: Batteries charge and discharge energy through a process of chemical reactions within their energy storage cells. During charging, electricity from an external source, such as the grid or renewable sources like solar or wind, is converted into chemical energy and stored in the battery cells. When electricity is needed, the stored chemical energy is converted back into electrical energy and discharged to the grid or the intended load. This bidirectional flow of energy is controlled by power electronics and sophisticated battery management systems, allowing the BESS to respond to grid demands and provide services like grid stabilization, peak shaving, and backup power when needed.[2]

Q: How many charge and discharge cycles can the battery have before significant capacity degradation occurs?

A: The battery's depth of discharge ("DoD") is 80%. Depth of discharge is used to describe the extent to which a battery has been discharged relative to its maximum capacity. It represents the amount of energy that has been taken out of the battery

[1] K.C. Divya, Jacob Østergaard, "Battery energy storage technology for power systems—An overview," Electric Power Systems Research, Volume 79, Issue 4, 2009, ISSN 0378-7796, https://doi.org/10.1016/j.epsr.2008.09.017.

[2] Grid-scale battery storage - National Renewable Energy Laboratory (NREL). (2019, September). https://www.nrel.gov/docs/fy19osti/74426.pdf

compared to its total energy storage capacity. It's recommended to keep the DoD between 20-80% for optimal performance and longevity.[3] AES Indiana designed its system to be able to undergo one charge/discharge cycle per day.[4]A higher depth of discharge typically leads to a more significant change of active particles during cycling which can potentially lead to issues such as stress, cracking, and cell degradation.[5]

Q: Does the BESS have black start capabilities?

A: Yes. Batteries cannot perform a black start on their own. Black starting is the process of restoring power to a completely dead or "black" electrical grid or power system. Batteries are not designed for this purpose because they themselves require a source of power to recharge. A battery can theoretically black start if certain conditions are met which may be implausible: Sufficient battery capacity, suitable state of charge, grid conditions, control systems, backup systems.

Q: **What is battery augmentation?**

A: Battery augmentation refers to the process of improving or enhancing the performance and capacity of an existing battery or energy storage system. This can be achieved through various methods and technologies to extend the lifespan, increase energy storage capacity, or enhance overall battery efficiency. Battery augmentation is often pursued to make existing batteries more competitive, sustainable, or adaptable to changing energy needs, and to address degradation of

[3] Luisa F. Cabeza, Introduction to the Section on Thermodynamics of Energy Storage, Encyclopedia of Energy Storage, Elsevier, 2022, Pages 1-4, https://www.sciencedirect.com/science/article/abs/pii/B9780128197233001578
[4] Attachment RS-2, AES Indiana Response to OUCC DR 2-14.
[5] Attachment RS-2, AES Indiana Response to OUCC DR 2-13.

battery performance over time. To account for battery degradation, AES Indiana designed the Pike Project, including augmentation events, to maintain 200 MW of capacity at 80% depth of discharge.

Q: What do you recommend regarding battery augmentation?

A: To ensure that ratepayers are receiving the greatest benefits throughout the life of the BESS, the OUCC recommends guaranteed battery augmentation to maintain capacity at a minimum of 190 MW x 4 hours for the 20-year term of the contract for differences ("CfD") to maintain reliability and resilience. Additionally, AES Indiana should provide progress reports to the Commission and the OUCC regarding this project and its battery augmentation updates on a regular basis. Battery energy storage systems are a relatively new technology. They have gained prominence due to technological advancements, the need for renewable energy integration, grid modernization efforts, and a growing market. They are still being actively researched for their potential for grid integration, addressing challenges like scalability and grid compatibility to maximize their benefits for a reliable and sustainable energy grid.

Q: How will the capacity accreditation for battery energy storage systems evolve in response to anticipated growth of BESS and changing grid dynamics in the coming years?

A: The As discussed by OUCC Witness John Hanks, the Midcontinent Independent System Operator ("MISO") is considering changes to the capacity accreditation process as more BESS installations come into the market. These changes may reflect the evolving energy landscape, market dynamics, and the need to efficiently integrate this and other battery storage systems into the grid. Some potential

changes that can occur are revised capacity requirements. As more BESS' are added to the grid, MISO may review and adjust its capacity requirements to account for the increased contribution of these resources. Additionally, the resource adequacy assessment may differ as MISO refines resource adequacy to consider the unique characteristics of a BESS, such as response time and discharge duration, when determining accredited capacity value. This could include technical specifications and safety standards. MISO may consider flexibility requirements that allow BESS owners to adjust their capacity commitments based on market conditions, demand forecasts, and other factors. This can optimize the utilization of BESS assets. Interest in MISO's generator interconnection queue suggests that there will be a substantial increase in the installed capacity of storage and hybrid (mainly combining solar and batteries) resources, potentially reaching several gigawatts within the next five years. As the adoption of these technologies continues to grow, forecasting processes may need to account for factors related to charging and discharging for market participants who own storage or hybrid assets. In the end, MISO's markets will need to evolve to fully incorporate the capabilities, expenses, and constraints of these newer energy resources.[6]

III. DECOMMISSIONING

Q: Does the BESS have a decommissioning plan?

A: No. Since the BESS will be constructed on land owned by AES Indiana, the joint venture will not be entering into a decommissioning agreement with any county,

[6] MISO, "Markets of the Future", November 2021, found at: https://cdn.misoenergy.org/MISO%20Markets%20of%20the%20Future604872.pdf.

township, or municipality, according to Petitioner's response to OUCC discovery.[7] Before the joint venture is approved, AES Indiana customers and landowners near the project site need assurances as to how Petitioner will address any cleanup requirements in the case of an emergency or at the end of the project's life.

Q: Is risk of fire at the BESS a concern?

A: Yes. High internal temperatures can lead to a fire within the BESS that can quickly spread to multiple battery cells within the system.[8] Concern about fire in battery storage systems prompted the Indiana Legislature to pass House Enrolled Act ("HEA") 1173 (2023), which requires any BESS to comply with the National Fire Protection Association's standards for energy storage systems and submit an emergency response plan to the local fire department. AES Indiana expects to deliver information in compliance with the requirements of HEA 1173 by Q4 of 2023.[9] To further address this concern, the OUCC recommends AES Indiana conduct BESS safety and fire training not only in the construction phase, as proposed by AES Indiana,[10] but also annually with the local fire department and Pike County Emergency Management for the term of the CfD. In addition, proper insurance coverage must be in place for the protection of the utility, its customers who will pay for the project, and those who own property near the project site. Petitioner should demonstrate that it has obtained necessary insurance for the life

[7] Attachment RS-1, AES Indiana Response to OUCC DR 1-12.
[8] "Energy Storage Systems Safety Fact Sheet," National Fire Protection Association, found at: www nfpa.org/~/media/Files/Code%20or%20topic%20fact%20sheets/ESSFactSheet.pdf .
[9] Attachment RS-1, AES Indiana Response to OUCC DR 1-14.
[10] Attachment RS-1, AES Indiana Response to OUCC DR 1-14.

of the CfD that will pay for the replacement of the battery to its initial capacity and clean-up in the event of a thermal accident.

Q: Who will be responsible for decommissioning the BESS or cleaning up the site in case of a fire or other emergency?

A: Based off the discussion between OUCC and AES Indiana Technical Staff on August 31, 2023, for the life of the joint venture, financial responsibility for closure and cleanup of the BESS will be divided between AES Indiana and the Tax Equity Partner ("TEP") according to the percentage of ownership that will be agreed to in the final CfD.[11] Based on discussions with AES Indiana in our tech to tech call on August 31, 2023, if the TEP sells its portion of the BESS to AES Indiana, then AES Indiana, and by extension its ratepayers, will take on all financial responsibility for decommissioning of the BESS.[12] Given the CfD is still in draft form and a TEP has not been chosen, the final agreement on decommissioning and cleanup costs may change.

Q: Does the lack of a decommissioning plan expose ratepayers to unnecessary risk?

A: Yes. Without a decommissioning plan in place and/or final language laying out how cleanup and closure costs will be addressed by the joint venture, the BESS could become a major environmental liability in case of a disaster or final decommissioning of the BESS for the period when the Pike Project is owned by the joint venture and before it is put into rate base. Without a plan in place, financial

[11] Technical Meeting between AES Indiana and OUCC, August 31, 2023.
[12] Technical Meeting between AES Indiana and OUCC, August 31, 2023.

liability for cleanup will not be properly addressed until after AES Indiana has fully acquired the BESS and placed it in rate base.

Q: What is your recommendation regarding decommissioning?

A: The final CfD should include a decommissioning plan with supporting financial instruments and calculate a portion of the salvage value in depreciation. This ensures proper environmental and financial planning in case of disaster or closure of the BESS before AES Indiana assumes full ownership. Without a decommissioning plan in place by the joint venture there will be a gap in proper environmental and financial planning for closure and cleanup of the BESS between the beginning of operation and the point when AES Indiana has fully acquired the BESS and placed it in rate base.

IV. ENGINEERING, PROCUREMENT, AND CONSTRUCTION CONTRACT

Q: Please provide a summary of the terms present in the EPC contract.

A: In accordance with the EPC agreement, the contractor will oversee all activities related to EPC for the Pike Project. This will be done in accordance with a predefined scope of work and minimum specifications. The contractor will also establish the required contracts for equipment supply and construction, ensuring they align with these specifications and, in some cases, predetermined contractual templates. AES Indiana's payment for construction expenses will be made as construction progresses and reaches specified milestones under the EPC agreement. The contractor will pay liquidated damages for [redacted]. The EPC

contract permits phased commissioning by block to effectively handle schedule-related risks.[13]

V. RECOMMENDATIONS

Q: **How would you summarize the risks, benefits, and costs of a BESS?**

A: A BESS is highly efficient, but it does lose some of the energy used to charge it. Degradation occurs but regular augmentation can reduce those concerns. Proper enclosure design and temperature monitoring can greatly reduce the probability of a thermal event and adding training and first responder awareness will limit safety risks. A well-managed BESS can be low-risk. But as OUCC witnesses Brittany Baker and John Hanks state, it is a significant added cost to the energy injected to the grid for four hours a day. However, without this energy, the reliability benefits of dispatchable capacity would be unavailable. These risks are somewhat offset by reliability benefits that are critically needed by Indiana's growing intermittent, invertor based renewable generation resources. The engineering challenge is to design, operate and maintain a BESS that provides adequate reliability at an affordable cost. This is achieved in this stand-alone application provided the OUCC's recommendations are met.

Q: What are your recommendations to the Commission.

A: Battery storage will play an important role in improving grid reliability and resilience. Given the newness of this proposal, however, the OUCC recommends the Commission include a number of consumer safeguards in its order. The OUCC

[13] AES Indiana Confidential Attachment GAC-1, EPC at Section 5.1

recommends augmentation be required to maintain capacity at a minimum of 190 MW x 4 hours for the term of the contract for differences ("CfD") and reported on a periodic basis. The OUCC also recommends the final CfD include language holding the TEP responsible for a portion of the final decommissioning costs and cleanup costs equal to the share of ownership in the BESS held by the TEP, in case of emergency. Also, the TEP's portion of the decommissioning costs should be deducted from the final agreed sale price if AES Indiana acquires the TEP interest in the project. To address the safety risk of the BESS, the OUCC recommends AES Indiana conduct a BESS safety and fire training annually , in addition to the initial training, for the term of the CfD. Finally, the OUCC recommends evidence of insurance be required that will pay for the replacement of the battery to its initial capacity and clean-up for the life of the CfD in the event of a thermal accident.

Q: Does this conclude your testimony?

A: Yes.

APPENDIX TO TESTIMONY OF

OUCC WITNESS ROOPALI SANKA

Q: Please describe your educational background and experience.

A: I hold a bachelor's degree in Energy Engineering from Indiana University Purdue University of Indianapolis. In August 2022, I began my employment with the OUCC as a Utility Analyst II in the electric division and work on demand side management ("DSM"); evaluation, measurement, & verification ("EM&V"); certificates of public convenience and necessity ("CPCN"). Additionally, I attended Scott Hempling's 'Fundamentals of Utility Law' course in the first quarter of 2023, and I attended the 2022 Indiana Energy Conference in October 2022, which focused on the current and future challenges facing the energy market.

Q: Have you previously testified before the Indiana Utility Regulatory Commission?

A: Yes.

Indianapolis Power & Light Company
d/b/a AES Indiana
Cause No. 45920
AES Indiana Responses to OUCC DR Set 1

Data Request OUCC DR 1 - Q12

Does the BESS project have a decommissioning agreement with the local county, township, or municipal authority? If so, please provide the agreement. If not, please explain.

Objection:

Response:
The BESS project does not have a decommissioning agreement with the local county, township, or municipal authority, because such agreement is not required. The BESS project is located on land owned by and leased from AES Indiana.

Data Request OUCC DR 1 - Q14

Does the project have an emergency plan in place with the local fire department in case of fire at the battery project?

a. What is the Fire Department's name and Emergency Medical provider's name for the location of the BESS?

b. Are the Fire Departments and Emergency Medical Providers in the foregoing question trained to respond to accidents, fires or other safety events related to utility scale battery energy storage systems? If not, when will that training occur and who will perform the training?

Objection:

Response:

The project will comply with House Enrolled Act ("HEA") 1173, issued in May 2023. This regulation provides that a person may not: (1) construct a new utility scale battery energy storage system (BESS); or (2) expand the capacity of an existing BESS by more than 10% of the system's original capacity; without the prior approval of the department of homeland security (department). The systems that are subject to the regulation must comply with the National Fire Protection Association's standard concerning stationary energy storage systems (NFPA 855). HEA 1173 requires the operator of a BESS to: (1) provide a copy of the operator's emergency response plan for the BESS; and (2) offer training to enable effective response to a fire or contaminant discharge at the BESS; to the fire department responsible for providing fire protection services in the area in which the BESS is located.

The project expects to deliver information to the department Q4 2023. The department will be the entity in charge of reviewing and approving the permitting application and the emergency plan.

a. Petersburg Fire Department located in the address: 624 E Illinois Street, Petersburg, IN 47567. The closest emergency medical center is: Deaconess Medical Clinic, 1004 E Illinois Street, Petersburg, IN. The closest hospital is: Daviess Community Hospital. 10.3 miles away. 1314 E Walnut Street Washington, IN 47501.
b. Training will be provided. Under the EPC Contract (on Exhibit D1, the Contractor will be responsible to provide with all required actions (including training). This training is expected to be provided during the construction stage and before starting commissioning activities (Q2-2024).

Data Request OUCC DR 2 - 13

What is the minimum discharging rate the battery can handle?

a. How does the performance change at different rates of charge and discharge?

b. How is the battery system cooled and how is temperature regulation maintained during operation?

c. What is the battery's depth of discharge?

Objection:

Response:

a. Higher Depth of Discharge generally results in a larger volume change of active particles during cycling, which may result in stress, cracking and cell degradation. The final performance and degradation will be a combination of the amount of cycles and the depth of discharge for each year. As an indicative view, Figure 1 in OUCC DR 2-13, Confidential Attachment 1 provides a view on the expected amount of cycles for a CATL battery as a result of the depth of discharge for a project.

b. Battery degradation is a function of battery temperature and Performance Guarantee. In general batteries use a mix of Ethylene Glycol/Water 50/20% as coolant. Temperature must average below 18°C to avoid warranty penalties. If battery cell temperatures exceed 56°C, the Cube's internal battery management system ("BMS") will curtail dispatch. Therefore, cooling system must maintain battery cell temperatures below 56°C.

   The cooling and heating system comprises one chiller + one HVAC unit (LD cube) or two chiller and two HVAC units (SD cube). Functions performed are: - Control temperature inside the Cube: HVAC unit(s) - Control air humidity inside the Cube: HVAC unit(s) - cooling and heating to the battery strings: Chiller unit(s) Note on Chiller functionality and embedded protection: The chiller units have rated cooling capacity of 7.5 kW for water at 15°C against external ambient temperature of 35°C. This cooling capacity is increased for higher water temperatures and decreased for higher external ambient temperatures. All operational curves are accounted for in Fluence's Thermal Model.

c. As modelled in the PVRR Analysis, the average depth of discharge is 80%.

Data Request OUCC DR 2 - 14

How many charge and discharge cycles can the battery endure before significant capacity degradation occurs?

Objection:
AES Indiana objects to the Request on the grounds and to the extent it is vague and ambiguous, particularly with respect to the phrase "significant." AES Indiana objects to the Request on the grounds and to the extent the Request solicits information that is confidential, proprietary, competitively sensitive and/or trade secret. Subject to and without waiver of the foregoing objections, AES Indiana provides the following response with the confidential information provided pursuant to the nondisclosure agreement between the parties.

Response:

It depends on how the system is operated. AES Indiana's system is designed to undergo one charge/discharge cycle per day. Based on this assumption, please see OUCC DR 2-5, Confidential Attachment 2 for degradation levels of the BESS if no augmentation events occurred.

Data Request OUCC DR 2 - 16

How does AES Indiana plan on adapting and accounting for the capacity accreditation for battery energy storage systems in the future as more BESS come online?

Objection:

Response:

AES Indiana will continue to monitor MISO capacity accreditation plans and methodological changes to BESS and other resources through direct engagement with MISO and MISO's working groups. At this time, MISO has not indicated changes that would cause a significant decrease to the accreditation for BESS.

AFFIRMATION

I affirm, under the penalties for perjury, that the foregoing representations are true.

Roopali Sanka
Utility Analyst
Indiana Office of Utility Consumer Counselor

Cause No. 45920
AES Indiana

September 15, 2023
Date

CERTIFICATE OF SERVICE

This is to certify that a copy of the ***Indiana Office of Utility Consumer Counselor's Redacted Testimony Filing of Roopal Sanka*** has been served upon the following counsel of record in the captioned proceeding by electronic service on September 15, 2023.

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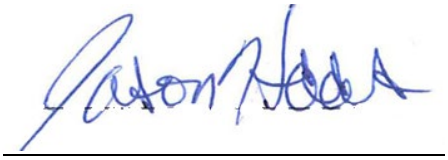

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