

**GOVERNMENT OF PUERTO RICO  
PUBLIC SERVICE REGULATORY BOARD  
PUERTO RICO ENERGY BUREAU**

**NEPR**

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IN RE:

REVIEW OF THE PUERTO RICO ELECTRIC  
POWER AUTHORITY INTEGRATED  
RESOURCE PLAN

CASE NO.:

CEPR-AP-2018-0001

**AES-PR'S MOTION SUBMITTING PRE-FILED SUPPLEMENTAL TESTIMONY**

TO THE HONORABLE PUERTO RICO ENERGY BUREAU:

AES-PUERTO RICO ("AES-PR"), by and through the undersigned attorneys, respectfully submits the following Pre-Filed Supplemental Testimony. Pursuant to the Puerto Rico Energy Bureau Resolutions in this case, AES-PR reserves its right to file substantive and legal arguments, based on information presented during discovery and the evidentiary hearings, at the Final Brief filing. AES-PR submits with this motion a duly attested Pre-filed Supplemental Testimony from Ronald Moe.

**CERTIFICATE OF SERVICE**

We certify that this Motion Submitting Pre-filed Testimony was sent to the Puerto Rico Energy Bureau through its electronic filing tool at <https://radicacion.energia.pr.gov> and through [wcordero@energia.pr.gov](mailto:wcordero@energia.pr.gov), [secretaria@energia.pr.gov](mailto:secretaria@energia.pr.gov); [legal@energia.pr.gov](mailto:legal@energia.pr.gov); [sugarte@energia.pr.gov](mailto:sugarte@energia.pr.gov) and [viacaron@energia.pr.gov](mailto:viacaron@energia.pr.gov), and to the Puerto Rico Electric Power Authority through the following email addresses: Katuska Bolaños ([kbolanos@diazvaz.law](mailto:kbolanos@diazvaz.law)); Nitza D. Vázquez Rodríguez ([n-vazquez@aepr.com](mailto:n-vazquez@aepr.com)); Carlos M. Aquino Ramos ([c-aquino@prepa.com](mailto:c-aquino@prepa.com)); Astrid I. Rodríguez Cruz ([astrid.rodriguez@prepa.com](mailto:astrid.rodriguez@prepa.com)); Jorge R. Ruiz Pabón ([jorge.ruiz@prepa.com](mailto:jorge.ruiz@prepa.com)), and Maralíz Vázquez ([mvazquez@diazvaz.law](mailto:mvazquez@diazvaz.law)). We also certify that on this date we sent a copy of this document to: [rtorbert@rmi.org](mailto:rtorbert@rmi.org); [victorluisgonzalez@yahoo.com](mailto:victorluisgonzalez@yahoo.com); [corey.brady@weil.com](mailto:corey.brady@weil.com); [presidente@ciapr.org](mailto:presidente@ciapr.org); [secretaria@energia.pr.gov](mailto:secretaria@energia.pr.gov); [csanchez@energia.pr.gov](mailto:csanchez@energia.pr.gov); [ireyes@energia.pr.gov](mailto:ireyes@energia.pr.gov); [asanz@energia.pr.gov](mailto:asanz@energia.pr.gov); [bmulero@energia.pr.gov](mailto:bmulero@energia.pr.gov); [nnunez@energia.pr.gov](mailto:nnunez@energia.pr.gov); [gmaldonado@energia.pr.gov](mailto:gmaldonado@energia.pr.gov); [sierra@arctas.com](mailto:sierra@arctas.com); [tonytorres2366@gmail.com](mailto:tonytorres2366@gmail.com); [cfl@mcvpr.com](mailto:cfl@mcvpr.com); [gmr@mcv.com](mailto:gmr@mcv.com); [info@liga.coop](mailto:info@liga.coop); [amaneser2020@gmail.com](mailto:amaneser2020@gmail.com); [hrivera@oipc.pr.gov](mailto:hrivera@oipc.pr.gov);

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In San Juan, Puerto Rico, on December 11, 2019.

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1 **COMMONWEALTH OF PUERTO RICO**  
2 **PUBLIC SERVICE REGULATORY BOARD**  
3 **PUERTO RICO ENERGY BUREAU**

IN RE:

Case No.: CEPR-AP-2018-0001

REVIEW OF THE PUERTO RICO  
ELECTRIC POWER AUTHORITY  
INTEGRATED RESOURCE PLAN

**SUBJECT:** PRE-FILED SUPPLEMENTAL  
TESTIMONY OF AES PUERTO RICO, L.P.

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5 **PRE-FILED SUPPLEMENTAL TESTIMONY OF RONALD MOE FOR**  
6 **INTERVENOR AES PUERTO RICO, L.P.**

7 **I. INTRODUCTION**

8 **A. Witness Identification**

9 **Q. Please state your name, title, employer, and business address.**

10 A. My name is Ronald Moe. I am a Vice President at Leidos Engineering, LLC. My  
11 business address is 1417 Fourth Avenue, Suite 300, Seattle, WA 98101.

12 **Q. On whose behalf are you testifying before the Puerto Rico Energy Bureau**  
13 **(the “Energy Bureau” or “PREB) in this proceeding?**

14 A. I am testifying on behalf of AES Puerto Rico LP (“AES-PR”).

15 **B. Purpose of Testimony**

16 **Q. What are the purposes and subjects of your supplemental testimony?**

17 A. I have reviewed three sets of responses to Requirements of Information (“ROIs”)  
18 regarding the *Puerto Rico Integrated Resource Plan 2018-2019* (“PREPA IRP”)<sup>1</sup> that Siemens  
19 Power Technologies International (“Siemens”) prepared for and at the direction of the Puerto

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<sup>1</sup> *Puerto Rico Integrated Resource Plan*, Siemens PTI Report Number: RPT-015-19, submitted by Siemens Industry, Prepared for Puerto Rico Electric Power Authority, PREPA Ex. 1.0, Draft for the Review of the Puerto Rico Energy Bureau, Rev.[2.1] 6/7/19 Corr., June 19, 2019.

1 Rico Electric Power Authority (“PREPA”) and provided to intervenors after October 23, 2019,  
2 the date I submitted my direct testimony in this case. This supplemental testimony summarizes  
3 the results of my review.

4 **Q. What are the specific ROI responses that you are addressing in your**  
5 **supplemental testimony?**

6 A. There are three:

7 1. PREPA/Siemens’ response to AES-PR’s Requirements of Information  
8 (“ROI”) 1-1, which considers PREPA’s options if the AES-PR coal plant is forced to  
9 retire at the end of 2020, instead of continuing to operate through November 2027 as  
10 specified in the Power Purchase and Operating Agreement (“PPOA”) between PREPA  
11 and AES-PR and as assumed in the PREPA IRP.<sup>2</sup>

12 2. PREPA/Siemens’ response to AES-PR’s ROI 1-2, which considers the  
13 option of extending the PPOA beyond 2027 to burn natural gas at the plant.<sup>3</sup>

14 3. PREPA/Siemens’ response to PREB ROI 09-01, which considers forecasts  
15 of customer energy efficiency savings that are materially lower than in the cases  
16 PREPA/Siemens analyzed for the PREPA IRP.<sup>4</sup>

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<sup>2</sup> AES-PR ROI: *In re: Review of the Puerto Rico Electric Power Authority Integrated Resource Plan*, Case No. CEPR-AP-2018-001, Requirements of Information, Oct. 2, 2019. PREPA Response: *In re: Review of the Puerto Rico Electric Power Authority Integrated Resource Plan*, Case No. CEPR-AP-2018-001, The Puerto Rico Electric Authority Responses to AES-Puerto Rico, LP Requirements of Information, provided to AES-PR as Word document *AP-2018-0001 AES-Puerto Rico ROI Set 1 12-0502019\_v1\_final.docx* on Dec. 9, 2019. The latter file is provided as Exhibit 1.

<sup>3</sup> Same sources as listed in Footnote 2.

<sup>4</sup> PREB ROI: *In re: Review of the Puerto Rico Electric Power Authority Integrated Resource Plan*, Case No. CEPR-AP-2018-001, 9<sup>th</sup> Requirements of Information to PREPA, Oct. 29, 2019. PREPA Response: *In re: Review of the Puerto Rico Electric Power Authority Integrated Resource Plan*, Case No. CEPR-AP-2018-001 The Puerto Rico Electric Authority Additional Responses to the Puerto Rico Energy Bureau Ninth Requirement of Information, Dec. 6, 2019.

1       **Q.     In brief, what conclusions did you derive from these ROI responses?**

2       A.     I have four principal conclusions:

- 3       1.     Forcing the retirement of the AES-PR coal plant at the end of 2020 will increase  
4             the net present value (“NPV”) of PREPA’s costs over the 2019-2038 period by  
5             \$938 million in the cases PREPA/Siemens analyzed utilizing the load forecast  
6             from the PREPA IRP. In addition, in the cases utilizing the Low Energy  
7             Efficiency (“Low EE”) load forecast specified in PREB ROI 09-01, early  
8             retirement of the plant will increase PREPA’s costs by \$755 million.
- 9       2.     If the AES-PR coal plant is forced to retire at the end of 2020, the NPV of costs to  
10            PREPA over the 2019-2038 period of having AES-PR convert the plant to burn  
11            natural gas beginning in 2023 is approximately the same (slightly less expensive,  
12            but likely within the relevant error bounds) as the cost of the least costly of the  
13            alternatives PREPA/Siemens considered for replacing the capacity and energy the  
14            AES-PR coal plant provides. Moreover, replacing the AES-PR coal plant with an  
15            AES-PR gas plant likely has lower execution risk than the alternatives  
16            PREPA/Siemens considered.
- 17       3.     If the AES-PR coal plant continues to operate through the end of November 2027,  
18            the NPV of costs to PREPA over the 2019-2038 period of extending the PPOA to  
19            operate on natural gas beyond 2027 is approximately the same (slightly more  
20            expensive, but likely within the relevant error bounds) as the cost of the least  
21            costly of the alternatives PREPA/Siemens considered for replacing the capacity  
22            and energy the AES-PR coal plant provides. Fine tuning by AES-PR and  
23            PREPA/Siemens of the assumptions about the AES-PR gas-fired plant that

1 PREPA/Siemens modeled would likely lead to selection of the modified AES-PR  
2 plant as an element of the least-cost plan. Moreover, even if extension of the  
3 AES-PR PPOA is not an element of a least-cost plan, it would likely be an  
4 element of one or more backup plans to be deployed if available capital, energy  
5 efficiency savings, or renewable capacity additions fall short of the amounts  
6 reflected in the least-cost plans.

- 7 4. The responses to PREB ROI 09-01 affect the critique of the PREPA IRP that I  
8 provided in my Direct Testimony<sup>5</sup> in only one way: they strengthen the concern I  
9 stated in my Direct Testimony that the preferred plan(s) may not be achievable.  
10 In particular, I expressed concern about the amount of capital required in the cases  
11 summarized in the PREPA IRP. The amounts of capital required in the new  
12 cases, however, are materially higher than in the cases summarized in the PREPA  
13 IRP.

14 **Q. How do the ROI responses affect the recommendations you made in your**  
15 **Direct Testimony?**

16 A. First, I have three new recommendations:

- 17 1. PREPA/Siemens' responses to AES ROI 1-1 clearly demonstrate that the AES-PR  
18 coal plant should not be forced to retire early.  
19 2. If my first recommendation is not followed, and the AES-PR coal plant is forced  
20 to retire prior to November 2027, PREPA/Siemens' responses to AES ROI 1-1  
21 clearly demonstrate that PREPA should work with AES-PR to amend the PPOA

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<sup>5</sup> *In re: Review of the Puerto Rico Electric Power Authority Integrated Resource Plan*, Case No. CEPR-AP-2018-001, Pre-Filed Direct Testimony of Ronald Moe for Intervenor AES Puerto Rico, L.P., Oct. 23, 2019.

1 to operate the AES-PR plant on natural gas as soon as possible after the coal plant  
2 shutdown.

- 3 3. PREPA/Siemens' responses to AES ROI 1-2 clearly demonstrate that PREPA  
4 should strongly consider extending the AES-PR PPOA beyond November 2027 to  
5 operate the AES-PR plant on natural gas.

6 Second, PREPA/Siemens fulfilled several of my recommendations to execute additional  
7 cases in their responses to the various ROIs.<sup>6</sup>

8 Third, the ROI responses either do not affect or materially strengthen the remaining  
9 recommendations in my Direct Testimony.<sup>7</sup> Specifically, I continue to recommend:

- 10 1. The Energy Bureau should approve the PREPA IRP filed on June 19, 2019  
11 subject to modification to address specific shortcomings described in my Direct  
12 Testimony<sup>8</sup> that can be completed without affecting the overall schedule PREB  
13 has established for the PREPA IRP.
- 14 2. The Energy Bureau should only approve PREPA requests to advance  
15 development of new fossil-fired generation and to implement the MiniGrid  
16 proposal until after PREPA/Siemens corrects the specific shortcomings described  
17 in my Direct Testimony<sup>9</sup> that would take more time to address.
- 18 3. The Energy Bureau should direct PREPA/Siemens to revise the Siemens Report  
19 to more accurately reflect the PREPA/Siemens analytic findings in the manner

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<sup>6</sup> For example, one of my recommendations was to execute a sensitivity case with lower assumed energy efficiency savings. PREB ROI 09-01 and PREPA/Siemens' response to it fulfill this recommendation.

<sup>7</sup> *Direct Testimony*, pp. 4, 6.

<sup>8</sup> *Direct Testimony*, pp. 2-4.

<sup>9</sup> *Direct Testimony*, pp. 2-3.

1 indicated in my Direct Testimony,<sup>10</sup> and not take action on the Siemens Report  
2 until this revision has been completed.

3 **Q. Can you discuss each of the ROI responses you considered?**

4 A. Yes.

5 **II. AES-PR ROI 1-1**

6 **Q. What is AES-PR ROI 1-1, and what is its purpose?**

7 A. AES-PR ROI 1-1 asked PREPA to evaluate the cost to PREPA and Puerto Rico  
8 consumers of retiring the AES-PR coal-fired plant in 2020. In my Direct Testimony,<sup>11</sup> I  
9 discussed *The AES Coal Plant Conversion Assessment* (“Siemens Report”)<sup>12</sup> that Siemens  
10 prepared for and at the direction of PREPA and outlined a number of deficiencies of the Siemens  
11 Report.<sup>13</sup> AES-PR ROI 1-1 requests PREPA/Siemens to execute four cases to address several of  
12 these deficiencies. Table 1 below describes the four requested cases:  
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<sup>10</sup> *Direct Testimony*, pp. 4-5.

<sup>11</sup> *Direct Testimony*, pp. 34-37.

<sup>12</sup> *In re: Review of the Puerto Rico Electric Power Authority Integrated Resource Plan*, Case No. CEPR-AP-2018-001, Submittal of Redacted AES Coal Plant Conversion Assessment, Aug. 23, 2019.

<sup>13</sup> *Direct Testimony*, pp. 37-43.



**Table 1**  
**Description of Four Cases Requested in AES-PR ROI 1-1**

	<b>1A</b>	<b>1B</b>	<b>1C</b>	<b>1D</b>
<b>Load forecast</b>	S4S2B ("High EE")	S4S2B ("High EE")	S4S2 Low EE	S4S2 Low EE
<b>AES-PR coal retirement</b>	Nov-20	Nov-20	Nov-20	Nov-20
<b>AES-PR gas plant start</b>	Jan-23	None	Jan-23	None
<b>Other assumptions</b>	Same as S4S2B	Same as S4S2B	Same as S4S2 Low EE	Same as S4S2 Low EE
<b>Simulated solar/battery capacity additions</b>	Same as S4S2B	Same as S4S2B	Same as S4S2 Low EE	Same as S4S2 Low EE

In all four cases the AES-PR coal plant was retired at the end of 2020. In two of the cases (1A and 1C) a 585-MW natural gas-fired AES-PR combined cycle plant was forced into the model at the beginning of 2023; in the other two cases the AES-PR gas-fired plant was precluded. In addition, no incremental solar and battery storage capacity over and above what was in the relevant base case was allowed. In the interest of time and to mitigate the burden on PREPA/Siemens, AES-PR requested:

- Only two pairs of additional cases, one pair (1A and 1B) using the S4S2B assumptions (except for the treatment of AES-PR) and the second (1C and 1D) using the S4S2 Low EE assumptions (with the same exception). The other PREPA IRP base cases (e.g., ESM Base) were not considered
- PREPA/Siemens to only consider one AES-PR gas conversion option (i.e., the 585-MW combined cycle plant) instead of all three options PREPA/Siemens considered in the analysis summarized in the Siemens Report.

1           **Q.     What analyses did PREPA/Siemens conduct in response to AES-PR ROI 1-**  
2 **1?**

3           A.     With one minor exception, PREPA/Siemens executed the four cases as AES-PR  
4 requested. The exception is that instead of using the S4S2B assumptions from the PREPA IRP  
5 as the starting point for cases 1A and 1B, PREPA/Siemens updated the delivered natural gas  
6 price forecast and the EcoElectrica contract terms to reflect information available to  
7 PREPA/Siemens as of November 2019, and to be consistent with the S4S2 Low EE case. As a  
8 result of this change, the results of cases 1A and 1B cannot be compared to the results for the  
9 S4S2B case presented in the PREPA IRP to produce an estimate of the cost to PREPA of the  
10 early retirement of the AES-PR coal plant. However, PREPA/Siemens subsequently produced  
11 an updated “base case” with the same assumptions as the 1A and 1B cases except that the AES-  
12 PR coal plant operates through the end of November 2027 as specified in the PPOA (and in the  
13 PREPA IRP S4S2B case).<sup>14</sup> The results of this adjusted S4S2B case can be compared to the  
14 results of the 1A and 1B cases to produce an estimate of the cost to PREPA of the early  
15 retirement of the AES-PR coal plant.

16           **Q.     What are the results of the analysis PREPA/Siemens conducted in response**  
17 **to AES-PR ROI 1-1?**

18           A.     The reported NPVs of PREPA production costs for the four cases and the  
19 corresponding “base” cases (i.e., with the AES-PR coal plant operating through the end of  
20 November 2027) are provided in the first row of Exhibit 2.<sup>15</sup>

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<sup>14</sup> In other words, the original S4S2B case with the updated natural gas price forecast and EcoElectric contract terms.

<sup>15</sup> Exhibit 2 and by reference the following paragraphs utilize information from the following “Metrix” files (in order, column 1 through column 6): 1) *S4S29B\_Metrics\_(Eco New Contract)\_r8\_New\_PPOA w Eco Staying Online.xlsx*, 2) *AES-PREPA ROI\_1\_01 Attach 1.xlsx*, 3) *AES-PREPA ROI\_1\_01 Attach 2.xlsx*, 4) *PREB-PREPA ROI\_9\_01 Attach 6.xlsx*, 5) *PREPA ROI AES S4S2B\_Case 1C CCGT Conversion v2.xlsx*, and 6) *PREPA ROI AES S4S2B Case 1D No Conversion.xlsx*. File #s 1, 3, and 4 are attached as Exhibits 3, 4, and 5, respectively.

1           **Q.     What is your critique of the analysis PREPA/Siemens conducted in response**  
2 **to AES-PR ROI 1-1 and the ensuing results?**

3           A.     The analysis PREPA/Siemens conducted more accurately reflects what would  
4 actually happen if PREB ordered the AES-PR coal plant to close at the end of 2020 than the  
5 analysis summarized in the Siemens Report, for two primary reasons. First, the results for all  
6 four of the early retirement cases (i.e., 1A through 1D) include PREPA's payment of a Demand  
7 Charge to AES-PR (discussed in the following paragraph). Second, none of cases 1A through  
8 1D allow incremental installations of solar or battery capacity over and above what is in the  
9 corresponding base case, as PREPA's ability to achieve the amounts in the relevant base cases is  
10 already suspect.<sup>16</sup> As a result, the results provided in the first row of Exhibit 2 more accurately  
11 reflect the costs PREPA would incur if the coal plant was forced to retire than the results  
12 summarized in the Siemens Report.

13           Having said that, the results files overlook one cost component that affects cases 1B and  
14 1D: the PPOA obligates PREPA to pay AES-PR a Demand Charge and a Fixed Operating and  
15 Maintenance ("O&M") Charge even if the plant is not operating. PREPA/Siemens appropriately  
16 added to the NPV of all cases that forced retirement of the AES-PR coal plant (i.e., 1A through  
17 1D) the NPV of the Demand Charge. However, PREPA/Siemens did not include the NPV of the  
18 Fixed O&M Charge PREPA must pay AES-PR between 2021 and 2027 for the two cases (1B  
19 and 1D) in which no AES-PR plant is operating. Including this value adds \$172 million to the  
20 NPVs for cases 1B and 1D.<sup>17</sup>

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<sup>16</sup> *Direct Testimony*, pp. 39-40.

<sup>17</sup> *Direct Testimony*, pp. 40-42. This uses the annual FOM values from the first and third Metrix files listed in Footnote 15, and the same discounting approach and parameters as in the PREPA IRP. I am not opining on the validity of either the approach or the parameters.

This correction is shown in the second row of Exhibit 2. The resulting corrected NPVs are displayed in the third row of Exhibit 2. They are also provided in the first row of Table 2 below, which includes the differences across relevant cases (all in millions of dollars) as well:

**Table 2**  
**Results for AES-PR ROI 1-1 Cases and Associated Base Cases**

	High EE Loads			Low EE Loads		
	Base	1A--AES Gas	1B--No AES Gas	Base	1C--AES Gas	1D--No AES Gas
NPV	14,763	15,702	15,854	16,556	17,310	17,584
Differences vs. Base vs. AES Gas		938	1,091 152		755	1,029 274

**Q. Can you discuss these results?**

A. Yes.

**Adjusted S4S2B (“High EE Loads”) Cases**

A comparison of the first three columns, which all utilize the adjusted S4S2B assumptions (which are labelled “High EE Loads” in Table 2), indicates that:

1. Forcing the retirement of the AES-PR coal plant at the end of 2020 increases PREPA’s costs by \$938 million (\$14.763 billion in the base case vs. \$15.702 in 1A, which is the lower of 1A and 1B). The \$938 million estimate constitutes 6.4 percent of the \$14.763 billion estimate, which likely is well outside the error bound of the estimates.
2. Installing the AES-PR gas-fired plant results in lower costs for PREPA than replacing the AES-PR coal-fired plant with an alternative (\$15.702 billion for 1A vs. \$15.854 billion for 1B, a savings of \$152 million). It should be noted that the

1           \$152 million estimate constitutes 1.0 percent of the \$15.702 billion estimate; this  
2           difference is likely within the error bound of the estimates, and so should be  
3           considered to be zero, i.e., the two NPVs are essentially equal.<sup>18</sup>

#### 4           **S4S2 Low EE Cases**

5           A comparison of the last three columns, which all utilize the S4S2 Low EE assumptions,  
6           indicates that:

- 7           1.     Forcing the retirement of the AES-PR coal plant at the end of 2020 increases  
8                 PREPA's costs by \$755 million (\$16.556 billion in the base case vs. \$17.310  
9                 billion in 1C, which is the lower of 1C and 1D). This incremental cost estimate  
10                constitutes 4.6 percent of the S4S2 Low EE NPV, which is well outside the error  
11                bound of the estimates.
- 12          2.     Installing the AES-PR gas-fired plant results in lower costs for PREPA than  
13                 replacing the AES-PR coal-fired plant with an alternative (\$17.310 billion for 1C  
14                 vs. \$17.584 billion for 1D, a savings of \$274 million). This savings estimate  
15                 constitutes 1.6 percent of the 1C NPV, which within the error bound of the  
16                 estimates and so should be considered to be zero.

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<sup>18</sup> The difference between two production cost NPVs from a resource planning model is not a statistical estimate that has an estimated standard error and that therefore can be tested formally to determine if it is statistically different from zero at a specified confidence level. However, such a difference most certainly 1) is an estimate that 2) is subject to errors. In my experience, small changes (possibly even small enough to be imperceptible to an observer except the modeler, and certainly well within their own error bounds) to one or two important assumptions can cause a difference in two production cost NPVs of approximately 2 percent or less to swing to the other sign, e.g., can swing from positive 1.8 percent to negative 1.8 percent. Models also have errors and imbedded assumptions, and a difference between production cost NPVs from one model of less than approximately 2 percent can swing to the other sign simply by using a different model. As a result, it is my opinion that differences in production cost NPVs of approximately 2 percent or less should be treated as if they are zero, meaning that the two NPV estimates are essentially equal.

1           **Q.     What conclusions do you derive from the analysis PREPA/Siemens**  
2 **conducted in response to AES-PR ROI 1-1 and the ensuing results?**

3           A.     I draw three conclusions from the analysis and results:

- 4           1.     The assumptions utilized in the analysis more accurately reflect what would  
5                 actually happen if PREB ordered the AES-PR coal plant to close at the end of  
6                 2020 than the analysis summarized in the Siemens Report. As a result, the cost  
7                 estimates presented in Exhibit 2 and Table 2 more accurately reflect the costs  
8                 PREPA would incur if the coal plant was forced to retire than the results  
9                 summarized in the Siemens Report.
- 10          2.     It will be very costly to PREPA and its customers if the AES-PR coal plant is  
11                 forced to retire at the end of 2020. Depending on the load forecast used, the NPV  
12                 of power supply costs over the 2019-2038 period will increase between 4.6 and  
13                 6.4 percent.
- 14          3.     If the AES-PR coal plant is forced to close at the end of 2020, the NPV of costs to  
15                 PREPA of replacing the lost capacity and energy with an AES-PR gas-fired plant  
16                 is essentially the same over the 2019-2038 period as replacing it with a non-AES-  
17                 PR gas plant. The costs to PREPA of utilizing the AES-PR gas plant are between  
18                 1.0 percent and 1.6 percent lower than with the alternative, depending on the load  
19                 forecast used. These estimates likely are within the relevant error bounds, and  
20                 should be considered as zero (i.e., the NPVs are essentially equal). A plan that  
21                 includes an AES-PR gas-fired plant likely would have materially lower execution  
22                 risk than a plan without this plant, given AES-PR's track record of investing in,  
23                 successfully developing, and reliably operating power plants in Puerto Rico.

**III. AES-PR ROI 1-2**

**Q. What is AES-PR ROI 1-2, and what is its purpose?**

A. One of the deficiencies of the PREPA IRP I discussed in my Direct Testimony<sup>19</sup> was PREPA/Siemens' failure to consider extending the AES-PR PPOA beyond November 2027 to operate on natural gas. AES-PR ROI 1-2 requests PREPA/Siemens to execute two cases to address this deficiency. In both cases the AES-PR coal plant is retired at the end of November 2027 as specified in the PPOA, and replaced with a 585-MW natural gas-fired AES-PR combined cycle plant that begins operation in December 2027. In one of the cases (labeled 2A) AES-PR asked PREPA/Siemens to utilize the same assumptions (except for the AES-PR gas-fired plant) as in the PREPA IRP S4S2B cases, and in the other (labeled 2B) PREPA/Siemens was asked to utilize the same assumptions (with the same exception) as in the S4S2 Low EE case. Table 3 below describes the two cases AES-PR requested PREPA/Siemens to execute:

**Table 3**  
**Description of Two Cases Requested in AES-PR ROI 1-2**

	<b>2A</b>	<b>2B</b>
<b>Load forecast</b>	S4S2B ("High EE")	S4S2 Low EE
<b>AES-PR coal retirement</b>	Nov-27	Nov-27
<b>AES-PR gas plant start</b>	Dec-27	Dec-27
<b>Other assumptions</b>	Same as S4S2B	Same as S4S2 Low EE

Again, in the interest of time and to mitigate the burden on PREPA/Siemens, AES-PR requested:

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<sup>19</sup> *Direct Testimony*, pp. 25-28.

1           1.       Only two additional cases, one (2A) using the S4S2B assumptions (except for the  
2                   AES-PR PPOA extension) and the second (2B) using the S4S2 Low EE  
3                   assumptions (with the same exception). The other PREPA IRP cases (e.g., ESM  
4                   Base) were not considered.

5           2.       PREPA/Siemens to only consider one AES-PR gas conversion option (i.e., the  
6                   585-MW combined cycle plant) instead of all three options PREPA/Siemens  
7                   considered in the analysis summarized in the Siemens Report.

8           **Q.       What analyses did PREPA/Siemens conduct in response to AES-PR ROI 1-**  
9           **2?**

10          A.       PREPA/Siemens executed the two cases as AES-PR specified, with the same  
11                   exception as with AES-PR ROI 1-1; namely, that instead of using the S4S2B assumptions for the  
12                   first of the two requested cases, PREPA/Siemens updated the delivered natural gas price forecast  
13                   and the EcoElectrica contract terms. Again, as a result of these changes, the results of case 2A  
14                   are not directly comparable to the PREPA IRP S4S2B results, but the same “base case”  
15                   discussed above for cases 1A and 1B can be used as a base case in this instance for 2A.

16          **Q.       What are the results of the analysis PREPA/Siemens conducted in response**  
17           **to AES-PR ROI 1-2?**

18          A.       The reported net present values (“NPVs”) of PREPA production costs for the two  
19                   cases and the corresponding “base” cases are provided in the first row of Table 4 below, which  
20                   also includes the differences across relevant cases (all in millions of dollars).<sup>20</sup>

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<sup>20</sup> The table and the text that follows utilize information from the following “Metrix” files (in order, column 1 through column 4): 1) *S4S29B\_Metrics\_(Eco New Contract)\_r8\_New\_PPOA w Eco Staying Online.xlsx*, 2) *AES ROI 01 Attach 05\_S4S2B\_Case 2A Late Conversion.xlsx*, 3) *PREB-PREPA ROI\_9\_01 Attach 6.xlsx*, and 4) *AES ROI 01 Attach 06\_S4S2B\_Case 2B Late Conversion.xlsx*. File #s 1, 2, and 4 are attached as Exhibits 3, 6, and 7, respectively.



1

**Table 4**  
**Results for AES-PR ROI 1-2 Cases and Associated Base Cases**

	High EE Loads		Low EE Loads	
	Base	2A--AES Gas	Base	2B--AES Gas
<b>NPV</b>	14,763	14,951	16,556	16,800
<b>Differences vs. Base</b>		188		244

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In addition to these production cost NPVs, another important (qualitative) result is that installation of the AES-PR gas-fired plant in cases 2A and 2B displaces a smaller combined cycle plant that is built in the other cases (302 MW in 2025 in the adjusted S4S2B case, 369 MW in 2028 in the S4S2 Low EE base case).

8

**Q. Can you discuss these results?**

9

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A. A comparison of the first two columns of Table 4, which both utilize the adjusted S4S2B assumptions (labelled “High EE Loads”), indicates that the cost to PREPA over the 2019-2038 period of extending the AES-PR PPOA to operate on natural gas would cost \$188 million more than the least costly alternative (\$14.951 billion vs. \$14.763 billion). This represents 1.3 percent of PREPA production costs over this period. This difference is likely within the error bound of the estimates, and so should be considered to be zero.

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Likewise, a comparison of the last two columns of the Table 4 shows that extending the PPOA would cost PREPA an incremental \$244 million (\$16.80 billion vs. \$16.556 billion), which constitutes 1.5 percent of the base case cost. Again, this difference is likely within the error bound of the estimates, and should be considered to be zero.

1           **Q.     What conclusions do you derive from the analysis PREPA/Siemens**  
2 **conducted in response to AES-PR ROI 1-2 and the ensuing results?**

3           A.     I draw three conclusions from the analysis and associated results:

- 4           1.     The NPV of costs to PREPA of extending the AES-PR PPOA to operate on  
5                 natural gas is essentially the same in the cases PREPA/Siemens analyzed as the  
6                 NPV of costs without the AES-PR gas plant. The costs to PREPA of extending  
7                 the PPOA are between 1.3 percent and 1.5 percent higher than with the  
8                 alternative, depending on the load forecast used. These estimates are within the  
9                 relevant error bounds, and should be considered as zero (i.e., the NPVs are  
10                essentially equal).
- 11          2.     Review of the detailed results files suggest that the small (essentially zero)  
12                 advantage that the non-AES-PR gas plants have relative to the AES-PR gas plant  
13                 (i.e., as reflected in cases 2A and 2B relative to their respective base cases) is that  
14                 the 585-MW AES-PR gas-fired plant may be larger than what the  
15                 PREPA/Siemens model thinks the system needs given all of the assumptions and  
16                 other resource decisions imbedded in the model. This suggestion is supported by  
17                 a comparison of the capacity factors (“CF”) of the AES-PR and alternative plants  
18                 in the various cases. For example, in the S4S2 Low EE base case, the 369-MW  
19                 combined cycle plant that is added in 2028 after the AES-PR coal plant retires at  
20                 the end of 2027 has a CF of 66 percent in 2028 that falls to 60 percent in 2038;  
21                 the AES-PR gas plant that is added in case 2B has CFs of 50 percent and 40  
22                 percent in these two years, respectively.<sup>21</sup>

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<sup>21</sup> Based on simple calculations utilizing annual production projections provided in the files *PREB-PREPA ROI\_9\_01 Attach 6.xlsx* and *AES ROI 01 Attach 06\_S4S2B\_Case 2B Late Conversion.xlsx*.

1           3.     The two conclusions provided above indicate that fine tuning by AES-PR and  
2                 PREPA/Siemens about the assumed operating characteristics and costs of the 585-  
3                 MW combined cycle that PREPA/Siemens modeled would likely lead to selection  
4                 of a (modified) AES-PR plant as an element of a least-cost plan. The benefit of  
5                 such fine tuning and selection of the AES-PR plant is that a least-cost plan  
6                 utilizing such an AES-PR gas-fired plant likely would have materially lower  
7                 execution risk than a plan without this plant, given AES-PR's track record of  
8                 investing in, successfully developing, and reliably operating power plants in  
9                 Puerto Rico.

10          4.     Finally, in my Direct Testimony<sup>22</sup> I concluded that even if the AES-PR PPOA  
11                 extension was not an element of a least-cost plan, it would likely be an element of  
12                 one or more backup plans to be deployed if available capital, energy efficiency  
13                 savings, and/or renewable capacity additions fall short of the amounts reflected in  
14                 the least-cost plans. The two conclusions provided above strengthen that  
15                 conclusion.

#### 16   **IV.   PREB ROI 09-01**

17          **Q.     What is PREB ROI 09-01, and what is its purpose?**

18          A.     As I discussed in my Direct Testimony,<sup>23</sup> the PREPA IRP incorporated an  
19                 aggressive assumption about reductions in future electricity consumption attributable to energy  
20                 efficiency ("EE") measures. These assumptions reflect the provisions of Act 17-2019.  
21                 Following submittal of the PREPA IRP in June 2019, the Puerto Rico Senate approved a

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<sup>22</sup> *Direct Testimony*, p. 28.

<sup>23</sup> *Direct Testimony*, pp. 16-18.

1 measure to repeal the energy efficiency provisions of Act 17-2019. PREB responded to this  
2 legislative action by directing PREPA/Siemens to prepare a set of cases that are otherwise  
3 consistent with cases PREPA/Siemens has already prepared (e.g., S4S2B) but incorporating two  
4 alternative load forecasts, labeled 1) “Low EE” that includes one-third of the energy efficiency  
5 savings included in the PREPA IRP and 2) “No EE,” which assumes no load reductions from  
6 energy efficiency measures.

7 **Q. What analyses did PREPA/Siemens conduct in response to PREB ROI 09-**  
8 **01?**

9 A. PREPA/Siemens developed ten new cases, two each (one with Low EE and one  
10 with No EE) for each of the previously prepared S1S2B, S3S2B, S4S2B, S5S1B, and ESM Base  
11 cases. In addition to incorporating the alternative load forecasts specified by PREB,  
12 PREPA/Siemens also included in these ten cases updated assumptions regarding the delivered  
13 natural gas price forecast and the terms of the EcoElectrica PPOA, so that the ten cases reflect  
14 information available to PREPA/Siemens as of November 2019. As a result of these additional  
15 changes to assumptions, it is not possible to determine the impact on the results of the changes in  
16 the energy efficiency assumptions alone by comparing the results from these ten cases to the  
17 results for the corresponding cases that use the energy efficiency assumptions incorporated in the  
18 PREPA IRP.

19 **Q. What are the results of the analysis PREPA/Siemens conducted in response**  
20 **to PREB ROI 09-01?**

1           A.     PREPA/Siemens distributed to intervenors a written summary of the results, as  
2 well as detailed Excel files similar to those it distributed for other cases.<sup>24</sup>

3           **Q.     What conclusions do you draw from the analysis PREPA/Siemens conducted**  
4 **in response to PREB ROI 09-01 and the ensuing results?**

5           A.     In general, I draw three conclusions from the analysis PREPA/Siemens conducted  
6 and the associated results:

- 7           1.     I recommended in my Direct Testimony<sup>25</sup> that PREPA/Siemens develop one or  
8 more cases incorporating less aggressive energy efficiency assumptions, and I  
9 applaud PREB and PREPA/Siemens for developing these cases.
- 10          2.     I indicated in the Direct Testimony<sup>26</sup> that I expected that changing the energy  
11 efficiency assumption would have a material impact on the results and, in fact, it  
12 did. In particular, the amount of capital that needs to be attracted increased  
13 materially. For example, although the results are not solely attributable to  
14 differences in energy efficiency assumptions, the amount of capital expenditures  
15 through the end of 2025 increased (in real 2018 \$) from \$5.7 billion in case  
16 S4S2B to \$6.8 billion in case S4S2 Low EE to \$7.4 billion in case S4S2 No EE.
- 17          3.     The only material effect that the analysis and the associated results has on the  
18 critique of the PREPA IRP I provided in my Direct Testimony is to strengthen the

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<sup>24</sup> Written response: *In re: Review of the Puerto Rico Electric Power Authority Integrated Resource Plan*, Case No. CEPR-AP-2018-001 The Puerto Rico Electric Authority Supplemental Responses to the Puerto Rico Energy Bureau Ninth Requirement of Information, Dec. 2, 2019. Excel files: *PREB-PREPA ROI\_9\_01 Attach ?.xlsx*, where ? takes on the values 2, 3, , 11.

<sup>25</sup> *Direct Testimony*, p. 32.

<sup>26</sup> *Direct Testimony*, p. 16.

1 concern I stated that the preferred plan(s) may not be achievable, particularly due  
2 to the amount of capital required as indicated in #2 above.<sup>27</sup>

3 **V. CONCLUSION**

4 **Q. Does this conclude your testimony?**

5 A. Yes, it does. I reserve the right to provide rebuttal testimony, as allowed by the  
6 Bureau's orders.

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<sup>27</sup> *Direct Testimony*, p. 24.

## **EXHIBIT 1**

**COMMONWEALTH OF PUERTO RICO  
PUBLIC SERVICE REGULATORY BOARD  
PUERTO RICO ENERGY BUREAU**

IN RE: REVIEW OF THE PUERTO  
RICO ELECTRIC POWER  
AUTHORITY INTEGRATED  
RESOURCE PLAN

NO. CEPR-AP-2018-0001

**SUBJECT: REQUIREMENTS OF  
INFORMATION**

**PREPA'S RESPONSES TO AES-PUERTO RICO'S  
FIRST SET OF REQUIREMENTS OF INFORMATION**

**TO: AES-PUERTO RICO**

Through:  
mpietrantoni@mpmlawpr.com  
apagan@mpmlawpr.com

**FROM: PUERTO RICO ELECTRIC POWER AUTHORITY**

Through its Counsel of record

PREPA objects to any Requirement of Information ("ROI") that calls for information or documents that are not in the possession, custody, or control of PREPA.

For ease of reference, the questions and requirements as set forth in the Request are herein transcribed and shown in bold previous to each answer.

**AES-PR requested sensitivities:**

- 1. AES-PR early conversion analysis – all assume AES-PR stops burning coal at the end of 2020.**
  - a. Re-run case S4S2B with the AES-PR gas-fired 2x1 CC forced in beginning in 2023 with 15-year PPOA (2023-2037), allowing retirement of the AES-PR gas-fired plant after the end of 2037 but not before, allowing delayed retirements of existing units to fill the 2021-2022 gap as in 1.b, and no incremental solar/battery over and above what was in the S4S2B case (to be completed by 11/8);**
  - b. Re-run case S4S2B with no AES-PR gas conversion allowed, no incremental solar/battery over and above what was in the S4S2B case (to be completed by 11/8);**
  - c. Same as (a), except using the new S4S2B Low Energy Efficiency case specified in yesterday's PREB ROI 09-01 (to be completed by 11/27);**

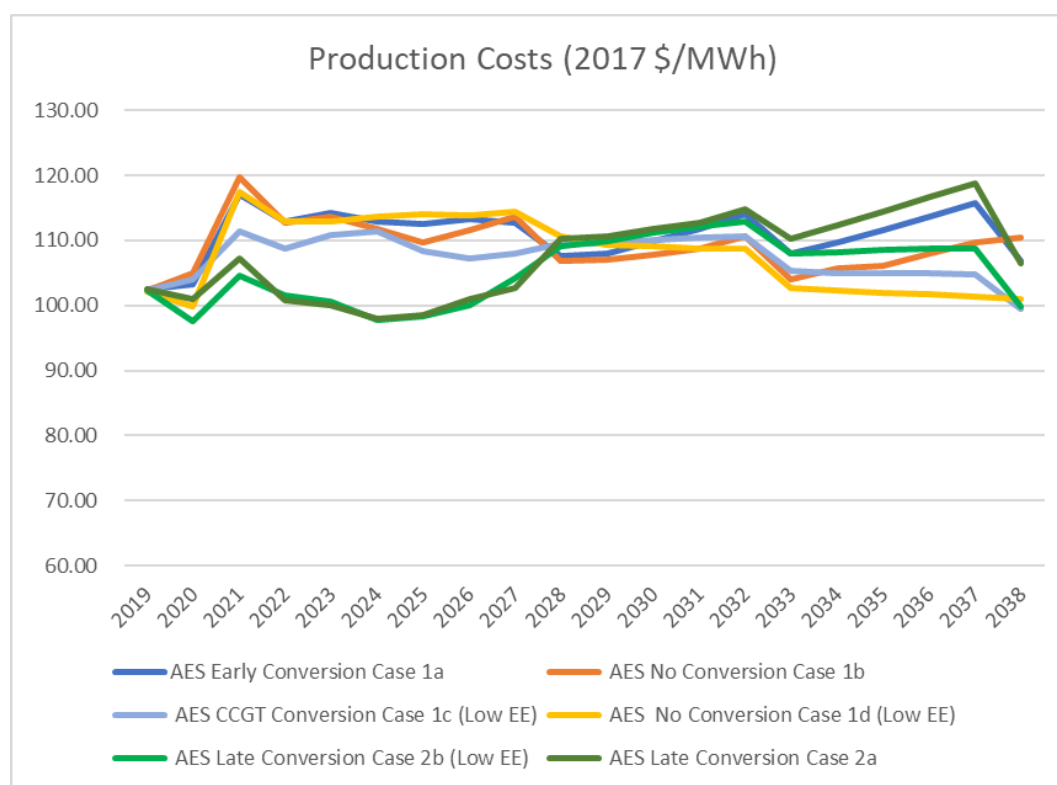


- Keeping the AES units running on coal through 2027 is the least cost solution under both load forecasts, which is the situation under the base case Scenario 4. As shown in Exhibit 1, the base case under either the IPR original load forecast (High EE -35%- gains) or the low EE load is less expensive for the island than retiring the units early or converting them to a CCGT, either in 2023 or 2027.
- The conclusion above is further supported by comparing the case where the units are retired early versus keeping them running until contract expiration 2027 (Cases 1B and 1D). From a cost of supply point of view, it is preferred to keep the units running on coal though 2027.
- If the units are forced to retire early, it is slightly better not to convert (Case 1B vs. 1A) for High EE and it is slightly better to convert the units (Case 1C vs 1D) for Low EE
- Of course, late conversion in 2027 is preferred to the early conversion in 2023, in terms of system costs, under either of the load forecasts (see Cases 2B vs. 1C, or Case 2A vs 1A).

*Exhibit 1: NPV of System Costs All Cases*

	IRP load (35% EE)				Low EE load			
	AES Early Conversion Case 1a	AES Early Retired No Conversion Case 1b	AES Late Conversion Case 2a	S4S2B Eco New PPOA (Base Case)	AES Early Conversion Case 1c (Low EE)	AES Early Retired, No conversion case 1d (Low EE)	AES Late Conversion Case 2b (Low EE)	S4S2B LOW EE case (Base Case)
NPV fuel	7,035,015	7,150,674	6,165,660	6,150,120	8,262,698	8,456,022	7,439,561	7,231,613
NPV Var O&M	250,591	270,612	359,766	357,253	289,187	338,853	398,121	397,863
NPV Fixed Costs	8,415,979	8,260,392	8,425,497	8,255,848	8,758,521	8,617,323	8,962,040	8,926,160
NPV Emissions Costs	-	-	-	-	-	-	-	-
Total	15,701,585	15,681,678	14,950,922	14,763,221	17,310,406	17,412,198	16,799,723	16,555,636
NPV of Energy not Served	593,795	208,499	405,682	242,924	581,032	573,119	652,143	499,794

*Exhibit 2: Production Costs Cases All Cases*



### **AES-PREPA-Case 1A:**

Cases 1A and 1B were provided to AES in the morning on November 11, 2019. Summary of results are provided below.

As requested, Siemens is providing the following metrics file attached to this response.

- a) PREPA ROI AES S4S2B\_Case 1A CCGT Conversion.xlsx – refer to file AES-PREPA ROI\_1\_01 Attach 1.xlsx

### **AES-PREPA-Case 1B:**

As requested, Siemens is providing the following metrics file attached to this response.

- b) PREPA ROI AES S4S2B\_Case 1B No Conversion.xlsx - – refer to file AES-PREPA ROI\_1\_01 Attach 2.xlsx

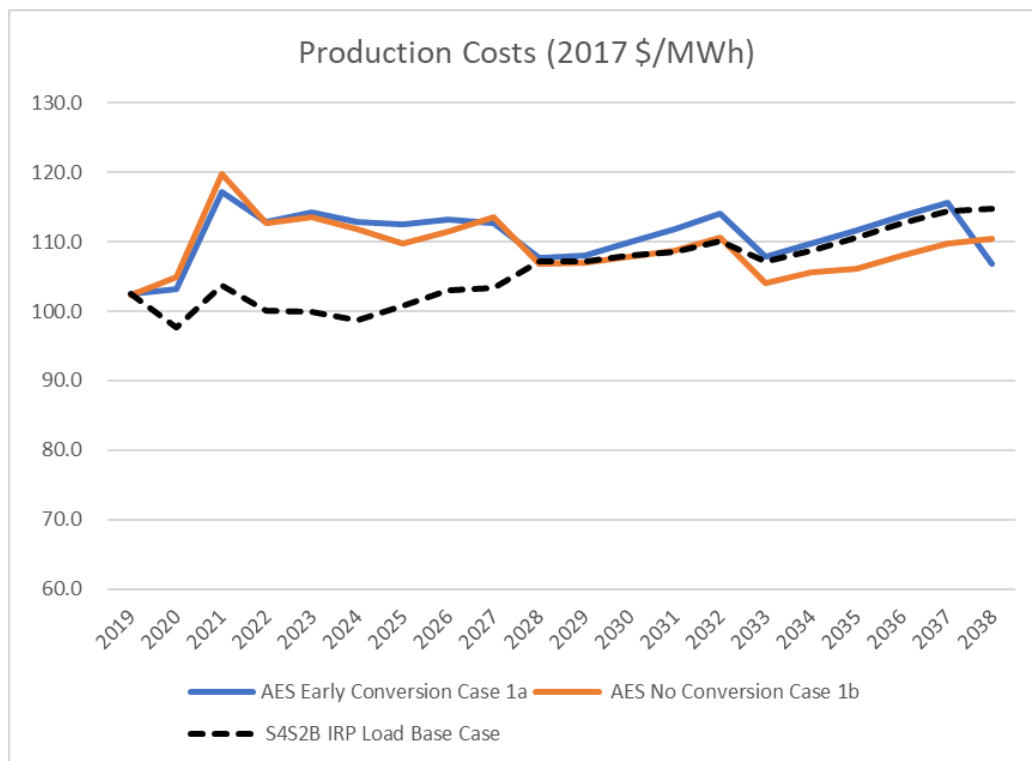
### **Summary of results for Cases 1A and 1B:**

- Cases 1A and 1B are simulated under the IRP load with high EE penetration.
- Both Case 1A and 1B have the same amount of solar (3,060 MW) and storage (1,880 MW), with similar timing for renewable additions.
- There is no incremental solar/battery over and above the S4S2B case filed in June, that is through 2025.
- Ecoeléctrica is modeled under the re-stated and negotiated PPOA and a further 33% reduction in capacity payments was modeled after 2032, when the PPOA ends.
- The largest difference in new thermal generation between the two cases is AES conversion to a CCGT in Case 1A compared to a new CCGT online in Palo Seco in 2025, built by the model in Case 1B. There are no other economic builds of CCGTs in both cases.
- In Case 1B retirements for San Juan 6, Palo Seco 3 & 4, Costa Sur 6 and Aguirre 3 CCGT are delayed compared to Case 1A, to fulfil the gap of AES retirement in 2020.
- AES Conversion is retired by the end of 2037 in Case 1A, despite the expiration of the capacity and regasification payments in that year. The NPV of system costs for the case with conversion is slightly higher (\$19 million) compared to the case without conversion (see Exhibit 1).
- Case 1A has a slightly higher costs compared to Case 1B, mostly driven by higher fixed costs (AES conversion costs) as shown in Exhibit 1. In other words, not doing

the conversion is least expensive under the IRP base load with high EE penetration levels.

- As shown in Exhibit 3, the differences in costs between the two cases start happening in 2023 with the conversion to natural gas. The difference between the two cases narrows in the 2026-2028 period with the commercial operation of the new CCGT in Palo Seco for Case 1B. However, system costs for Case 1A increase further after 2028 driven by rising fixed costs, despite very similar variable costs in the long-term between the two cases.
- Retiring the units early or converting them to gas are more expensive options than keeping them running on coal through 2027 (Base case).
- The capacity payments for AES' PPOA through 2027 are included in the results with a net present value for those payments of \$364 million (included in the fixed costs).

*Exhibit 3: Production Costs Cases 1A and 1B*



### AES-PREPA-Case 1C:

As requested, Siemens is providing the following metrics file attached to this response. The results for Case 1C have been revised. After a further expert review, Siemens

considered the case had excess generation impacting production costs. Siemens performed the following revisions, with respect of the cases initially provided:

- Retired Costa Sur earlier in 2022 instead of staying online (driving costs higher)
- Reduced the amount of new diesel peakers added by the model

The revisions do not show to have a material impact on mini-grid or system wide reserves with reserve margins above targets.

c) AES ROI 01 Attach 03 AES S4S2B\_Case 1C CCGT Conversion v2.xlsx

#### **AES-PREPA-Case 1D:**

As requested, Siemens is providing the following metrics file attached to this response.

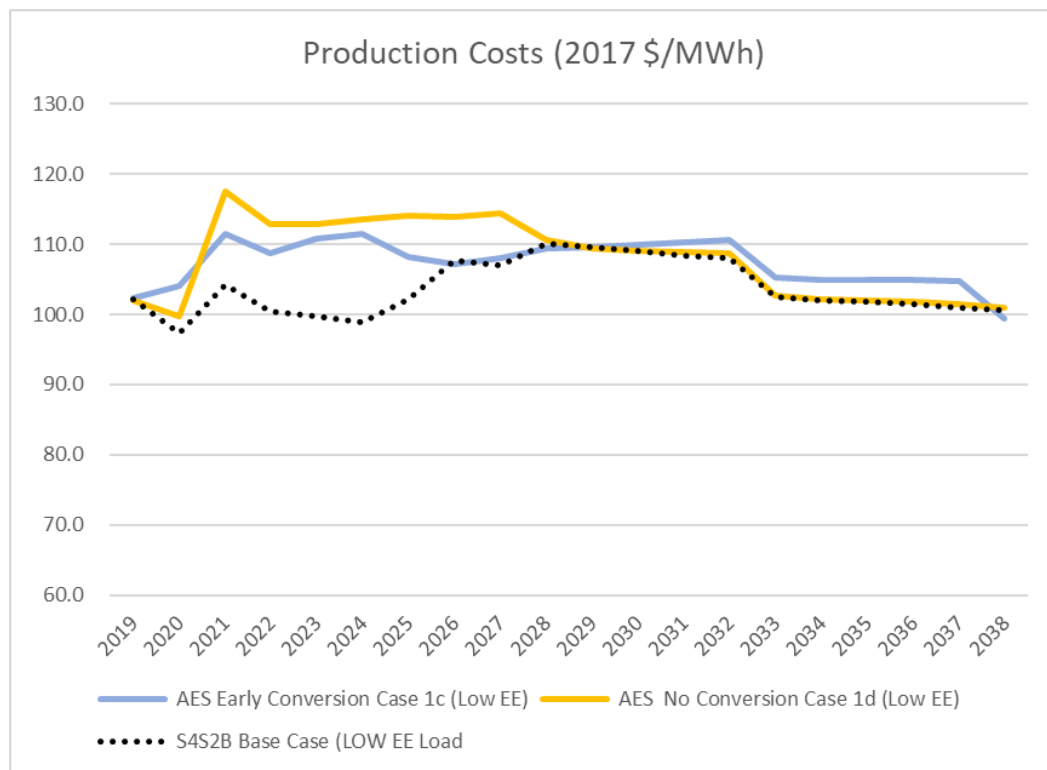
d) AES ROI 01 Attach 04AES S4S2B\_Case 1D No Conversion.xlsx

#### **Summary of results for Cases 1C and 1D:**

- Cases 1C and 1D are equivalent to Cases 1A and 1B but simulated under the Low Energy Efficiency demand, as requested by AES under ROI 9.
- As a result, both Cases have higher amounts of installed solar PV and battery storage driven by a 39% increase in load compared to the IRP filing by 2038.
- There is 3,840 MW of solar PV in both cases with 1,840 MW and 2,080 MW of Battery Storage for Case 1C and 1D, respectively.
- Renewable additions are equivalent in both cases with 3,420 MW added through 2027 with the rest added in 2028-2031 for Case 1C and all in 2028 for Case 1D, indicating the need to optimize solar additions early without the conversion of AES.
- There is no incremental solar/battery through 2025 above the S4S2B case filed in June.
- In line with cases 1A and 1B, the largest difference in new thermal generation comes from having the AES conversion to a CCGT in Case 1C compared to the new CCGT in Palo Seco for Case 1D. There are no other large thermal builds in both cases.
- Ecoeléctrica is retired in 2037 under Case 1C, compared to staying online for case 1D. Both Costa Sur 5 and 6 retire in 2022, after the expert review.

- Under Case 1D, the Aguirre 2 CC stays online through the study period, mostly to provide reserves in the South, dispatching at low capacity factors. Other decisions in terms of retirements are similar between the two cases including the retirement of San Juan 6 in the 2025-2027 timeframe.
- The NPV of system costs for the two cases with early retirement and/or conversion under low EE are higher in the range of \$1.5 to \$1.9 billion compared to the same cases with the IRP load.
- The conversion in 2023 under the low EE case results in a lower NPV compared to the case without conversion by \$101 million, after the revision. The difference in costs between the two cases is driven by lower fuel and variable costs, partially offset by higher fixed costs under Case 1C.
- The current capacity payments for AES' PPOA through 2027 are included in the results for both cases with a net present value for those payments of \$364 million.
- Retiring the units early or converting them to gas are more expensive options than keeping them running on coal through 2027 (Base case), under the low EE load forecast, as shown in Exhibit 4.

*Exhibit 4: Production Costs Cases 1C and 1D*



**AES-PREPA-Case 2A:**

As requested, Siemens is providing the following metrics file attached to this response.

- a) AES ROI 01 Attach 05\_ S4S2B\_Case 2A Late Conversion.xlsx

**AES-PREPA-Case 2B:**

As requested, Siemens is providing the following metrics file attached to this response.

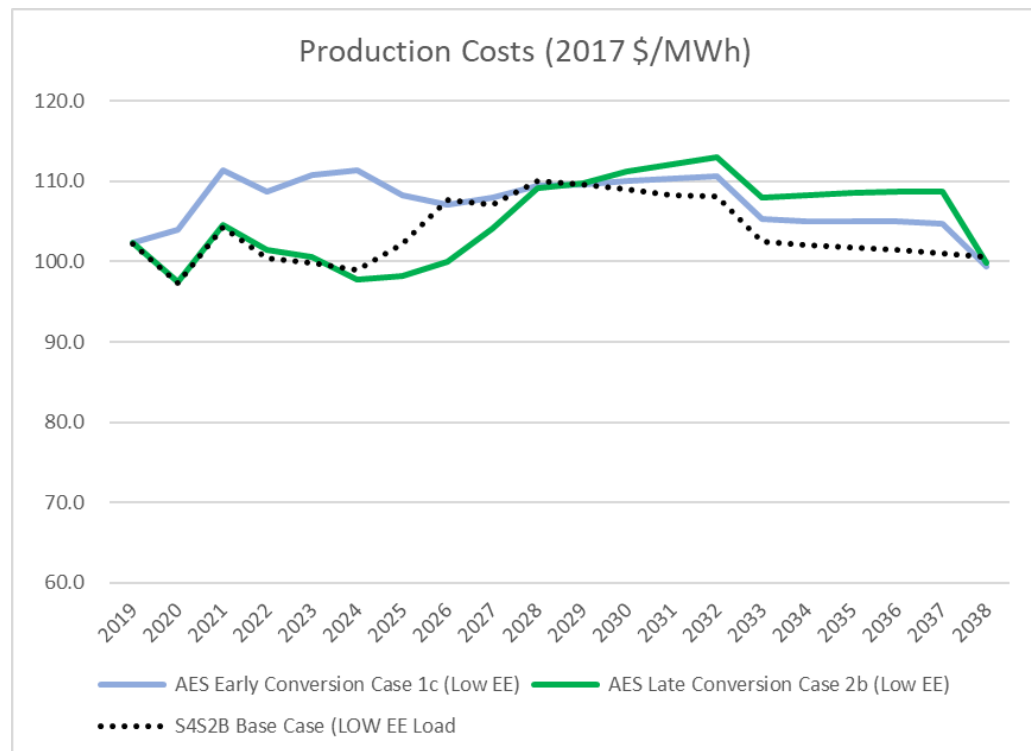
- a) AES ROI 01 Attach 06\_ S4S2B\_Case 2B Late Conversion.xlsx

**Summary of results for Cases 2A and 2B:**

- Cases 2A and 2B are converted to a gas-fired 2x1 CC beginning on December 2027 with an extended PPOA for an additional 15-years. The units burn coal through November 2027 under the existing PPOA. Case 2A is simulated under the IRP load forecast (high EE penetration) and Case 2B under the Low EE forecast.

- The plan under both cases has significant similarities in terms of thermal generation and timing for retirements. EcoEléctrica stays online through the study period, San Juan 5 (converted) staying online and the Aguirre units retired in the mid-2020s. Under Case 2B, Costa Sur 6 is not retired to provide reserves in the south.
- The greatest difference is in terms of solar PV additions with 3,060 MW for Case 2A and 3,840 MW in Case 2B, as a result of higher demand in the later.
- There is no incremental solar/battery through 2025 above the S4S2B case filed in June.
- As shown in Exhibit 5, converting the units later in 2027 is preferred to convert them early in 2023, which is expected.
- Also, conversion is more costly than not converting, both for the High EE situation; Case 2A more costly than S4S2B Base Case and for the Low EE situation Case 2B more costly than S4S2B (see Exhibit 1).

*Exhibit 5: Production Costs 2B and 1C*





Response to AES-Puerto Rico First Set of ROIs

Matter No: CEPR-AP-2018-0001

Page 10

## **EXHIBIT 2**

**Comparison of Various Cases with and without AES Coal Plant Retirement in 2020 (All Dollar amounts in millions, 2019-2038 NPV @ 9%)**

	S4S2B Loads			S4S2 Low EE Loads		
	Adj S4S2B	AES S4S2B 1A	AES S4S2B 1B	S4S2 Low EE	AES S4S2 1C	AES S4S2 1D
<b>Reported NPV</b>	14,763	15,702	15,682	16,556	17,310	17,412
<b>Adjustments:</b>						
<b>AES-PR coal FOM payments</b>	0	0	172	0	0	172
<b>Adjusted NPV</b>	14,763	15,702	15,854	16,556	17,310	17,584
<b>Differences</b>						
<b>Reported vs. "Base"</b>		938	918		755	857
<b>Reported vs. AES Gas</b>			-20			102
<b>Adjusted vs. "Base"</b>		938	1,091		755	1,029
<b>Adjusted vs. AES Gas</b>			152			274

**ATTESTATION**

Affiant, Ronald J. Moe, being first duly sworn, states the following: The prepared Pre-Filed Supplemental Testimony and the information, documents and workpapers attached thereto constitute the direct testimony of Affiant in the above-styled case. Affiant states that he would give the answers set forth in the Pre-Filed Supplemental Testimony if asked the questions propounded therein at the time of the filing. Affiant further states that, to the best of his knowledge, his statements made are true and correct.



Ronald J. Moe

12/11/2019

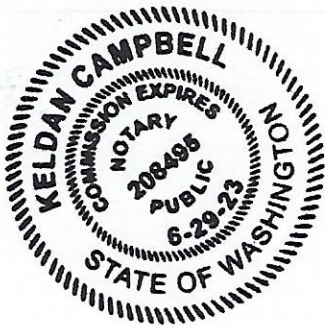
Date

FOR WITNESSING OR ATTESTING TO A SIGNATURE

State of Washington

County of Snohomish

Signed or attested before me on 12/11/19 by Ronald J. Moz



[Signature]  
Notary Signature

Keldan Campbell  
Name Printed, Notary Public in and for the State  
of Washington

6/29/23  
My appointment expires

This notarization is attached to a 1 page Attestation

Making this page 2 of 2

Customer selected notary language: [Signature]