

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

NEPR

Received:

Dec 26, 2019

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IN RE:

**REVIEW OF THE PUERTO RICO
ELECTRIC POWER AUTHORITY
INTEGRATED RESOURCE PLAN**

CASE NO.:

CEPR-AP-2018-0001

SUBJECT:

Resolution and Order dated
December 19, 2019

**MOTION IN COMPLIANCE WITH RESOLUTION
AND ORDER DATED DECEMBER 19, 2019**

TO THE HONORABLE PUERTO RICO ENERGY BUREAU:

COMES NOW the Puerto Rico Electric Power Authority through the undersigned legal representation and respectfully sets forth and pray:

1. On December 11, 2019, AES Puerto Rico L.P. (AES) filed the supplemental testimony of Mr. Ronald Moe (the “Moe Testimony”)¹. The Moe Testimony lists documents that were included as part of the Puerto Rico Electric Power Authority (PREPA) response to AES’ first requirement for information². On December 19, 2019, the Puerto Rico Energy Bureau (the “Energy Bureau”) entered a *Resolution and Order* noting that “upon [a] review of the documents available in the administrative file of the [] case [of caption], [it] had not found evidence of receiving the document referenced in the [Moe Testimony], nor the related workpapers.”³ The Energy Bureau ordered PREPA to file the document referenced in the Moe Testimony and any associated workpapers. *Id.* PREPA files the instant motion in response to the Order.

¹ AES-PR’s Motion Submitting Pre-Filed Supplemental Testimony.

² AES-PR’s Requirement of Information dated October 2, 2019 (the “ROI”).

³ See *Resolution and Order* (the “Order”).

2. PREPA and AES' consultants were in constant communication right after the service of the ROI. During said communications the consultants discussed possibilities and alternatives to narrow down the amount of questions included in the discovery and scope, as well as revisions to timelines for production of responsive answers and documents. The consultants also engaged in discussions of technical aspects of the questions and responses. On November 27, 2019, PREPA's consultant, Siemens Industry, Inc., produced to AES a response to the ROI representing that it was the final and official response to the ROI (the "November 27 Response")⁴. *See* Exhibit A. The November 27 Response included several exhibits, all referenced in the answers to the interrogatories and request for production of documents.

3. On December, PREPA served on the Parties⁵ a document with the same title as the November 27 Response (the "December 5 Response"). *See* Exhibit B. Said document included the responses to the ROI. The December 5 Response also had several exhibits in response to the interrogatories included as part of the AES-ROI⁶. The exhibits are also the same exhibits that were submitted to AES with the November 27 Response.

4. A review of the Responses shows that their substantive content is identical. *See* Exhibit C. Exhibit C is a redline version of the responses to facilitate the revision and evaluation of the differences between both documents. As the redline version shows, the revisions to the November 27 Reponse are mostly cosmetic and of formatting to maintain the consistency with the responses that PREPA has served to answer other requirements for information and also, to and identify the files pursuant to the Energy Bureau's orders on how to submit responses to requests for information and how all files must be labeled.

⁴ PREPA's Responses to AES-Puerto Rico's First Set of Requirements of Information.

⁵ The Energy Bureau and intervenors are herein referred to as the "Parties".

⁶ The November 27 Response and the December 5 Response are herein referred to as the "Responses".

5. In summary, the Parties already have the November 27 Response since these are substantively identical to the December 5 Response. Besides to what is attached to this motion, there is no other difference between the Responses or the attachments thereto.

WHEREFORE, the Puerto Rico Electric Power Authority requests the Energy Bureau to note PREPA's compliance with the Order.

RESPECTFULLY SUBMITTED.

In San Juan, Puerto Rico, this 26th day of December 2019.

/s Katuska Bolaños
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TSPR 18,888

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CERTIFICATE OF SERVICE

It is hereby certified that, on this same date I have filed the above motion using the Energy Bureau's Electronic Filing System, at the following address: <http://radicacion.energia.pr.gov> and that a courtesy copy of the filing was sent via e-mail to: sierra@arctas.com; tonytorres2366@gmail.com; cfl@mcvpr.com; gnr@mcvpr.com; info@liga.coop; amaneser2020@gmail.com; hriviera@oipc.pr.gov; jriviera@cnslpr.com; carlos.reyes@ecoelectrica.com; ccf@tcmrslaw.com; manuelgabrielfernandez@gmail.com; acarbo@edf.org; pedrosaade5@gmail.com; rmurthy@earthjustice.org; rstgo2@gmail.com; larroyo@earthjustice.org; jluebkmann@earthjustice.org; acasellas@amgprlaw.com; loliver@amgprlaw.com; epo@amgprlaw.com; robert.berezin@weil.com; marcia.goldstein@weil.com; jonathan.polkes@weil.com; gregory.silbert@weil.com; agraitfe@agraitlawpr.com; maortiz@lvprlaw.com; rnegron@dnlawpr.com; castrodieppalaw@gmail.com; voxpopulix@gmail.com; paul.demoudt@shell.com; javier.ruajovet@sunrun.com; escott@ferraiuoli.com; SProctor@huntonak.com; GiaCribbs@huntonak.com; mgrpcorp@gmail.com; aconer.pr@gmail.com; axel.colon@aes.com; rtorbert@rmi.org; apagan@mpmlawpr.com; mpietrantoni@mpmlawpr.com.

In San Juan, Puerto Rico, this 26th day of December, 2019.

s/ Katuska Bolaños
Katuska Bolaños

Exhibit A

November 27 Response

**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:

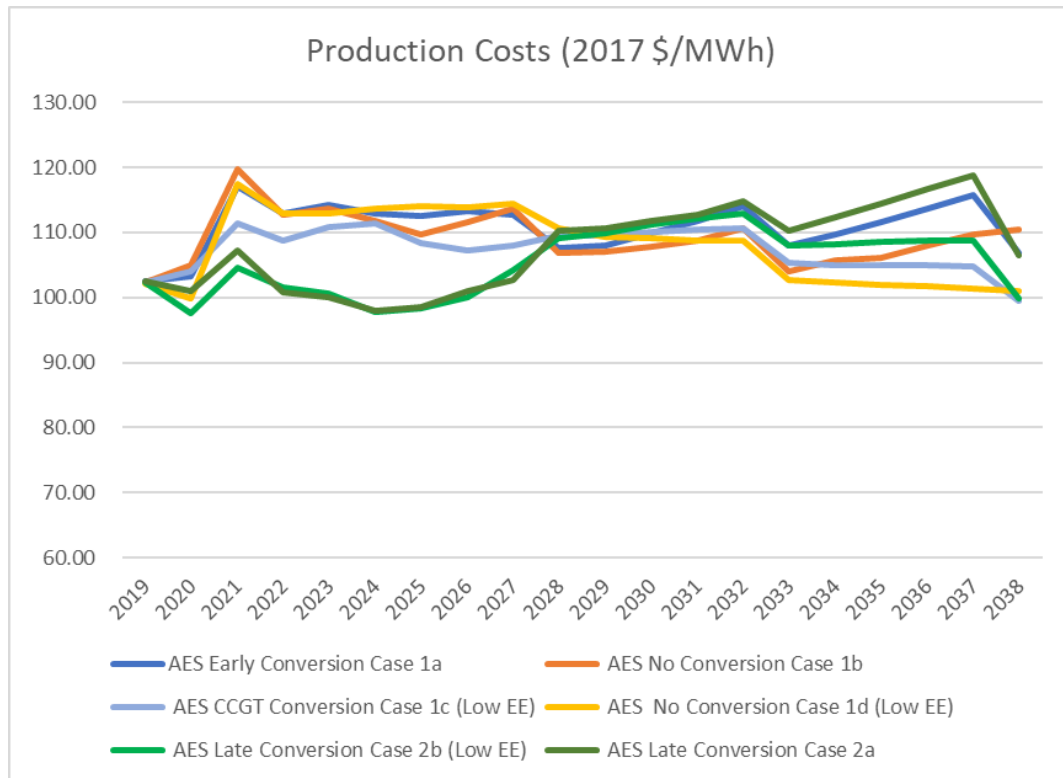
- 1. AES-PR early conversion analysis – all assume AES-PR stops burning coal at the end of 2020.**
 - a. Re-run case S4S2B with the AES-PR gas-fired 2x1 CC forced in beginning in 2023 with 15-year PPOA (2023-2037), allowing retirement of the AES-PR gas-fired plant after the end of 2037 but not before, 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);**

- 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.

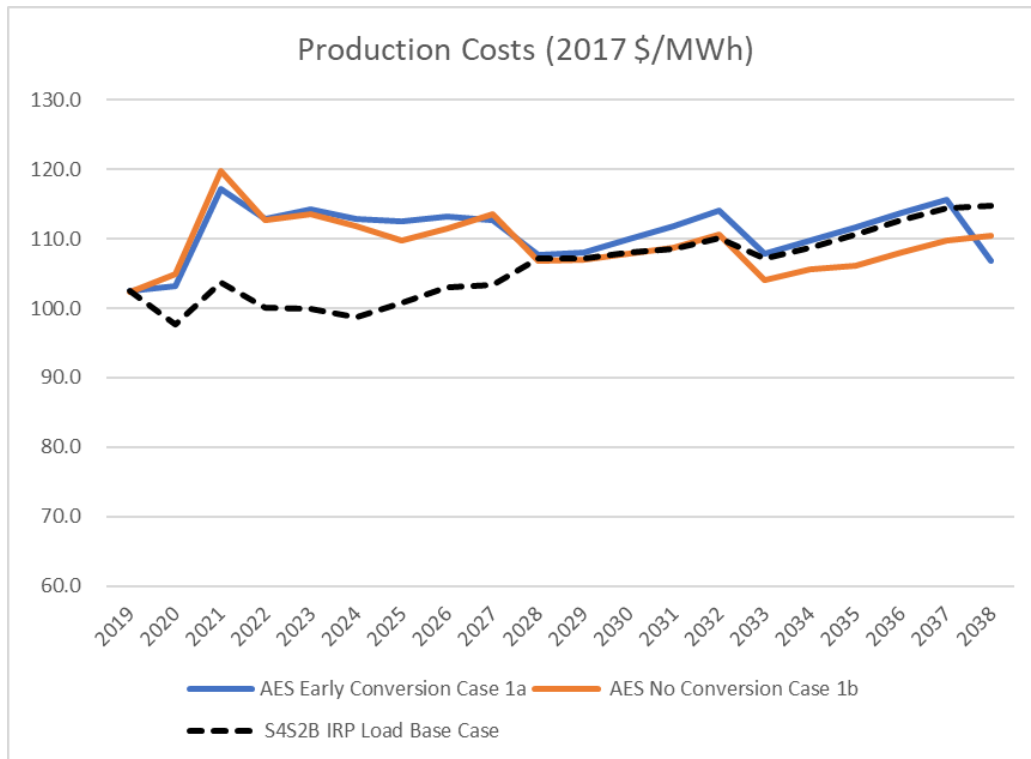
- b) PREPA ROI AES S4S2B_Case 1B No Conversion.xlsx - – refer to file AES-PREPA ROI_1_01 Attach 2.xlsx

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 **Error! Reference source not found.**, 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.

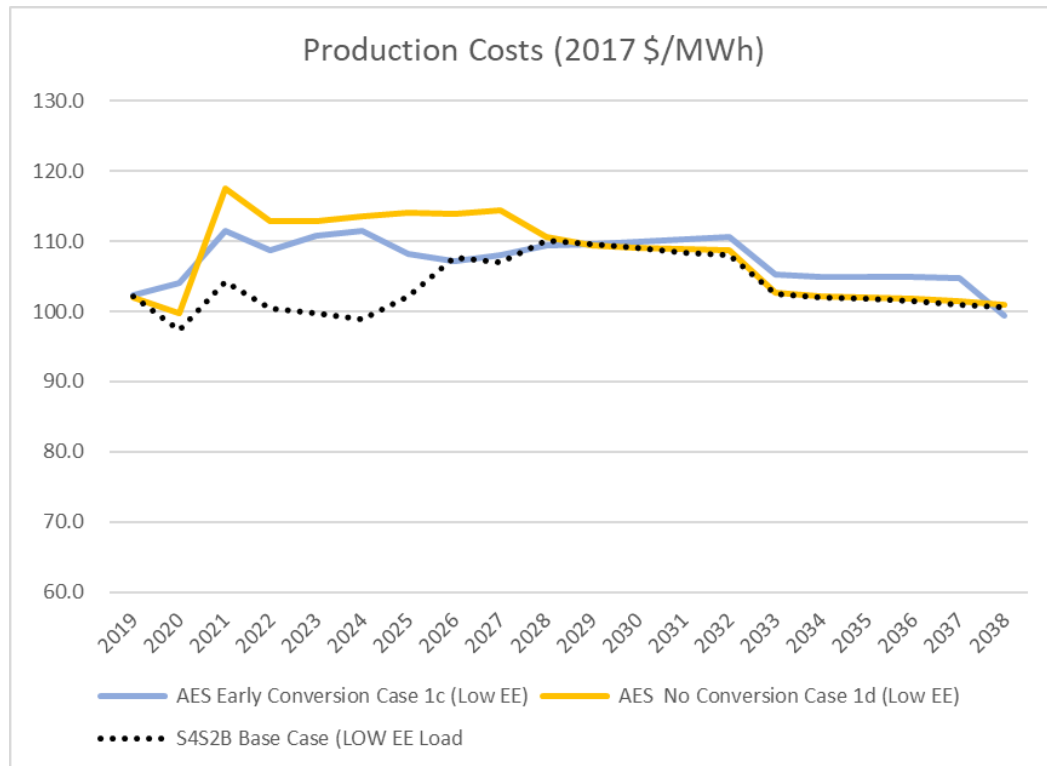
d) AES ROI 01 Attach 04AES S4S2B_Case 1D No Conversion.xlsx

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

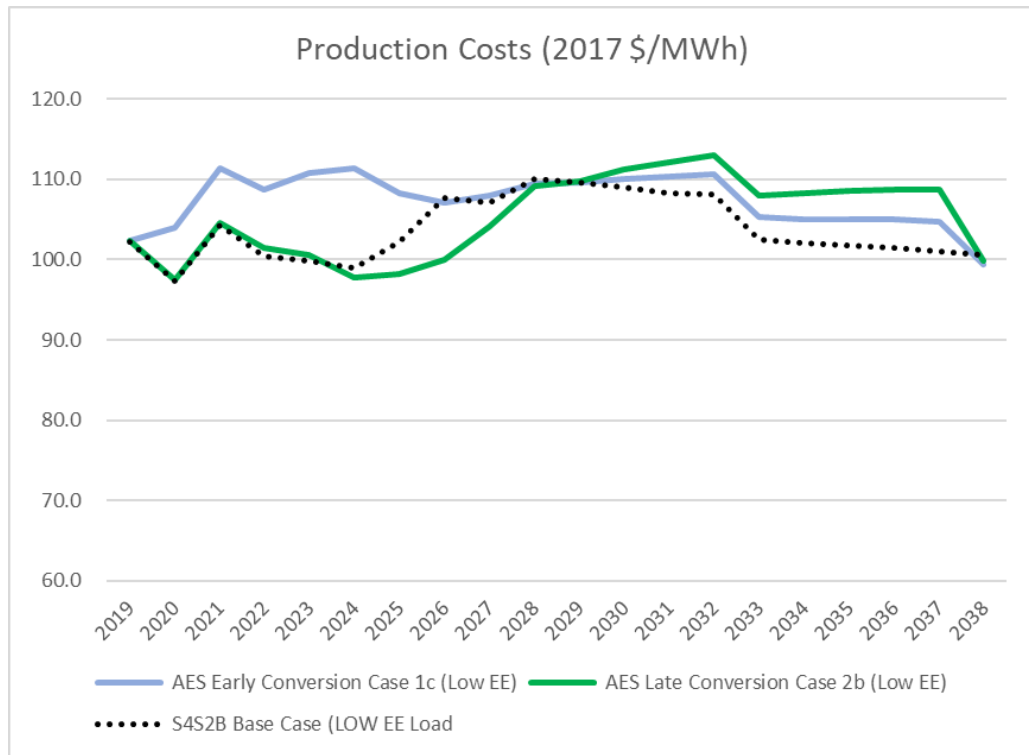


Exhibit B

December 5 Response

**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.

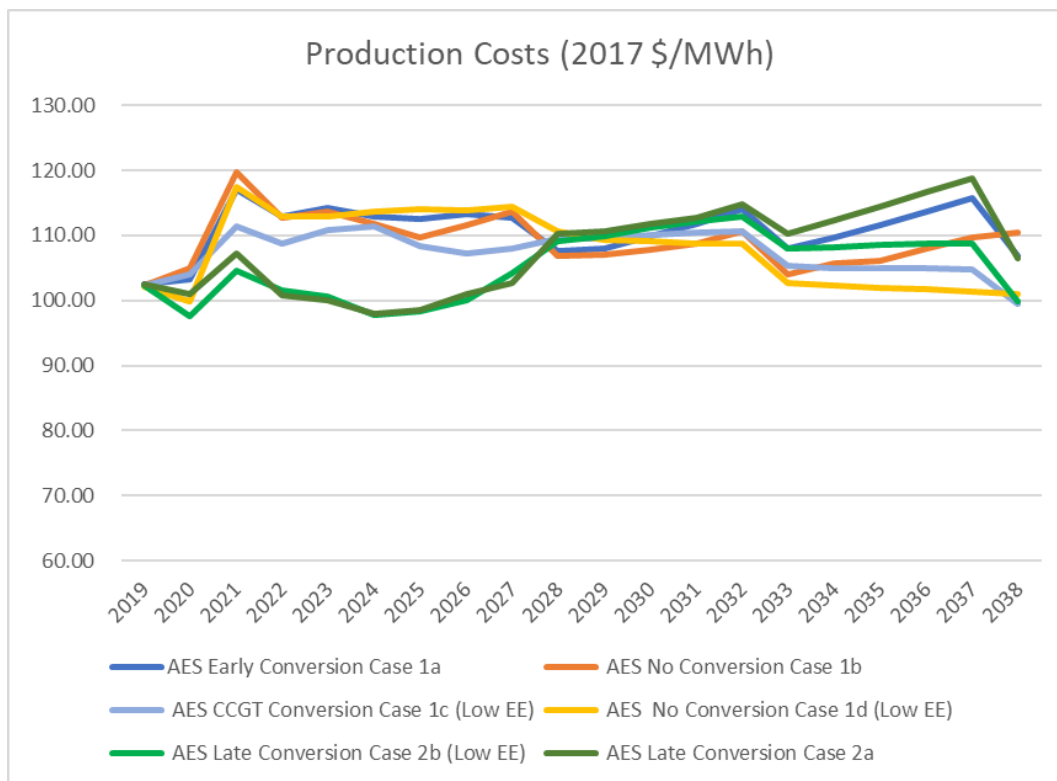
AES-PR requested sensitivities:

- 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);**

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.

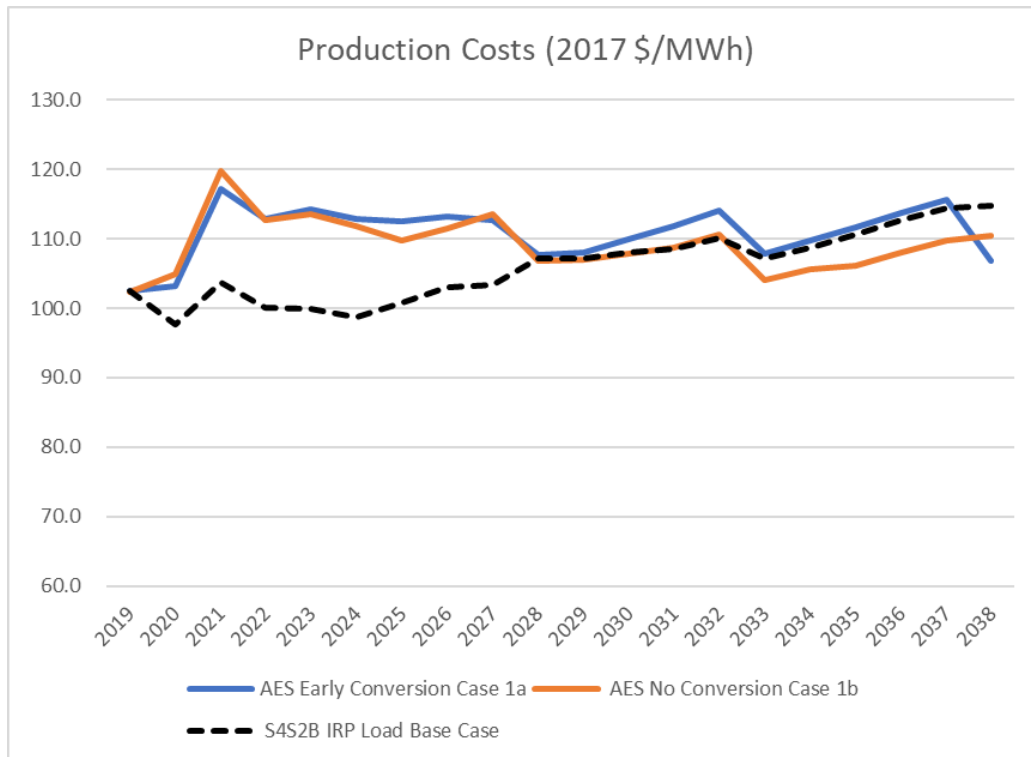
- b) PREPA ROI AES S4S2B_Case 1B No Conversion.xlsx - – refer to file AES-PREPA ROI_1_01 Attach 2.xlsx

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~~Error! Reference source not found.~~, 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 - refer to file AES-PREPA ROI_1_01 Attach 3 rev 1.xlsx

AES-PREPA-Case 1D:

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

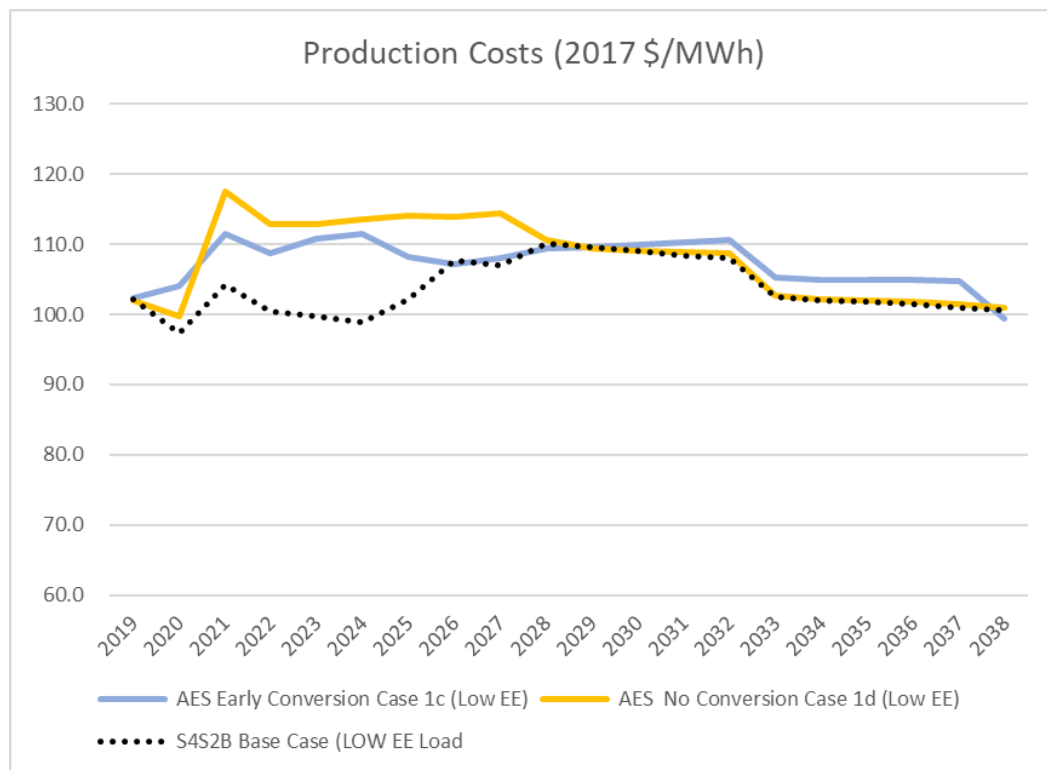
- d) PREPA AES ROI 01 AES S4S2B_Case 1D No Conversion.xlsx – refer to file AES-PREPA ROI_1_01 Attach 4.xlsx

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 S4S2B_Case 2A Late Conversion.xlsx – refer to file AES-PREPA ROI_1_02 Attach 1.xlsx

AES-PREPA-Case 2B:

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

- a) AES ROI 01 S4S2B_Case 2B Late Conversion.xlsx – refer to file AES-PREPA ROI_1_02 Attach 2.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

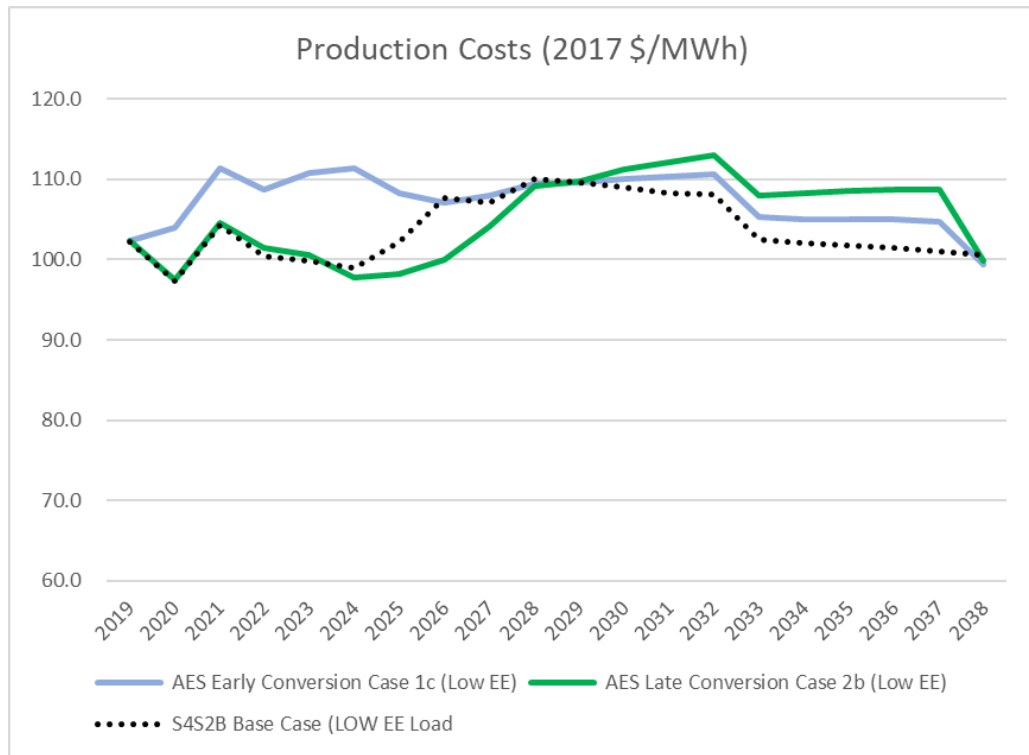


Exhibit C

Redline Comparison

**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.

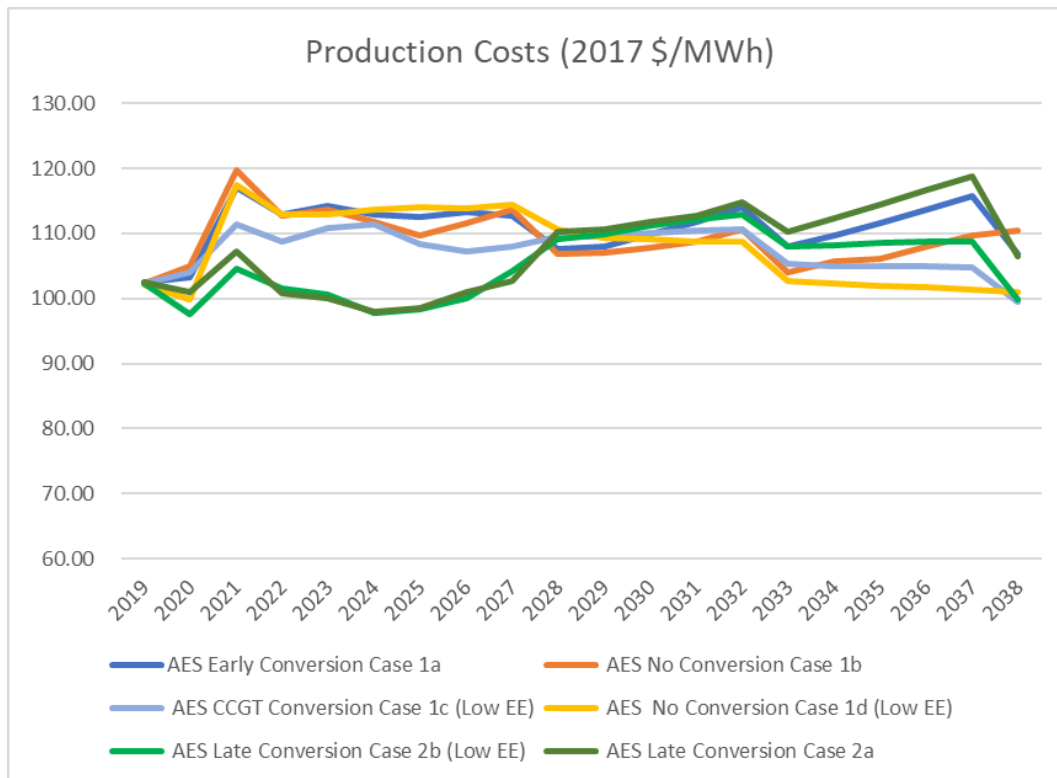
AES-PR requested sensitivities:

- 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);**

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

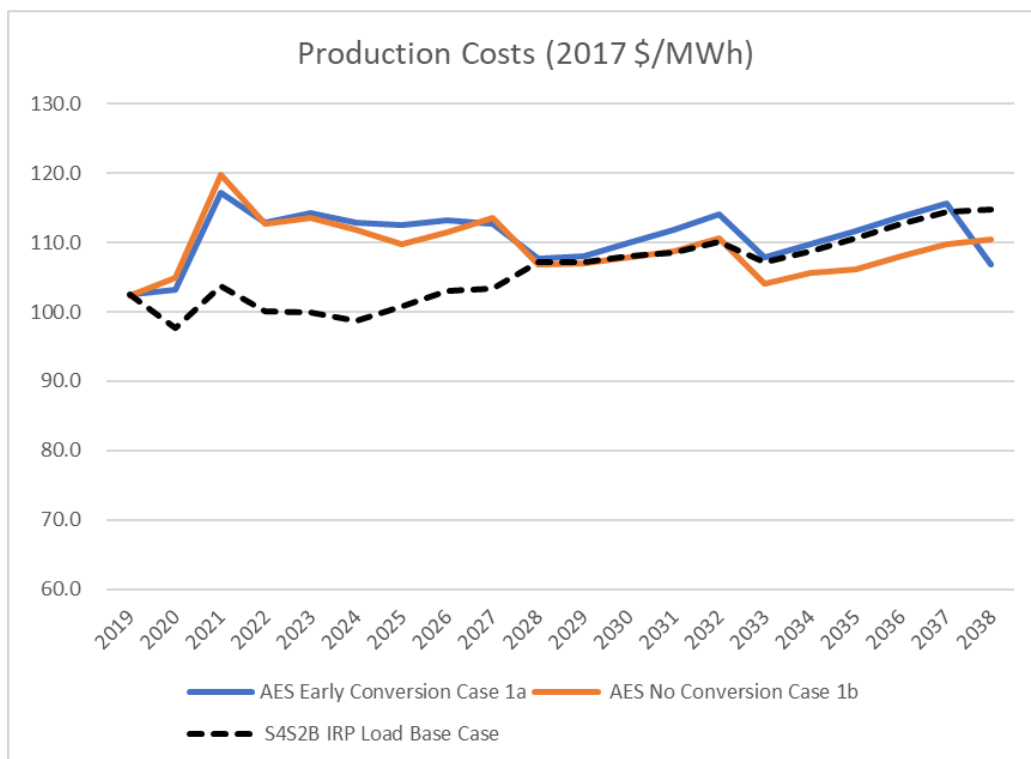
Summary of results for Cases 1A and 1B:

-
- 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~~Exhibit 3Error! Reference source not found., 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 - [refer to file AES-PREPA ROI 1 01 Attach 3 rev 1.xlsx](#)

AES-PREPA-Case 1D:

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

- d) [PREPA AES ROI 01 Attach 04 AES S4S2B_Case 1D No Conversion.xlsx](#) - [refer to file AES-PREPA ROI 1 01 Attach 4.xlsx](#)

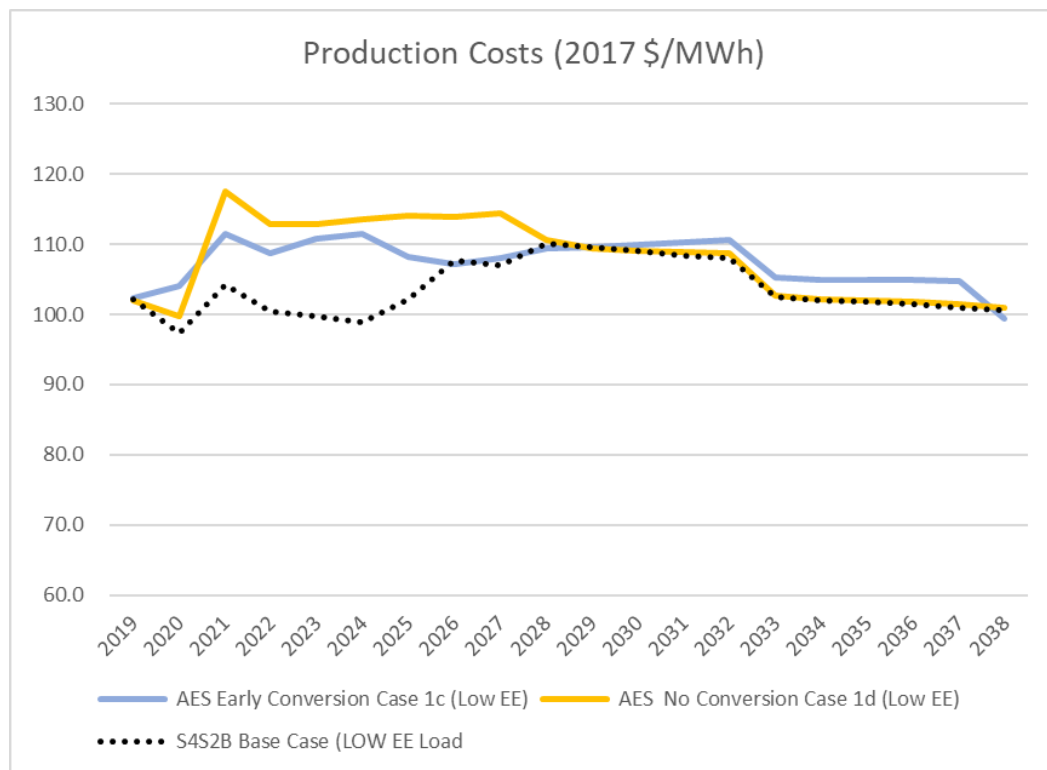
Summary of results for Cases 1C and 1D:

-

- 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](#) – refer to file [AES-PREPA ROI 1_02 Attach 1.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](#) – refer to file [AES-PREPA ROI 1_02 Attach 2.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

