

COMMONWEALTH OF PUERTO RICO

PUERTO RICO ENERGY COMMISSION

'18 AGO -1 P2

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

NO. CEPR-AP-2018-0001

**SUBJECT:** PREPA'S COMPLIANCE  
FILING FOR ITEMS DUE AUGUST 1,  
2018

**PREPA'S COMPLIANCE FILING FOR  
ITEMS DUE AUGUST 1, 2018**

TO THE HONORABLE PUERTO RICO ENERGY COMMISSION:

COMES NOW the Puerto Rico Electric Power Authority ("PREPA") and respectfully submits to the honorable Puerto Rico Energy Commission (the "Commission") PREPA's Compliance Filing for items due August 1, 2018. This Compliance Filing consists of information provided in the body of this document and Attachment 1 hereto.

1. The Commission's Order of July 2, 2018, in this Docket orders in part: "PREPA shall respond to the attached information requirements (Appendix A) on or before August 1, 2018.
2. Appendix A was a list of 45 items, many of them calling for very detailed information.
3. PREPA is highly concerned regarding Appendix A, Item 33.
  - a. Item 33 states: "Section 2.03(G)(2): If, pursuant to Section 3.01(B) of Regulation 9021, the Commission were to require PREPA to consider different scenarios than the ones considered by PREPA in the development of the IRP, identify the information the Commission would need to specify or define such scenarios."

- b. PREPA and its outside IRP experts at Siemens Industry, in developing the approach to the 2018 IRP: (1) have carefully considered the Commission's orders in PREPA's 2015 IRP case, subsequent events, and the highly detailed 2018 IRP regulation (Regulation 9021) issued by the Commission effective April 24, 2018; and (2) will carefully consider the results of the robust stakeholder input process that PREPA and Siemens have conducted for this IRP and which is nearing the conclusion of its first phase. See also PREPA's response to item 35.
- c. As a practical matter, if the Commission "down the road" were to require PREPA and Siemens to consider different scenarios than those agreed at this time including the ones developed by PREPA and Siemens based on lessons learned in and since the 2015 IRP case, Regulation 9021, and stakeholder inputs or a modification thereof, it is likely to add one or more months to the IRP process.
- d. Such a delay would jeopardize or diminish the value of the IRP to the Government of Puerto Rico in working on the transformation of PREPA and the electric sector provided for by the Government's policies and the certified Fiscal Plans for the Commonwealth and PREPA.
- e. Such a delay also would mean that PREPA would not reach the objectives of finishing the IRP as such by September 30, 2018, and being able to submit the IRP and the associated required filings to the Commission by the end of October 2018.
- f. PREPA believes that it needs to finalize the applicable inputs, including the scenarios, by August 8, 2018 at the latest, in order to minimize impacts on schedule and be able to file with the commission by the end of October 2018.

PREPA respectfully requests and encourages the Commission to provide any comments on these inputs, including the scenarios, by that date. According to the informal Phase 1 of the IRP Proceeding and at the convenience of the Commission, PREPA recommends to hold an informal meeting with the Commission the week of August 6<sup>th</sup>, in which the Commission provides and explains its comments and concerns regarding these inputs, including the scenarios.

4. PREPA's responses to the 45 items are set forth in Attachment 1 hereto.
5. Please note that the responses include concerns about item 33 and certain other items.

WHEREFORE, the Puerto Rico Electric Power Authority respectfully requests that the Honorable Puerto Rico Energy Commission accept this Compliance Filing.

RESPECTFULLY SUBMITTED,

IN SAN JUAN, PUERTO RICO, THIS 1ST DAY OF AUGUST, 2018

**PUERTO RICO ELECTRIC POWER AUTHORITY**



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### **CERTIFICATION OF FILING AND SERVICE**

I hereby certify that on August 1, 2018, I have sent the above Compliance Filing to the Puerto Rico Energy Commission through its Clerk via email to [secretaria@energia.pr.gov](mailto:secretaria@energia.pr.gov) and [bmulero@energia.pr.gov](mailto:bmulero@energia.pr.gov); and to the office of the Commission's internal legal counsel via email to [legal@energia.pr.gov](mailto:legal@energia.pr.gov).



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## Information Requirements on PREPA's IRP Development

PREPA shall respond and file the following information at the Commission on or before August 1, 2018. References to sections refer to Regulation 9021.

1. *Provide the name of each external organization that PREPA expects to contribute to the development of the 2018 IRP. This shall include any contractor or consultant under contract with PREPA as well as all identified subcontractors. Describe the role and responsibilities of each such contractor. PREPA may satisfy this question by providing all contracts and scopes of work with such entities.*

**Answer:**

Siemens Industry will be performing the IRP. Attached is the proposal signed with the contract.

PREPA understands this question to be limited to contractors and subcontractors and not to include other entities or persons who have provided or may provide input, whether through the IRP stakeholder processes or other formal or informal mechanisms. For example, PREPA has received or may receive input from elements of the U.S. Department of Energy National Labs, the federal Financial Oversight and Management Board, etc.

2. *Identify any provision of the IRP regulation for which PREPA intends to request a waiver for this proceeding.*

**Answer:**

It is premature for PREPA to develop and provide a complete and extensive list of all the items for which PREPA will or may need to request a waiver in whole or in part. PREPA reserves the right to submit a final, complete list with the filing of the IRP. PREPA will submit one or more advance waiver requests, before filing, if needed and if it is practical to do so.

3. *Sections 1.13(B) and 2.01(F)(1): Describe in detail the native electronic formats of each document, tool, work paper, or model that PREPA will use to develop the IRP.*

**Answer:**

- 1) Licensed and Proprietary Models:

There will be a series of programs and models used to perform the IRP, including specialized systems and models that are licensed and proprietary in nature, including, but not limited to the following:

- a. Aurora (by EPIS now Energy Exemplar) for capacity expansion, hourly portfolio dispatch
- b. PROMOD (by ABB) for security constrained unit commitment / security constraint economic dispatch
- c. PSS@E (by Siemens) for power flow and system stability analysis to be used for transmission system analysis and evaluation of impact of generation additions
- d. Gas Pipeline Competition Model (GPCM®) for entire interconnected North American natural gas market modeling
- e. PREPA's economic models for distributed generation forecast
- f. GT Pro licensed by Thermoflow to assess thermal generation performance on site conditions.
- g. Siemens proprietary load forecasting model in MATLAB

Inputs and outputs of licensed and proprietary models will be shared in spreadsheet format. Any post processing using formulas in the spreadsheets will be maintained intact.

## 2) Word, Excel, and PowerPoint Files

Files in Word, Excel and PowerPoint will be provided in native electronic formats, specifically identifying and including all references to external or internal (PREPA) source documents relied upon for the development of the proposed IRP. If a source document is publicly available on the Internet, a specific link (URL address) to the source document shall be provided. If a source document referenced by PREPA in any portion of its IRP filing is not publicly available or readily accessible, an electronic copy of such source documents will be provided along with the IRP filing. If a source document consists of a study, report, book, periodical, or other publication not publicly available or readily accessible, PREPA will provide copies of the relevant pages from such source document relied upon by PREPA in the development of its proposed IRP. All pages which are necessary to understand the relevant context will be provided. Upon request, PREPA shall make available the entirety of such source document. In the case such source documents are protected under federal copyright law, PREPA will make a reference to the documents used for the development of the proposed IRP.

## 3) Work Papers

Work papers which are available in electronic form will be provided electronically in native format. All formulae and viable links will be left intact for all electronic files. PREPA will provide the following work papers to the Commission upon submission of the IRP:

- a) Load Forecast Development work papers;
- b) Fuel Price Forecast Development work papers;
- c) Resource Plan modeling input files;

- d) Resource Plan modeling output files as used by PREPA;
- e) Any post-processing or analysis work papers used to assess the Resource Plan modeling output files, including financial models used to calculate the present value of revenue requirements, rate impacts or other cost elements of the IRP;
- f) Electronic, spreadsheet-based versions of all tables and figures as presented in the IRP.

**4. Section 2.01(A): What are the start and end dates of the planning period to be used in the IRP?**

**Answer:**

The IRP will cover a 20-year horizon of fiscal years 2019-2038 (July 1, 2018 to June 30, 2038).

**5. Section 2.01(F)(2): What computer models and software will PREPA use in the development of the IRP? Will PREPA provide the model, including software and licenses, to the Commission and its consultants? If not, what alternative means of providing reasonable access does PREPA intend to use?**

**Answer:**

Please see response to question 3 for the software models. Please note that these systems are licensed, and cannot be freely distributed and used except by those who paid for such licenses to the program authors. PREPA can provide text outputs of the program runs, and show the inputs used. Also, the data included in many systems can be both Critical Electrical Infrastructure Information, protected by federal or Puerto Rico Law or commercially sensitive information that would give an existing or potential competitor an unfair business advantage over PREPA, and the people of Puerto Rico. As was done in the IRP case, an arrangement for the visit of the qualified personnel to PREPA, to view the documents and the systems, can be arranged on a set date to see such systems.

**6. Section 2.03 (B): Provide a description of the federal, state and municipal standards or rules that could impact PREPA's the requirements for energy efficiency, renewable energy, fuel alternatives and other resource requirements.**

**Answer:**

PREPA anticipates that the following regulation could impact the IRP and will be taken into consideration:



- *PREPA Energy Efficiency* - Act No. 57-2014 establishes energy savings mandates which states that by 2022, all state agencies, public corporations and all judicial branch buildings must reduce their electrical energy consumption by at least 40%. Further, the 2018 PREPA certified Fiscal Plan (4/19/2018) suggests "Establishing a mechanism that promotes energy efficiency and additional savings above the mandated total consumption cap imposed on Municipalities by Act-57-2014 (i.e. 5% yearly reduction in the maximum consumption amount for a total 15% reduction over three years)." Subsequent to the last IRP, PREC ordered more aggressive energy efficiency goals.
- Act No. 82-2010, as amended, known as the "Public Policy on Energy Diversification by Means of Sustainable and Alternative Renewable Energy in Puerto Rico Act," lays down the specific requirements to promote energy diversification by creating a Renewable Portfolio Standard (RPS). Current law establishes compliance as a percent of purchased REC's of qualifying renewable generation vs total sales, subject to certain grounds for permissible non-compliance. Puerto Rico Renewable Portfolio Standard (RPS) is defined as below-
  - o 12 percent - 2015 through 2019
  - o 15 percent - 2020 through 2027
  - o 20 percent - 2035 and beyond

Qualifying renewable generation resources fall into two categories. The first category ("Sustainable Renewable Energy") includes solar, wind, geothermal, renewable biomass, qualified hydroelectric energy, marine and hydrokinetic, ocean thermal, and any other "clean or renewable energy." The second category is "Alternative Renewable Energy," which includes energy derived from municipal solid waste (MSW), landfill gas, anaerobic digestion, hydrogen fuel cells, biodiesel, ethanol, and any other "alternative energy."

- *Distributed generation, net metering, and microgrids* - the IRP will account for the existing and expected increase of distributed generation in Puerto Rico as encouraged and promoted by existing laws and regulations (e.g., Net Metering Act No. 114-2007) and will consider the resiliency and economic benefits that the development of microgrids can bring. This last aspect is in line with the PREC final Microgrid regulation that has the stated intentions of setting a regulatory framework to promote and encourage the development of microgrids in Puerto Rico, enable customer choice and control over their electric service, increase system resiliency, foster energy efficiency and environmentally sustainable initiatives and spur economic growth by creating a new and emerging market for microgrid services. While supporting microgrids where operationally and economically beneficial, PREPA has concerns with the final Microgrid

regulation adopted by PREC and may seek changes or a substitute regulation. Among other things, final Microgrid regulation authorizes multi-customer "in front of the meter" microgrids that raise a number of legal, financial, operational, safety, and customers rights issues and that are not compatible with the certified Fiscal Plan objectives; the regulation gives customers degrees of "optionality" in terms of switching back and forth from taking and not taking PREPA service that no utility could accept and that also is out of synch with the Fiscal Plan; and the regulation is problematic or incomplete in certain other respects.

- *Environmental law and regulation* - the IRP will be in compliance with EPA regulations including National Ambient Air Quality Standards (NAAQS), Mercury and Air Toxics Standards (MATS), and other carbon regulations like Greenhouse Gas (GHG) Emission Standards and the Clean Power Plan (CPP) as applicable, which would push PREPA's generation toward alternative fuels, among other changes, but it is in the process of repeal.
- *Regulation 9021* - The 9021 regulation will be guiding the Regulation on Integrated Resource Plan for the Puerto Rico Electric Power Authority. The IRP will consider all the reasonable resources to satisfy the demand for electricity services during a twenty (20)-year planning period, taking into account both supply and demand-side electric power resources. The stated purposes of this Regulation are to ensure that the IRP serves as an adequate and useful tool to guarantee the orderly and integrated development of Puerto Rico's electric power system, and to improve the system's reliability, resiliency, efficiency, and transparency, as well as the provision of electric power services at reasonable prices. PREPA could seek waiver of provisions of the regulation but has not yet made any decision to do so. See item 2, above.

**7. Section 2.03 (B): Describe the status of PREPA's plan for complying with environmental requirements, including but not limited to, the Mercury and Air Toxics Standards.**

**Answer:**

See item 6, above.

Compliance with environmental regulations is a driving factor in the portfolio decisions with respect of retiring (or designating limited use) of existing generation and the new resources to be brought online as determined in the IRP. PREPA and its advisor Siemens are

reviewing existing regulations and preparing an outlook for potential new compliance requirements over the study horizon (2019-2038). Although there are numerous environmental policies impacting the energy sector at the federal, state and local levels; the primary policies that are driving power markets and generation decisions generally are the suite of Environmental Protection Agency (EPA) rules addressing plant emissions and state driven renewable and alternative energy portfolio standards. The environmental regulations determined by Siemens and PREPA to be potentially significant and factored into the IRP analysis include federal air regulations, water regulations, and local policy dictating targets for renewable and alternative energy, specifically:

- National Ambient Air Quality Standards (NAAQS)
- Mercury and Air Toxics Standards (MATS)
- Carbon Regulation
  - o Greenhouse Gas (GHG) Emission Standards
  - o Clean Power Plan (CPP)
  - o Outlook for potential future regulation of GHG emissions from power generators
- Puerto Rico Renewable Portfolio Standard (RPS)
- Section 316(b) of the Clean Water Act
- Puerto Rico Water Quality Standards Regulation

Detailed plan for compliance will be developed as part of this IRP study.

**8. Section 2.03 (B): Include a discussion of the legislative changes that have occurred since the last IRP filing that could impact PREPA's system and the IRP Update.**

**Answer:**

The following legislative changes could impact PREPA's System and the IRP. (PREPA notes that item 8 refers to the "IRP update", but the 2018 IRP is a standalone new IRP.)

- 1) Act 4-2016 as amended (PREPA Revitalization Act). Act 4 is a very detailed statute. The original securitization that was intended to be accomplished by Act 4 did not close. On July 30, 2018, the Governor of Puerto Rico and the federal Financial Oversight and Management Board announced a new agreement relating to restructuring certain of PREPA's debt, which may or may not implicate Act 4 in one or more respects. A restructuring, if consummated, could affect PREPA's cost of capital in the IRP.

- 2) PREPA Government Board Vision: The IRP is designed to conform to the overarching objectives of the Fiscal Plan and in particular with the targets and goals for the IRP as delineated in the said Fiscal Plan. Moreover, the Fiscal Plan acknowledges that once the IRP is finalized, PREPA will be able to determine the fiscal impacts of aligning to the selected preferred IRP option. The IRP will be governed by the Boards' Vision for the future of power in Puerto Rico Development:
  - Customer-Centric
  - Financial Viability
  - Reliable and Resilient
  - Model of Sustainability
  - an Economic Growth Engine for Puerto Rico
- 3) PROMESA Title III Court orders: The Puerto Rico Oversight, Management, and Economic Stability Act, Pub. Law 114-187 ("PROMESA" or the "Act"), was enacted into law on June 30, 2016. The Senate had passed PROMESA on June 29, 2016, and President Obama signed the Act into law on June 30, 2016, one day before the Commonwealth of Puerto Rico was expected to, and did, default on substantial payment obligations. Title III of the Act creates its own provisions under which Puerto Rico itself or an instrumentality selected by the Financial Oversight and Management Board (FOMB) can file a case to reorganize its debts in a plan of adjustment. Title III is an in-court debt restructuring process akin to U.S. bankruptcy that is part of PROMESA.
- 4) PREC's final Microgrid Regulation in various respects is intended to set the regulatory framework required to promote and encourage the development of microgrid systems in Puerto Rico, enable customer choice and control over their electric service, increase system resiliency, foster energy efficiency and environmentally sustainable initiatives and spur economic growth by creating a new and emerging market for microgrid services. As indicated earlier the IRP will consider the increasing role of customer installed generation and the use of microgrids for resiliency and economics.
- 5) Privatization: Puerto Rico's Legislative Assembly adopted and the Governor signed Act 65-2018, a law authorizing PREPA to sell its generating assets to two or more private buyers and to entering into concession or other agreements relating to the "T&D" functions of PREPA. Under the bill, PREPA and Puerto Rico's Authority for Public-Private Partnerships will carry out the sales / contracting process. Certain kinds of agreements must be ratified by Puerto Rico's legislature and governor. The

bill also requires the Puerto Rico Energy Commission to conduct a certificate process. . The IRP will consider that new utility scale generation (not behind the customer meter) will or may be installed by private parties with PREPA as counterparty.

6) Regulation 9021; see details in answer to question 6.

**9. Section 2.03(C) (1) (c): Describe the sources and methodology used to develop the historic peak and off-peak demand and the energy profiles on peak and off-peak demand days. What methodology will PREPA use for estimates, where metered (or otherwise measured) data is not available?**

**Answer:**

PREPA developed hourly profiles based on measurements for all customer classes (residential, commercial, industrial, etc.) and rate level. These profiles were used to convert the monthly energy forecast by customer class into yearly hourly (8760) profiles that once aggregated by system area resulted in the load profiles to be used with the software tools described under the answer to question 3.

**10. Section 2.03(C) (1): Provide the inputs and methodology to determine preliminary load forecast data and describe in detail the methodology to estimate the magnitude and direction of changes in load for the next ten years.**

**Answer:**

PREPA and its advisor Siemens developed the preliminary load forecast. The applied methodology considered mathematical models using statistical and econometric tools to develop forecast series of monthly energy sales. For the three largest customer classes, residential, commercial and industrial, the gross energy demand forecast was developed using a Classical Linear Regression Model (CLRM) in which the dependent variable, energy sales, is expressed as a linear combination of the independent variables. In this case, 17 variables are considered including three weather variables, two economic variables (population and GDP), and 12 month specific dummy variables (one for each month of the year) to capture the seasonality of energy demand on a monthly basis.

For the smaller customer classes (agriculture, lighting and other) the overall fit of the CLRM model was weak with the economic and weather fundamental variables providing little explanatory value on the energy demand for each class. For these smaller customer classes, Siemens developed the forecast based on historical seasonality and using a simpler extrapolation technique with the

expectation that each class follow similar growth rates to the overall system.

Final sources, inputs, and results will be made available upon completion and review, which includes reconciliation with the forecasts used for the FOMB Certified Fiscal Plan.

**11. Section 2.03(C) (1) (e): Has PREPA completed the evaluation of the prior load forecast? If so, provide it. If not, when will it be available?**

**Answer:**

Such analysis, as available, will be delivered in the IRP.

**12. Section 2.03(C) (2) (a): Provide the preliminary load scenario assumptions for the three baseline load forecasts. Explain the underlying rationale for each, and specifically address how "demand destruction" or island load loss following the 2017 hurricanes is factored into these load scenario assumptions.**

**Answer:**

To generate scenarios for load growth, Siemens developed statistical distributions based on the deterministic load forecasts. The process involves two steps, the first one, encompasses developing parametric distributions around the key fundamental variables that could present more volatility in the future (weather and economic performance in Puerto Rico) utilizing historical data to develop 2,000 scenarios for weather and GDP that are feed into the econometric regression model to determine 2,000 iterations of average and peak load. The second step involves developing Quantum distributions, which incorporate future uncertainties not captured by the historical data.

#### Parametric Distributions

To produce load distributions, Siemens propagates three independent random paths: CDD, GDP, and a residual. The development of stochastics is based on building probability distributions around the deterministic forecast.

- To produce reasonable weather data projections, Siemens samples 17-year monthly historical weather data based on CDD for 2000-2017.
- GDP is assumed to follow a Geometric Brownian Motion. This means that there exists a normal distribution with constant mean and variance that describes how the GDP could behave at any time in

the future. The process is developed using historical quarterly GDP data for 2000-2017.

- Finally, to account for unexplained variation in the observed data, Siemens adds a normally distributed residual with mean zero and standard deviation equal to the root mean squared error from a stepwise regression.

Based on historical volatility, 2,000 distributions of these variables are developed and used in the stepwise regression model to develop an intermediate distribution of average and peak load distributions for the forecast time period.

#### Quantum Distribution: Additional Variability

It is Siemens' opinion that future power demand may differ substantially from past power demand. To accommodate for this possibility, we add an additional "Quantum Distribution" to our empirically derived distribution. The 5th percentile of this distribution reflects a low growth scenario (e.g. higher degree of population attrition, grid defection or energy efficiency). The upper tail of this distribution (95th Percentile) is weighted to match Siemens' analysis of historical high periods of load growth or to capture other events such as higher penetration of air conditioning loads and rising demand from electric vehicles. Using this high and low growth scenarios, Siemens generates a distribution using statistical techniques. This distribution is super imposed on the parametric distribution obtained in the step discussed above. The resulting distribution is considered the final average and peak load distribution (2,000 iterations).

**13. Section 2.03(C) (2) (a): If PREPA chooses to conduct only three baseline load forecasts, PREPA should be prepared at the technical conference to address why it believes only three baseline load forecasts are sufficient.**

**Answer:**

See full response to Question 12.

**14. Section 2.03(C) (2) (b): Which economic factors will PREPA account for in developing forecasts of electricity consumption? What are the data sources to be used for those factors?**

**Answer:**

For developing the forecast demand by customer class, Siemens used GDP, population and manufacturing employment. GDP forecast originally used came from Moody's Analytics, and population forecast dome from US Census Bureau. Manufacturing employment is based on historical data reported by the Federal Reserve of Economic Data of St. Louis (FRED) and Siemens own projections. In addition to the economic variables, Siemens accounted for the impact of weather in the load forecast (cooling degree days and rainfall) and the impact of the hurricanes in fiscal year 2018.

Other economic data was considered, including disposable income and income per-capita but they were not included in absence of an independent forecast available and considering that both are highly correlated to GDP, diluting its predictive value.

Siemens is currently reviewing the load forecast to assess the effect of using Puerto Rico specific GDP and population forecasts developed for to be used in the certified Fiscal Plan.

**15. Section 2.03 (C) (2) (b): If PREPA has defined preliminary load scenario assumptions, provide them.**

**Answer:**

See response to question 12.

**16. Section 2.03 (C) (2) (d): How will PREPA incorporate naturally occurring energy efficiency in its load forecasts? Describe the assumptions PREPA intends to use for naturally occurring energy efficiency.**

**Answer:**

Naturally occurring energy efficiency is incorporated in the forecast based on recent trends observed in Puerto Rico. In the IRP, the econometric model used to estimate the demand forecast incorporates the impact of naturally occurring energy efficiency in the last few years. Future energy efficiency programs are assessed separately.



In addition, the impact of potentially larger than expected energy efficiency impacts on load is incorporated in the IRP's stochastic scenarios for future energy demand.

**17. Section 2.03(C)(2)(g): What inputs and methodologies is PREPA expecting to use to quantify the impact on the load forecast from existing demand-side resources, anticipated changes in rate design, building codes and standards, and deployment of distributed generation (including solar PV and microgrids)?**

**Answer:**

Siemens is developing projections for energy efficiency and demand response based on measures deemed appropriate for PREPA based on implementation in other similar environments and through discussions with PREPA. Building codes standards for new construction is one of the measures considered. Estimated energy savings, program costs, and impacts to load are developed specific to each measure as part of this IRP.

**18. Section 2.03(D): Describe the impact of the expected transformation process on PREPA's existing resources, due to the implementation of the Puerto Rico Electric System Transformation Act, and on how they are analyzed or modeled in the IRP.**

**Answer:**

The transformation process is an ongoing process that is in its early stages. The Government of Puerto Rico and AFAAF along with the P3 Authority have the leading roles, although PREPA also plays a significant role and the Commission does as well, as detailed in the applicable legal provisions. PREPA will do its best to answer this question within this circumstance.

The implementation of the Puerto Rico Electric System Transformation Act is a separate process outside the timeline of developing the IRP. We understand that the expected transformation process provides the legal framework for the sale or transfer of assets, operations, functions, and services of PREPA to interested private parties. In such context, the IRP will fully incorporate PREPA's generation, transmission and distribution assets based on performance and cost expectations and consider funding of new generation investment to be done by private parties. In particular the necessary investments to

retire, designate limited use or modify fossil fuel fired steam electric generation to fully comply with MATS regulation in the near term is an important consideration. Also, plans to restore the hydro assets will be reflected in the IRP. As part of the PROMESA Title III process, information on renegotiated or new contracts will also be incorporated as such information becomes available.

**19. Section 2.03 (D): Describe how the IRP will consider the impact of the 2017 hurricanes on the operation and maintenance of PREPA's existing generation resources.**

**Answer:**

This is a very broad question. In brief, the IRP will use reasonably available information about PREPA's existing generation resources. This IRP essentially will consider that the generation system is fully restored to pre-Maria conditions. If the question is about reliability and resilience, then those objectives will be taken into account, along with others, in the IRP. See also question 23.

**20. Section 2.03(D) (2): What demand-side resources is PREPA currently implementing, if any?**

**Answer:**

None at the moment.

**21. Section 2.03(F): How does PREPA expect that the FOMB's "critical project" process under Section 503 of PROMESA will impact the identification of new supply-side resources?**

**Answer:**

FOMB's "critical project" process under Section 503 of PROMESA is a separate process outside the timeline of the IRP development.

Certain aspects of the critical projects process will be incorporated in the IRP, if concrete information exists and is provided or reasonably available and deemed important to model. In addition, the IRP could consider the potential Expedited Permitting Process (the "EPP") associated with the critical project process if that is deemed feasible for certain near term projects, in particular with respect of those associated with resiliency and deployment of local generation and transmission and distribution hardening.

**22. Section 2.03 (F): Describe the impact of the expected transformation process on PREPA's options for new supply resources, due to the implementation of the Puerto Rico Electric System Transformation Act, and on how they are analyzed or modeled in the IRP.**

**Answer:**

The transformation process is an ongoing process that is in its early stages. The Government of Puerto Rico and AFAAF along with the P3 Authority have the leading roles, although PREPA also plays a significant role and the Commission does as well, as detailed in the applicable legal provisions. PREPA will do its best to answer this question within this circumstance.

The implementation of the Puerto Rico Electric System Transformation Act is a separate process outside the timeline of developing the IRP. We understand that the expected transformation process provides the legal framework for the sale or transfer of assets, operations, functions and services of PREPA to interested private parties. In such context, the IRP will consider future builds to be financed by third parties, assuming PREPA obtains financial backing to contract as a credit-worthy counterparty.

**23. Section 2.03(F): How will PREPA take the location of potential new supply-side resources into account in its IRP? Will this analysis include transmission constraints and capacity? How will it account for resilience impacts of generator location?**

**Answer:**

This is taken into consideration in two ways. First, the optimal capacity expansion program will correctly allocate new resources by working at a zonal level considering transmission limitations between areas, load-side resources (DG) and minimum generation requirements (e.g. minimum local reserves). In this way we can ensure that at the zonal level there is appropriate resource allocation and no major transmission limitations are violated. Second, this first zonal analysis is followed up by a system analysis using PROMOD and PSS@E. PROMOD will be used to confirm resource adequacy in terms of energy not served, loss of load hours and renewable curtailment considering the new resources in place (utility and supply side) and hourly operation. PSS@E will be used to assess steady state and system stability. The steady state assessment will consider contingency conditions (N-1, N-2, N-1-1, etc.) to determine performance in terms of overloads and voltage violations. System stability will confirm proper frequency response, absence of voltage collapse or severe voltage dips and angular stability.

On a typical IRP, transmission investments to bring cheaper generation (usually renewable) to the load are considered in the analysis and portfolios that include these investments have increased transmission levels between zones allowing the optimal capacity expansion plan to add cheaper resources to remote areas. However, in the case of Puerto Rico given the need for resiliency and extended times required for building long overhead transmission lines, the IRP needs to identify an optimal balance between local generation resources and limited centralized new generation. To achieve this, we plan to define our Portfolios based on two strategies; the first one will be centered predominantly distributed resources which will come naturally for renewable generation and storage but also will apply to new thermal generation. To achieve this, the system will be split in a number of electrical islands (called minigrids) and the optimal capacity expansion plan will seek to achieve 100% load generation balance at the minigrid level. Note that the minigrids are being defined considering the vulnerabilities of the overhead transmission system and they do not rely on lines that could take month to rebuild after a major hurricane (e.g. cat 4). Also, in the design of the minigrids we are identifying transmission lines that need to be hardened (e.g., undergrounding) to ensure integrity of supply to critical loads and timely recovery of the balance of the local loads.

The system as identified by the strategy above may be more costly as some benefits of economies of scale particularly for thermal generation may not be realized and the benefits of using of more economic fuels (e.g., natural gas) may not be fully exploited.

Given the above, we will evaluate a second strategy where we accept that the minigrids will depend partly on resources located in other areas (centralized generation). This can be achieved by defining a minimum level of local generation at the minigrid level and allowing the balance of the generation to be allocated elsewhere.

The resulting portfolios by the application of the strategies above will be assessed under normal operating conditions where the system is operating on an integrated mode and only subject to the high probability low impact events (e.g., N-1 or N-1-1 contingencies) and under low probability high impact events. With respect of these second class of events we intend to consider the impacts of a severe but relatively frequent events (e.g., a Cat 1 Hurricane passing near Puerto Rico every year) leaving the system on a degraded but integrated condition and the impact of a major hurricane (Cat 4 Hurricane hitting the island every X years) leaving the system split into the minigrids. For both of these severe events we will estimate the amount of load that would need to be shed to maintain the security of the system and using an estimation of Value of Lost Load (VoLL) the corresponding cost that will be added to the Portfolio as the cost of reduced resiliency.

**24. Section 2.03(F): How is PREPA considering the potential for customer use of microgrids in the IRP? How is PREPA considering the potential for utility-owned or operated microgrids in the IRP?**

**Answer:**

See also question 6.

As described under question 23, PREPA is formulating a plan for establishing electrical islands (minigrids) that will allow maintaining supply to critical loads, and timely recover from major atmospheric event, such as a category 4 hurricane; by rapidly reestablishing service to commercial loads, industrial loads and large segments of the population. As we progress in the analysis of these minigrids we are identifying loads that cannot be reconnected to the minigrid within a reasonable amount of time and are being identified as potential microgrid sites. The development of these identified microgrids could be either by the utility or by private investors. Moreover if during the development of the IRP we become aware of plans for a privately owned microgrid, this will be incorporated as an option when assessing the coverage of the minigrids.

**25. Section 2.03(F)(3): Describe in detail the methodology PREPA intends to use to characterize demand-side resources, including energy efficiency and demand response, for inclusion in the Resource Plan analysis.**

**Answer:**

To reasonably project energy efficiency and demand response for the IRP, first a list of potential measures was developed based on effective programs implemented in similar climates and island settings. PREPA and Siemens reviewed this list and filtered down the measures to a subset which were deemed most appropriate for PREPA. These measures were then evaluated and characterized using models which build estimates on participation rates, energy savings, and program costs.

**26. Section 2.03(F)(4): Identify the methods and data sources PREPA intends to use to incorporate current cost and performance standards for utility-scale short-duration (less than 2-hour) battery energy storage systems into the resource selection process.**

**Answer:**

Storage resources similar to conventional resources can fulfill two main roles; energy supply and ancillary services.

In the case of battery energy storage systems (BESS) the energy supply function is related to its capacity to store energy at times

where it is less expensive or in the case of Puerto Rico that would be curtailed as the renewable generation exceeds the load, and then to be delivered at times where more expensive generation would have to be dispatched (including peaking costly generation) or as could be in the case with high levels of renewable penetration, there would be no other resources to supply the load. This "Energy Shifting" function is the lead driver behind the need for energy storage capacity (less than 2 hours, 2 hours, 4 hours, 6 hours, etc.). The selection is a cost optimization function seeking to minimize on one hand the cost of the energy storage capacity and the cost to the system on the other. Thus, if the need for energy shifting is small as could be the case with lower levels of renewable penetration combined with flexible generation or if the bulk of the energy shifting is provided by large strategically located BESS resources, then a low energy storage capacity BESS (under 2 hours) may be selected. However, if the needs for energy shifting are large then optimization process needs to select the right size of energy storage (2, 4 or 6 hours) by balancing the cost of the BESS versus the otherwise incurred costs including expensive generation dispatched and/or renewable energy curtailment.

The second and very important function of BESS is that of providing ancillary services; e.g., primary and secondary frequency regulation, voltage support and reserves. Frequency regulation enhancement is expected to be a very important factor with high levels of penetration of inertia-less intermittent renewable resources that will add to the natural variability of the load and reduce the inertia of the system that prevents rapid changes in the frequency. BESS with the extremely fast response are excellent candidates to provide this service.

In addition to the above, BESS by nature can be located closer to the load and provide voltage support and local reserves to address the trip of conventional generation or rapid reduction in renewable generation.

For this second function the need for energy storage capability is secondary (it may be there for other reasons), but the important element is the energy delivery/absorption capacity (MW). So if the driving need for the BESS is the ancillary services then small (possibly sub-hourly) energy storage capacity would be appropriate.

With respect of costs; Siemens has independently developed estimates for the capital costs, and benchmarked the costs against various public sources including Lazard levelized cost of storage report, California Energy Commission (CEC), I.H.S Markit, and NYSEDA published prices. The capital costs have been developed by Siemens and through third party estimates in the industry with adjustment to Puerto Rico conditions.

**27. Section 2.03(F)(4): Identify the methods and data sources PREPA intends to use to incorporate current cost and performance standards for utility-scale longer-duration (equal to and greater than 2-hour) battery energy storage systems into the resource selection process.**

**Answer:**

See answer 26.

**28. Section 2.03(F)(4): Identify the methods and data sources PREPA intends to use to incorporate current cost and performance standards for distributed resource (e.g. small scale) battery energy storage systems into the resource selection process.**

**Answer:**

See answer 26.

**29. Section 2.03(F)(4): Identify the methods and data sources PREPA intends to use to incorporate current cost and performance standards for thermal energy storage systems, such as ice-storage HVAC systems, into the resource selection process.**

**Answer:**

The IRP will identify the capacity for storage needs, basically consisting of BESS. However, at the time of implementation, other technologies like is the case of ice-storage HVAC systems, can be considered as part of the pre-implementation optimization process.

**30. Section 2.03(G): Describe the data sources and methods that PREPA intends to use for each of the seven identified inputs in section 2.03(G)(1).**

**Answer:**

The IRP Model assumption Documentation includes the following:

	Input parameter	Data Source/ Methods
1.	Annual fuel prices	Siemens prepared fuel price forecasts for natural gas at the Henry Hub, crude oil (West Texas Intermediate or WTI), and the oil-derivate products of diesel (No. 2 fuel oil) and residual fuel oil (No. 6 fuel oil with 0.5% sulfur). The Henry Hub benchmark is located in Erath, LA while the WTI benchmark is located in Cushing, OK. The diesel and residual fuel oil forecasts are based on New York pricing (per the contract terms for Costa Sur)
2.	Annual emission prices	Siemens will not include any carbon price for the base case. Despite the absence of the CPP or any other national regulation of carbon emissions from power generators at this time, the potential for enactment of such regulation over the study horizon remains. To account for this uncertainty in the IRP analysis, Siemens ran sensitivities that include a price on all CO2 emissions from fossil generators. The price will be developed based on data from U.S. Energy Information Administration, Synapse, I.H.S and Siemens
3.	Economic conditions	Siemens compiled and reviewed several sources of macroeconomic data (historical and forecasts) from several sources including the International Monetary Fund, the World Bank, the U.S. Census Bureau, Federal Reserve of Economic Data of St. Louis (FRED), Puerto Rico's Oversight Board, and Moody's Analytics, among others. Moody's projects the GDP to eventually recoup much of its hurricane-related losses and to remain relatively stable throughout the forecast horizon. Siemens considered other outlooks, including Puerto Rico's Financial Oversight and Management Board (FOMB) and the IMF. The FOMB GDP forecast shows a relatively fast recovery from Maria's impact, driven by the impact of the disaster relief spending and the structural reforms proposed, including a reform of the electrical grid, raising the standard of fiscal transparency and bringing Puerto Rican labor law into closer alignment with U.S. labor law.



	Input parameter	Data Source/ Methods
4.	Environmental regulations	The U.S. EPA sets standards for six criteria pollutants under the Clean Air Act (CAA) and is required to regularly review and as necessary update these standards. Particulate matter, nitrogen oxides and sulfur dioxide (SO <sub>2</sub> ) are criteria pollutants that are emissions from fossil fuel combustion. Ozone levels can indirectly be impacted by fossil fuel emissions. The EPA regulates emissions of hazardous pollutants as well. EPA's Mercury and Air Toxics Standards Final Rule (MATS), originally issued in December 2011, requires facility specific emission reductions of mercury, acid gases, and particulate matter. This is a command-and-control type of regulation with no allowance trading. The rule came into effect in April 2015 and existing plants can apply for a one year extension to reach compliance.
5.	Other non-environmental regulations, including renewable portfolio standards	Renewable Portfolio Standards (RPS) are regulated programs placing an obligation on electricity suppliers that a certain percentage of their electricity sold be derived from alternative or renewable energy resources. At this time, 29 states, Puerto Rico, and the District of Columbia have enacted mandatory state-level RPS requirements. These RPS rules dictate expansion options and economics.
6.	Utility discount rate or weighted average cost of capital	The weighted average cost of capital considers potential third party independent power producers to build new project, assuming PREPA achieves financial backing to be a credit-worthy counterparty. Currently we are looking at a WACC in the range of 9-10% under these assumptions.
7.	Annual debt limitations	At this stage, we do not have clear guidelines on the capital constraints for the IRP. This could be incorporated as part of the scenarios including the cost of capital if consensus guidelines could be provided in a timely manner.

**31. Section 2.03(G)(2): What exogenous elements will PREPA include in its forecasts? What data sources and methods will PREPA use to define these elements? How will PREPA develop a range of possible values for each element?**

**Answer:**

This answer is split in load forecast and fuel forecast.

Load forecast: In line with the econometric model, Siemens used population, GDP, weather variables and the monthly dummy variables as explanatory variables to develop the load forecast by customer class for FY 2019-2038. Siemens compiled and reviewed several sources of macroeconomic data (historical and forecasts) from several sources including the International Monetary Fund, the World Bank, the U.S. Census Bureau, Federal Reserve of Economic Data of St. Louis (FRED), Puerto Rico's Oversight Board, and Moody's Analytics, among others. In addition, historical monthly NOAA data was retrieved (2000-2016) and normalized to provide a monthly average shape for Cooling Degree Days (CDD).

Regarding economic and population forecasts, Siemens used Moody's Analytics' future projections on GDP and population and is currently assessing the effect of using Puerto Rico specific GDP and Population Forecast as provided by the FOMB consultants and used in the certified Fiscal Plan.

Please see response to Question 12 regarding specific discussion of the range of load forecast.

Fuel forecast: For Fuel, Siemens prepared fuel price forecasts for natural gas at the Henry Hub, crude oil (West Texas Intermediate or WTI), and the oil-derivate products of diesel (No. 2 fuel oil) and residual fuel oil (No. 6 fuel oil with 0.5% sulfur). The Henry Hub benchmark is located in Erath, LA while the WTI benchmark is located in Cushing, OK. The diesel and residual fuel oil forecasts are based on New York pricing (per the contract terms for Costa Sur).

Similarly, the natural gas distributions are developed based on historical volatility, historical mean reversion, historical correlation and an expert view of low, middle and high cases. With this integrated approach, these inputs are fed into the stochastic model to create 2,000 Monte Carlo simulations and then followed by a random stratified sample of 200 distributions to capture the uncertainty of the gas price variable.

**32. Section 2.03(G)(2): If PREPA has defined scenarios it expects to use in IRP analysis, describe each scenario.**

**Answer:**

The IRP will capture a series of uncertainties, including load, DER, cost of capital, fuel availability and price forecasts, policy, market prices, weather, and contracts through a combination of scenarios, probabilistic (stochastics) risk analysis and sensitivities. These will be designed to test each strategy against a combination of availabilities of fuel and other uncertainties.

As per the Regulation on Integrated Resource Plans for the Puerto Rico Electric Power Authority 9021, scenarios refer to a combination of system requirements needed to serve load, commodity prices, capital costs, and risks that influence the choice of resources serving PREPA's future load. For the 2018 IRP, four scenarios are included in the core scope. Traditional uncertainties (e.g. load forecasts, fuel forecasts, renewable capital costs) are dealt with via stochastic analysis, as described later. With respect of fuel infrastructure, the following scenarios are considered:

- Scenario 1: no new gas-fired generation
- Scenario 2: gas to North: Land-based LNG at San Juan can achieve permitting approval
- Scenario 3: gas to the South: AOGP can achieve permitting approval
- Scenario 4: Gas to the South through AOGP and gas to the North through land-based LNG at San Juan achieving regulatory approval

The model will be run with a variety of generation options to determine the least cost portfolio for each Scenario. It should be noted that the possibility of achieving permitting approval does not mean that the option of gas generation will automatically be selected nor its size.

It should be noted that the scenarios described here or its modified version must be locked up so the analysis can proceed. Any changes made to the scenario setup will cause delays and will make it impossible to meet the agreed deadlines for completing the IRP as such. See also the points made regarding item 33 in the cover filing for this Compliance Filing and below.

In addition to scenarios, risk analyses will be performed on a set of uncertain variables, such as load, technology costs, emission costs, and fuel prices. Distributions that reflect uncertainties are developed for each variable and then 200 simulations of input combinations are selected to represent uncertainty on each selected portfolio.

- Stochastic analysis in Aurora Model will capture ranges and variability of the revenue requirement given uncertainties in load, DER penetration, fuel prices, and capital costs.
- Monte Carlo simulations in PROMOD will capture loss of load hours (LOLH) and Energy Not Served (ENS) considering the expected performance of the generating fleet. Additionally for the impact of weather events, two approaches can be considered:

- o Modeled in PROMOD: a scenario representative of system condition after a major storm that is expected to occur with relatively frequency (e.g. Category 1 Hurricane) and evaluate the LOLH and ENS for a period of one month assuming that the system will stay in this condition.
- o Model a scenario of the system condition after a major storm that is expected to occur more infrequently (e.g. a Category 4 Hurricane) in which the system is split into the pre-designed minigrids. Each minigrid will be assumed to operate in isolation for one month. An estimation of load not served during minigrid formation can be included.

Finally, the sensitivity analyses will hold the resources developed in each Scenario (Resource Plan) constant and examine the impacts of changing specific (uncertain) forecasts. For the 2018 IRP, three sensitivities are included in the core scope. Sensitivities will be run off the Preferred Strategy and the three Scenarios. For example, Sensitivity 1 (if adopted) would be aligned with Scenario 1 (no new gas); Sensitivity 2 could be evaluated as part of Scenario 3 (AOGP); and Sensitivity 3 (AES Extension and small LNG) would be linked with Scenario 2 (Gas to the North).

- Sensitivity 1: increased RPS with low cost of solar and storage
- Sensitivity 2: termination of PPOAs; termination of EcoEléctrica at expiration.
- Sensitivity 3: AES extension and gas to the North: Floating LNG at San Juan

Additional important sensitivities requested by the stakeholders include:

- The sensitivity to regulatory aspects (no RPS and/or postponed MATS compliance) to show the cost of compliance, if any.
- Gas to the South if pipelines could achieve permitting approval.
- Gas to other areas (e.g. Mayagüez) if such projects could achieve permitting approval.
- Emissions prices (CO2)
- Cost of capital sensitivities

If selected, these sensitivities would have to replace one of the proposed sensitivities.

Exhibit 1 and Exhibit 2 summarize how the uncertainties are treated in the IRP. The variables and factors were prioritized primarily driven by stakeholder inputs, our expert opinions and best practices.

The four scenarios, three sensitivities and risk analysis are included in the core IRP scope. Due to the accelerated schedule, some variables and factors could be included in additional sensitivity analysis outside the core IRP scope. These exhibits are not final, as they are currently under discussion.

**Exhibit 1: Uncertainty Factors, Scenario, Sensitivity, and Risk Analysis (Part 1)**

Category	Factor	Scenario				Sensitivity			Risk Analysis	
		1	2	3	4	1	2	3	Aurora Stochastics	PROMOD Monte Carlo
Load	Load forecast	X	X	X	X				X	
	DER penetration	X	X	X	X				X	
	FOMB or other load forecasts	Potential additional sensitivity								
Fuel	Fuel forecast	X	X	X	X				X	
	Gas to the South: AOGP can achieve permitting approval.			X						
	Gas to North: Land Based LNG can achieve permitting approval.		X							
	Gas to the North: Floating LNG can achieve permitting approval.							X		
	Gas to the South through AOGP and gas to the North through land-based LNG at San Juan can achieve permitting approval.				X					
	Gas to the North and South: Eco to Aguirre to San Juan Pipeline can achieve permitting approval.	Potential additional sensitivity								
	Gas to other areas (e.g. Mayagüez) can achieve permitting approval.	Potential additional sensitivity								
	LPG to the North can achieve permitting approval (technology option).	X	X	X	X					

**Exhibit 2: Uncertainty Factors, Scenario, Sensitivity and Risk Analysis  
(Part 2)**

Category	Factor	Scenario				Sensitivity			Risk Analysis	
		1	2	3	4	1	2	3	Aurora Stochastics	PROMOD Monte Carlo
Policy/ Regulatory	Policy: no new gas fired generation	X								
	Policy: no RPS	Potential additional sensitivity to assess impact								
	MATS compliance postponed	Not Considered								
Market	Policy: increased RPS (e.g. 50% renewable)					X				
	Large drop in cost of renewable /storage					X				
	Base case cost of renewable /storage	X	X	X	X				X	
	New builds capital costs	X	X	X	X				X	
	Emissions prices (CO2)	Potential additional sensitivity to assess impact								
Weather	Weather impacts /climate change									X
Contracts	AES expires in 2027	X	X	X	X					
	AES renewal							X		
	EcoEléctrica expires in 2022						X			
	EcoEléctrica renewal	X	X	X	X					
	AES early termination	Not considered								
	EcoEléctrica early termination	Not Considered								
Weighted Average Cost of Capital	Private cost of capital for generation	X	X	X	X					
	Low cost of capital for transmission	X	X	X	X					
	Low cost of capital for generation	Potential additional sensitivity								

**33. Section 2.03(G) (2):** If, pursuant to Section 3.01(B) of Regulation 9021, the Commission were to require PREPA to consider different scenarios than the ones considered by PREPA in the development of the IRP, identify the information the Commission would need to specify or define such scenarios.

**Answer:**

See the concerns raised regarding item 33 in the cover filing of this Compliance Filing. In addition, PREPA notes the following.

The development of the IRP is a very complex process, under an accelerated schedule. If the Commission identifies the need for an additional scenario it would be best if this is done as early in the process so that they can be readily incorporated in the analysis

minimizing the inevitable need for extending the timeline. The information that we would need from the Commission to identify the scenario is a function of the nature of such scenario. However greater level of detail will ensure that it is properly represented as the Commission expects. At minimum we would expect the Commission to provide; a) general description of the scenario, b) what it is expected to demonstrate or contribute to the analysis and c) detailed assumptions in tabular form for describing key inputs as a function of time.

**34. Section 2.03(H)(1)(a): How many Resource Plans does PREPA intend to analyze in the IRP?**

**Answer:**

Portfolio cases are unique combinations of scenarios and strategies. As part of the stakeholder process, Siemens shared three potential strategies as shown in **Exhibit 3**, below.

1. Strategy 1 reflects a traditional and centralized energy program that emphasizes reliability and economic metrics;
2. Strategy 2 reflects a distributed system of flexible generation, and micro or mini-grids and hardening of existing infrastructure around Puerto Rico, which emphasizes resiliency and closeness to the customer;
3. Strategy 3 reflects a hybrid of the first two strategies that embodies a combination of the benefits of Strategy 1 and Strategy 2.

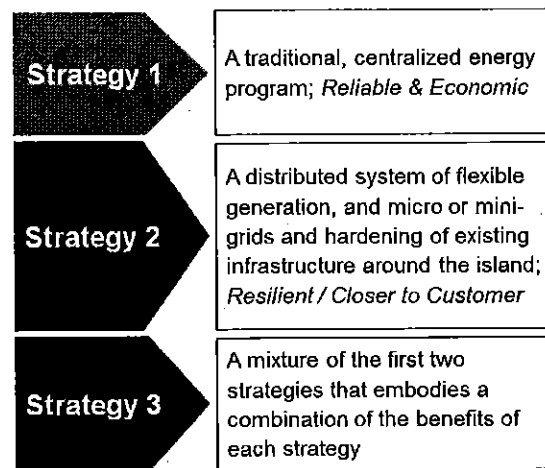
To achieve the vision of a more renewable, resilient, and reliable Puerto Rico electric system, the IRP incorporates minigrids, micro-grids and grid modernization to systematically improve resiliency with pockets of critical loads served by distributed resources that can operate in both grid-connected and islanded modes. These minigrids are proposed to be strategically sited at a cluster of critical loads, downstream of transmission vulnerabilities. The IRP seeks to balance low cost reliable operation under normal conditions and the ability to mitigate and timely recover from major disruptive events.

Stakeholders generally reached consensus that a distributed strategy is more appropriate to Puerto Rico's situation than a centralized strategy because it provides a more resilient grid. Generally, participants viewed strategy 3 ("hybrid strategy" of centralized and distributed generation) as a short- or medium-term transition to strategy 2 (a long-term mix of distributed and flexible generation in



Puerto Rico where supply is located closer to load). Most stakeholders in general did not consider that the centralized strategy should be pursued, except possibly as a reference point. However, certain stakeholder groups requested that strategy 1 to be explicitly modeled.

Exhibit 3: PREPA IRP Strategies



For each strategy a combination of assets will be developed by putting constraints on the generation, transmission and distribution assets that are available to the island for a specific strategy. For example, a fully distributed strategy will not consider large traditional generating assets such as large gas combined cycle plants. A partially distributed system will consider only a limited amount of traditional assets.

Exhibit 4 illustrates the eight portfolio cases to be modeled in the core IRP. It should be noted that Strategy 1 is excluded based on majority stakeholders' inputs. It should be noted that the definition of the portfolio cases are preliminary but needs to be firmed up.

Exhibit 4: Portfolio Cases in the Core IRP

Portfolio Cases	Strategy 2	Strategy 3
	Distributed system of flexible generation, and micro or mini-grids and hardening of existing infrastructure around the island	Hybrid of traditional and centralized energy program and Distributed system of flexible generation
<b>Scenario 1</b> No new gas-fired generation	Portfolio Case 1 Strategy 2 + Scenario 1	Portfolio Case 5 Strategy 3 + Scenario 1
<b>Scenario 2</b> Gas to North: Land-based LNG at San Juan can achieve permitting approval	Portfolio Case 2 Strategy 2 + Scenario 2	Portfolio Case 6 Strategy 3 + Scenario 2
<b>Scenario 3</b> Gas to the South: AOGP can achieve permitting approval	Portfolio Case 3 Strategy 2 + Scenario 3	Portfolio Case 7 Strategy 3 + Scenario 3
<b>Scenario 4</b> Gas to the South through AOGP and gas to the North through land-based LNG at San Juan	Portfolio Case 4 Strategy 2 + Scenario 4	Portfolio Case 8 Strategy 3 + Scenario 4

In addition, three sensitivity analyses (included in the core scope) will hold the resources developed in each Scenario (Resource Plan) constant and examine the impacts of changing specific (uncertain) forecasts. These sensitivities were presented under answer 32.

**35. Section 2.03(H) (1) (a) (ii): Describe the process PREPA intends to use to incorporate stakeholder input and Commission requirements into the Resource Plan.**

**Answer:**

The PREPA IRP team will facilitate at least three stakeholder meetings during the course of the 2018 IRP to understand stakeholder concerns, get feedback on assumptions and to answer and address

concerns throughout the project. Feedback will be solicited at each stage which can inform assumptions, scenarios, portfolios, and recommendations.

- The first stakeholder meeting focused on suggested approaches, base case assumptions, a description of how the process will be carried out; explaining that stakeholders will have three chances to have input to the study. The central objective of this meeting is to address the following aspects: (1) to get stakeholders inputs into the strategies to be considered; (2) how they see their participation and contributions to the process; (3) what are the key uncontrollable inputs that can influence results (scenarios) and the key risks to be considered, in their view?
- This initial stakeholder meeting was expected to be completed over a period of one week; however it has extended to include various follow up sessions with stakeholders that could not participate in the first set of meetings and responses of questionnaires of key stakeholders (including this one). This extended stakeholder process while highly desirable for the successful completion of the IRP is taken a significant amount of time on an already compressed timeline.
- We expect that the initial stakeholder process and the "locking" of assumptions, projections, scenarios, and sensitivities will be achieved by the end of the technical conference on the August 14, at the latest.
- The second meeting will be an interim meeting that will discuss the screening analysis of technologies and uncontrollable variables, the suggested selection of the portfolios that represent the three strategies for the island and a detailed description of the inputs to our risk analysis.
- The third stakeholder meeting will describe the risk analysis results, the basis for the selection of the recommended strategy and next steps for implementation, including a discussion of alternative glide paths should expectations for key variables change.

**36. Section 2.03(H) (2) (a): Identify the Capacity Expansion Model that PREPA will use to develop Resource Plans.**

**Answer:**

As part of the screening analysis, Aurora utilizes an hourly, chronological production cost model with an integrated long term capacity expansion feature (LTCE), which produces a least cost

resource expansion plan given resource options and constraints around those options. The options can include applicable supply-side and demand-side resources, including storage, for inclusion in the expansion plan, existing resources and existing resources for economic retirement as desired. The LTCE considers constraints such as reserve margin targets or requirements, renewable portfolio standards, carbon limits, and ancillary service constraints.

**37. Section 2.03(H) (2) (b): Describe the methodology PREPA intends to use to define the range of sensitivity analyses to be performed around each Resource Plan.**

**Answer:**

Please see responses to Questions 32 and 34.

**38. Section 2.03(H) (2) (b) (iii): Identify which method of sensitivity analysis PREPA intends to use, from those identified in this subsection or otherwise.**

**Answer:**

Please see responses to Question 32 and 34.

**39. Section 2.03(H) (2) (d) (ii): Identify each criterion that PREPA intends to use, in addition to the present value of revenue requirements, when selecting the Preferred Resource Plan.**

**Answer:**

The IRP plans to include preliminary metrics as shown in Exhibit 5 below, which are subject to change with stakeholder inputs.

**Exhibit 5: IRP Metrics**

<b>OBJECTIVES</b>	<b>METRICS (illustrative)</b>
Customer Centric	Diversity/Choice (Number of options) Affordable Power (\$/MWh cost)
Least Cost: financial viability	Minimum Cost of Supply; e.g. Net Present Value (NPV) of Revenue Requirements + VOLL (value of lost load)
Reliable	Meets or exceeds resource reliability targets (e.g. LOLE, ENS LOLH) as well as network reliability (e.g. NERC TPL-001-4) all the time
Resilient	Able to maintain supply to critical loads, timely restoration of supply to customers during high impact low probability events. Metrics include loads expected to ride through the events and load restoration times (% recovered vs time)
Sustainable: Stewardship	Renewable penetration (percentage), CO2 and other emission reductions from 2019 (base year) Compliance with EPA rules
Economic Growth	Job creation, availability & cost of electricity,
Risk Minimization: Volatility	95 percentile of (worst) outcome

**40. Section 2.03(1): Provide a list of key caveats and limitations that PREPA anticipates in its analysis and modeling mechanisms, including any significant regulatory assumptions (such as the potential sale or lease of its assets) that will impact PREPA's Preferred Resource Plan.**

**Answer:**

- The IRP is conducted with extensive inputs from a broad group of stakeholders including the public, the customers, under an accelerated timeline, in parallel with many other activities, but may not consider or fully consider externalities that are critical for implementation or execution.
- The IRP evaluates the highest public good and the protection of the interests of the residents of Puerto Rico, which may not necessarily be identical to the interests of PREPA if viewed from a narrow utility perspective.
- The IRP does not directly address specific asset technology asset optimization, fuel optimization, procurement, contract re-

negotiation, collective bargaining rights, site specifics, or ownership.

- The IRP does not set rate structures.
- The IRP does not directly address the debt restructuring process under the Puerto Rico Electric Power Revitalization Act.
- The implementation of the Puerto Rico Electric System Transformation Act is a separate process outside the accelerated timeline of developing the IRP.
- FOMB's "critical project" process under Section 503 of PROMESA is a separate process outside the accelerated timeline of the IRP development.
- The IRP is a planning tool to be used as a guide for the development of future resources in Puerto Rico and may not have all the details necessary for the actual RFP issuance (if necessary), contracting, and implementation.
- The IRP is not a Distribution Master Plan that would require a level of effort similar to the development of the IRP. Thus distribution investments are considered at a representative level.

***41. Section 2.03(2): Identify the tools and methods PREPA intends to use to complete the Transmission and Distribution Systems Analyses.***

**Answer:**

As indicated in the answer to question 23, PREPA will conduct transmission system analysis considering the impact of hourly dispatch using PROMODIV and steady state and stability analysis using PSS@E.

PROMOD performs a security constrained unit commitment and economic dispatch that is optimized with operating reserve requirements, similar to how ISOs set schedules and determines prices. PROMOD accounts for transmission constraints resulting more accurate determination of costs, generation curtailment and reliability of supply. PROMOD is the tool that PREPA currently uses to analyze the expected operation of its generating fleet and purchased power.

For power flow analysis, PSS@E has multiple modules and the most relevant for the IRP: a) Power Flow and Contingency Analysis: fast and robust power flow solution for network models up to 200,000

buses, fast steady-state contingency analysis, including automatic corrective actions and remedial action scheme modeling, automated PV/QV analysis with plot generation, and b) The PSS®E Dynamic Simulation module is a versatile tool to investigate system response to disturbances that cause large and sudden changes in the power system. The dynamic simulation module employs a vast library of built-in models for modeling different types of equipment, and with capability to create user defined models of any complexity. An integrated dynamic simulation plotting package allows for quick generation of plotting with ability to export to several popular graphic formats.

For distribution assessment PREPA will leverage its experience using Synergi for feeder hosting capabilities and performance assessment.

**42. Section 2.03 (J): Describe how the IRP will consider the impact of the 2017 hurricanes on the configuration, operation, and maintenance of PREPA's transmission resources.**

**Answer:**

Please see response to question 23 for detail on how we plan to address in the IRP the need to redesign the system to address the impact of major events with the deployment of the minigrid or electrical island concept based on local generation and transmission hardening. The minigrids will be designed to operate autonomously after a major hurricane and will have local maintenance resources (crews, tools and materials) deployed to them in preparation for the storm and before major roads become impassable.

See also the answer to question 19.

**43. Section 2.030): Identify the transmission system operating standards PREPA will use when considering supply or demand-side resource expansion alternatives (e.g., N-1, N-1-1, N-2; or specific NERC standards).**

**Answer:**

PREPA intends to use its planning operating standards supplemented by NERC TPL 001-4 and special considerations to assess performance after a major hurricane where the system may be on an N-XSO condition, where XSO are a number of transmission outages post storm.

**44. Section 5.01: Identify the performance metrics on which PREPA intends to report in the IRP. Describe in detail the methodology**

PREPA intends to use to estimate the impact of each resource action in the IRP on the performance metrics.

**Answer:**

See response to Question 39.

45. Identify the individuals from PREPA or its contractors or consultants who will attend the Technical Conference, along with their areas of expertise and responsibility.

**Answer:**

Mary Zapata, Head Planning and Research Division, PREPA  
Nelson Bacalao, Siemens PTI, Senior Manager Consulting and project manager of the IRP  
Fengrong Li, Siemens PTI/EBA. Director and technical manager of the IRP  
Scott Hulett, Siemens PTI, General Manager Siemens PTI



**PUERTO RICO ELECTRIC POWER AUTHORITY  
AND SIEMENS INDUSTRY, INC.  
PROFESSIONAL SERVICES CONTRACT**

**APPEAR**

**As First Party:** Puerto Rico Electric Power Authority (PREPA), a public corporation and government instrumentality of the Commonwealth of Puerto Rico, created by Act No. 83 of May 2, 1941, as amended, represented in this act by its Chief Executive Officer, mister Walter M. Higgins III, of legal age, married, and resident of San Juan, Puerto Rico.

**As Second Party:** Siemens Industry, Inc. (Consultant), a corporation organized and existing under the laws of Delaware, with offices at 400 State Street, Schenectady, NY 12305, herein represented by its General Manger, Scott Hulett, of legal age, and a resident of Texas, and its Commercial Controller, Krishant Sivanesan, of legal age, and resident of New York duly authorized to appear in representation of the Consultant by Resolution dated March 5, 2018.

Both, PREPA and the Consultant which are hereinafter referred to individually as a "Party" and jointly as "Parties",

**WITNESSETH**

**WHEREAS,** PREPA, by virtue of its enabling act, Act No. 83 of May 2, 1941, as amended (Act 83), has the authority to engage those professional, technical and consulting services necessary and convenient to the activities, programs, and operations of PREPA.

**WHEREAS,** Act of May 27, 2014, No. 57, as amended (Act 57), requires PREPA to develop an Integrated Resources Plan (IRP), which shall consist of a detailed planning

process considering all reasonable resources for satisfying the demand for electrical services in Puerto Rico during a period of twenty (20) years, including those resources related to energy supply and demand.

**WHEREAS**, PREPA desires to enter into this Professional Services Contract (Contract) with the Consultant for the performance of an IRP, which assess the needs and resources of Puerto Rico's power system for achieving the goal of providing a reliable, resilient and environmentally amicable electrical service with the least cost possible, promotes the participation of all stakeholders, complies with environmental laws and regulations, and considers PREPA's current financial situation.

**WHEREAS**, by virtue of Resolution number 4606 of April 27, 2018, PREPA's Board of Directors authorized the Chief Executive Officer to enter into this Contract.

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**WHEREAS**, the Consultant states that it is ready, willing and able to provide the professional services needed for the performance of the IRP pursuant to the terms and conditions set forth herein.

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**NOW THEREFORE**, in consideration of the mutual promises and the terms and conditions set forth herein, PREPA and the Consultant agree as follows:

**1. SCOPE OF SERVICES**

The Consultant must provide all required analysis and tasks, hereinafter referred to as "the Services", to create and support the IRP that conforms to established laws and regulations, PREPA Governing Board's Vision for the Future of Power in Puerto Rico, and all other requirements and scope of work established by PREPA in its Request for Proposals (RFP), included in Appendix A of this Contract. The Services to be performed by the Consultant and its work plan are described in the Consultant's

Proposal included in Appendix B. In case of any discrepancies between the RFP and the Consultant's Proposal, the RFP shall be deemed supreme.

## 2. TERM OF CONTRACT

This Contract shall be in effect from the date of its execution until ~~June 30, 2019~~ <sup>September 30, 2018</sup> (Contract Period). The Contract may be extended, upon mutual agreement of the Parties, for additional annual fiscal periods subject to the availability of funds and previous authorization of the Secretary of the Executive Branch. Either Party shall have the right to terminate this Contract for its convenience, at any moment, by providing the other party thirty (30) days written notice by registered mail, return receipt requested, or overnight express mail. If notice is given, this Contract shall terminate upon the expiration of thirty (30) days and PREPA shall be obligated to pay all fees and expenses incurred up to the day of effective termination, in accordance with the terms of this Contract. The rights, duties and responsibilities of the Parties shall continue in full force and effect during the thirty (30) day notice period. The Consultant shall have no further right to compensation except for what has been accrued for services rendered under this Contract until said date of effective termination.

## 3. COMPENSATION AND PAYMENT

- a. As compensation for services rendered under this Contract, PREPA agrees and Consultant accepts that the total amount to be paid under this Contract shall not exceed \$908,000 (Contract Amount). However, nothing herein shall preclude the Parties from agreeing to increase said amount. PREPA will only pay for services that are evidenced by a properly submitted invoice for services rendered. Notwithstanding the foregoing, any increase to the Contract Amount shall be

evidenced in writing and signed by both Consultant and PREPA. PREPA will not be required to make advance payments for any service to be rendered by Consultant under this Contract. The Contract Amount includes the \$808,000 for the Services plus \$100,000 for any required additional work. The Contract Amount includes the reimbursement of travel expenses presented in Section 4, which shall not exceed eight percent (8%) of the Contract Amount.

- b. All payments performed under this Contract will be charged to PREPA's budget account number 01-4019-92306-550-059.
- c. Consultant shall submit its invoices every two (2) weeks for work performed. Each invoice for professional services shall be itemized and must be duly certified by an authorized representative of Consultant. Consultant shall allocate any invoiced fees between: (i) activities undertaken outside of Puerto Rico; and (ii) those relating to activities undertaken within Puerto Rico.
- d. Invoices will be approved or denied by PREPA's contract manager within seven (7) calendar days of Consultant's submission of its invoice, after which time, acceptance of the invoice and milestone specified in the invoice will be deemed accepted by PREPA. Payment will be due within thirty (30) days from invoice approval if they are in compliance with the requirements set forth in this Contract, including the evidence of compliance with insurance policies, certifications and other governmental documents. The Consultant is responsible to continuously verify that PREPA has their current and valid insurance policies, certifications and other governmental documents. If the invoice is denied, PREPA will submit to the Consultant the corresponding objections to the payment. The Consultant will make

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the corresponding adjustments to the invoice and submit it for PREPA's approval.

PREPA reserves the right to conduct the audits it deems necessary, and it will not be subject to finance charges regarding invoice payments subject to an audit."

- e. After providing written notice to PREPA, Consultant may immediately suspend all work in the event any undisputed invoice becomes past due. Consultant shall have no obligation to resume work until PREPA has made payment for all past due invoices. In any instance where Consultant elects to suspend work for past due invoices, the project scheduled shall be extended for a period of time equal to the period of suspension.

- f. Invoices must also include a written and signed certification stating that no officer or employee of PREPA, and their respective subsidiaries or affiliates, will personally derive or obtain any benefit or profit of any kind from this Contract, with the acknowledgment that invoices that do not include this certification will not be paid. This certification must read as follows:

"We certify under penalty of nullity that no public servant of the Puerto Rico Electric Power Authority, their respective subsidiaries or affiliates, will derive or obtain any benefit or profit of any kind from the contractual relationship which is the basis of this invoice. If such benefit or profit exists, the required waiver has been obtained prior to entering into the Contract. The only consideration to be received in exchange for the services provided is the agreed-upon price that has been negotiated with an authorized representative of the Puerto Rico Electric Power Authority. The total amount shown on this invoice is true and correct. The services have been rendered, and no payment has been received."

\_\_\_\_\_  
Consultant's Signature

- g. Consultant agrees to submit bank account wiring instructions to PREPA in order to facilitate payment by means of electronic transfer.
- h. Final acceptance of the work by PREPA will occur only after successful completion of the final report by the Consultant and after PREPA's receipt of all final Documents reflecting all changes and corrections.
- i. Consultant shall request final acceptance in writing stipulating in the final invoice that:

*The work is completed.*

*Final acceptance and payment does not constitute a waiver by PREPA of any rights with respect to Siemens's continuing obligations under the Contract.*

*Siemens PTI waives all claims against PREPA beyond final payment, other than those previously made in writing and still unsettled.*

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- j. Final acceptance of the work will be confirmed by PREPA upon the earlier of: (1) the final payment to Consultant; or (2) thirty (30) days, following submission of the final invoice.

4. REIMBURSABLE EXPENSES

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- a. PREPA shall reimburse Consultant for out of pocket expenses incurred in providing the Services, subject to the terms of this Contract. As established in Appendix C, reimbursable expenses shall not exceed \$72,640, which is the eight percent (8%) of the Contract Amount, and will be reimbursed by PREPA through the presentation of acceptable evidence for such expenses. Reimbursement for air travel expenses is restricted to lowest available economy airfares. PREPA shall not pay for travel time, provided, however, that Consultant personnel may work

while traveling, and such time is compensable as otherwise provided under this Contract. Payment for travel time shall be made only if the invoice details the services rendered and the time billed on each matter as required in this Contract.

- b. Any travel and lodging expense for which a reimbursement is requested shall be reasonable and necessary, and any travel and lodging expenses shall be authorized in writing and in advance by PREPA. PREPA will not reimburse expenses that do not comply with this provision and Appendix C. Under no circumstances will expenses for alcoholic beverages be reimbursed.
- c. Third-Party Vendors and/or Out of Pocket Expenses: PREPA shall reimburse Consultant for costs that may be invoiced to Consultant by third party vendors for goods or services (related, for example, to tele-communication services, research, print materials, court reporters, or messengers) necessary to support the Services and provided exclusively for the benefit of PREPA.

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## 5. CONFLICTS OF INTEREST

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- a. Consultant acknowledges that in executing its services pursuant to this Contract, its Power Technologies International business segment (Business Segment) within Siemens Industry, Inc.'s Digital Grid Business Unit of the Energy Management Division has an obligation of complete loyalty towards PREPA, in rendering professional services, including having no conflict of interests. "Conflict of interests" means representing clients who have or may have interests that are contrary to PREPA, but does not include rendering services that are unrelated to this engagement. This duty includes the continued obligation to disclose to PREPA all circumstances of the Consultant Business Segment's, its relations with

clients and third parties, which would result in a conflict of interest, and any adverse interest which would influence Consultant Business Segment when executing the Contract or while it is in effect.

- b. This conduct by one of Consultant's Business Segment managers, executives, officers, clerks or employees shall be attributed to Consultant for purposes of this prohibition. Consultant shall endeavor to avoid even the appearance of the existence of a conflict of interest that has not otherwise been waived.
- c. Consultant acknowledges the power of the Executive Director of PREPA to oversee the enforcement of the prohibitions established herein. If the Executive Director of PREPA determines the existence or the emergence of conflict of interest with Consultant Business Segment, he shall inform such findings in writing and his intentions to terminate the Contract within a thirty (30) day term. Within such term, Consultant can request a meeting with the Executive Director of PREPA to present its arguments regarding the alleged conflict of interest. This meeting shall be granted in every case. If such meeting is not requested within the specified term, or if the controversy is not settled satisfactorily during the meeting, this Contract shall be terminated at the end of said thirty (30) day period.
- d. Consultant certifies that at the time of the execution of this Contract, the Consultant Business Segment does not have nor does represent anyone who has conflict of interest that is in conflict with PREPA. If such conflicting interests arise after the execution of this Contract, Consultant shall, to the extent consistent with its obligations to other clients, notify PREPA immediately.

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- e. No employee, officer, or agent of PREPA shall participate in the selection, or in the award or administration of a contract, supported by Federal funds, if a conflict of interest, real or apparent, would be involved.

## **6. RESPONSIBILITIES OF PREPA**

PREPA shall use reasonable efforts to cooperate with the Consultant, including by providing any information reasonably requested by Consultant and providing access to any facility at which the Services are to be performed at such times as may reasonably be requested by the Consultant.

## **7. OWNERSHIP AND USE OF DOCUMENTS**

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With the exception of Consultant's working papers, the Consultant acknowledges PREPA's ownership of all results of any study, report, investigations or any other by-product of the Services performed by the Consultant under this Contract. The Consultant shall retain all right, title, and interest in and to proprietary works of authorship, pre-existing or otherwise, that have not been created under this Contract. PREPA shall retain the right to use, refer, share, or provide to any third party, as PREPA may determine, the results of any study, report, investigation or any other by-product of the services performed by the Consultant under this Contract provided that such use, reference or sharing with third parties will be done at the sole risk of PREPA and without any liability to the Consultant. Notwithstanding anything to the contrary, the license to Work provided herein shall not include any software or software documentation. Any such license needed to use software programs shall be obtained by PREPA from the software owners. In the event of any termination, Consultant shall deliver such information, reports, papers and other materials to PREPA, in document

form and/or as computer object files, and the Consultant recognizes PREPA's right to request such documentation. Should Consultant fail to deliver said information, PREPA may seek a judicial order to enforce its rights. Except as otherwise provided, all information, drafts, documents, reports, papers and other materials developed and prepared by the Consultant or any Sub-Consultant, or any of its agents or representatives, for purposes of performing the obligations hereunder shall be deemed privileged work product of PREPA.

#### **8. NON-DISCLOSURE AND CONFIDENTIALITY**

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*EPH*  
a. **Confidential Information (the "Confidential Information"); Definition:** The term Confidential Information, as used throughout this Contract, means any information by either Party to the other Party that is marked confidential or concerning PREPA and/or PREPA's operations and that of Consultant (e.g., the projects, computer processing systems, object and source codes and other business and financial affairs of PREPA). The term Confidential Information shall also be deemed to include all notes, analysis, compilation, studies and interpretation or other documents prepared by Consultant, its agents or representatives in connection with the PREPA's operations.

#### **b. Non-Disclosure:**

- 1) Consultant and its employees, affiliates and authorized subcontractors agrees to take all reasonable steps or measures to keep confidential all Confidential Information and will not, at any time, present or future, without PREPA's express written authorization, use or sell, market or disclose any Confidential Information to any third party, firm, corporation, or association for any purpose

whatsoever. Consultant further agrees that, except as they relate to the normal course of the service, the Consultant will not make copies of the Confidential Information except upon PREPA's express written authorization, signed by an authorized representative of PREPA, and will not remove any copy or sample of Confidential Information without the prior written authorization from PREPA. Consultant retains the right to control its work papers subject to these confidentiality provisions.

- 2) "Confidential Information" shall not apply to any information which:
- a) is generally known to (a) the public at the time of disclosure or becomes generally known through no wrongful act on the part of receiving party;
  - b) is in the receiving party's possession at the time of disclosure otherwise than as a result of the receiving party's breach of any legal obligation;
  - c) becomes known to the receiving party through disclosure by sources other than receiving party having the legal right to disclose such information; or
  - d) is independently developed by the receiving party without reference to or reliance upon the confidential information.
- 3) In addition, these provisions shall not prohibit a receiving party from making any disclosure pursuant to applicable law or any subpoena or order of a court or a Governmental or Administrative tribunal which may assert jurisdiction over a receiving party; provided that, to the extent legally permissible, the receiving party shall promptly notify the disclosing party of any such

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disclosure obligations and reasonably cooperate with the disclosing party's efforts to lawfully avoid and/or minimize the extent of such disclosure.

- 4) Consultant will not disclose any Confidential Information relating to the work that Consultant performs under this Contract.
- 5) A receiving party may divulge Confidential Information to its employees and employees of its affiliates who need to know such information to fulfill the purposes of this engagement provided that such persons: (i) shall have been advised of the confidential nature of such information and receiving party shall direct them, and they shall agree, to treat such information as confidential and to return all materials upon request, but for one copy for record purposes only; and (ii) in each case, such person shall be bound by the terms of this Contract.
- 6) Consultant may develop for itself, or for others, problem solving approaches, frameworks or other tools and processes developed in performing the services and any additional services provided hereunder, and nothing contained herein precludes Consultant from developing or disclosing such materials and information provided that the same do not contain or reflect Confidential Information.

- c. **Return of Documents:** Consultant shall return or destroy all Confidential Information, as well as any other document that may relate to its work under this Contract, to PREPA within thirty (30) days after date of the expiration or earlier termination of this Contract, and shall certify that all the information has been returned to PREPA or destroyed, but for electronic information held in archive

and/or backup files to the extent such files cannot be deleted without unreasonable effort or expense and created in the ordinary course pursuant to established data backup/archive procedures; provided, however, Consultant may retain its own work product as long as it maintains the confidentiality of PREPA's Confidential Information as otherwise provided in this Contract. During this thirty (30) day period, and except to the extent making such documents available would result in the loss of legal privilege for PREPA, these documents shall be available for inspection by the Office of the Comptroller of Puerto Rico. This Article shall survive the termination, expiration or completion of this Contract.

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- d. **Equitable Relief:** A receiving party's material negligent discharge or the breach of the confidentiality clause hereinabove continuing after receipt of written warning or abandonment of the duties assigned hereunder shall constitute a breach of this Contract and the disclosing party will be entitled to terminate this Contract forthwith, without having to comply with the requirements of notice et forth above, without limitations of any other rights and remedies under law, and will release and discharge the disclosing party from any further obligations and liabilities hereunder.

9. **TERMINATION BY THE CHIEF OF STAFF OF THE GOVERNOR OF PUERTO RICO AND INTERAGENCY AGREEMENTS**

- a. Pursuant to Memorandum No. 2017-001, Circular Letter 141-17, of the Office of the Chief of Staff of the Governor of Puerto Rico (*Secretaría de la Gobernación*) and the Office of Management and Budget (*Oficina de Gerencia y Presupuesto – OGP*), the Chief of Staff shall have the authority to terminate this Contract at any time. If so directed by the Chief of Staff, PREPA will terminate this Contract by

delivering to the Consultant a notice of termination specifying the extent to which the performance of the work under this Contract is terminated, and the effective date of termination. Upon the effective date of termination, the Consultant shall immediately discontinue all services affected and deliver to PREPA all information, studies and other materials property of PREPA. In the event of a termination by notice, PREPA shall be liable only for payment of services rendered up to and including the effective date of termination.

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- b. Both Parties acknowledge and agree that the contracted services herein may be provided to another entity of the Executive Branch which enters into an interagency agreement with PREPA or by direct disposition of the Office of the Chief of Staff. These services will be performed under the same terms and conditions in terms of hours of work and compensation set forth in this Contract. For the purpose of this clause, the term "entity of the Executive Branch" includes all agencies of the Government of Puerto Rico, as well as public instrumentalities, public corporations and the Office of the Governor.
- BPM

#### **10. COMPLIANCE WITH THE COMMONWEALTH OF PUERTO RICO CONTRACTING REQUIREMENTS**

- a. The Consultant will comply with all applicable State Law, Regulations or Executive Orders that regulate the contracting process and requirements of the Commonwealth of Puerto Rico. Particularly: Law No. 237-2004, as amended, which establishes uniform contracting requirements for professional and consultant services for the agencies and governmental entities of the Commonwealth of

Puerto Rico. 3 L.P.R.A. § 8611 et seq., and the Puerto Rico Department of Treasury Circular Letter Number 1300- 16-16. CC Num. 1300-16-16 (22/01/2016).

b. **Executive Order Num. OE-1991-24 of June 18, 1991 to require certification of compliance with the Internal Revenue Services of the Commonwealth of**

**Puerto Rico:** Pursuant to Executive Order Number OE-1991-24 of June 18, 1991, the Consultant will certify and guarantee that it has filed all the necessary and required income tax returns to the Government of Puerto Rico for the last five (5) years. The Consultant, further will certify that it has complied and is current with the payment of any and all income taxes that are, or were due, to the Government of Puerto Rico. The Consultant shall provide, to the satisfaction of PREPA, and whenever requested by PREPA during the term of this Contract, the necessary documentation to support its compliance with this clause. The Consultant will be given a specific amount of time to produce said documents. During the term of this Contract, the Consultant agrees to pay and/or to remain current with any repayment plan agreed to by the Consultant with the Government of Puerto Rico.

c. **Executive Order Num. OE-1992-52 of August 28, 1992 to require certification of compliance with the Department of Labor of the Commonwealth of Puerto**

**Rico.** Pursuant to Executive Order Number 1992-52, dated August 28, 1992 amending OE-1991-24, the Consultant will certify and warrant that it has made all payments required for unemployment benefits, workmen's compensation and social security for chauffeurs, whichever is applicable, or that in lieu thereof, has subscribed a payment plan in connection with any such unpaid items and is in full

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compliance with the terms thereof. The Consultant accepts and acknowledges its responsibility for requiring and obtaining a similar warranty and certification from each and every Consultant and Sub Consultant whose service the Consultant has secured in connection with the services to be rendered under this Contract and shall forward evidence to PREPA as to its compliance with this requirement.

- d. **Social Security and Income Tax Retentions:** In compliance with Executive Order 1991 OE- 24; and C.F.R. Part 404 et. Seq., the Consultant will be responsible for rendering and paying the Federal Social Security and Income Tax Contributions for any amount owed as a result of the income, from this Contract.
- e. **Government of Puerto Rico Municipal Tax Collection Center:** The Consultant will certify and guarantee that it does not have any current debt with regards to property taxes that may be registered with the Government of Puerto Rico's Municipal Tax Collection Center (known in Spanish as *Centro de Recaudación de Ingresos Municipales* ("CRIM")). The Consultant further will certify to be current with the payment of any and all property taxes that are or were due to the Government of Puerto Rico. The Consultant shall provide, to the satisfaction of PREPA and whenever requested by PREPA during the term of this Contract, Certification issued by the Municipal Revenues Collection Center (MRCC), assuring that Consultant does not owe any tax accruing to such governmental agency. To request such Certification, Consultant will use the form issued by the MRCC (called "*CRIM-Certificados, Radicación, Estado de Cuenta y Todos los Conceptos*" in the website). The Consultant will deliver upon request any documentation requested by PREPA. During the Term of this Contract, the

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Consultant agrees to pay and/or to remain current with any repayment plan agreed to by the Consultant with the Government of Puerto Rico with regards to its property taxes. The Consultant shall provide a Personal Property Tax Filing Certification, issued by the MRCC which indicates that Consultant has filed its Personal Property Tax Return for the last five (5) contributory terms or Negative Debt certification issued by the MRCC with respect to real and property taxes and a sworn statement executed by Consultant indicating that (i) its revenues are derived from the rendering of professional services, (ii) during the last five (5) years (or the time in which it has been providing professional services) it has had no taxable business or personal property on the 1st of January of each year, (iii) that for such reasons it has not been required to file personal property tax returns, as required under Article 6.03 of Act 83-1991, as amended and (iv) that for such reason it does not have an electronic tax file in the MRCC's electronic system.

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- f. The Consultant shall furnish a Certification issued by the Treasury Department of Puerto Rico which indicates that Consultant does not owe Puerto Rico Sales and Use taxes to the Commonwealth of Puerto Rico; or is paying such taxes by an installment plan and is in full compliance with its terms.
- g. The Consultant shall provide a Puerto Rico Sales and Use Tax Filing Certificate, issued by the Treasury Department of Puerto Rico assuring that Consultant has filed his Puerto Rico Sales and Use Tax for the last sixty (60) contributory periods. A copy of Consultant's Certificate of Merchant's Registration issued by the Treasury Department of Puerto Rico.
- EPM

h. **Income Tax Retention Law:** PREPA shall deduct and withhold seven percent (7%) of any and all payments to residents of the Commonwealth of Puerto Rico as required by the Internal Revenue Code of Puerto Rico. In case of US citizens and Non US citizens, which are nonresidents of the Commonwealth of Puerto Rico the Consultant will retain twenty percent (20%) and twenty-nine percent (29%) respectively. PREPA will remit such withholdings to the Government of Puerto Rico's Treasury Department (known in Spanish as *Departamento de Hacienda de Puerto Rico*). The Consultant will request PREPA not to make such withholdings if, to the satisfaction of PREPA, the Consultant timely provides a release from such obligation by the Government of Puerto Rico's Treasury Department. 3 L.P.R.A. § 8611 et seq., 2011 L.P.R. 232; 232-2011. PREPA shall provide a certificate stating that such tax withholding was collected under this Article 10.

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i. **Special Contribution for Professional and Consulting Services:** As required by Act No. 48-2013, as amended, PREPA will withhold a special contribution of one point five percent (1.5%) of the gross amounts paid under this Contract.

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j. **Puerto Rico Child Support Administration (ASUME):** The Consultant shall present, to the satisfaction of PREPA, the necessary documentation certifying that the Consultant nor any of its owners, affiliates of subsidiaries, if applicable, have any debt, outstanding debt, or legal procedures to collect child support payments that may be registered with the Puerto Rico Child Support Administration (known in Spanish as the *Administración Para El Sustento de Menores* (ASUME)). The Consultant will be given a specific amount of time to deliver said documents. 3 L.P.R.A. § 8611 et seq.

k. **Compliance with Act No. 1 of Governmental Ethics:** The Consultant will certify compliance with Act No. 1 of January 3, 2012, as amended, known as the Ethics Act of the Government of Puerto Rico, which stipulates that no employee or executive of PREPA nor any member of his/her immediate family (spouse, dependent children or other members of his/her household or any individual whose financial affairs are under the control of the employee) shall have any direct or indirect pecuniary interest in the services to be rendered under this Contract, except as may be expressly authorized by the Governor of Puerto Rico in consultation with the Secretary of Treasury and the Secretary of Justice of the Government. 3 L.P.R.A. § 8611 et seq.

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l. **Law 168-2000: Law for the Strengthening of the Family Support and Livelihood of Elderly People:** The Consultant will certify that if there is any Judicial or Administrative Order demanding payment or any economic support regarding Act No. 168-2000, as amended, the same is current and in all aspects in compliance. Act No. 168-2000 "Law for the Strengthening of the Family Support and Livelihood of Elderly People" in Spanish: "*Ley para el Fortalecimiento del Apoyo Familiar y Sustento de Personas de Edad Avanzada*", 3 L.P.R.A. §8611 et seq.

m. **Law Num. 127, May 31, 2004:** Contract Registration in the Comptroller's Office of Puerto Rico Act: Payment for services object of this Contract will not be made until this Contract is properly registered in the Office of the Comptroller of the Government of Puerto Rico pursuant to Law Number 18 of October 30, 1975, as amended.

- n. **Dispensation:** Any and all necessary dispensations have been obtained from any government entity and that said dispensations shall become part of the contracting record.
- o. **Rules of Professional Ethics:** The Consultant acknowledges and accepts that it is knowledgeable of the rules of ethics of his/her profession and assumes responsibility for his/her own actions.
- p. **Anti-Corruption Code for a New Puerto Rico:** Consultant agrees to comply with the provisions of Act No. 2-2018, as the same may be amended from time to time, which establishes the Anti-Corruption Code for a New Puerto Rico. The Consultant hereby certifies that it does not represent particular interests in cases or matters that imply conflicts of interest, or of public policy, between the executive agency and the particular interests it represents.
- q. Consultant shall furnish a sworn statement to the effect that neither Consultant nor any president, vice president, executive director or any member of a board of officials or board of directors, or any person performing equivalent functions for Consultant has been convicted of or has pled guilty to any of the crimes listed in Article 6.8 of Act 8-2017, as amended, known as the Act for the Administration and Transformation of Human Resources in the Government of Puerto Rico or any of the crimes included in Act 2-2018.
- r. Consultant hereby certifies that it has not been convicted in Puerto Rico or United States Federal court for under Articles 4.2, 4.3 or 5.7 of Act 1-2012, as amended, known as the Organic Act of the Office of Government Ethics of Puerto Rico, any of the crimes listed in Articles 250 through 266 of Act 146-2012, as amended,

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known as the Puerto Rico Penal Code, any of the crimes typified in Act 2-2018, as amended, known as the Anti-Corruption Code for a New Puerto Rico or any other felony that involves misuse of public funds or property, including but not limited to the crimes mentioned in Article 6.8 of Act 8-2017, as amended, known as the Act for the Administration and Transformation of Human Resources in the Government of Puerto Rico.

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- s. PREPA shall have the right to terminate the Contract in the event Consultant is convicted in Puerto Rico or United States Federal court for under Articles 4.2, 4.3 or 5.7 of Act 1-2012, as amended, known as the Organic Act of the Office of Government Ethics of Puerto Rico, any of the crimes listed in Articles 250 through 266 of Act 146-2012, as amended, known as the Puerto Rico Penal Code, any of the crimes typified in Act 2-2018, as amended, known as the Anti-Corruption Code for a New Puerto Rico or any other felony that involves misuse of public funds or property, including but not limited to the crimes mentioned in Article 6.8 of Act 8-2017, as amended, known as the Act for the Administration and Transformation of Human Resources in the Government of Puerto Rico.

- t. The Consultant shall provide a Good Standing Certificate and Certificate of Authorization to do business in Puerto Rico, both issued by the Department of State of Puerto Rico.

- u. **Consequences of Non-Compliance:** The Consultant expressly agrees that the conditions outlined throughout this Section 10 are essential requirements of this Contract. Consequently, should any one of these representations, warranties or certifications be incorrect, inaccurate or misleading, in whole or in part, there shall

be sufficient cause for the PREPA to render this Contract null and void, and the Consultant shall reimburse the PREPA all moneys received under this Contract.

**11. Breach of Contract Terms.** Any violation or breach of terms of this Contract on the part of the Consultant or a Sub-Consultant may result in the suspension or termination of this Contract or such other action, including the recovery of damages, as may be necessary to enforce the rights of PREPA. The duties and obligations imposed by this Contract and the rights and remedies available hereunder shall be in addition to, and not a limitation of, any duties, obligations, rights and remedies otherwise imposed or available by law.

**12. Changes.** At any time, and only through a mutually agreed written change order, the PREPA may make changes in the Services or work to be performed within the general scope of this Contract. If such changes cause an increase or decrease in Consultant's cost of, or time required for, performance of any services under this Contract, an equitable adjustment shall be made and this Contract shall be modified in writing accordingly, provided, however, that no changes shall be made to the scope of the Services that would render the costs incurred in the performance of this Contract unallowable or not allocable under, or outside the scope or not reasonable for the completion of, Federal grant awards from FEMA or any other U.S. Federal agency.

**13. Indemnification.** The Consultant shall indemnify, defend and hold harmless PREPA, its agents and employees, from and against any and all third party claims, actions, suits, charges and judgments arising from, or related to, personal injury including death or damage to tangible property to the extent resulting from the

negligence, fraud or willful misconduct of the Consultant in the performance of the services called for in this Contract. The failure of the Consultant to obtain, maintain, or pay for any insurance coverage necessary to insure its obligations under this Contract and/or the failure of Consultant's insurance carrier to provide insurance coverage shall not relieve Consultant of its indemnification obligations. If notified promptly in writing by PREPA, and given the authority, information, assistance and the sole right to control the defense and settlement of same, the Consultant shall pay all damages and costs awarded therein against PREPA.

- KS/SSH  
GDM
14. **Liabilities.** Neither Consultant, nor its suppliers shall be liable, whether in Contract, warranty, failure of a remedy to achieve its intended or essential purposes, tort (including negligence), strict liability, indemnity or any other legal theory, for loss of use, revenue or profit, or for costs of capital or of substitute use or performance, or for indirect, special, liquidated, incidental or consequential damages, or for any other loss or cost of a similar type, or for claims by PREPA for damages of PREPA's customers. Consultant's maximum liability under this Contract shall be the amount received by Consultant under this Contract. PREPA and Consultant agree that the exclusions and limitations set forth in this article are separate and independent from any remedies which PREPA may have hereunder and shall be given full force and effect whether or not any or all such remedies shall be deemed to have failed of their essential purpose.

15. **INSURANCE**

- a. The Consultant shall maintain adequate insurance coverage to hold harmless PREPA, its agents and employees from and against any and all claims, actions,

suits, charges and judgments arising from or related to the negligence, fraud or willful misconduct of the Consultant in the performance of the Services.

- b. Consultant shall obtain and maintain in full force and effect during the life of this Contract policies of insurance covering all the services engaged under the Contract, which shall be obtained from insurance companies authorized to provide coverage for operations in Puerto Rico, and to that effect it shall provide in original certificates of insurance and endorsements, as follows:

- 1) Employer's Liability Insurance – Consultant shall provide Employer's Liability Insurance with minimum bodily injury limits of \$1,000,000 for each employee and \$1,000,000 for each accident covering against the liability imposed by law upon Consultant as result of bodily injury, by accident or disease, including death arising out of and in the course of employment, and outside of and distinct from any claim under the Workmen's Compensation Act of the Commonwealth of Puerto Rico.
- 2) Commercial General Liability Insurance – Consultant shall provide a Commercial General Liability Insurance with limits of \$1,000,000 per claim and \$1,000,000 aggregate.
- 3) Commercial Automobile Liability Insurance – Consultant shall provide a Commercial Automobile Liability Insurance with limits of \$1,000,000 combined single limits covering all owned, non-owned and hired automobiles.
- 4) Professional Liability Insurance – Consultant shall maintain a Professional Liability Insurance with limits of \$1,000,000 per claim and \$1,000,000 aggregate.

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- 5) Workmen's Compensation: The Consultant shall provide Workmen's Compensation insurance as required by Act 45-1935, as amended. Consultant shall also be responsible for compliance with Act 45 by all its subcontractors, agents and invitees, if any, or shall certify that such subcontractors, agents and invitees have obtained said policies on their own behalf. Consultant shall furnish to PREPA a certificate from the Puerto Rico's State Insurance Fund showing that all personnel employed in the work are covered by the workmen's compensation insurance, in accordance with this Contract.

c. Requirements under the Policies:

KS/SH  
The Commercial General Liability and Commercial Automobile Liability Insurance required under this Contract shall be endorsed to include:

- 1) As "additional insured":

BPA  
Puerto Rico Electric Power Authority

Risk Management Office

PO Box 364267

San Juan, Puerto Rico 00936-4267

- 2) A thirty (30) day cancellation or nonrenewable notice to be sent by certified mail with return receipt to the above address.
- 3) An endorsement including this Contract under contractual liability coverage and identifying it by number, date and parties to the contract.
- 4) Waiver of subrogation in favor of PREPA for claims due to Consultant's sole negligence.

- 5) Breach of Warranties or conditions: The breach of any of the Warranties or Conditions in this policy by Consultant shall not prejudice PREPA's rights under this policy.

d. Furnishing of Policies:

- 1) All required policies of insurance shall be in a form acceptable to PREPA and shall be issued only by insurance companies authorized to do business in Puerto Rico.
- 2) Consultant shall furnish a certificate of insurance in original signed by an authorized representative of insurer in Puerto Rico, described the coverage afforded.

KS / JSH  
16. **Modifications and Amendments.** No amendment to or modification or other alteration of the Contract shall be valid or binding upon the parties unless made in writing, signed by the parties and, if applicable, approved by the Commonwealth of Puerto Rico.

CPR  
17. **Assignment.** The Contractor shall not assign, hypothecate or encumber any interest in this Contract, and shall not transfer any interest or any of its liabilities or obligations under this Contract (whether by assignment or novation) without the prior written approval of PREPA.

18. **DISPUTES**

- a. In the event of a disputed or contested billing, the PREPA shall withhold only the contested amount and shall pay any undisputed amount. No interest shall accrue on any unpaid balance.

b. Any claims or causes of action that may arise out of this Contract must be heard by a court of competent jurisdiction in the Commonwealth of Puerto Rico, and the Consultant hereby irrevocably submits to the exclusive jurisdiction of the United States District Court for the District of Puerto Rico / the courts of the Commonwealth of Puerto Rico in connection with any claims or causes of action that may arise out of this Contract.

19. **Governing Law.** This Contract shall be governed by, interpreted and enforced in accordance with, the laws of the Commonwealth of Puerto Rico and any applicable Federal laws and regulations. In the event of conflict between Puerto Rican law and Federal laws and regulations, the latter shall prevail.

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EPA  
20. **Severability.** In the event that any one or more of the provisions contained in this Contract are for any reason held to be invalid, illegal or unenforceable in any respect, such invalidity, illegality or unenforceability will not affect other provisions of this Contract. If any clause is not applicable to the specific type of Contract in no way that will affect the applicability of all applicable clauses within this Contract.

21. **Certification of Government Agreements:** The Contractor hereby certifies that, at the time of execution of this Contract, it does not have any other agreement with any agency, public corporation, municipality, or instrumentality of the Government of Puerto Rico.

22. **Notices.** All notices and other communications hereunder shall be in writing and shall be deemed given when delivered personally or sent by telecopy, or sent, postage prepaid, by registered, certified or express mail (return receipt requested) or reputable overnight courier service and shall be deemed given when so

delivered by hand, or telecopied, or if mailed, three days after mailing (one business day in the case of express mail or overnight courier service) to the parties at the following addresses:

To PREPA: Walter M. Higgins III  
Chief Executive Officer  
Puerto Rico Electric Power Authority  
PO Box 364267  
San Juan, Puerto Rico 00936-4267

To Consultant: Nelson Bacalao  
Senior Manager, Consulting  
Siemens Industry, Inc.  
4615 Southwest Freeway, Suite 900  
Houston, Texas 77027 USA

KS / SH  
23. **Counterparts.** This Contract may be executed in any number of counterparts, each of which shall be deemed to be an original, but all of which together shall constitute one and the same instrument.

EPA  
24. **WARRANTY**

- a. The Consultant warrants that it shall perform the services under this Contract with the standard of care, skill and diligence expected, at the time and place of performance, of recognized professional firms performing services of a similar type and nature (the "Standard"). No other warranty, express or implied, is made or intended by this Contract, by furnishing oral or written reports of findings made, or by any other act of the Consultant. The Consultant shall re-perform, at no additional cost to PREPA any services under this Contract or extra work that do not meet the Standard, provided that the Consultant shall be notified in writing of such failure to meet the Standard within one year after the date of the completion

of the services under this Contract or after the date of the completion of any extra work, whichever occurs first. The Consultant's liability, responsibility and obligations, and PREPA's sole remedy, for the Consultant's failure to meet the Standard or for any errors or omissions in the performance of Services under this Contract or extra work under this Contract shall be limited to such re-performance. Notwithstanding any other provision of this Contract, the Consultant shall not, in any way, be responsible or liable for any performance or process guarantees of any kind.

- KS / SJH
- b. CONSULTANT HEREBY DISCLAIMS ALL OTHER WARRANTIES, EXPRESS OR IMPLIED, WITH REGARD TO THE SOFTWARE, INCLUDING BUT NOT LIMITED TO IMPLIED WARRANTIES OF MERCHANTABILITY, FITNESS FOR A PARTICULAR PURPOSE, COURSE OF DEALING AND USAGE OF TRADE.

25. **Force Majeure.** The Parties hereto shall be excused from performing hereunder and shall not be liable in damages or otherwise, if and only to the extent that they shall be unable to perform, or are prevented from performing by a Force Majeure event. For purposes of this Contract, Force Majeure means any cause without the fault or negligence, and beyond the reasonable control of, the party claiming the occurrence of a Force Majeure. Force Majeure may include, but not be limited to, the following: acts of God, industrial disturbances, acts of the public enemy, war, strikes, blockages, boycotts, riots, insurrections, epidemics, earthquakes, storms, floods, civil disturbances, lockouts, fires, explosions, interruptions of services due to the acts or failure to act of any governmental authority, provided that these events, or any other claimed as a Force Majeure event, and/or its effects, are

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beyond the reasonable control and without the fault or negligence of the Party claiming the Force Majeure, and that such Party, promptly after the occurrence, but not later than ten (10) days, of the alleged Force Majeure, gives the other Party written notice describing the particulars of the occurrence and its estimated duration. The burden of proof as to whether a Force Majeure has occurred shall be on the Party claiming the Force Majeure. In the event of any delay which can be shown to be attributable to a Force Majeure, the date for performance of the work shall be extended for a period equal to the period of delay and its impact to the project schedule, providing the Consultant or PREPA has taken reasonable steps to proceed with the performance of its obligations under the Contract and has made written notification of such delay and of any corrective action taken. Consultant shall not be entitled to any increase in compensation.


- KS / JSH
26. **Entire Contract.** Subject to any additional Commonwealth requirements not specified herein, this Contract and its attachments, (and any executed amendments to either), constitutes the entire Contract between the Parties and supersedes all prior agreements and understandings, oral or written, with respect to the subject matter hereof. This Contract will inure to the benefit of, and be binding upon, the Parties and their respecting successors and assigns.
- GPM

IN WITNESS THEREOF, the Parties hereto execute this Contract as of the 14 of  
June, 2018.

Puerto Rico Electric Power Authority  
Employer Social Security 660-43-3747

Per:   
\_\_\_\_\_  
Walter M. Higgins III  
Chief Executive Officer

Siemens Industry, Inc.  
Employer Social Security 13-2762488

  
\_\_\_\_\_  
Scott Hulett  
General Manager

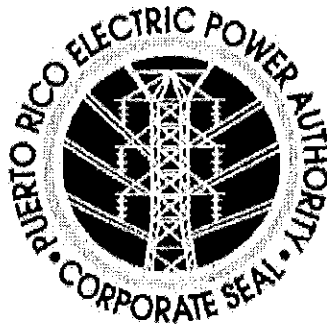
  
\_\_\_\_\_  
Krishant Sivanesan  
Commercial Controller

**Appendix A**  
**Request for Proposal**

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## **Request for Proposals**

### **Preparation and Support of the Integrated Resource Plan**

March 10, 2018

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# 1 PROPOSAL REQUIREMENTS

## 1.1 General Information

The Puerto Rico Electric Power Authority ("PREPA") is interested in identifying a Professional Services Company in connection with performing a study to create and to support an Integrated Resource Plan ("IRP"). This effort is required by Puerto Rico Act 57 of 2014, as amended. Proposals will be submitted in accordance with this Request for Proposal ("RFP") document and the Invitation Letter. Proposals shall include the specific Scope of Work. The Proponent's responses shall not deviate from the requirements stated in this RFP.

## 1.2 Definitions

For purposes of this RFP, the following terms and phrases shall have the meaning specified under this Section 1.2, unless otherwise specifically set forth in this RFP:

- 1 Addendum – A formal written notice issued before the Proposal submittal due date and time by PREPA to inform the Proponents about any changes, modifications, clarifications, additional instructions, document requirements incorporated or to be incorporated in the conditions established in this RFP, forms, appendixes, or related documents.
- 2 Calendar day – shall mean each and every 24 hours period as shown on a calendar, beginning and ending at midnight.
- 3 Clarifications – Additional information issued by PREPA in writing, at its sole discretion, and as response to a Request for Clarification ("RFC") or Request for Information ("RFI") submitted by Proponents before or on the date established in the RFP schedule provided herein.
- 4 Contract – shall mean a binding written agreement entered into by the selected Proponent and PREPA pursuant to this RFP, except where the word "contract" is not capitalized and is used in a more general sense or has a different meaning in context in this RFP. The agreement may be memorialized in one or more documents.
- 5 Day – shall mean each and every 24 hours period.
- 6 Evaluation Criteria – Set of requirements established in this RFP document with which PREPA is to evaluate the Proponents' Proposals.
- 7 IRP means an integrated resource plan that complies with this RFP, subject to any and all Addendums. This term includes the plan plus any and all deliverables that are required to be part of or to accompany the IRP when it is filed with the Puerto Rico Energy Commission (the "Energy Commission" or "PREC") or any successor. (References to the PREC are intended to include any successor when applicable in context.)
- 8 Proponent – An eligible party that submits a proposal to PREPA in response to this RFP.
- 9 RFP Schedule – Set of events, milestones, dates and times, or deadlines established by PREPA for the RFP process.
- 10 Selection Committee – PREPA's specialized technical staff that could be either internal employees, or external consultants, and advisors selected at PREPA's sole discretion,

assigned to evaluate and rank duly submitted Proposals from Proponents, in accordance with this RFP.

### 1.3 Introduction to PREPA

PREPA was created by the Puerto Rico Electric Power Authority Act, Act 83 of May 2, 1941, as amended ("Act 83"), serving the Commonwealth of Puerto Rico. PREPA was created as a public corporation and governmental instrumentality of the Commonwealth of Puerto Rico for the purpose of conserving, developing and utilizing, and aiding in the conservation, development and utilization of the water and power resources of the Commonwealth, in order to promote its general welfare and increase commerce and prosperity. PREPA seeks to provide efficient, clean, and reliable power to the ratepayers. PREPA is seeking to modernize its infrastructure while complying with Puerto Rico law related to the Renewable Portfolio Standard, federal and Puerto Rico law related to environmental compliance, and the move toward energy sector transformation, among others.

PREPA is currently a Debtor under Title III of the federal Puerto Rico Oversight, Management, and Economic Stability Act ("PROMESA"), 42 USC §§ 2101-2241, and as such is working with the Government of Puerto Rico and the Government's statutory fiscal agent for PREPA (the Fiscal Agency and Financial Advisory Authority or "AAFAF") in order to reach restructuring and electricity sector transformation, which as the Governor of Puerto Rico recently stated, is proposed to involve the privatization of PREPA's generation assets and the operation by a private party of the transmission and distribution system owned by PREPA.

KS/SH  
On February 1, 2018, PREPA's Governing Board established a Vision for the Future of Power in Puerto Rico. This needs to guide all the work to be done in the IRP, and the IRP needs to address all these points in the recommended course of action.<sup>1</sup> The IRP also needs to comply with all other requirements of this RFP, subject to any and all Addendums.

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First and foremost, the system is Customer-Centric

The system serves the customer with affordable, reliable power, with transparent metrics for quality of service and with equitable consideration across all customers. Quality/Reliability can be differentiated for customers in a manner that serves their total cost and risk objectives. Customers are engaged by innovative products and value added services that provide choice among rate plan and risk management options, and provide access to wholesale contracting options for large customers. Customers are empowered with behind-the-meter alternatives for energy efficiency, demand management, and distributed generation, with the ability to become prosumers if they so choose.

Second, the system promotes Financial Viability

The system is premised on positive economics on both sides of the meter. Rates are reasonable and create value for the customer, while pricing is sufficient to cover costs.

<sup>1</sup> See February 1, 2018, PREPA Governing Board Press Release. The Press Release may be found here: <https://www.aeepr.com/Noticias/noticiasread.asp?r=YQVATMSJWX>

Rate and market design create incentives to purchase, consume or produce energy in a manner that benefits the entire system. Subsidies are minimized, and those that remain have a non-distortionary impact. Operational excellence and sound long term planning reduce the cost to serve. Rates are affordable within a model that allows the utility to earn a reasonable rate of return and service its debt. The business model is robust to changes such as outmigration and reduction in energy demand, and does not create disincentives for adoption of cheaper energy resources, either at the grid level or at the customer premises.

Third, the system is Reliable and Resilient

The grid is thoughtfully planned, well maintained and safely operated to achieve defined reliability and resiliency goals. There is visibility into the system at all levels, and control where appropriate. Standards for recoverability create a measure for resilience. The choice of architecture (distributed vs. regionalized vs. centralized) is intentionally made to balance reliability/resilience and cost objectives while also taking advantage of advancements in technology and innovation.

Fourth, the system is a Model of Sustainability

There is a progressive focus on diversifying energy resources and reducing the carbon intensity of the power sector, in both primary generation and backup generation. Power generation is efficient and minimizes emissions. Customers have incentives to use energy wisely and to generate their own clean energy. The grid and grid systems are designed to take maximum advantage of increasingly cost effective renewable power generation alternatives and to integrate emerging technologies.

Finally, the power system serves as an Economic Growth Engine for Puerto Rico

The quality, reliability, and cost of power attracts new commercial and industrial development to Puerto Rico, and encourages existing commercial and industrial customers to expand their operations. Transformation and reinvestment in the power system creates new jobs. Innovation in the generation and delivery of power creates a local ecosystem of businesses that provide for evolving needs for equipment, technology and services in Puerto Rico and beyond.

#### 1.4 Proposal Presentation

PREPA reserves the right to request a proposal presentation from a short list of proponents who respond to the RFP. The presentation will explain the Proponent's capabilities and strategies to perform the IRP and the experience of the proposed staff. The Presentation will be less than 3 hours in length. The selected proponents and the schedule of presentations will be established after PREPA has been able to review the submitted proposals for the IRP.

### 1.5 PREPA's Public Disclosure Requirements

PREPA is required by law to file a copy of the final executed Contract with the Puerto Rico Comptroller's Office (at which time the contract becomes registered and effective). Upon filing, the Contract will become subject to open records requirements. The content of the Proposals submitted pursuant to this RFP are not subject to mandatory public filing, nevertheless, PREPA could be required to disclose information from the Proposals to comply with a future audit of the RFP process; as part of the filing of the IRP with, or subsequent processes regarding the IRP conducted before, the PREC; or pursuant to some other legal or public policy requirement.

### 1.6 Disclaimers

PREPA reserves the right to modify the terms of this RFP, prior to the submittal date of the Proposals or to cancel it, at any time. PREPA reserves the right to reject any or all Proposals, to postpone (or accelerate) the date and time of Proposal's submittal, by prior written notice, if it is in the best interest of PREPA. This RFP shall not be construed as an offer, and PREPA is not bound to purchase services from any Proponent pursuant to this RFP. PREPA is under no obligation whatsoever to Proponents to enter into a contract. Each prospective Proponent shall bear its own respective costs for all consulting, legal, accounting fees, and other expenses incurred by it in connection with participation in this RFP process, including Proposal and presentation expenses, among others. PREPA shall have no responsibility for any or all such costs.

### 1.7 Communications with PREPA

KS/SSH  
All communications regarding this RFP and the Proposal submission shall be addressed to the Selection Committee through:

Rfp-irp@prepa.com

EDM  
Communications during the RFP process shall **only** be accepted through the above address. **Direct Communications with PREPA personnel or representatives of PREPA during the RFP process is strictly prohibited.** Questions, Requests for Clarifications and Requests for Information shall only be considered when presented in writing. The Selection Committee will determine if it is reasonable to proceed with Proponent's request(s). PREPA shall endeavor to provide and issue an Addendum, with written answers, to all timely and reasonable requests from any and all Proponents.

PREPA will not respond, nor will it be responsible, for other explanations or interpretations of the RFP documents that are not submitted pursuant to these instructions. Proponents shall not contact any PREPA employee, agent, advisor, consultant, or other representative regarding the RFP or Proposals under evaluation during such period nor shall they follow any other procedures for clarifications or additional information than those stated above.

### 1.8 RFP Schedule / Deadlines

PREPA acknowledges the condensed schedule of this project and recognizes that commensurate resources will be needed to complete the Scope of Work in accordance with the timeline detailed below.

All responses to the RFP will be due to PREPA by 5:00 pm Atlantic Standard Time two weeks from the issuance date of the RFP. The RFP will be sent out on March 10, 2018.

PREPA anticipates that the contract resulting from this RFP is estimated to be executed within ten days of the Award Notification. However, the final contract execution day will be subject to final contract documents.

The preferred completion date for the IRP is September 28, 2018. However, the proponent should offer the most expeditious timeline in which it can feasibly complete the scope of work, even if the projected completion date is after the preferred completion date.

### 1.9 RFP Packaging and Delivery

Proponents shall submit the electronic version of the original Proposal with attachments. A non-editable format for the electronic copies, such as a searchable PDF is acceptable. Proponent shall sign all documents. All pages of the original Proposal must be sequentially numbered (i.e., 1 of the total number of pages, such as 1 of 20) including those pages that are intentionally left blank, if any. Proposals shall be clearly identified and shall be delivered according to Section 1.8.

### 1.10 Confidentiality

PREPA will take reasonable precautions and use reasonable efforts to protect any claimed proprietary and confidential information of the Proponent contained in a Proposal, provided that such information is clearly identified by the respondent as *Proprietary and Confidential*. Nevertheless, this process may be subject to review from the PREC, which may issue determinations regarding which information is or is not confidential. PREPA also may need to engage in disclosures as provided in Section 1.5.

### 1.11 Legal and Regulatory

The IRP must conform to established laws and regulations, which include

1. Act 57-2014, as amended
2. Act 4-2016, as amended
3. Act 82-2010, as amended
4. Act 114-2007, as amended
5. Puerto Rico Energy Commission Regulation No. 8594, as amended, in particular Article II. Please note that on February 8, 2018, the PREC issued a Resolution and proposed Regulation of Integrated Resource Plan that would repeal and replace Regulation No. 8594 as currently amended. The proposed regulation might or might not become effective, and may be adopted in a modified form if and when it goes into effect.
6. EPA regulations, including MATS and the proposed Clean Power Rules.
7. PREPA Government Board Vision Statement February 1, 2018.
8. The forthcoming PROMESA board-certified Fiscal Plan for PREPA. Please note that PREPA's proposed Fiscal Plan is in the process of certification by the PROMESA board and certification is expected in the near future.



## 9. PROMESA Title III Court orders.

The Proponent's response to this RFP must describe in appropriate and sufficient detail how the Proponent will comply with this RFP, including but not limited to the relevant provisions of all of the foregoing laws and regulations. See also Section 3.5.

The Proponent also must be prepared, able, and willing to comply with any and all federal and Puerto Rico legal and regulatory requirements and principles for the protection of critical infrastructure information and other confidential information and controls to ensure the lawful use and disclosure of intellectual property and other confidential information of PREPA and third parties.

The Proponent also should be familiar with the PREC's September 23, 2016, final order in PREPA's first IRP case (case no. CEPR-AP-2015-0002), and the PREC's subsequent orders regarding requests for clarification, reconsideration, and rehearing.<sup>2</sup>

### 1.12 Proposal Contents

The document must include:

- KS/SSH  
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1. Topics that the Proponent considers necessary for the success of the IRP.
  2. A detailed description of the procedure and methodology to be used to prepare and support the IRP and accomplish the IRP objectives.
  3. A detailed description of the data and other information that PREPA must share. Given PREPA's limited resources, also include alternatives to estimate or work with limited data availability.
  4. If the Proponent uses computer programs and systems other than the ones used by PREPA, provide a technical description of such systems that will be used by the proponent to prepare the IRP, and how the data from such models can be transferred into PREPA's existing analysis systems at the conclusion of the study.
    - 4.1. PREPA's current software systems:
      - 4.1.1. PROMOD
      - 4.1.2. STRATEGIST
      - 4.1.3. PSS/E
      - 4.1.4. EVIEWS
  5. The Proponent's plans for protecting critical infrastructure information and other confidential and proprietary information provided by PREPA and for ensuring adequate computer and information systems security.
  6. Provide a total cost for the completion of the IRP as well as a milestone payment schedule.

<sup>2</sup> The PREC's orders in that case currently may be found here:  
<http://energia.pr.gov/en/dockets/?docket=cepr-ap-2015-0002>

7. Include a contingency for discovery, public and evidentiary hearings, written and oral testimony, and additional studies before regulatory and administrative agencies, such as the PREC, the PROMESA board, and the PREPA Governing Board, among others.
8. Provide a schedule to complete intermediate deliverables and the final IRP.

### 1.13 Evaluation Process & Criteria

Proposals shall be evaluated on a Best Acceptable Value ("BAV") criteria basis. Under these evaluation criteria, the successful Proponent will not necessarily be the one submitting the lowest cost Proposal.

#### 1.13.1 Pricing Analysis

The Selection Committee will evaluate pricing of Proposals only on a US Dollar basis. The Selection Committee will rank Proposals from lowest to highest prices.

#### 1.13.2 Non-Pricing Analysis

The Selection Committee will also evaluate and consider the following criteria of the submitted Proposals:

1. Proposed Strategy to complete the IRP: methodology, scope, deliverables, etc.
2. Proposals consistent with the terms and conditions of the RFP
3. Proposals consistent with all the Technical Specifications.
4. Proponent's personnel experience
5. Proposed delivery date of the IRP

#### 1.13.3 Agreement Execution Probability Evaluation

In addition to evaluating the Proposals on a commercial basis (pricing and non-pricing considerations), PREPA will evaluate each Proposal to determine the probability that the parties can successfully execute a contract.

#### 1.13.4 Selection of Successful Proponent

PREPA will rank the Proposals based on the analysis stated above or as further detailed here-in and will identify the responsive and best acceptable value ("BAV") Proposals to select the successful Proponent.

PREPA has assigned weights to the Pricing and Non-Pricing elements of its evaluation of the Proposals. PREPA will apply those weights to the evaluation scores obtained by Proponents throughout its evaluation process.

#### Best Acceptable Value Criteria

(Weights for Pricing and Non-Pricing Evaluation Elements)

Element	Weight
1. Price	25%
2. Proposed strategy - Compliance with IRP methodology, scope, deliverables, etc.	40%
3. Proponents' personnel experience	35%
<b>Total</b>	<b>100%</b>

### **1.14 Instructions to Proponents**

Please read and carefully follow these instructions. Ignorance or misinterpretation of the instructions shall not be an excuse for failing to comply with them.

#### **1.14.1 Interpretation of Documents**

Should any Proponent have questions regarding the RFP documents, the Proponent may submit a written Request for Information or Clarification as provided under Communications with PREPA (Section 1.7), within the specified time and as included above herein. PREPA is not responsible for other explanations or interpretations of the RFP documents that are not submitted pursuant to these instructions. Requests for Information or Clarification submitted out of the specified time or form shall not be considered as submitted and the requesting Proponent assumes full responsibility for its reply and interpretation.

#### **1.14.2 Selection and Rejection**

1. The contract shall be awarded to the Best Acceptable Value Proponent that meets the specifications and requirements of this RFP and PREPA's needs in order to be able to successfully complete and commission this IRP. The contract shall not be assigned, ceded, mortgaged, or in any other way transferred without the previous written consent of PREPA's Contracting Officer or authorized representative.
2. PREPA reserves the right to reject any or all of the Proposals, as well as to overlook any minor informality in the Proposals received.
3. Proposals with insufficient information to identify and appropriately qualify the strategy and services offered to complete the IRP shall be rejected.

#### **1.14.3 Postponements**

Requests for postponements of the submittal date will be considered by PREPA only when done in writing, shall include the reasons for the postponement request, and shall be submitted at least two (2) days in advance of the submittal date, March 24, 2018. Postponements will only be considered in the best interests of PREPA and in accordance, granted, at its sole discretion.

#### **1.14.4 Award Notification**

1. Award will be made to that Proponent whose Proposal represents the Best Acceptable Value to PREPA, considering all elements and criteria evaluated during the Proposal evaluation process as well as the requirements set forth in the RFP, and which are responsive to the best interests of PREPA.
2. PREPA will notify the successful Proponent by a letter sent by e-mail to the address shown on the Proposal, that the Proposal has been accepted and that it has been selected to complete the award procedure. This document shall be used only to establish the intention of PREPA to retain services from a particular Proponent.
3. The Proponent to which a contract is to be awarded shall provide all the required documents to execute the contract within ten (10) calendar days after the day of the award notification.
4. No Proposal shall be considered binding upon PREPA, until a contract has been signed and registered pursuant to the laws of Puerto Rico.

#### 1.14.5 Insurance and Bonds

Insurance - The successful Proponent (also referred to here and in the next Section as the "Consultant") shall comply with all insurance requirements stated hereunder. These requirements will be incorporated in the Contract.

The Consultant shall obtain and maintain in full force and effect during the life of the contract and thereafter as provided herein, policies of insurance covering all the Consultant and its sub consultant operations engaged in by the contract, which shall be formally agreed upon with insurance companies from Puerto Rico, and to that effect it shall provide in original certificates of insurance and endorsements, as follows:

1 Workmen's Compensation Insurance

The Consultant shall provide Workmen's Compensation Insurance as required by the Workmen's Compensation Act of the Commonwealth of Puerto Rico, as applicable. The Consultant shall also be responsible for compliance with said Workmen's Compensation Act by his subcontractors, agents, and invitees. The Consultant shall furnish PREPA a certificate from the State Insurance Fund showing that all personnel employed in the work are covered by the Workmen's Compensation Insurance, in accordance with the Contract.

2 Employer's Liability Insurance

The Consultant shall provide Employer's Liability Insurance with minimum bodily injury limits of \$1,000,000 for each employee and \$1,000,000 for each accident, covering against the liability imposed by Law upon the consultant as a result of bodily injury, by accident or disease, including death arising out of and in the course of employment, outside of and in the course of employment, and outside of and distinct from any claim under the Workmen's Compensation Act of the Commonwealth of Puerto Rico.

3 Commercial General Liability Insurance

The Consultant shall provide a Commercial General Liability Insurance with limits of \$1,000,000 per occurrence and \$1,000,000 aggregate.

4 Automobile Liability Insurance

The Consultant shall provide proof of Automobile Liability Insurance with limits of \$1,000,000 combined single limit covering all owned, non-owned and hired automobiles.

5 Professional Liability Insurance

The Consultant shall provide a Professional Liability Insurance with limits of \$5,000,000 per occurrence and \$5,000,000 aggregate.

6 Requirements under the Policies

The Commercial General Liability and Automobile Liability Insurance required under this service contract shall be endorsed to include:

7 As additional insured:

Puerto Rico Electric Power Authority  
Risk Management Office  
PO Box 364267  
San Juan, PR 0093-4267

- 8 A 30 days cancellation or nonrenewable notice to be sent by certified mail with return receipt to the above address.
- 9 An endorsement including this contract under contractual liability coverage and identifying it by number, date and parties to the contract.
- 10 Waiver of Subrogation in favor of PREPA.
- 11 The Breach of any Warranties or Conditions in these policies by the Consultant shall not prejudice PREPA's rights under the policies.

**1.14.6 Income Tax Withholding**

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SH
- CPM
1. PREPA will deduct and withhold at source to the Consultant the equivalent of seven percent (7%) from payment for services rendered under this Contract, in compliance with the 1994 Puerto Rico Internal Revenue Code, section 1143, as amended. Notwithstanding, the withholding to be done by PREPA as herein stated could be increased to twenty percent (20%) in the event that the Contractor is a non-resident individual, which is a U.S. citizen, as provided by the 1994 Puerto Rico Internal Revenue Code, section or twenty-nine percent (29%) in the event that the Contractor is a non-resident and non U.S. citizen individual; or a foreign corporation or partnership which is not dedicated to industry or business in Puerto Rico, as provided by the 1994 Puerto Rico Internal Revenue Code, sections 1147 and 1150.
  2. If a Release Letter has been issued to the Contractor by the Treasury Department, the Contractor shall be responsible to submit a copy of said Release Letter to PREPA for every calendar year; otherwise, payments under the Contract shall remain subject to withholding at source. All invoices shall be segregated by concepts (services, materials, equipment, etc.), to identify the amounts subject to withholding and avoid undue deductions.
  3. PREPA will deduct and withhold a Special Contribution to the Consultant the equivalent of one point five percent (1.5%) from payment for services under the Contract, in compliance with Article 1, Act 48-2013. Notwithstanding, advertising spots, reimbursable expenses, and the costs of equipment and materials are excluded.

## 2 PROJECT DESCRIPTION

The Scope of Work must address PREPA Governing Board's Vision for the Future of Power in Puerto Rico (Section 1.3 and below) and the other requirements of this RFP and any Addendums. The Vision includes the following elements: a) Customer-Centric, b) Financial Viability, c) Reliable and Resilient, d) Model of Sustainability, and e) Economic Growth Engine for Puerto Rico, as quoted in Section 1.3.

### Customer-Centric, Reliability and Resiliency

Each customer class has a different requirement for reliability and quality of service. Large commercial and industrial customers require the highest level of reliability and power quality. Critical facilities also require the highest level of reliability. Rural customers cannot tolerate long duration of outages, and the remaining customers require good power quality and can tolerate some minimal outages. These customer requirements will drive the definition for resource adequacy, as well as the assumptions around microgrid and distributed generation deployment.

Reliability and resiliency can be addressed from both supply and grid perspectives. Supply options may include smaller and more dispersed generation, and diversification of fuel types, and renewables. Grid enhancements may include minigrids, microgrids, distributed generation and storage.

### Financial Viability and Economic Growth Engine

These goals may be satisfied by meeting customer objectives while minimizing total system costs. Total system costs include: a) Capital costs, b) Operating expenses, c) Fuel costs, and d) Business interruption cost (or value of lost load, or "VOLL"). Fuel costs, especially fossil fuels, have different volatility characteristics than capital and operating costs, and that volatility must be accounted for in the analysis. Diversification of fuel types also can minimize fuel cost and volatility.

The VOLL may be different for each customer class, and may be mitigated using different supply and demand strategies. Total system cost can be calculated as a net present value to capture the trade-offs and varying characteristics between the different cost components.

### Sustainability and Environmental Protection

The IRP must provide for meeting, at the earliest practical date, as a minimum requirement, the renewable integration targets as established by Act 82-2010, as amended. The optimization methodology should not constrain the quantity of renewable energy, but should allow economic builds. The targets should be considered a floor quantity that is forced in only if the economic builds do not meet the minimum. The renewable portfolio standard statute does provide grounds for non-compliance, including but not limited to "insufficiency of sustainable renewable energy

or alternate renewable energy providers” and “the excessive cost of acquisition of the electric power generated by a renewable energy producer”. If the IRP does not provide for promptly meeting the renewable integration targets, then it must adequately and credibly explain and support the reason(s).

The IRP also must bring PREPA into EPA MATS compliance in an expeditious manner. All other current EPA and other applicable environmental regulations also must be considered and met.

Given the ongoing reconstruction efforts after the impacts of Hurricanes Irma and María, the IRP should consider the possible federal government reconstruction initiatives.

### **3 SCOPE OF WORK AND TOPICS TO BE INCLUDED IN THE IRP**

The IRP services must provide for an IRP that conforms with established laws and regulations (Section 1.11), conform with the PREPA Governing Board’s Vision for the Future of Power in Puerto Rico (see Sections 1.3 and 2), and conforms with all other requirements of this RFP and any Addendums. The IRP services should include the following tasks and analytical elements. The Proponent can modify and/or add to these items if those modifications enhance the ability to deliver on the Board goals in Sections 1.3 and 2.

#### **3.1 Stakeholder Engagement**

The stakeholder engagement component will be a critical part of the IRP process. Given the emphasis on the transformation of the PREPA system, the Proponent should anticipate a significant amount of engagement with both internal stakeholders at PREPA and external stakeholders, including the public, industry groups, current investors, and potential investors. PREPA will expect concise, but continuous, communications with the Proponent.

##### **1. Engage internal stakeholders**

- a. Interface with PREPA management and planning staff to align goals and deliverables
- b. In-person kick-off meeting at the start of the project
- c. Prepare a clearly defined work plan with schedule and interim deliverables
- d. The Proponent will maintain weekly communications with PREPA staff to update project progress, data issues, questions on scope and methodology, etc.
- e. The Proponent will present the results of the IRP to PREPA at a meeting at the PREPA offices

##### **2. Engage external stakeholders**

- a. Initial public meeting to present IRP methodology and principal assumptions
  - i. Listen to concerns of the public, industry groups, environmental groups, current bondholders, and potential investors
  - ii. Discuss the role the IRP will play in reliability and resiliency

- b. Meetings with potential project investors and industry groups to solicit visions and solutions for grid transformation
- c. Second public meeting to present the incorporation of comments into the IRP assumptions, and to solicit additional comments
- d. At the conclusion of the IRP, and presentation of results to PREPA, a final public meeting to present the results of the IRP to the public
- e. PREPA will provide the facilities for all meetings at no cost to the Proponent
- f. The Proponent will prepare the presentations for all meetings, and will be required to present to the public. Each public meeting will be scheduled for a 4-hour time frame.

### 3.2 Demand

- 1. Load forecasts will be produced for a planning period of twenty (20) years
- 2. PREPA currently utilizes three separate economic models to develop the peak demand and energy forecasts for residential, industrial and commercial customers.
  - a. This RFP asks the Proponent to evaluate the PREPA economic models, and either use them or the Proponent's own load forecast model
- 3. Produce a range of demand forecast scenarios
  - a. At a minimum, low, reference and high cases must be considered
  - b. Load decline scenario assuming current economics
  - c. Load growth scenario assuming PREPA transformation drives economic growth
- 4. Energy Efficiency
  - a. Summary of higher efficiency technologies
  - b. Account for measure penetration and adoption rates unique to Puerto Rico
  - c. Technical, Economic and Achievable potentials
  - d. Comply with all mandated energy efficiency targets
- 5. Demand Response
  - a. Current programs
  - b. Technical, Economic and Achievable potentials
- 6. Potential impact of smart grid technologies on load growth and load shape
- 7. Potential to reduce Technical and Non-Technical Losses
- 8. Produce final peak demand and energy forecasts netted for energy efficiency and demand response

### 3.3 Resource Adequacy

While the system must have enough resources to maintain reliability and resiliency, reducing the planning reserve margin may also reduce total system costs.

- 1. Planning reserve margin calculation methodology



- a. Must be dynamic and change over time to account for changes in the characteristics of the supply portfolio
- b. Reliability requirements driven by the customer class requirements in Customer-Centric information provided by PREPA
- 2. Factors that may drive changes in Planning Reserve Margin
  - a. Improved availability of existing generation under privatization
  - b. Improved availability from new generation
  - c. Smaller generators in more diverse locations
  - d. More renewable generation in diverse locations, some with storage
  - e. Impact of minigrids/microgrids around critical infrastructure and large C&I customers

### 3.4 Supply-Side Plan

- 1. Methodology Requirements
  - a. Must be able to dynamically select the optimal portfolio given a view of the future (e.g., demand, fuel prices, generation cost). Not an evaluation of pre-selected supply portfolios.
  - b. Minimizes Total System Costs
    - i. Capital, operating expenses, fuel and VOLL
    - ii. Both supply-side and demand-side resource options
  - c. Satisfies and iterates with the Planning Reserve Margin
  - d. The selected portfolio should represent the best options across an efficient frontier of possible outcomes
  - e. All references to costs in the IRP must be clear and specific as to whether they are real or nominal figures, as of what date, and, if they include inflation or other factors, the values and sources of those factors.
- 2. Existing Generation
  - a. Impact of the Governor's plan to divest and privatize all current PREPA generation
    - i. Potential performance and availability improvements
    - ii. Repowering and conversion opportunities
    - iii. Potential retirement
    - iv. Potential limited use designations
    - v. Potential use for transmission system support, such as system black start and frequency regulation
  - b. Evaluation of the effect of a cancellation/renewal/extension of current PREPA purchase power agreements
    - i. AES and EcoEléctrica
    - ii. Current renewables contracts
- 3. New Generation

K5/  
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- KS / JSH
- EPA
- a. Cost and performance of new resources as deployed in Puerto Rico, with appropriate financing costs
    - i. New fossil fuel generation using new or existing fuel options
      - 1. Combined-cycle and simple-cycle turbines
      - 2. Internal combustion engines
    - ii. New renewable generation of all types (wind, solar, biomass, etc.) with and without storage
    - iii. Storage resources
    - iv. Distributed energy resources
  - b. Application of storage co-located with generation and/or dispersed on the grid
  - c. New generation must be placed in the right locations and in appropriate quantities to alleviate transmission constraints. The Proponent and PREPA will use existing transmission studies, to the extent practical, to determine the appropriate quantity and locations.
4. Fuel Supply and Prices
- a. Forecast of fuel prices delivered to Puerto Rico, or similar island locations
  - b. Quantitative treatment of fossil fuel supply and price risk
  - c. The fuels should include delivered costs of liquefied natural gas, liquefied petroleum gas, bunker fuel, diesel, and any other alternatives
  - d. Produce a range of fuel prices; at a minimum low, reference, and high fuel prices
  - e. Potential fuel projects
    - i. Aguirre Offshore Gasport
    - ii. Natural Gas to the North plants
    - iii. Other alternatives
5. Minigrids/Microgrids for industrial, large commercial, and critical infrastructure loads
6. New transmission and distribution infrastructure, with consideration of hardening for system resiliency
7. Environmental and renewable portfolio standard compliance
- a. Puerto Rico Renewable Portfolio Standard
  - b. US EPA Mercury and Air Toxics Standards Compliance
  - c. All current EPA and other environmental Regulations

### 3.5 Deliverables

The IRP report contents are set by PREC regulations, as amended, and consist of the following in PREC's pending proposed IRP regulation referenced in Section 1.11. The main body of the report will contain the following sections based on and assuming the adoption of that proposed regulation. **Please refer to the PREC proposed IRP regulation attached to this RFP for details on the contents of each section. PREPA can help assemble some of the required information.**

1. Part One - Introduction and Summary of Conclusions
2. Part Two - Planning Environment
3. Part Three - Load Forecast
4. Part Four - Existing Resources
5. Part Five - Resource Needs Assessment
6. Part Six - New Resource Options
7. Part Seven - Assumptions and Forecasts
8. Part Eight - Resource Plan Development
9. Part Nine - Caveats and Limitations
10. Part Ten - Action Plan

The Technical Appendices shall include all ancillary information and descriptions required by PREC regulations but not are included in the main body of the report.

1. Appendix 1 - Transmission and Distribution Planning
2. Appendix 2 - Prior Action Plan Implementation Status
3. Appendix 3 - Renewable Energy Project Status
4. Appendix 4 - Demand-Side Resources
5. Appendix 5 - New and Existing Supply-Side Resources Supplemental Data
6. Appendix 6 - Additional information, as required by the Commission through an Order, that may address additional subjects related to integrated resource planning.

The deliverables also shall include source references and documents, work papers, and written testimony as provided in the PREC's proposed IRP regulation.

The deliverables listed in this Section 3.5 are not intended to be exhaustive. The Proponent must plan to comply with all applicable requirements.

## 4 QUALIFICATIONS

The qualifications required are a reflection of the scope of work described in Sections 2 and 3. Proponents can leverage information already provided in the response to the prior Request for Information issued by PREPA, with clarifications on how those qualifications meet these requirements. Proponents are also encouraged to partner if necessary, because the proper execution of this IRP will depend on the capabilities of the project team. If Proponents partner, they shall submit a unified (combined) response to this RFP.

### 4.1 Background of Proponent

1. Provide Proponent's legal name, address, structure, nature of business and description, number of years in business, and number of permanent employees.
2. Two years (the most recent) of audited financial statements.

3. The name, address, telephone number, e-mail and facsimile number of a representative who is authorized to execute letter agreements, memorandum of understandings ("MOU"), or contracts under the submitted proposal with the Puerto Rico Electric Power Authority.
4. Provide a listing and background of principal officers, owners, or partners.

#### 4.2 IRP Team and Organizational Chart

1. The proponent shall submit a listing and background of project technical staff and management team, including any sub-contractors that will participate in the study.
2. The proponent shall provide an organizational chart showing the management and technical team for the IRP.
3. A résumé for each member of the team shall be provided for evaluation.

#### 4.3 Experience

1. Provide a listing of the IRPs or similar projects performed by the company, by the technical team, and by the management team. Place special emphasis on studies performed for electrically isolated power systems similar to PREPA.
  - a. Provide examples and references for IRP's done for island (or other electrically isolated) systems similar to PREPA
  - b. Provide examples and references for IRP's done for large utilities
  - c. Indicate which IRP's or similar projects were performed by and/or managed by the members of the technical team and management team, and their roles in those projects
  - d. Indicate the IRP projects on which the technical team and the management team had previously worked together
2. Given the PREPA governing board's Vision for the Future of Power in Puerto Rico, it is important that this IRP be more comprehensive than a traditional IRP. When considering staffing for the IRP, please address the following areas of expertise.
  - a. The modeling methodology must be able to select an optimal portfolio of resources, instead of simply testing pre-defined portfolios
  - b. Forecasting of fuel prices delivered to Puerto Rico, or similar island locations, including Quantitative treatment of fossil fuel risk. The fuels should include delivered costs of liquefied natural gas, liquefied petroleum gas, bunker fuel, diesel, and any other alternatives
  - c. The cost of new generation specific to Puerto Rico or similar island locations, including the cost of conventional generation, renewable generation, storage, and microgrids. Generic cost estimates for projects on the mainland will not be sufficient
  - d. Integration cost of new renewables, storage and microgrids.
  - e. Integration of weather risk to optimization models with respect to renewables.
  - f. Load forecasting, including potential load and load shape evolution due to economic changes and the penetration of microgrids. Explain whether load forecasting algorithms are deterministic, dynamic, or probabilistic.
  - g. Energy efficiency and demand-side management
  - h. The modeling of storage and its impact on the grid

- i. The modeling of microgrids and their impact on system reliability and resilience
  - j. Analysis of transmission and distribution infrastructure and reliability
  - k. Quantitative Analysis of system wide infrastructure resilience
  - l. Environmental regulations and compliance
  - m. Utility (including integrated and restructured utilities and generation) performance metrics
  - n. Diversification of energy sources
3. Experience with protecting critical infrastructure information, confidential and proprietary information of other parties, and computer and information systems security,
  4. Provide a detailed list of all prior work completed in Puerto Rico.
  5. Experience with discovery in investigations, regulatory proceedings, and/or court litigation.
  6. Provide a list of prior relevant written/oral testimony experience, in particular defending IRP's. The chosen consultant will be required to present and provide sworn testimony regarding the presented IRP, as indicated earlier in this RFP.
  7. Indicate compliance with Article 3 of Act 458-2000.

#### 4.4 Equal Opportunity Employer

Be an equal opportunity employer and comply with the local and federal laws which prohibit discrimination based on age, race, color, gender, national or social origin, social status, political ideas or affiliation, religious creed, for being or perceived to be a victim of domestic violence, sexual aggression or harassment; civil status, war veteran and handicap or disability status.

#### 4.5 Authorized to work in Puerto Rico

Be duly organized under applicable Puerto Rico laws and authorized to do business in Puerto Rico. All Proponents that are out-of-state corporations must have filed the necessary documents with the Puerto Rico State Department requesting authorization to conduct business in Puerto Rico and open, maintain, and operate a full time operating office in Puerto Rico, through which all issues related to the project will be channeled, resolved, managed, and completed.

#### 4.6 Spanish Language Experience

Detail the Spanish language abilities (speaking/reading/writing) of all key team members. At least one member of the team must have advanced Spanish language experience/abilities.

#### 4.7 Conflict of Interest

1. Proponent must disclose any and all conflicts of interest against PREPA or the Government of Puerto Rico and any agencies and instrumentalities thereof. Please inform of any engagements, current or recent (five years or less), with any of PREPA's bondholders or other creditors or contractual counter-parties.
2. Please report contracting by any government agency, corporation, or other legal entity in Puerto Rico
3. Please report any contracting by any advocacy group in Puerto Rico or the US Mainland.

4. Describe any and all completed, pending, and potential litigation and regulatory proceedings that could affect the viability of the Proponent's proposal in response to this RFP or the Proponent's financial stability or legal eligibility to enter into the Contract. This includes, without limitation, any civil or criminal proceeding involving any principals of the Proponent.
5. Non-disclosure of any conflict of interest or other required information can lead to the termination of the RFP, or the study process.

## 5 DATA AVAILABLE FROM PREPA

The following is data available from PREPA to support the IRP analysis, subject to possible requirements relating to critical infrastructure information and confidential and proprietary information.

1. Data required for Demand Forecasting
2. Electricity Sales Records
3. Demand Records
4. Macro-Economic Data
5. Population/Demographic Data
6. Energy End-Use Data
7. Plant and T&D system configuration and data
8. PREPA Planning and Studies Tools
  - a. PROMOD v 11 with HMC module – Generation System Planning, Dispatch and Cost Allocation
  - b. Strategist (Proview) Generation capacity expansion planning
  - c. EvIEWS v8 - Econometric Analysis
  - d. PSS/E v32 - Transmission system load flow and dynamic analysis (long and short term)
9. The proponent must be able to use or convert the data files from PREPA's existing software systems.
10. Other sales and demand data will be provided in Excel, Access, or text files, depending on data volume