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

IN RE: REVIEW OF THE PUERTO RICO ELECTRIC POWER AUTHORITY INTEGRATED RESOURCE PLAN CASE NO.: CEPR-AP-2018-0001

SUBJECT: Hydroelectric Facilities Refurbishing Feasibility Study

MOTION TO SUBMIT STATUS REPORT OF FEASIBILITY STUDY FOR IMPROVEMENT OF PREPA'S HYDROELECTIC SYSTEM AND TO REQUEST EXTENSION OF TIME TO SUBMIT FINAL STUDY

TO THE HONORABLE PUERTO RICO ENERGY BUREAU:

COMES NOW, the Puerto Rico Electric Power Authority, through its counsel of record and respectfully sets forth and prays:

1. On August 24, 2020, the Puerto Rico Energy Bureau of the Public Service Regulatory

Board (the "Energy Bureau") entered Final Resolution and Order on the Puerto Rico Electric

Power Authority's Integrated Resource Plan (the "Final IRP Order") directing the Puerto Rico

Power Authority (the "Authority") to, among other things, complete a feasibility study of

refurbishing each of the Authority's hydroelectric facilities (the "Hydro Study").

2. In this regard, the Energy Bureau ordered the Authority to file the results of the Hydro Study along with a proposed action plan for each facility within 180 days from the Final IRP Order's notice.¹ The deadline to submit the Hydro Study expires today, February 22, 2021. As

¹ The Final IRP Order provides: pags. 269-270, ¶ 868

The Energy Bureau ORDERS PREPA to complete a feasibility study of refurbishing each of its hydroelectric facilities, including the expected cost and likely change in electricity production, as well as the potential to control production to produce at the times of greatest value in the context of increasing solar and battery storage. The Energy Bureau ORDERS PREPA to file the results of this study with the Energy Bureau, along with a proposed action plan for each facility informed by the study, within 180 days from the notification date of this Final Resolution and Order.

explained below, the Authority is not prepared to submit the Hydro Study to the Energy Bureau today. However, the Authority hereby submits a detailed report of the efforts conducted towards completing the study and informs that this report will be submitted on a monthly basis.

3. Upon being served with the Final IRP Order, the Authority identified the need for an engineering consultant with expertise and experience to conduct the Hydro Study. During the years 2012 through 2014, the Authority had retained the services of Black & Veatch Puerto Rico, PSC ("Black & Veatch") to conduct a detailed evaluation of the Authority's hydroelectric system. Wherefore, to avoid duplicity of certain evaluations that have already been made by the same consultant, the Authority decided to retain the services of Black & Veatch to conduct the Hydro Study mandated in the Final IRP Order. To this end, on January 5, 2021, the Authority and Black & Veatch executed a professional services contract.

4. The kickoff meeting between the Parties² was held on January 12, 2021. On January 27, 2021, Black & Veatch submitted its work plan for the Hydro Study which was approved by the Authority. The first site visits to the Dos Bocas-Caonillas, Toro Negro, Garzas, Rio Blanco and Yauco water systems were conducted during the second week of February 2021.

5. The Authority hereby submits a presentation titled *Feasibility Study for Improvement to PREPA's Hydroelectric System- Status Report* dated February 19, 2021, which includes a list of deliverables and a detailed timeline to submit the complete Hydro Study in compliance with the Final IRP Order (the "Hydro Status Report"). Exhibit A. The presentation was completed using the project timeline submitted by Black & Veatch to the Authority.

6. As detailed in the Hydro Status Report, the timeline provided by Black & Veatch provides that the Hydro Study will be completed on June 22, 2021. Therefore, the Authority respectfully

² The Authority and Black & Veatch, collectively known as "the Parties".

requests the Energy Bureau an extension of time, until June 30, 2021 to submit the Hydro Study in compliance with the Final IRP Order.

7. Since the timeline to complete the Hydro Study is longer than what the Final IRP Order mandates, the Authority will submit a monthly status report to the Energy Bureau. The status report will detail the progress towards completing study, including the activities performed, pending and achieved milestones, a tracking schedule, as well as a detailed report on expenditures and budget allocation and balance.

WHEREFORE, the Authority herein requests the Energy Bureau to accept the Hydro Status Report and to GRANT an extension of time until June 30, 2021 to file the Hydro Study.

RESPECTFULLY SUBMITTED.

In San Juan, Puerto Rico, this 22nd day of February 2021.

<u>s/ Katiuska Bolaños Lugo</u> Katiuska Bolaños Lugo <u>kbolanos@diazvaz.law</u> TSPR 18,888

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CERTIFICATE OF SERVICE

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

In San Juan, Puerto Rico, this 22nd day of February 2021.

<u>s/ Katiuska Bolaños Lugo</u> Katiuska Bolaños Lugo

<u>Exhibit A</u>



Puerto Rico Electric Power Authority

• <u>Objective</u>

- Provide an assessment of PREPA's hydroelectric facilities.
- Evaluate the potential to increase generation production and hydroelectric capacity.
- Perform an economic feasibility evaluation of any refurbishment cost necessary to achieve these goals.
- Provide recommendations regarding the repair, rehabilitation, and replacement of the turbine-generator and major balance-of-plant equipment considering new technologies available in the industry, which may result in increased efficiencies for optimum hydropower generation.

• <u>Purpose</u>

- To comply with the PR Energy Bureau Order to complete a feasibility study of refurbishing each of its hydroelectric facilities, including the expected cost and likely change in electricity production, as well as the potential to control production to produce at the times of greatest value in the context of increasing solar and battery storage.
- The facilities included on the study are:
 - Dos Bocas
 - Caonillas 1 & 2
 - Toro Negro 1 & 2
 - Yauco 1 & 2
 - Río Blanco
 - Garzas 1 & 2







• What is the best way to comply with spirit of the PREB's order:





- Criteria for Decision on Consultant's Procurement Process
 - Scope of Work required.
 - Timeline to Complete the SOW
 - Cost
 - Quality Assurance
 - Consultant's expertise on the matter
 - Consultant's experience on similar types of studies
 - Consultant's knowledge of the PREPA's hydroelectric system
- **Decision on Procurement Process**
 - It was decided to procure the services of an engineering consultant firm with the expertise and experience on works related to the PREPA's hydroelectric system. This firm is Black & Veatch Puerto Rico, PSC (the "Consultant").
 - In 2012-2014, the Consultant was engaged in a detailed system evaluation of the PREPA hydropower system. The knowledge gained from that study allows the Consultant to hit the ground running and ensure study's schedule constraints are met while at the same time providing tremendous value.



- Decision on Procurement Process (Cont.)
 - The Consultant has previous information and computer hydrologic-hydraulic water models which will help on verifying the water availability on the hydroelectric sites water sheds so PREPA may be able to maximize the amount of water necessary for the improvement of the capacity factors of each of the generation units.
 - The technical personnel from the Consultant is already familiarized with PREPA's hydroelectric system, which will reduce the infrastructure assessment process and minimize costs regarding this particular activity.
 - Compliance with all the PREPA's organic statutes and state laws and regulations regarding procurement and contracting processes.
- **Timeline on Procurement Process:**

Procurement and Contracting Milestones	Date Achieved	
PREB'S Order for Feasibility Study	August 2020	
PREPA and Consultant Discussion and Negotiation Scope of Work, Cost and Timeline for Study	September-November 2020	
Contract Negotiation and Approval by both parties	December 2020- January 2021	P Ele

Authority 6

- Project Work Plan The project work plan includes the following tasks:
 - Task 100 Project Management
 - Task 200 Assessment of the hydropower facilities
 - Task 300 Review Water Availability Models
 - Task 400 Review Water Operational Curves
 - Task 500 Evaluation for Frequency Response and Remote Control
 - Task 600 Economic Feasibility Evaluation
 - Task 700 Prepare Summary Report
- Task 100 preparation of Project Action Item List to track requests, target dates and responses
 / actions taken. Black & Veatch will conduct weekly project conference calls to discuss
 progress, review the schedule and open items.



- Task 200 Assessment of the hydropower facilities
 - Estimates of Generation Capacity review the available information and, for each facility, estimate the total capacity and annual generation potential of the facilities and compare the estimates to actual facility performance. This effort will build on the previous evaluations of the listed hydroelectric systems.
 - Head and Flow Conditions review and update the previous analyses of head and flow conditions at each site to identify available head and flow conditions at each powerhouse facility and used to quantify the potential hydroelectric capacity (MW) of each site and perform estimates of average annual generation (MWh).
 - Capacity and Generation Estimates review and update the estimates of potential generating capacity (MW) and average annual energy generation (MWh) previously identified for each site. Review the net head at the design discharge estimated and the installed capacity potential previously determined for each site.
 - Visual Site Inspections perform an estimated five (5) working-day site visit to the Dos Bocas, Caonillas, Toro Negro, Garzas, Rio Blanco and Yauco facilities.
 - Assessment of Powerhouse Facilities based on the findings and data gathered during the site visits.
 - Site Visits Memorandum a Site Visit Memorandum will be prepared and will include collected information from the site visits, including site pictures and general meeting minutes.



- Task 200 Assessment of the hydropower facilities (Cont.)
 - Technical Memorandum a draft Technical Memorandum will be prepared summarizing the installed capacity potential and average annual generation potential for each site. To the extent practical and based on existing facility records, the potential capacity and generation will be compared to actual values for each facility to identify the potential for increased performance and increases in installed capacity. The following data will be summarized for each hydroelectric facility.
 - Existing and potential installed capacity (MW).
 - Existing and potential average annual generation (MWh).
 - Variation of head and flow conditions at the site.
 - Reliability and sufficiency of available project data.
 - Potential opportunities for increasing performance and/or installed capacity Head and Flow Conditions.

The Technical Memorandum will summarize the facilities condition assessment, providing recommendations on rehabilitation and modernization activities and will be provided to PREPA for review.



- Task 300 Review Water Availability Models
 - review the existing water availability models previously developed for the Dos Bocas, Caonillas, Toro Negro, Garzas, Rio Blanco and Yauco water systems. The following describes the previous scope used to develop the models and analysis that will be reviewed under this new scope of work.
 - Hydrological Analysis entails a hydrological determination, based on existing or generated streamflow data, of the amount of water that is potentially available for a specific use or uses. The previous hydrological analysis will be reviewed and incorporated into this PREPA feasibility study.
 - Basic Reservoir Operations entailed performing water accounting of reservoir inflows as well as turbine, water supply and other demands while taking into account the configuration of the dam elements and the system connectivity following basic operational rules. The purpose of this was to determine overall water availability and not necessarily evaluate the efficacy of possible operational schemes.
 - Evaluation of System Performance system performance was previously evaluated within the context of reliability. Reliability is a measure of dependability at which water needs can be met. The reliability of a system is measured (or quantified) in order to determine the capability of the simulated system to satisfy water use requirements.



- Task 300 Review Water Availability Models (Cont.)
 - Estimate of Gross Hydroelectric Power Potential previous modeling results will be reviewed and used to compare the average potential power production for the system identified under Task 200.
- Task 400 Review Reservoir Operational Curves
 - Review the existing reservoir operation curves prepared for the Dos Bocas-Caonillas, Toro Negro, Garzas, Rio Blanco and Yauco water systems for this new PREPA Feasibility Study.
 - The objective is to maximize system production and efficiency within a multipurpose framework contingent to water use priorities and other system constraints.
 - A Technical Memorandum will be prepared for the hydropower systems summarizing review of the existing methodologies and results of the water availability analysis and operational policies (Tasks 300 and 400).



- Task 500 Evaluation for Frequency Response and Remote Control
 - Potential for Automated Frequency Response The Dos Bocas, Caonillas 1, Yauco 1 and Yauco 2 units have frequency control capabilities. For the remaining sites, the turbine governors will be evaluated to determine their ability to automatically respond to frequency variations within the electrical system. The condition of the governors and control system will be evaluated in Task 200.
 - A Technical Memorandum will be prepared documenting the existing unit's responsiveness and identifying recommendations for governor upgrades or required modifications for each of the sites.
 - Potential for Remote Control PREPA has an Energy Control Center (ECC) at Monacillos, San Juan which currently provides voltage and power control remotely for Yauco 1 and 2 after they are locally started and put online manually. The Consultant will evaluate all of the powerhouses listed above to determine the existing potential for remote startup, shutdown, voltage and power control from the ECC. The evaluation will address communication between the facilities and the ECC.
 - A Technical Memorandum will be prepared providing existing potential for remote control of each unit listed above, for the overall communication between facilities and ECC requirements to provide remote operation.

Authority

- Task 600 Economic Feasibility Evaluation
 - Hydroelectrical Systems' Capacity and Energy Output under this task, the consultan will rely on existing estimates and forecasts of the total system and hydroelectrical capacity and energy output maintained by PREPA. This information will be utilized to develop an energy use profile for the total hydroelectrical system.
 - Hydroelectrical Systems' Cost of Operations review the costs associated with operating the hydroelectric systems that have been in operation over the last 5 years. Costs associated with operations and maintenance (O&M), debt service, capital and other requirements will be assessed to understand the baseline cost of operations.

In addition, the costs and benefits associated with the proposed improvements to the hydroelectric system will be used to understand the incremental increases in cost and electric production. This includes the operating and capital costs associated powerhouse, main generating and balance-of-plant equipment, and system elements such as, pipelines, canals, and penstocks



- Task 600 Economic Feasibility Evaluation (Cont.)
 - Hydroelectrical Systems' Unit Cost of Operations upon determining the annual energy output and the annual cost of operations, Black & Veatch will determine the unit cost of operations which will include the unit cost of O&M, including the cost of power, debt service, and other expenditures per unit of annual energy output. Black & Veatch will develop a comparison of the historical and future estimated cost of hydroelectric power to determine potential savings in energy cost per hydroelectrical system.
 - The economic feasibility of operating the ten hydroelectric facilities after implementing the recommended improvements identified by Black & Veatch will be determined. The Consultant will rely upon PREPA to provide the total system aggregate unit revenues (in MWh). Thereafter, The Consultant will compare the hydroelectric unit revenues and power cost savings, if applicable, with the cost of operations determined in Sub-task 602. In addition, the Consultant will calculate the Net Present Value (NPV) per Hydroelectrical System to determine the current value of the identified savings.

A draft report of the Economic Feasibility Report will be submitted to PREPA for review and discussion. Comments will then be incorporated in a final version of the study.



- Task 700 Summary Report
 - Prepare a draft report summarizing the technical memorandums submitted for Tasks 200 to 600, coordinating all of the information presented separately. This version will be review by PREPA and all comments will be incorporated in a final version report.
 - The Final Report will be submitted to the PREB.



• Project Timeline:

Milestone	Date
Procurement Process for Services (Scope of Work Evaluation, Cost, Deliverables and Timeline)	September 15, 2020 – November 19, 2020
Contract Negotiation & Execution	January 5, 2021
Submittal & Approval of Project Work Plan	January 27, 2021
Task 202 – Site Visit	Feb 8-12, 2021
Task 201 – Draft Site Visit Memorandum	March 5, 2021
Task 201 – Draft Generation Capacity Technical Memorandum	March 26, 2021
Task 300 – Complete Review Water Availability Models	March 19, 2021
Task 400 – Submit Draft Operating Scenarios & Technical Memorandum	April 23, 2021
Task 500 – Submit draft Evaluation for Frequency Response and Remote Control & Technical Memorandum	March 26, 2021
Task 600 – Submit draft Economic Feasibility Evaluation Report	April 23, 2021
Task 700 – Submit draft Final Summary Report	June 2, 2021
Project Complete, 160 days after NTP	June 22, 2021

Project Milestones Payments Breakdown & Status:

Milestone	Payment Amount	Payment Approval Date
Task 200 - Kick-Off Meeting, Document Review, Project Planning, Mobilization	\$70,485	February 17, 2021
Task 200 - Site Visits Memorandum	\$60,660	
Task 200 - Draft Technical Memorandum – Generation Capacity	\$30,206	
Task 200 - Final Technical Memorandum – Generation Capacity	\$5,849	
Task 400 - Draft Technical Memorandum – Operating Scenarios	\$83,330	
Task 400 - Draft Technical Memorandum – Operating Scenarios	\$10,130	
Task 500 - Draft Technical Memorandum – Frequency Response/RC	\$35,530	
Task 500 - Final Technical Memorandum – Frequency Response/RC	\$5,310	
Task 600 - Economic Feasibility Criteria	\$56,117	
Task 600 - Draft Economic Feasibility Report	\$56,117	
Task 600 - Final Economic Feasibility Report	\$4,676	
Task 700 - Draft Feasibility Study Summary Report	\$38,617	
Task 700 - Final Feasibility Study Summary Report	\$12,873	

- Maintaining the PREB Informed on Status of the Study
 - PREPA shall submit a Monthly Progress Report on the status of study.

The report shall include:

- Activities Performed
- Achieved Milestones
- Tracking the Schedule
- Expenditures and budget balance



							PREPA Feasibility Study Schedule 20210217.mpp
D	0	Task Mode	r Task Name	Duration	Start	Finish	December 12/28 12/
0			PREPA Feasibility Study Schedule_01262021	113 days	Wed 1/13/21	Fri 6/18/21	
1	\checkmark	*	PREPA Issues Notice-to-Proceed	1 day	Wed 1/13/21	Wed 1/13/21	▲ 1/13
2			Task 100 - Project Management	108 days	Wed 1/20/21	Fri 6/18/21	
3			Task 200 - Assessment of Hydropower Facilities	64 days	Wed 1/20/21	Mon 4/19/21	25%
4			Task 201a - Preliminary Estimates Generation (29 days	Mon 2/15/21	Thu 3/25/21	0%
5			Task 201a - Prelim Est Generation Capacity - Su	i 1 day	Fri 3/26/21	Fri 3/26/21	*p*
6			Conf Call - PREPA comments Gen Cap TM	1 day	Mon 4/12/21	Mon 4/12/21	* 0%
7			Task 201b - Prelim Est Generation Capacity - Su	5 days	Tue 4/13/21	Mon 4/19/21	×0%
8	\checkmark		Task 202a - Review Site Data	13 days	Wed 1/20/21	Fri 2/5/21	100%
9	\checkmark		Task 2028 - Site Inspections (all 10 sites)	5 days	Mon 2/8/21	Fri 2/12/21	10%
10			Task 202c - Site Visit Memorandum	15 days	Mon 2/15/21	Fri 3/5/21	0%
11							
12			Task 300 - Review Water Availability Models	15 days	Mon 3/1/21	Fri 3/19/21	9%
13							
14		-4	Task 400 -Review Reservoir Operation Curves	41 days	Mon 3/22/21	Mon 5/17/21	0%
15			Task 400a - Rvw Reservoir Operation Curves - E	24 days	Mon 3/22/21	Thu 4/22/21	·0%
16		-4	Task 400a - Rvw Rsvr Operation Curves - Submi	a 1 day	Fri 4/23/21	Fri 4/23/21	¥0%
17		- 1	Conf Call - PREPA comments to Rsvr Op Curves	1 day	Mon 5/10/21	Mon 5/10/21	5,0%
18			Task 400b - Rvw Rsvr Operation Curves - Submi	i 5 days	Tue 5/11/21	Mon 5/17/21	±0%
19		-					
20			Task 500 - Evaluate Local Autmation / Remote C	c49 days	Mon 2/15/21	Thu 4/22/21	
21		-	Task 500a - Gov Response/Remote Cntl - Evalu	a 29 days	Mon 2/15/21	Thu 3/25/21	*
22			Task 500a - Gov Response/Remote Cntl - Subm	i1 day	Fri 3/26/21	Fri 3/26/21	2 bi
23		-	Conf Call - PREPA comments to Gov Response/	1 day	Mon 4/12/21	Mon 4/12/21	50%
24			Task 500b - Gov Response/Remote Cntl - Subm	i8 days	Tue 4/13/21	Thu 4/22/21	• 0%
25			Task 500c - Automation Requirements - Evalua	t 29 days	Mon 2/15/21	Thu 3/25/21	× 1 ⁴⁴
26		-	Task 500c - Automation Reg - Submit Draft TM	1 day	Fri 3/26/21	Fri 3/26/21	¥05
27			Conf Call - PREPA comments to Automation Re	c1 day	Mon 4/12/21	Mon 4/12/21	•0%
28			Task 500d - Automation Reg - Submit Final TM	8 days	Tue 4/13/21	Thu 4/22/21	↓ 0%
29							
30		-4	Task 600 - Economic Feasibility Evaluation	38 days	Mon 3/29/21	Wed 5/19/21	1 0%
31		-4	Task 600a - Economic Feasibility Evaluation	19 days	Mon 3/29/21	Thu 4/22/21	, ™ 1 0%
32		-4	Task 600a - Economic Feasibility Eval - Submit I	01 day	Fri 4/23/21	Fri 4/23/21	*ox
33			Conf Call - PREPA comments to Economic Eval	[1 day	Mon 5/10/21	Mon 5/10/21	▼_ 0%
34		-4	Task 600b - Economic Feasibility Eval - Submit	F7 days	Tue 5/11/21	Wed 5/19/21	0%
35							
36		-4	Task 700 - Final Summary Report	29 days	Tue 5/11/21	Fri 6/18/21	
37			Task 700 - Prepare Final Summary Report	17 days	Tue 5/11/21	Wed 6/2/21	۳۵ ۲ ۴
38		-4	Task 700 - Submit Draft Summary Report	1 day	Thu 6/3/21	Thu 6/3/21	*0%
39			Conf Call - PREPA comments on Final Summary	1 day	Fri 6/11/21	Fri 6/11/21	*_ px
40		-4	Task 700 - Submit Final Summary Report	5 days	Mon 6/14/21	Fri 6/18/21	• • • • • • • • • • • • • • • • • • •

Critical	Split		Finish-only	3	Baseline Milestone	\$	Manual Summary	_	Inactive Task	
Critical Split	Task Progress		Duration-only		Milestone	•	Project Summary		Inactive Milestone	
Critical Progress	Manual Task		lastice		Summary Progress		External Tasks		Inactive Summary	
Task	Start-only	C	Easeline Split		Summary		External Milestone 💠		Deadline	+

<u>Site Visit to Caonillas 1 Hydro</u>





• Site Visit to Caonillas 1 Hydro





• Site Visit to Dos Bocas Hydro





• Site Visit to Garzas 1 Hydro







• Site Visit Garzas 2 Hydro



<u>Site Visit to Río Blanco Hydro</u>







• Site Toro Negro 1 Hidro





<u>Site Visit Toro Negro 2 Hidro</u>





• Site Toro Yauco 1 Hydro



• <u>Site Visit Yauco 2 Hydro</u>



