

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

NEPR

Received:

Oct 26, 2019

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

CASE NO.: CEPR-AP-2018-0001

SUBJECT: APOSTILLE TO INITIAL PRE-
FILED TESTIMONY OF BRIAN T.
FLADGER ON BEHALF OF WÄRTSILÄ
NORTH AMERICA, INC.

MOTION SUBMITTING APOSTILLE
TO INITIAL PRE-FILED TESTIMONY OF BRIAN T. FLADGER
ON BEHALF OF WÄRTSILÄ NORTH AMERICA, INC.

TO THE HONORABLE PUERTO RICO ENERGY BUREAU:

On October 23, 2019, pursuant to: (i) Regulation No. 9021, known as the Regulation on Integrated Resource Plan for the Puerto Rico Electric Power Authority; (ii) Regulation No. 8543, known as the Regulation on Adjudicative, Notice of Noncompliance, Rate Review and Investigation Proceedings; and (iii) the Resolutions and Orders regarding intervenors' written testimony signed by the Puerto Rico Energy Bureau (the "Bureau") on July 3, 2019, August 21, 2019, and September 23, 2019, Wärtsilä North America, Inc. ("Wärtsilä") timely submitted the Initial Pre-Filed Testimony of Brian T. Fladger ("Initial Pre-Filed Testimony").

The Initial Pre-Filed Testimony was sworn and verified before a notary public. However, due to international travel taken by Mr. Fladger, Wärtsilä was unable to obtain an official apostille for the Initial Pre-Filed Testimony by the end of the day of October 23, 2019, the filing deadline for intervenors' written testimony. Rather than delay filing, Wärtsilä filed the Initial Pre-Filed Testimony on October

23, 2019 with a signed and notarized Attestation page, along with a notarized Notary Public Commission certificate from the State of Texas for the notary public who signed the Attestation page, and obtained an apostille as soon as possible.

Wärtsilä submits with this Motion the original Initial Pre-Filed Testimony, a new signed and notarized Attestation page dated October 24, 2019, and an apostille obtained from the Office of the Secretary of State for the State of Texas on October 25, 2019. No changes to the Initial Pre-Filed Testimony have been made.

Wärtsilä respectfully requests that the Bureau take notice of what is stated in this Motion and accept the attached Initial Pre-Filed Testimony, Attestation page, and apostille.

RESPECTFULLY SUBMITTED,

/s/ Shemin V. Proctor

Shemin V. Proctor*

Gia V. Cribbs*

Hunton Andrews Kurth LLP

2200 Pennsylvania Avenue, NW

Washington, DC 20037

Tel. (202) 662-3052

Email: SProctor@huntonak.com

Email: GiaCribbs@huntonak.com

/s/ Eugene Scott

Eugene Scott Amy

TSPR-RUA No. 13235

Ferraiuoli LLC

221 Ponce de León Avenue, Suite 500

San Juan, PR 00917

Tel. (787) 766-7000

Email: escott@ferraiuoli.com

*admitted *pro hac vice*

Counsel for Wärtsilä North America, Inc.

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

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

CASE NO.: CEPR-AP-2018-0001

SUBJECT: INITIAL PRE-FILED
TESTIMONY OF BRIAN T. FLADGER ON
BEHALF OF WÄRTSILÄ NORTH
AMERICA, INC.

**INITIAL PRE-FILED TESTIMONY OF
BRIAN T. FLADGER
ON BEHALF OF WÄRTSILÄ NORTH AMERICA, INC.
OCTOBER 23, 2019**

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

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

CASE NO.: CEPR-AP-2018-0001

**SUBJECT: INITIAL PRE-FILED
TESTIMONY OF BRIAN T. FLADGER ON
BEHALF OF WÄRTSILÄ NORTH
AMERICA, INC.**

Initial Pre-Filed Testimony of Brian T. Fladger

1 **I. INTRODUCTION**

2 **A. Witness Identification**

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

4 A. My name is Brian T. Fladger. I am Market Development Analyst for the
5 Americas, Market Development of Wärtsilä North America, Inc. ("Wärtsilä").

6 My business address is 62 Rookwood Court, The Woodlands, Texas 77382.

7 **Q. On whose behalf are you testifying before the Puerto Rico Energy Bureau**
8 **(the "Energy Bureau") in this proceeding?**

9 A. I am testifying on behalf of Wärtsilä, an intervenor in this proceeding.

10 **Q. Have you previously provided testimony before the Energy Bureau?**

11 A. No, I have not previously provided testimony before the Energy Bureau.

12 **B. Summary of Initial Pre-Filed Testimony**

13 **Q. What are the purposes and subjects of your Initial Pre-Filed Testimony?**

1 A. My Initial Pre-Filed Testimony addresses the following purposes and subjects: (i)
2 issues with the modeling approach used by the Puerto Rico Electric Power
3 Authority ("PREPA") in the 2018 Integrated Resource Plan update ("IRP"); and
4 (ii) the use of the IRP as a roadmap.

5 **Q. Is your Initial Pre-Filed Testimony the only testimony you intend to file in**
6 **this proceeding?**

7 A. No. The Puerto Rico Energy Bureau's ("PREB") October 16, 2019 Resolution
8 and Order amended the procedural calendar in this proceeding to allow parties, on
9 or before November 11, 2019, to submit Supplemental Written Testimony based
10 on PREPA's responses to several outstanding Requirements of Information
11 ("ROI"), including Wärtsilä's Second Set of ROIs. Therefore, Wärtsilä intends to
12 file my Supplemental Written Testimony on or before November 11, 2019
13 specifically addressing PREPA's responses to Wärtsilä's Second Set of ROIs.

14 **Q. What are your conclusions and recommendations related to your Initial Pre-**
15 **Filed Testimony?**

16 A. The IRP should not be prescriptive and should be considered a roadmap.
17 However, the IRP's roadmap is based on modeling that has issues, including the
18 use of software that leads to less accurate results, inaccurate cost inputs, the
19 failure to consider start-up costs, the failure to accurately model minimum
20 downtime for reciprocating internal combustion engine ("RICE") technology, and
21 inaccurate modeling of variable operation and maintenance costs in the combined
22 cycle gas turbine ("CCGT") model, all of which have led to inaccurate results that

1 do not properly give full consideration to all types of technology. Wärtsilä
2 believes that the PREB should consider these issues during the final approval
3 process for the IRP.

4 **Q. Are there any exhibits attached to your Initial Pre-Filed Testimony?**

5 A. Yes. My Initial Pre-Filed Testimony includes the following exhibit:

- 6
 - Wärtsilä Ex. 1.01: My resume

7 **C. Qualifications and Professional Background**

8 **Q. How long have you been Market Development Analyst for the Americas of**
9 **Wärtsilä and what are your duties and responsibilities in that position?**

10 A. I have been in this position since June 2017. As Market Development Analyst, I
11 am responsible for generating country level, analytics-based value propositions,
12 including direct research quantifying optimal pathways towards high renewable
13 penetration in utility portfolios in the United States, Central and South America,
14 and the Caribbean Islands.

15 **Q. Have you previously held any other positions at Wärtsilä?**

16 A. No. Prior to my employment at Wärtsilä, I was both an Analytics Consultant at
17 Humana Inc. and a Portfolio Analyst at Southern Company Services.

18 **Q. What is your educational background?**

19 A. I received a Bachelor of Science degree in Economics from Hampton University;
20 a Master of Arts degree in Economics from Clemson University; and a Master of
21 Science degree in Applied Statistics from the University of Alabama.

1 **II. DISCUSSION**

2 **A. Issues with the Modeling Approach Used by PREPA in the IRP**

3 **Q. Did you attend the Initial Technical Hearing that was held in this proceeding**
4 **at the PREB on September 4 and 5, 2019?**

5 **A. Yes.**

6 **Q. Specifically, do you recall the portion of the Initial Technical Hearing on**
7 **September 4, 2019 when Dr. Nelson Bacalao, Senior Consulting Manager for**
8 **Siemens Power Technologies International (“Siemens”), which is PREPA’s**
9 **expert in this proceeding, discussed the modeling used for the IRP?**

10 **A. Yes.**

11 **Q. What software was used to model the IRP?**

12 **A. Aurora software was used to model the IRP.**

13 **Q. Is PREPA aware of another type of software that could have been used to**
14 **model the IRP?**

15 **A. At the September 4, 2019 Initial Technical Hearing, Dr. Bacalao stated that he**
16 **could not speculate about other types of software that could have been used in the**
17 **IRP.**

18 **Q. Is there another type of software that could have been used in the IRP to**
19 **ensure more accurate results?**

20 **A. Yes. Plexos, like Aurora, is a production cost modeling software that is a part of**
21 **the Energy Exemplar software suite. As described on the Energy Exemplar**

1 solutions page (<https://energyexemplar.com/solutions/>), Aurora is designed to
2 provide fast results that do not require “heavy lifting” to create a more “out-of-
3 the-box experience” for the end-user, whereas Plexos is a heavier tool designed to
4 include “tons of variables and constraints” to “get the most real-world results.”
5 As a user of both platforms, I have found that in the context of modeling island
6 grids that seek to increase levels of renewable penetration and have no possible
7 way to import electricity, Plexos is a more robust tool because it allows users to
8 meticulously configure grid constraints.

9 **Q. Is the software the only issue you have with the modeling approach used in**
10 **the IRP?**

11 A. No. There are several other issues with the modeling approach used in the IRP. I
12 will address each of these below.

13 **Q. Do you recall the portion of the Initial Technical Hearing on September 5,**
14 **2019 when Dr. Bacalao discussed how the model used in the IRP selects**
15 **technology based on inputs?**

16 A. Yes. Dr. Bacalao stated that the modeling in the IRP is directly related to the
17 inputs, and selects units based on size and price.

18 **Q. Do you agree with Dr. Bacalao’s conclusion?**

19 A. Yes. If the inputs to the model are incorrect, then the model would not produce
20 correct or accurate results. In fact, Dr. Bacalao agreed that incorrect inputs could

1 have an effect on the outcome of the model and that certain inputs, such as the
2 cost of renewables, would have more of an impact than others.

3 **Q. Are there cost inputs to the IRP model that are incorrect in relation to RICE**
4 **technology?**

5 A. Yes. In 2015, in the context of an Expression of Interest, Wärtsilä gave PREPA
6 detailed cost and performance information regarding its RICE technology which
7 is substantially more competitive than the information shown in Part 6 of the IRP
8 and utilized by Siemens in its IRP conclusions. For example, that information
9 Wärtsilä gave to PREPA in 2015 showed a price of installed kW in the range of
10 \$780-\$918, plus \$100-\$120/kW additional for dual fuel alternatives. The IRP
11 reflects a price of installed kW of \$1,600 plus. Additionally, Exhibit 6-15 to the
12 IRP specifically references the Wärtsilä engine model 18V50DF and lists capital
13 costs that are almost double the current capital costs.

14 **Q. How did PREPA obtain the RICE technology cost inputs it used in the IRP?**

15 A. In response to Wärtsilä-PREPA-01-02(b), PREPA stated that the 2015 Wärtsilä
16 cost information was escalated to current dollars.

17 **Q. Do you believe that the RICE cost inputs in the IRP accurately reflect 2018**
18 **costs?**

19 A. No. In fact, I have the current pricing in Puerto Rico as of today. Specifically,
20 Wärtsilä's scope of current pricing in Puerto Rico for the 18V50DF engines is: 18

1 engines: \$981 USD/kW; 36 engines: \$926.50 USD/kW; and 54 engines: \$872
2 USD/kW.

3 **Q. What should PREPA have done to ensure that accurate cost information was**
4 **included in the IRP?**

5 A. PREPA should have contacted vendors to obtain the most accurate information.
6 In response to Wärtsilä-PREPA-02-01, PREPA stated that the intent was to
7 contact vendors if specific information needed for the modeling inputs was not
8 publicly available or available from prior experience. However, PREPA admitted
9 that no vendors were contacted for information for the IRP. Instead, as described
10 in the response to Wärtsilä-PREPA-02-02, PREPA simply escalated all costs
11 using the same deflator throughout the IRP, and the result is clearly inaccurate.

12 **Q. Why is it important that the IRP utilize the most up to date and accurate cost**
13 **information?**

14 A. As stated by Dr. Bacalao, the modeling in the IRP is directly related to the inputs
15 and units are selected based on size and price. If the cost inputs are not accurate
16 and too high, then certain types of technology, such as RICE technology, may not
17 be selected as a result.

18 **Q. Are there other issues with the modeling approach used by PREPA?**

19 A. Yes. Many utilities, municipalities, and cooperatives in the United States dealing
20 with the need to accommodate large blocks of renewable capacity have used
21 parameters not included in the IRP when comparing gas turbines versus RICE

1 technology, such as start-up costs. PREPA confirmed in its response to Wärtsilä-
2 PREPA-01-12 that start-up costs were not considered in the IRP.

3 **Q. Please describe start-up costs.**

4 A. Gas turbines, especially heavy duty gas turbines like the ones represented in the
5 IRP, have start-up costs which can be represented two ways: first, as maintenance
6 costs, meaning gas turbines incur start-up costs by way of shortened service
7 intervals that are directly impacted by the number of machine starts; and second,
8 as start-up efficiency. The starting time for a gas turbine is relatively slow, and
9 the electrical efficiency during start-up periods is much lower than it would be
10 for full power base load profile. Additionally, start-up efficiency is much lower
11 for CCGTs.

12 **Q. Were start-up costs considered in the IRP?**

13 A. No. Dr. Bacalao stated that only minimum down time and minimum run time
14 inputs were included as well as variable operation and maintenance ("O&M") and
15 that unless there was an energy charge at start up there are no costs. He later
16 clarified that there are some costs but they can be blended into O&M.

17 **Q. Do you agree with these statements?**

18 A. No.

19 **Q. Did the PREB consultant, Mr. Fagan, appear to agree with Dr. Bacalao?**

20 A. No. In fact, he stated that start-up costs inputs have a significant effect on unit
21 commitment. He said he would pose a ROI to follow up on this point.

1 **Q. Did the PREB follow up and what was PREPA's response?**

2 A. Yes. In ROI PREB-PREPA-06-05, which was issued on September 6, 2019, the
3 PREB asked PREPA to complete two new sensitivity runs to account for high
4 infrastructure cost sensitivities. In response, PREPA provided two attachments,
5 "PREPA ROI_06_05 Attach 1.xlsx" and "PREPA ROI_06_05 Attach 2.xlsx."
6 Both of these attachments contain multiple instances under various sheets in the
7 workbooks where start-up costs or the sum of start-up costs are listed either as
8 zero or are blank, which confirms that PREPA did not consider start-up costs.

9 **Q. Why do you think it is important to consider start-up costs in the IRP?**

10 A. If you do not include start-up costs in the IRP, you do not reflect the true cost of
11 turning on the generation, which makes it seem like you can turn on and turn off
12 the generation without any costs. This skews the IRP's selection toward
13 combined cycle units instead of flexible units. Thus, failing to include start-up
14 costs will have an impact on unit commitment dispatch optimization and the
15 choices selected in the model.

16 **Q. Can you describe the start conditions of a CCGT and how the costs are**
17 **measured?**

18 A. The run up time for a CCGT is the time it takes to turn on and reach a minimum
19 stable load. Before it reaches a minimum stable load, air is compressed in a
20 combustion chamber and fuel is added, and the machine starts to turn on to
21 generate power for the grid. The run up time is from when the machine is turned
22 on to the point of lowest mechanical operation, and during this entire time it

1 consumes fuel and the electrical energy that is created is inefficient so it takes
2 more fuel to generate the low level of generation. It takes about three hours for a
3 CCGT to reach a minimum stable load from a cold condition, and only after that
4 time can it reach the maximum load and be variable and efficient. For a CCGT of
5 about 300 MW with 300 starts per year that cycles, it will cost approximately
6 \$5,000-\$10,000/start. This is why it is important to consider start-up costs in the
7 IRP. Furthermore, because there are many starts, there are also high maintenance
8 costs; well over the \$1.75 mentioned in the IRP. O&M costs for CCGTs under
9 those conditions are much closer to \$5/MWh.

10 **Q. Is there another issue with the modeling approach used by PREPA?**

11 A. Yes. Exhibit 6-13 of the IRP lists the minimum downtime for RICE technology
12 as two hours. However, the minimum downtime of Wärtsilä's RICE technology
13 is only five minutes, which means that a plant is always ready to start and provide
14 grid support as compared to CCGTs that need to wait two hours before they can
15 produce any power after a recent stop.

16 **Q. Why is the downtime listed in the IRP for RICE technology so inaccurate?**

17 A. In response to Wärtsilä-PREPA-01-06, PREPA stated that all units with "short up
18 times and down times" were modeled at two hours because that is the maximum
19 resolution of the Long-Term Capacity Expansion ("LTCE"), as it is formulated by
20 modeling every other hour.

21 **Q. Did Dr. Bacalao confirm this at the Initial Technical Hearing?**

1 A. Yes. At the Initial Technical Hearing on September 4, 2019, Dr. Bacalao
2 confirmed that the two-hour downtime was used across the board for all
3 technologies because two hours was the fastest downtime the model that was used
4 could do.

5 **Q. Why is it a concern that the IRP does not recognize the short downtime of**
6 **RICE technology?**

7 A. RICE technology allows for better flexibility to integrate renewables and is a
8 resource option that PREPA should have to the greatest extent possible. By
9 utilizing a model that cannot account for a downtime of less than two hours, the
10 IRP fails to recognize an important benefit of RICE technology.

11 **Q. Are there any other limitations with the modeling used to generate the IRP?**

12 A. Yes, there are two additional issues with the modeling of variable O&M costs for
13 the CCGT. First, the model shows heavy levels of renewable penetration. With
14 this, the importance of modeling flexibility increases because there is more
15 intermittency on the grid. By modeling every two hours in a twenty-four hour
16 day, only twelve dispatches are considered in the IRP model rather than twenty-
17 four. Also, the modeling was done only four days per week, not seven, and only
18 one week per month, not four. There are 8,760 hours in a year, but the modeling
19 approach only accounts for 576 hours per year. With all of those simplifying
20 assumptions, the model does not capture the true peaks and valleys of the net
21 load, *i.e.*, variability. The resulting unit commitment and dispatch decisions and

1 operational costs are not realistic, which means that the true value of flexibility is
2 not observed.

3 Second, CCGTs will start and stop more frequently when there are heavy
4 amounts of renewable generation. More starting and stopping means the variable
5 O&M costs would be much higher than the \$1.75 included in the IRP. This cost
6 understates the actual variable O&M costs that would be included with daily starts
7 and stops. If a CCGT has 300 starts per year, the variable O&M costs will be
8 closer to \$5. This O&M cost increase would greatly affect the true dispatch costs
9 of the CCGT. The Aurora model is a production cost model, so if the dispatch
10 costs of one generator are higher relative to another (as in this case with the
11 variable O&M costs misstated), it will impact the selection of the technology
12 chosen to build and skew the selection toward CCGTs. As Dr. Bacalao agreed at
13 the Initial Technical Hearing, incorrect inputs could have an effect on the
14 outcome of the model.

15 **Q. Did PREPA recognize the importance of both including RICE technology in**
16 **the IRP and the flexibility of RICE units at the Initial Technical Hearing?**

17 A. Yes. At the Initial Technical Hearing on September 5, 2019, Dr. Bacalao stated
18 that it was “absolutely correct” that in order to integrate the amount of renewables
19 PREPA wants, thermal units have to be a part of the system. Moreover, he
20 specifically agreed that RICE technology allows for better flexibility to integrate
21 renewables and stated that, to his knowledge, “RICE are one of the most flexible
22 units” because they “can turn . . . off and on and they can come up very rapidly.”

1 **Q. What is the result of these issues with the modeling approach used by**
2 **PREPA in the IRP?**

3 **A. By utilizing incorrect cost inputs, ignoring relevant inputs such as start-up costs,**
4 **and failing to account for certain benefits such as short downtimes, the IRP's**
5 **modeling approach leads to inaccurate results that do not properly give full**
6 **consideration to all types of technology.**

7 **B. Use of the IRP as a Roadmap**

8 **Q. Do you recall the portion of the Initial Technical Hearing on September 4,**
9 **2019 where PREPA discussed how the IRP is not prescriptive and is a**
10 **roadmap subject to final approval by various governmental bodies such as**
11 **the PREB?**

12 **A. Yes.**

13 **Q. Do you agree with PREPA's description of the IRP as a roadmap?**

14 **A. Yes. The IRP should not be prescriptive and should be considered a roadmap.**
15 **However, the IRP's roadmap is based on modeling that has issues, including the**
16 **use of inaccurate inputs, and Wärtsilä wanted to identify those issues to the PREB**
17 **for its consideration during the final approval process for the IRP. The modeling**
18 **issues identified above can lead to inaccurate results, which will be the topic of**
19 **my Supplemental Written Testimony.**

20 **III. CONCLUSION**

21 **Q. Does this conclude your Initial Pre-Filed Testimony?**

1 A. Yes, it does.

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PUBLIC SERVICE REGULATORY BOARD
PUERTO RICO ENERGY BUREAU

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CASE NO.: CEPR-AP-2018-0001

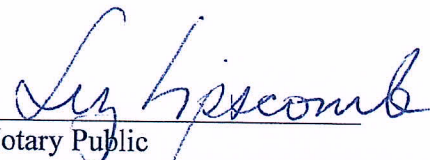
SUBJECT: INITIAL PRE-FILED
TESTIMONY OF BRIAN T. FLADGER ON
BEHALF OF WÄRTSILÄ NORTH
AMERICA, INC.

ATTESTATION

Affiant, Brian T. Fladger, being first duly sworn, on oath states the following: the prepared Initial Pre-Filed Testimony and the information, documents, and workpapers attached thereto constitute the pre-filed testimony of the Affiant in the above-styled proceeding. Affiant states that he would give the answers set forth in the Initial Pre-Filed Testimony if asked the questions propounded therein at the time of the filing. Affiant further states that, to the best of his knowledge, his statements made are true and correct.

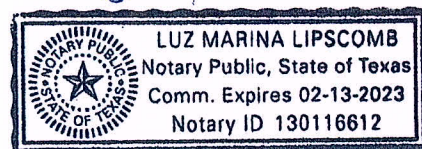

Brian T. Fladger

Subscribed and sworn to before me, a Notary Public in and for Texas, this
24 day of October, 2019.


Notary Public

My Commission expires:

Feb 13, 2023



IN THE NAME AND BY THE AUTHORITY OF
THE STATE OF TEXAS



Notary Public Commission

TO ALL TO WHOM THESE PRESENTS SHALL COME—GREETINGS:

Whereas **Luz Marina Lipscomb**

has been appointed by the Secretary of State of Texas a Notary Public in the State of Texas. Now, therefore, the above named person is hereby commissioned a Notary Public for the State of Texas under the laws of the State of Texas with all the rights, privileges and emoluments appertaining to said office.

TERM OF OFFICE: 02/13/2019 - 02/13/2023

NOTARY ID# 13011661-2



GREG ABBOTT, GOVERNOR OF TEXAS

Rolando B. Pablos
Secretary of State

NOTARY PUBLIC OATH OF OFFICE

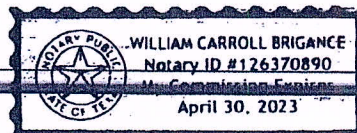
State of Texas
County of Harris

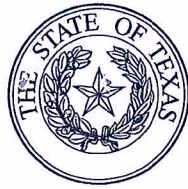
I, Luz Lipscomb, do solemnly swear (or affirm), that I will faithfully execute the duties of the office of notary public of the State of Texas, and will to the best of my ability preserve, protect, and defend the Constitution and laws of the United States and this state, so help me God.

X

Sworn to and subscribed before me on this 28 day of November, 2018.

Seal


Notary Public Signature



The State of Texas

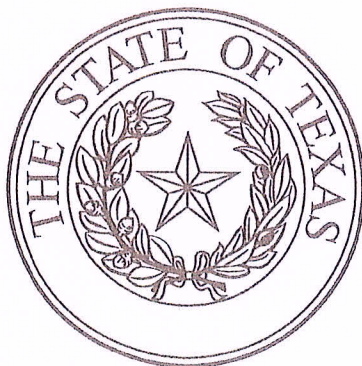
Secretary of State

I, Ruth R. Hughes, Secretary of State of the State of Texas, DO HEREBY
CERTIFY that according to the records of this office,

LUZ MARINA LIPSCOMB

was commissioned as a Notary Public for the State of Texas on February 13,
2019, for a term ending on February 13, 2023.

Issued: October 25, 2019
Certificate Number 11826580



A handwritten signature in black ink, appearing to read "Ruth R. Hughes", written over a horizontal line.

Ruth R. Hughes
Secretary of State
GF/rm

Brian Fladger

9 Hidden View Place ♦ Spring, TX 77381 ♦ (346) 236-7510 ♦ Brian.Fladger@gmail.com

Work Experience

WARTSILA NA – HOUSTON TX

MARKET DEVELOPMENT ANALYST, MARKET DEVELOPMENT *JUNE 2017—PRESENT*

- Led IRP planning consulting projects for several Island (micro-grid applications) and Central American countries
- Developed country level power system models for several Latin American, and Caribbean countries to influence government officials, financial intuitions and Independent Power Producers (IPPs) to invest in the optimal mix of renewable, energy storage and thermal generating technologies
- Coordinated global market modeling workshops for Wartsila key accounts in the USA, Argentina, The Dominican Republic, Honduras, Mexico, Peru(in progress) and Chile(in progress)
- Developed strategic partnerships with modeling software providers to publicly emphasize the importance of proper modelling
- Presented at several key power market conferences including the Platts Nodal Conference and the NRECA Resource Planners Conference
- Provided ad-hoc consultation to sales team on generator (internal combustion engines, combustion turbines and combined cycle gas turbines) performance, specs and estimated fixed and variable costs

HUMANA INC. – IRVING TX

ANALYTICS CONSULTANT, BEHAVIORAL HEALTH ANALYTICS *OCTOBER 2016—JUNE 2017*

- Developed identification models for HUMANA INC's Loneliness and Social Isolation intervention campaign
- Conducted quality analysis of in-network behavioral health providers to measure their effectiveness and efficiency
- Provided ad-hoc analytical and reporting support for HUMANA BEHAVIORAL HEALTH stakeholders and the HUMANA INC. ENTERPRISE GOAL business development team

SOUTHERN COMPANY SERVICES – BIRMINGHAM, AL

PORTFOLIO ANALYST, FLEET OPERATIONS AND TRADING *MAY 2014—OCTOBER 2016*

- Developed trading strategies using supervised and unsupervised machine learning techniques , resulting in over \$750,000 in annual gross margin
- Provided analytical and modeling support for Southern Company's pilot FTR options trading program
- Provided ad-hoc analytical and structural support to Southern Company wholesale stakeholders, Southern Power Company and Southern Wholesale Energy
- Developed and maintained internal forecasting tools to support hourly and term traders
- Replaced a subscription based software with internal forecasts, saving the company \$100,000 per year
- Created hourly forecasts to predict price spikes in PJM and MISO markets
- Modeled the PJM ISO in AuroraXMP to forecast energy and congestion

NATIONAL NUCLEAR SECURITY ADMINISTRATION – WASHINGTON, DC

INTERN, CAPITAL PLANNING *JUNE 2012—AUGUST 2012*

- Led a research team of 12 interns and presented weekly updates to senior level management on the status of research oriented projects
- Developed a data-driven capital investment model to quantify the priority of infrastructural maintenance projects
- Led a cross functional team of policy experts and mathematicians to generate metrics for intangible public value characteristics for usage as decision variables in capital investment models

POTOMAC HEALTHCARE SOLUTIONS – SPRINGFIELD, VA

INTERN, DEFENSE CONTRACTS *JUNE 2011—AUGUST 2011*

- Developed a pricing model used to effectively calculate the billing rate of contractual service bids for multiple Department of Defense contracts
- Compiled salary data and labor statistics for 32 states and 24 positions, the data was used to generate the optimal billing rate for a United States Coast Guard Medical facility contract that potentially generated \$221 million in revenue
- Communicated expansion opportunities and potential threats of contractual bids to executive partners

Brian Fladger

Skills Summary

Advanced Modeling (Power System Modeling (zonal and nodal), Machine Learning, General Linear Models, Design of Experiments, Time Series Analysis, Stochastic Optimization, Hierarchical Models, Econometrics)

Advanced Use of Modeling Software (Plexos, Aurora, GT Pro, SQL, Base SAS, SAS Enterprise Miner, SAS Enterprise Guide, JMP, MATLAB, Python and Minitab)

Advanced Use of Microsoft Office (Excel, Word, PowerPoint)

Education

Master of Science in Applied Statistics, THE UNIVERSITY OF ALABAMA, Tuscaloosa, AL

MAY 2014

Master of Arts in Economics, CLEMSON UNIVERSITY, Clemson, SC

AUGUST 2012

CERTIFICATE OF SERVICE

I hereby certify that on October 25, 2019, I have sent the Motion Submitting Apostille to the Initial Pre-Filed Testimony of Brian T. Fladger on Behalf of Wärtsilä North America, Inc. via email to the Energy Bureau, PREPA, and the intervenors:

- Energy Bureau (secretaria@energia.pr.gov; wcordero@energia.pr.gov; legal@energia.pr.gov; sugarte@energia.pr.gov; viacaron@energia.pr.gov; csanchez@energia.pr.gov; ireyes@energia.pr.gov; asanz@energia.pr.gov; bmulero@energia.pr.gov; nnunez@energia.pr.gov; gmaldonado@energia.pr.gov);
- PREPA (mvazquez@diazvaz.law; kbolanos@diazvaz.law; astrid.rodriguez@prepa.com; jorge.ruiz@prepa.com; n-vazquez@aeepr.com; c-aquino@prepa.com);
- Environmental Defense Fund (acarbo@edf.org);
- Sunrun, Inc. (javier.ruajovet@sunrun.com);
- Local Environmental Organizations (pedrosaade5@gmail.com; rmurthy@earthjustice.org);
- EcoEléctrica, L.P. (carlos.reyes@ecoelectrica.com; ccf@tcmrslaw.com);
- Grupo WindMar (victorluisgonzalez@yahoo.com; mgrpcorp@gmail.com);
- Oficina Independiente de Protección al Consumidor (hrivera@oipc.pr.gov; jrivera@cnslpr.com);
- Empire Gas Company, Inc. (manuelgabrielfernandez@gmail.com);
- National Public Finance Guarantee Corp. (acasellas@amgprlaw.com; corey.brady@weil.com);
- Progression Energy (maortiz@lvprlaw.com; rnegron@dnlawpr.com);
- Shell NA LNG LLC (paul.demoudt@shell.com);
- Non Profit Intervenors (agraitfe@agraitlawpr.com);
- Renew Puerto Rico (castrodiappalaw@gmail.com; voxpathulix@gmail.com);
- Solar and Energy Storage Association of Puerto Rico & Caribe GE International Energy Services, Corp. (cfl@mcvpr.com);
- League of Cooperatives of Puerto Rico and AMANESER 2025, Inc. (info@liga.coop; amaneser2020@gmail.com);
- Arctas Capital Group, LP (sierra@arctas.com, tonytorres2366@gmail.com)

/s/ Eugene Scott

Eugene Scott Amy

TSPR-RUA No. 13235

Ferraiuoli LLC

221 Ponce de León Avenue, Suite
500

San Juan, PR 00917

Tel. (787) 766-7000

Email: escott@ferraiuoli.com