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December 7, 2020

VIA: ELECTRONIC FILING

Mr. Adam Teitzman
Commission Clerk
Florida Public Service Commission
2540 Shumard Oak Boulevard
Tallahassee, Florida 32399-0850

Re: Docket No. 20200000-OT – Undocketed
2019 FEECA Report Data Collection

Dear Mr. Teitzman:

Attached for filing in the above docket is Tampa Electric Company's Responses to Staff's Second Data Request (Nos. 8) dated November 25, 2020.

Thank you for your assistance in connection with this matter.

Sincerely,

Malcolm N. Means

Malcolm N. Means

MNM/bmp
Attachment

cc: All parties of record (w/attachment)

8. In TECO's Response to Staff's First Data Request, Item 2, dated March 27, 2020, the Company provided information on research and development initiatives.

A. Please provide a detailed update on the Small to mid-size Commercial Battery Storage initiative.

B. Please provide a detailed update on the Large Commercial Electric Vehicle Battery Storage initiative.

C. Please provide a detailed update on any other research and development initiatives that are related to energy storage.

A.

A. Small to mid-size Commercial Battery Storage: At this time, the Research and Development ("R&D") project is still in a waiting status due to the COVID-19 pandemic, which is preventing the company from initiating the second phase of the original R&D Project plan. This second phase is the identification of one or two commercial facilities for potential battery installation which requires site visits and face-to-face interactions with customers.

In the last quarter of 2016, Tampa Electric partnered with the University of South Florida ("USF") College of Engineering to assist in the performance of this R&D project to evaluate the feasibility of potentially offering a battery storage DSM program for commercial/industrial customers. This R&D project will evaluate these small to mid-size commercial battery storage through research and field study with at least one battery being installed at a commercial/industrial customer's facility. Tampa Electric specified the size of battery for this R&D project to be between 10 kW and 150 kW with the project from inception to completion lasting approximately three-years. The original timeline was to afford enough time to study these batteries and potentially justify a Demand Side Management ("DSM") program within the company's 2020-2029 DSM Plan if the results were positive. The original R&D project was projected to cost approximately $250,000 to achieve the following objectives:

- Evaluate the potential for battery storage for the use of load shifting on demand savings.
- Evaluate the efficiency of load shifting from a battery storage system and the associated control and monitoring system.
- Evaluate the impact on the total energy consumption of the battery and facility when used in a load shifting capacity (versus reliability).

- Evaluate and compare batteries based on performance and cycling tolerance when used in Florida's climate.
- Examine the associated costs from cradle to disposition of battery.
- Evaluate the load profile impact on power vs. capacity tradeoffs.

To achieve these objectives, the Small to mid-size Commercial Battery Storage project was broken down into the following four main phases:

1. Battery selection
2. Identify commercial facilities
3. Battery vendor selection
4. Installation of storage system

Phase 1 was completed by USF in 2017. Tampa Electric included a copy of the battery research study in the company's annual DSM report that was filed with the Commission on March 1, 2018. In 2017, after completion of the initial portion of the R&D project, the company sought product availability and costs and found that the prices were greater than the allocation of funds allowed as an R&D program and placed the pursuit of this R&D project on hold until the prices of the batteries dropped to an acceptable level. The company's Commercial Energy Management Team ("CEMT") has continued to keep a pulse on the market and monitors the prices of the batteries to continue the R&D project. In addition to monitoring the prices of the batteries to continue the R&D project, Tampa Electric also filed for an increase in the allowable funds to be used for R&D in the company's most recently filed and Commission approved 2020-2029 DSM Plan. In the 2020-20229 DSM Plan, the program costs were increased on an annual basis from $200,000 per year to $400,000 per year and increased the five-year period total allowable costs from $1,000,000 to $2,000,000.

Tampa Electric has had preliminary facilities identified for follow-up once the restriction of face-to-face engagement with customers that may be interested in participating in this R&D project is lifted. The two preliminary facilities include a 911-call center and a low-income community center. The company is hopeful that this R&D project will move forward in 2021.

B. Large Commercial Electric Vehicle Battery Storage: At this time, the R&D project is included as a component of the Integrated Renewable Energy System (Pilot) program. It is in construction phase and is expected to be fully operational by May 1, 2021.

In 2017, Tampa Electric partnered with USF's Center for Urban Transportation Research ("CUTR") to study the potential benefits that electric vehicles could provide to a DSM Program. The partnership developed two studies. The first study was the electric vehicle energy education study which has been fully implemented into the three high schools in Hillsborough County. The second study was to perform in-depth research on the benefits that Tampa Electric could potentially realize if the company offered a DSM Program related to electric vehicles. As the performance of this report was being conducted, Tampa Electric began exploring the operational capabilities and characteristics of large commercial electric vehicle lithium-ion batteries and their potential capability to export power to the company's electrical grid during peak times. The company explored developing a separate R&D project that would involve installing truck batteries (either a three (3) kW or 10 kW sized battery) within three of the company's line trucks to evaluate the potential energy consumed by the charging stations and the amount of demand that can be exported to the grid. In addition, the ability to control the level of discharge to a specified point will also be evaluated to understand the operational impacts of performing these exports during the summer and winter peak season hours. Other items the project would analyze will include the following:

- Economics and cost-effectiveness
- Customer site integration
- Integration of multiple trucks

Because of the costs for batteries seen in the other Small to mid-size Commercial Battery Storage project, Tampa Electric made the decision that this R&D project would be placed on hold until additional funding was available or the battery and associated costs decreased to an acceptable level. In early 2019, the company decided that this R&D project would provide additional benefits if it were included as part of the Integrated Renewable Energy System (Pilot) Program proposed in the company's 2020-2029 DSM Plan.

Tampa Electric believes that the Integrated Renewable Energy System (Pilot) program will be a very cost effective way to gain the knowledge regarding load shifting during current peak times, load shifting during changing peak times due to high solar penetration, and how to maximize the DSM benefits of these integrated systems (Solar Photovoltaic ("PV") Array, Large Electric Vehicle

Charging, Electric Vehicle Charging, Battery Storage). Another important part of the pilot is to make the technology available for viewing and education by potential commercial/industrial customers that are interested in these systems.

The Integrated Renewable Energy System will include the following components:

1. 800 kW (AC) solar PV array
2. 290 kW / 1,160 kWh battery energy storage system
3. 10 large electric vehicle access plugs for charging
4. Six (6) dual headed passenger vehicle charging stations

C. Other research and development initiatives that are related to energy storage: Tampa Electric is also involved in the following four energy storage initiatives. While these initiatives at this time are not part of the company's conservation efforts toward meeting the objectives of the Florida Energy Efficiency and Conservation Act ("FEECA"), depending on the results of these projects, or portions of these projects could lead to becoming a formal DSM Program within a future DSM Plan by Tampa Electric.

Utility Scale Battery Energy Storage: In December 2019, Tampa Electric completed the installation of a 12.6 MW / 26.2 MWh battery energy storage system adjacent to the company's 20 MW Big Bend Solar site in Apollo Beach. This utility scale, lithium-ion battery system is primarily being used for load shifting/peak shaving, which typically involves up to one full steady charge and discharge per day. The company is studying this system for determining operational performance characteristics, advantages, disadvantages, degradation, and functionality to determine the long-term characteristics of how this system will operate in conjunction with a utility sized PV array. The company is also utilizing the battery energy storage system for frequency regulation and other ancillary services, which involve thousands of small but frequent partial charges and discharges throughout the day.

Florida Aquarium solar and battery covered pavilion: In November 2020, Tampa Electric completed the installation of a solar PV array coupled with two small batteries to cover the new guest pavilion at the Florida Aquarium in Tampa. This project includes 134 kW (AC) of solar PV arrays on the new pavilion and tank canopy along with the two small-sized 14 kW, 28 kWh commercial/residential batteries that provides its power directly to Tampa Electric's grid. The purpose of the project is to utilize the solar PV array to provide power to the grid when the sun is shining and to charge the batteries, then when the power from the batteries is desired, to initiate their discharge.

This control of discharging of the batteries is being studied to determine the viability of this type of system to be used to reduce utility peak load at peak times or during situations which require Tampa Electric to reduce the load on the utility system. The project also provides opportunities for Tampa Electric to gain expertise with integration of solar and battery storage as well as the impacts of distributed resources on the company's electrical system and will provide valuable operational insight that will facilitate the company's ability to properly evaluate potential and future battery storage and distributed generation opportunities with customers.

Direct Current ("DC") Microgrid: Emera Technologies LLC, an affiliate f of Tampa Electric, constructed and deployed a demonstration of their DC microgrid ("Block Energy System") at Kirtland Air Force Base ("KAFB") in Albuquerque, New Mexico. This system currently provides all power to several homes and a community gathering space within the base. This Block Energy System at Kirtland Air Force Base system has been in continuous operation since December of 2019.

On October 27, 2020, Tampa Electric filed a petition for approval of a four-year pilot program (Docket 20200234-EI) which will involve implementation of the Block Energy System.

If approved, Tampa Electric will install the project in a new residential neighborhood being developed in Southern Hillsborough County. This project consists of the following Battery Energy Storage Systems ("BESS"), rooftop mounted solar PV systems and natural gas powered generation:

1. Community Energy Park (one community park)
    a. 220 kWh BESS
    b. Small natural gas generators
    c. Interconnection point to Tampa Electric's AC Grid
2. Individual homes (total of 37 homes)
    a. 18 kWh average BESS per home
    b. 7 kW (AC) rooftop mounted solar PV system

Tampa Electric plans for the Pilot to last four years, beginning when the first home is occupied and energized from the Block Energy System. Tampa Electric believes the utilization of the Block Energy System will provide several potential benefits that will be studied during the four-year pilot program. These benefits include:

- Verifying the capability of the initial design to deliver at least 60 percent of the energy provided to the home from renewable sources.

- Study how the system and its design will aggregate renewable and natural gas generation sources and utilize distributed storage at or from each home and the community energy park to meet the anticipated needs of the homes in a resilient, efficient and cost-effective manner.
- Study the system's power quality at the home as the inverter is designed to provide a low harmonic distortion sine wave with finer voltage control than can be accomplished on the AC system. The community as a whole and the individual homes are not subjected to abnormal conditions experienced elsewhere on the AC or DC systems including momentary interruptions.
- Study the system's actual reliability and immunity to disturbances from the main AC distribution network since it is designed to operate as an independent power system with the ability to operate autonomously from the AC grid. The use of DC technology allows the microgrid to have truly seamless connection and disconnection from the AC grid.
- Verify the capability of the system and its design to ensure that no power is imported from the AC grid during peak load hours.
- Study the ability of the system to export power as an aggregated system to the AC grid during peak load hours if local conditions permit.
- Study the system and its design to provide a higher level of resiliency during storms since all power requirements for full load servicing are contained locally within the microgrid and all distribution is located underground.

Florida Conservation and Technology Center ("FCTC") flow battery: In October 2020, Tampa Electric installed a 10 kW / 40 kWh flow battery at the FCTC. Tampa Electric will study and perform testing to better understand the operational capabilities of flow battery technology as compared to lithium ion. The company will be studying its charge/discharge rate, roundtrip efficiency, response time, degradation over years, along with other battery characteristics. This flow battery has been advertised as extremely durable, which would be necessary to survive in Florida's hot and humid climate. The flow battery does not require air conditioning for cooling and utilizes only internal fans for cooling. This flow battery's system's original specifications show it to have minimal year to year degradation vs. lithium ion, is non-flammable, and requires little maintenance. This flow battery project will allow the company to test and verify these claims and determine if flow batteries should be included in future considerations for large scale energy storage projects.