



**Texas Commission on Environmental Quality
New Technology Implementation Grant (NTIG) Program**

Upton 2 Battery Energy Storage Project

Final Report

for:

New Technology Implementation Grant (NTIG) Program

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Task Deliverable/Final Status Report Overview

This final report illustrates that Vistra Energy Corp has completed the engineering, procurement and construction of a 10MW/42MWh battery system co-located at the 180MW Upton 2 Solar facility located in McCamey, Texas. The facility was constructed utilizing Samsung batteries, FlexGen operating system and Mortenson as the general contractor.

Introduction/Background

Vistra Energy is a Texas-based energy company focused on the competitive energy and power generation markets through operation as the largest retailer and generator of electricity in the growing Texas market. Through the generation portion of our business, Luminant, Vistra generates and sells electricity and related products from our diverse fleet of generation facilities totaling approximately 13,600 MW of generation in Texas and a total of 42GW across the United States. In June 2018, Vistra completed a 180MW photovoltaic solar power facility in McCamey, Texas.

The Upton 2 Battery project was built to complement the solar facility in that the batteries would charge during the day and discharge when the price of power is typically the highest in the evenings. Production at the solar facility ramps down in the evening so the battery system is designed to discharge as the solar facility drops below 180MW.

Project Objectives/Technical Approach

Vistra had several objectives that we wanted to accomplish during the project:

- To fully utilize the energy storage system in coordination with the existing Upton 2 Solar facility to “peak shave” solar generation during the day to utilize later in the day when solar comes down but power prices are up.
- Understand battery technologies and the difference between chemistries across the industries.
- Understand how to automate a battery management system so that the battery could react to change market conditions

- To demonstrate the ability to monitor and control the system from a remote location

Tasks

The Tasks for the Grant Scope of Work for the grant included the following activities:

- Task 1 Secure Rights to Location and Install and Commission the Solar Facility
- Task 2 Secure All Necessary Permits to Install and Operate BESS
- Task 3 Specific Project Site Preparation for BESS Installation
- Task 4 ERCOT Generation Interconnection with Solar Facility
- Task 5 Purchase of Equipment and Installation of BESS
- Task 6 Testing of Final Design of BESS to ERCOT Grid
- Task 7 Implementation Reporting
- Task 8 Operating Reporting Period

Task 1 – Secure Rights to Location and Install and Commission the Solar Facility

Vistra secured a 20 year lease for the construction of Upton 2 Solar Facility in 2017 before construction of that project commenced. The lease is for approximately 1,900 acres. The Upton 2 BESS project is co-located on the same 1,900 acres, directly adjacent to the solar substation. The substation was built with an extra breaker bay for future expansion. The BESS utilized the extra breaker bay for interconnection to ERCOT.

Upton 2 Solar facility was placed In Service on May 31, 2018 and a Certificate of Completion was provided and executed at that time. The letter as well as the lease document for the 1,900 acres was provided to finalize this Task of the Grant Scope of Work.

Task 2 – Secure All Necessary Permits to Install and Operate BESS

The Upton 2 BESS project was built on an existing operating power plant. All permitting required was completed under the solar facility construction. There were several permits that were required including Storm Water Pollution Prevention Plan, Spill Prevention Control and Countermeasure as well as minimal Construction Permits that were all obtained for construction. To complete this Task of the Grant Scope of

Work, a Permit Matrix was submitted. Also submitted was proof of insurance coverage for the project.

Task 3 – Specific Project Site Preparation for BESS Installation

Construction on the project commenced in September, 2018. All contracts were finalized by the end of May with all equipment ordered by August, 2018. Included in the FlexGen contract, the Samsung batteries were due to arrive onsite by October, 2018 and the containers in September. Mortenson, the general contractor that built the facility, needed to complete all civil work and foundations before batteries could be received and set inside the containers. This civil scope was complete in early September to allow the equipment to be set in place. As part of EPC contract for the project, the contractor was required to submit weekly and monthly status reports. Task 3 was complete with the submittal of the civil report from January 2019 indicating all civil work was complete.

Task 4 – ERCOT Generation Interconnection with Solar Facility

The Upton 2 Solar facility Interconnect Agreement with Lower Colorado River Authority (LCRA) was signed on August 27, 2015 and amended on April 18, 2017. The SGIA was assigned Project No. 35077 and was further amended on November 15, 2018 for the BESS project. These documents were provided to complete this Task as part of the Grant Scope of Work.

Task 5 – Purchase of Equipment and Installation of BESS

In May, 2018, Vistra negotiated the purchase of the battery system with FlexGen and hired Mortenson to engineer, procure and construct the remaining portions of the project which included the civil, electrical and tie in work to the existing substation. The schedule of the project was critical as the work had to be complete by December 31, 2018. Coordination between the two contractors for delivery and during commissioning was pivotal to make the schedule. Vistra IT was also critical as the facility is monitored and operated from the company headquarters in Irving, TX.

The project proved to be successful. This task was completed with pictures of the installed units found in Appendix A.

Task 6 – Testing of Final Design of BESS to ERCOT Grid

The final testing of the system was performed by both contractors and included Vistra IT and operations. The final test included a performance test that checked that the battery could charge both from the ERCOT grid and the battery facility and discharge

completely to the grid. Coordination with ERCOT was important to ensure each checklist was complete in a timely fashion.

Task 7 - Implementation Reporting

Vistra met the quarterly reporting requirements associated with this Task throughout the construction of the project.

Task 8 - Operating Reporting Period

The Upton 2 BESS will be operated for approximately 10 years. Vistra will continue to post annual operating reports on the performance of the battery project and post them to the following location:

<https://www.luminant.com/upton-2-solar-power-plant-energy-storage-facility/>

Vistra will provide an annual operation status annually for five years and will submit a final operations report at the conclusion of the five year period.

Discussion/Observations

Objectives and Results

The objectives of this project were met in that the plan was to install 10MW/40MWh of energy storage at the existing Upton 2 Solar facility. Vistra was able to meet these objectives by working with an experienced integrator and construction contractor to complete the project. The main objectives of the project were:

- **Battery and Integrator selection:** The objective was to understand the differences between battery vendors and the operating software that runs the system. This objective was accomplished as Vistra researched a variety of technologies for both batteries and integrators. Understanding each technology allowed us to make an informed decision and helped in the basis for future projects.
- **Engineering:** Upfront engineering and design was pivotal to the success of the project. Vistra management had to work closely with both contractors to ensure that the project was built to specification and would operate as planned. This objective was achieved as the project operated as planned.
- **Construction:** The project was successfully installed on schedule. The lesson learned is also to coordinate delivery so that batteries are received and

immediately installed into their final location. Storing batteries onsite can delay schedule and increase risk of damage.

- Technical objectives and accomplishments
 - Battery technology: The main technical objective was to procure a long lasting battery that can be utilized multiple times a day, depending on operating conditions. By utilizing Samsung, this objective was complete as Vistra selected a well known, dependable battery.
 - Usage and degradation curves: Each battery manufacturer has different degradation curves based on usage. The objective was to understand the usage of the batteries and understand limitations for future projects. This objective was complete as Vistra gained knowledge on each of the main battery suppliers and was able to see the degradation first hand vis operations.
 - Battery operating system: The main objective of this project was to learn how to automate the operation of the system using various inputs from ERCOT, the market and other factors. The objective was complete as Vistra was able to develop a system that can react and adjust to the signals real time.

Critical issues/Technical goals and barriers

- IT/Communications - This system was designed to operate remotely. To operate this facility from alternative locations was a challenge that required roughly 3 months of work to complete.
- Air conditioner design: This project is installed in west Texas where temperatures regularly hit over 100F. The batteries degrade more quickly in warmer temperatures. The design of the air conditioner system for each of the containers was initially sized so that there was a much larger parasitic load for the project. Recommendation: Size the AC system so that it has some redundancy, but do not oversize.
- HMI Interface: A user friendly / graphical HMI interface is important to understand how the batteries operate. The design of such a system should be completed early so there is adequate time in the schedule to commission. Recommendation: Understand what is required/needed early in the project so that testing can occur.

- Operations: The team that will be dispatched to perform preventative and corrective maintenance should be involved from the beginning of the project. This allows the team to learn about the systems they will be operating.

Scope for future work

The Upton 2 battery project was the first of its kind for Vistra Energy. The learnings from this project have directly contributed to Vistra's ongoing projects in other parts of the country including a 300MW/1200MWh energy storage system that is currently under development in California.

Summary/Conclusions

Vistra Energy has concluded that this project was a success from all aspects. The project was completed on schedule with all planned objectives achieved. The incorporation into the solar facility was also a success as the operations team can now charge the batteries using excess solar power from the Upton 2 Solar facility.

This project was the company's initial step into energy storage power generation. It has been a learning process that has proven pivotal in current projects underway across the Vistra fleet.

Acknowledgments

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- Texas Commission on Environmental Quality Grants team for support during the project.
- Lower Colorado River Authority for expediting their interconnect project to meet the overall project schedule
- Electric Reliability Council of Texas for working with Vistra to provide the first Solar/Battery integration project in Texas
- FlexGen and Mortenson for their parts in the engineering, construction and commissioning of the project.

Appendices

Appendix A: Project Picture - Upton 2 BESS (Solar in the background)

