



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

Operation Phase Annual/Final Status Report

Contract Number: 582-15-53908-1471
Grantee: NRG Texas Power, LLC
Report for the Annual period: 2018 **Date Submitted:** 5/22/2019

Section I. Accomplishments

Provide a bulleted list of operations of the facility during the past year. Include exact numbers and/or estimates.

During 2018, the Elbow Creek Battery Storage (ECBS) project provided energy and frequency response by:

- Successfully executing over 12,000 deployments, an estimated 5.9 deployments per hour.
- Discharging over 430MWhrs.
- Charging over 509 MWhrs, from renewable power.

Section II. Key Events and Issues

Report any key events that occurred during this reporting period. Please include any major project updates that impacted operations.

- During heavy use events with extremely high outdoor ambient temperatures, the cooling system can reach its thermal limits. Some measures are being taken to address this which are further described below.

Report any anticipated or unanticipated problem(s).

- Increased Cycling – The changes in the Fast Responding Regulation Service (FRRS) Parameters causes the ECBS to deploy sooner, longer, and at higher rate of deployment than initially designed. ECBS is able to comply and operate under the revised parameters.
- Cell Heating – The system continues to operate in the frequency market as anticipated; however, because of some changes to the frequency market structure, the battery is being exercised more than its design use-case resulting in unanticipated heating of the battery cells. Additionally, during heavy use events with extremely high outdoor ambient temperatures, the cooling system can reach its thermal limits.

- Battery State of Charge Level Indication (SOC) – State of Charging level indication requires resetting periodically to allow for recalibration.
- Pro-Rated Regulation Down (RegDn) Awards – FRRS RegDn Day-Ahead Market (DAM) awards are now being awarded on a pro-rated basis due to an oversupply of market offers.

Proposed Solution(s): Report any possible solution(s) to the anticipated or unanticipated problem(s).

- Increased Cycling – Reduction of deployments within an available operating hour, under the current the Fast Responding Regulation Service (FRRS) parameters, is very unlikely. The only option within NRG’s control to reduce increased cycling would be to adjust when EBCS is offered into the market. Due to the cell heating issue, scheduling optimization allows the ECBS batteries to cool, thereby offering some cycling relief for the interim period.
- Cell Heating – Scheduling optimization of ECBS allows the batteries to cool without impacting key hourly deployment periods within a day. It was determined the ambient temperature rating of the original chiller was exceeded during certain heat wave events. To address this issue, NRG and Toshiba mutually determined after evaluating several options to install a second chiller unit with a water storage tank to support ECBS during heat wave events.
- Battery Charge Level – NRG operations periodically resets the batteries, thus allowing the SOC calculation to recalibrate. NRG and Toshiba are working on improving the algorithms that calculate SOC or possibly changing the charging criteria to be based on battery voltage.

Action(s) Conducted and Results: Describe the action(s) taken to resolve the anticipated or unanticipated problem(s). Were the actions successful in resolving the problem?

- Electrical cables and trays were replaced to mitigate electrical connection issues.
- Certain external sections of the chiller water supply piping were replaced to improve UV protection and avoid future degradation which could cause plumage in the chiller system.
- Additional thermocouples were added to enhance chiller temperature monitoring as an upward trend can indicate restrictions in chiller water.
- Software logic revisions were implemented to comply with ERCOT Nodal Protocols 8.5.1.1(1) & 8.5.2.1(1), and Nodal Operating Guide 2.2.8(1).
- Software logic revisions were implemented allowing ECBS to operate from a signal driven mode or autonomous mode.

Section III. Provide a summary of the overall state of the facility and grant funded equipment.

- ECBS is generally functioning as designed, with the few exceptions noted in this report.
- Cooling system performance continues to be investigated to identify areas for improvement.
- ECBS is responding to ERCOT’s deployment signals within the prescribed time as required by ERCOT.

Section IV. Goals and Issues for Upcoming Period

Provide a brief description of the project goal(s) you hope to realize during the next reporting period.

- Continue to collaborate with ERCOT to cross reference data telemetry to validate accuracy, discuss current and future protocols that impact ECBS' operation and compliance with ERCOT Protocols and Operating Guides.
- Installation of a secondary chiller unit and water storage tank

DAVID A. FREEMAN

Authorized Official/ Project Representative's Printed name
(blue ink)

David A. Freeman

Date: 5/22/19

Authorized Official Signature/ Project Representative's name
(blue ink)

NOTE: *Please attach any additional information that you feel should be a part of your report.*

This form may be submitted via e-mail to your Grant Coordinator or a paper copy may be sent to the following address:

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