



Sagehen Creek Field Station Microgrid

Project Name:

Sagehen Field Station Microgrid

Developer:

BoxPower Inc.

Customer:

Liberty Utilities

Date Contracted:

7/23/20

Date Commissioned:

11/23/20

Contact:

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Project Summary:

BoxPower was contracted through a competitive request for proposal (RFP) for the process to design and build a hybrid solar, battery, and generator microgrid system for Liberty Utilities. The purpose of this project was to enable Sagehen Creek Field Station to be taken 'off-grid' during fire season (approximately 6 months out of the year). The Sagehen Field Station is the largest privately operated experimental research forest in the US, managed by UC Berkeley in conjunction with the National Forest Service. It is located in Tahoe National Forest at an elevation of 6,390 feet in the Sierra Nevada Mountains approximately 10 miles north of Truckee, CA.

The Problem:

Liberty Utilities, like other California utilities, has been severely impacted by wildfires. They are working to 'harden' their grid against high-wind events that could spark wildfires when trees or debris touch lines. One such method of 'grid hardening' involves installing insulated conductors and extensively clearing trees and brush from around transmission and distribution lines. While this is an effective method of preventing wildfires, it can be prohibitively expensive. This is especially true for remote sites served by long distribution lines. Grid hardening costs for the Sagehen Creek Field Station were estimated to cost \$3M.

The Solution:

BoxPower designed, built, and installed an advanced islandable microgrid capable of powering the entire field station while Liberty Utilities de-energizes their service line for fire season (June - December). The system consists of 20kW of Solar PV, 68.4kWh of LiFePO4 battery storage, a 14kW bi-directional inverter, site controller, and a 35kW prime-power propane generator, all prefabricated inside of a climate-controlled 20' shipping container. The system also includes an advanced remote monitoring and control system, that allows for both autonomous operation, as well as complete remote control and diagnostic capabilities. While this system is very similar to BoxPower's standard SolarContainer product line, some extreme environmental challenges and the unique needs of a utility customer required substantive additional features.

◆ **Extreme Snow Loading:**

The Sagehen field station can receive in excess of 8 feet of snow in the winter, requiring a snow-loading design of 375 lbs per square foot. This required additional reinforcement and insulation of the container, as well as an adjustable tilt elevated solar array that could be tilted to nearly vertical during the winter to shed snow.

◆ **SCADA/DERMS system:**

Utilities require advanced monitoring and control of their assets, and integration with their legacy supervisory control and data acquisition (SCADA) or distributed energy resource management (DERMS) platforms. For this, BoxPower partnered with New Sun Road, a California based microgrid controls company, to provide an advanced, satellite-connected monitoring and control interface that provides complete access to the systems functionalities through a secure online portal.

◆ **Island/Grid Synchronization:**

Most microgrids are designed for one of two operational modes: grid-connected or off-grid. The Sagehen Creek Field Station is unique in that it will switch between these modes at least twice a year, allowing the facility to operate independently of the grid for extended periods, while still enabling grid harmonization the rest of the year.



Financial Performance:

When considering both the upfront cost of grid hardening efforts, and the ongoing maintenance required to maintain them, the Sagehen Creek Field Station microgrid will save Liberty Utilities over \$2M in avoided capital and operation and maintenance costs.

Opportunities for Replication:

BoxPower is working with Liberty Utilities, as well as a number of other US utilities to replicate the model demonstrated at Sagehen. With increasingly frequent natural disasters happening across the country, utilities face both a huge challenge and an opportunity to experiment with novel methods of energy delivery, that both decarbonize and harden our energy infrastructure. BoxPower believes that the grid of the future is **decentralized, interconnected, and autonomous.**

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“It would have cost about \$3 million to harden the entire four-mile line, which has 90 poles and serves Berkeley’s Sagehen Creek Field Station. By avoiding having to upgrade the line, the utility expects to save more than \$2 million over the lifetime of the microgrid.”

- Amanda Chee, Liberty Utilities

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