Alameda County Santa Rita Jail Microgrid

Project Overview

Alameda County's Santa Rita Jail may be the greenest jail in the world. Designed and constructed by ENGIE, this pioneering project set the stage for advances that merged concepts of smart grid and microgrid.

The Santa Rita Jail microgrid is the culmination of several energy projects that date back to the California energy crisis in 2001. In response to that crisis, the County installed a 1.2 MW solar photovoltaic system on the jail's roof, one of the largest installations of its kind at the time. The Jail also reduced its energy usage through retrofits to the jail's central plant. The next milestone for the project came in 2005, with the installation of a 1 MW fuel cell cogeneration plant that provides ultraclean energy and waste heat recovery. That project was followed in 2008 and 2009 with the implementation of multiple energy efficiency and water conservation measures to reduce the jail's peak electrical loads (including so-called "cool roof" technologies to reduce air conditioning demand on hot summer days.) In 2010, five small wind turbines were installed, further adding to the jail's renewable energy capacity. With the installation in 2011 of a 2 MW advanced energy storage system and an automatic disconnect switch, the facility evolved into a one of the most sophisticated microgrids in the world.

The Problem

With a prison population the size of many small American towns, Santa Rita Jail is the fifth largest county jail in the nation, requiring 3 megawatts (MW) of reliable and secure electricity 24 hours a day, seven days a week to power the million-square-foot facility. Any interruption to that power supply could have negative consequences for the Sheriff's Department staff or the inmates housed there. As one prison guard once noted, a power outage here can be the scariest moments of one's life when the lights go out for an indefinite amount of time. If there ever was a critical facility, this jail is it since an extended outage could endanger the lives and public safety.

The Solution

A self-sustaining microgrid was envisioned to mitigate these concerns by integrating the jail's onsite generation with energy storage to ensure that power is never lost. When a disturbance to the utility grid occurs, a microgrid l can automatically disconnect seamlessly from the Pacific Gas & Electric's distribution network and operate independently until local utility power is restored. The first rendition of this microgrid was the country's largest CERTS-based* microgrid, which relied upon droop frequency to keep the microgrid in balance. But in a sign of things to come, Encorp engineers were called upon to optimize the controls that orchestrate all of the DER just days before the project's public unveiling, fine-tuning the control regime to enable stable operations.

Later, issues with the fuel cell tripping off-line due to frequency deviations led to the realization that an overhaul of the controls scheme was necessary. It is now in the process of being retrofitted with Encorp's Egility controls, displacing the CERTS-based system. That's why Encorp was awarded a million-dollar plus contract in 2020 to optimize the control scheme via its advanced Egility platform. The Egility control system also provides additional features now highly valued in energy markets with its ability to dramatically reduce peak demand during normal grid-connected operations or during a demand response event.

(cont.)

The Solution (cont.)

The Santa Rita Jail microgrid provides a pathway for reducing utility grid peak demand while improving power quality and reliability, increasing grid security, reducing grid congestion, and helping Alameda County meet its energy and environmental goals. The project was funded by the U.S. Department of Energy, the California Energy Commission and the California Public Utilities Commission, and benefitted from partnerships between public and private entities, including Alameda County's General Services Agency, ENGIE, Pacific Gas and Electric Company, California ISO, Lawrence Berkeley National Laboratory, the National Renewable Energy Laboratory, and the University of Wisconsin.

Key Project DER Features:

- 1.2 MW rooftop solar PV system
- 1 MW fuel cell power plant with heat recovery for facility hot water and space heating
- Five 2.3 kW wind turbines
- Two 1.2 MW emergency backup diesel generators
- 2 MW advanced energy storage system

As illustrated below, Encorp Egility Controls encompass a wide range of control products that can orchestrate this complex mix of DER assets including: (1) Point of Common Coupling (PCC) interface; (2) microgrid control system; (3) battery interface control; (4) remote load controllers; (5) generator control system and (6) SCADA and control network or what is now commonly referred to as distributed energy resource management systems (DERMS).