Final Technical Report Cover Page

Recipient Organization:	San Pasqual Band of Mission Indians (SPBMI)
Project Title:	SPBMI Microgrid
Date of Report:	March 28, 2024
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DISCLAIMER

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1.0 Executive Summary

The San Pasqual Band of Mission Indians' (referred to as 'SPBMI' or 'Tribe' herein) SPBMI Microgrid project consists of the installation of a hybrid microgrid system, capable of functioning autonomously from the utility grid when needed. The SPBMI Microgrid includes 184 kilowatts (kW) of solar photovoltaic (PV) capacity, a 150-kW battery energy storage system with 300 kilowatt-hours (kWh) of energy storage capacity, and a 44-kW liquid propane generator for standby power. The SPBMI Microgrid was designed to achieve four primary objectives: 1) to ensure the availability of resilient energy for five tribal facilities identified as essential in the San Pasqual Hazard Mitigation Plan and San Pasqual Energy & Resiliency Plan; 2) to provide solar generation sufficient to achieve net-zero energy consumption at the five essential facilities; 3) to reduce the Tribe's lifetime levelized costs of energy (LCOE); and 4) to support tribal energy objectives including reducing greenhouse gas emissions and achieving net-zero energy balance.

2.0 Background

San Pasqual Band of Mission Indians is a federally recognized Native American tribe that maintains a reservation covering about 3,127 acres in northeastern San Diego County in Southern California. The reservation was established on July 1, 1910, and is home to about 1,800 people, including 280 enrolled tribal members, with hundreds of additional lineal descendant families also living on the reservation and relying on SPBMI for public services.

SPBMI since 2015 has undertaken a series of strategic planning steps, including establishing a tribal Energy and Resiliency Plan, and has analyzed several options for achieving the tribe's energy and resiliency objectives. These options include consideration of multiple vendor proposals and studies, in addition to iterative modeling using HOMER Pro software.

Also, in its Energy and Resiliency Plan, SPBMI established a goal of reducing its energy consumption by 25%, compared to its 2015 baseline, and installing onsite renewable generation capacity sufficient to offset substantially 100% of its electricity consumption by 2021. The Tribe has taken multiple substantial steps toward achieving its sustainable energy goals, including working with GRID Alternatives since 2011 to establish a community solar deployment program that has resulted in the installation of 63 rooftop and ground-mount PV systems totaling more than 230 kW of generating capacity, and making targeted energy efficiency upgrades, such as the replacement of old, inefficient air conditioning units at the SPBMI Tribal Administration building, installing smart thermostats for temperature control, and replacing old lighting in all government buildings with LED bulbs.

SPBMI's mission includes preserving and sharing cultural traditions, improving the general welfare of the San Pasqual community, and compassionately providing for the San Pasqual people and future generations. The SPBMI Microgrid project supports that mission directly by improving the tribal

administration's ability to maintain essential services despite interruptions to utilities and other services.

3.0 Project Objectives

The SPBMI Microgrid Project aims to achieve four primary objectives that support the tribe's strategic goals, plans, and mission: 1) Ensure the availability of resilient energy for five essential tribal facilities as identified in the San Pasqual Hazard Mitigation Plan and described in the San Pasqual Energy & Resiliency Plan; 2) Provide solar generation sufficient to achieve net-zero energy consumption at the five essential facilities; 3) Reduce the tribe's lifetime levelized costs of energy (LCOE); and 4) Support tribal energy objectives including reducing greenhouse gas emissions.

Secondary objectives include supporting local workforce development and employment, in part by utilizing commercially available and warranted technologies that can be operated and maintained by tribal staff. Expected outcomes from the project include substantially eliminating long-duration disruptions to essential tribal services due to utility outages; reducing lifetime energy costs by approximately $1.13 million; and producing approximately 6.5 GWh of renewable electricity over the system's lifetime.

Essential Tribal Facility Summary

Facility	Essential Purpose	Essential Electric Loads
Tribal Administration	Red Cross evacuation center; emergency public shelter; tribal management command and control	HVAC, lighting, telecommunications
Housing & Security	First response (police); public safety and security monitoring	Telecom/IT, security camera monitoring, lighting
Fire Department	First response (residential fire station); 911 emergency dispatch	Telecom/IT, 911 emergency dispatch center, lighting, overhead door operation
Education Building	Emergency public shelter	HVAC, food storage, food service, lighting
Preschool	Emergency public shelter	HVAC, lighting

SPBMI implemented the Project in two Phases – 1. Design Engineering; and 2. Deployment and Commissioning. Phase 1 included procurement of all system components and services, including: PV systems; battery energy storage systems (BESS); liquid propane standby generator; microgrid controls; energy-management controls; and design engineering, construction, commissioning, and O&M training services. Subcontractor procurement adhered to all tribal procurement policies and procedures.

In addition to adding assets and controls, the system required reconfiguration of campus electricity distribution infrastructure, including upgrading existing single-phase lines to 3-phase service, installing net-generation and master/sub-meters, and safety and protection systems for a single point of interconnection with the SDG&E secondary distribution system.

4.0 Description of Activities Performed

One concrete pad (approx. 8’ wide x 15’ long x 6” deep) was installed to accommodate BESS and standby gensets. Solar carport structures were installed in the Tribal Admin parking lot. Trenches were excavated to accommodate 3-phase microgrid bus and system-intertie cables as needed.

An existing rooftop solar array located on the Education Building, that was installed with a previously funded DOE award was tied into the microgrid system. All inverters and wiring were installed to connect PV and BESS systems with the microgrid bus. Centralized BESS and Standby Gensets were installed on the concrete pad.

Cable runs for the microgrid bus and interties were installed in trenches. Interconnection safety and protection systems were installed, including automatic transfer switch (ATS). Master, sub-, and generation meters and distributed controls were installed. Microgrid controls were installed and integrated with a consolidate singe campus meter and controls. All systems were inspected, and code compliance verified by a EsGil, a third-party electrical inspector. SDG&E completed pre-parallel inspections and certified the system for energizing and synchronization to the SDG&E distribution system. Design-Build Contractor provided training and support to on-site operations and maintenance staff.

Commissioning testing was performed to verify protection settings and system functionality, including trip tests, interlocking circuit tests, and in-service tests.

5.0 Conclusions and Recommendations

Despite delays due to the Covid – 19 pandemic and supply chain delays associated with the pandemic; the project was a success. The Microgrid is meeting its performance standards for solar and battery. I would recommend involving the utility as early as possible as this will help streamline interconnection issues. SPBMI government is seeing large energy bill reduction and cost saving in electricity bills. SPBMI saw a cost saving of $50,000 in SDGE utility bills during the first year of operation, with our biggest saving occurring during the summer months. The amount saved continues to increase as SDGE continues to raise their electrical rates for customers. Furthermore, tribal government employees appreciate the lighting installed on solar canopy, especially during the winter months when it gets dark early, and the lighting makes it easier and safer when walking to their cars. Employees and residents are constantly using the EV charging stations as many have purchased EV’s and hybrid EV’s, they are enjoying the extra benefit of the EV charging stations being set to free so they can charge while at work at no cost. SPBMI has also given numerous tours of the microgrid to neighboring Tribal reservations staff and leadership, such as Pala, La Jolla, Morongo, Jamul, and even the City of San Diego have all come out over the years to view the microgrid.

6.0 Lessons Learned

While it can be difficult to find space to store equipment, I would recommend buying as much of your equipment as soon as possible, as supply chain issues and the cost of material can negatively impact your project timeline in the form of delays and project budget with the cost of material increasing. Meet with all your stakeholders, both internal and external, as early and often as possible on such a project. The most important external stakeholder is your local utility, and you should meet with them during preconstruction to make sure the utility and grid does not need any upgrades to the system to accept any power you might be sending back. Also, the utility will want to inspect all your contractor's work, regardless of 3rd party inspection and utility inspection can take months to get an inspector out. Often with construction, things such as conduit and transformers, switch gear and generators might need to be moved due to unforeseen obstacles and challenges, such as rock in the ground or utility rules and regulations, so it is good to have a few back up locations vetted and approved by internal and external stakeholders in case you need to move the location of equipment.

PROJECT PHOTOS

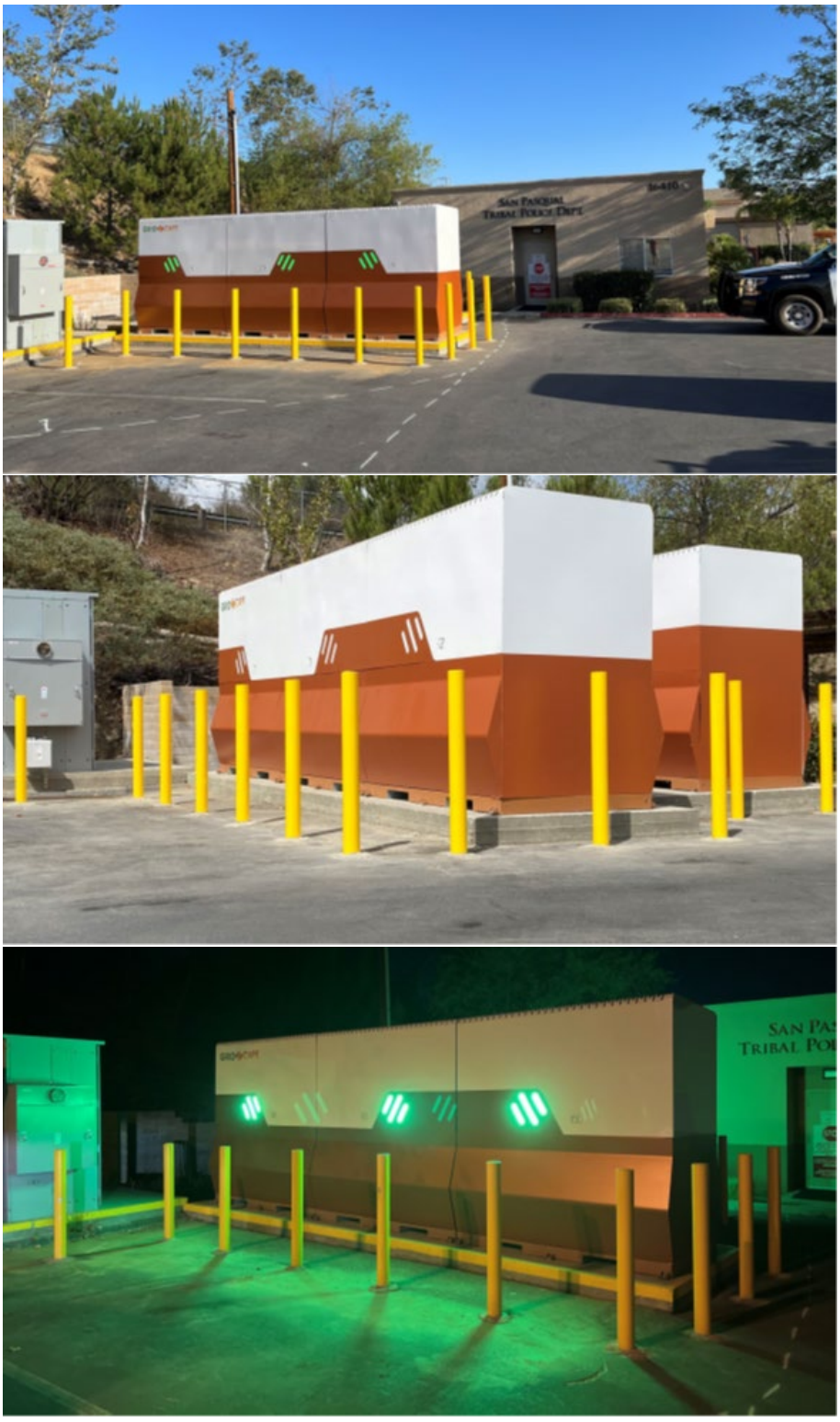

Image 1: Multiple views of the battery energy storage system (BESS).

Image 2: Day and night views of the bi-facial solar PV carports.

Image 3: Pad ready for transformer (top), and installed transformer (bottom).

Image 4: From top to bottom: liquid propane genset delivery; lifting the genset in place; genset installed.