San Pasqual Band of Indians Microgrid Project

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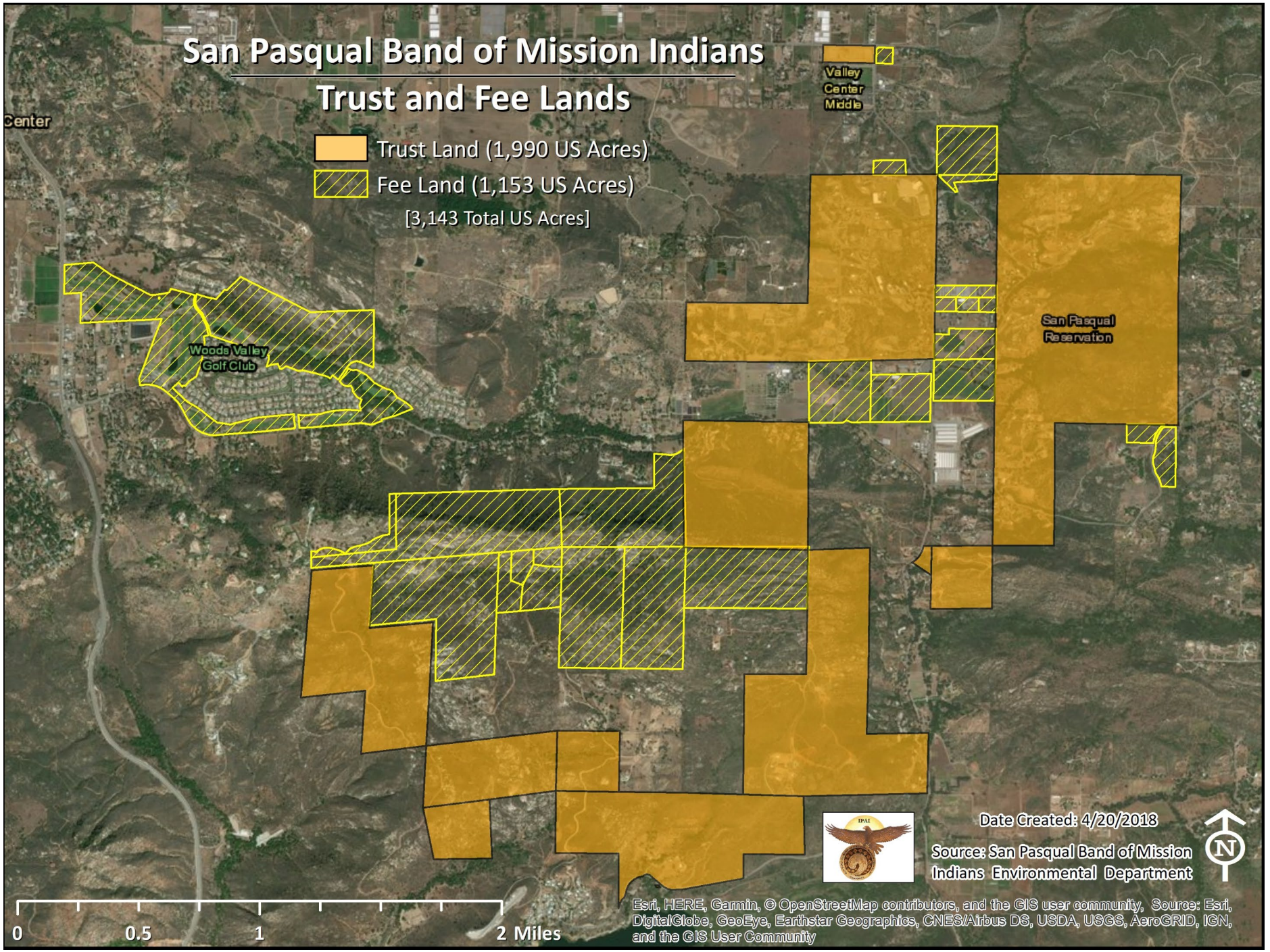
San Pasqual Band of Mission Indians
Trust and Fee Lands
Trust Land (1,990 US Acres)
Fee Land (1,153 US Acres)
[3,143 Total US Acres]
Center
Valley Center Middle
Woods Valley Golf Club
San Pasqual Reservation
Date Created: 4/20/2018
Source: San Pasqual Band of Mission Indians Environmental Department
N
0
0.5
1
2 Miles
Esri, HERE, Garmin, © OpenStreetMap contributors, and the GIS user community, Source: Esri, DigitalGlobe, GeoEye, Earthstar Geographics, CNES/Airbus DS, USDA, USGS, AeroGRID, IGN, and the GIS User Community

Project Title: SPBMI Microgrid

Topic Area: 3.a. Energy Infrastructure Deployment on Tribal Lands – 2018

Key Personnel: John Flores, SPBMI Environmental Director; David Martinez, Public Works Director; Andrew Orosco, SPBMI Planning Director; Desiree Morales-Whitman, SPBMI Utility Manager

Project Summary: The SPBMI Microgrid Project, a hybrid solar + storage + LP system with 184 kW of PV capacity, 150 kW/300 kWh of batteries, and 44 kW of standby generation, is designed to achieve four primary objectives: 1) 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) 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 and achieving net-zero energy balance by the year 2021.

Description of Impact:

- Strengthening the tribal administration's ability to provide critical public services including first response (both fire and police), reservation security, emergency sheltering and evacuation capacity, and administration command and control capabilities.
- Saving approximately $45,190 in electric energy costs per year on average, or $1.13 million over the system's 25-year useful life.
- Reducing net electric energy imports to the reservation by approximately 278,300 kWh per year, offsetting about 96% of the tribe's grid electricity consumption for five essential tribal facilities.

San Pasqual Band of Mission Indians

Federal Funds Requested	**$698,318**
Cost-Share Proposed	**$698,318**
Total Project Costs	**$1,396,636**


Solar PV Site
Existing Solar PV
BESS and Genset Location
Structure to be removed
Point of Interconnection (proposed)
Meter location
120/208v Three-Phase UG Cable
Microgrid Service Bus (AC)
1
2
3
4
5
6
7

2017 Usage & Cost

During 2017, the five essential facilities consumed 288,481 kWh of electricity supplied by SDG&E

SDG&E billed the tribe $74,886 for that electricity over a 12-month period – representing an average unit cost of $0.2596 cents/kWh

The tribe pays a relatively high price ($0.256/kWh) for grid electric service that has been demonstrated vulnerable to outages

Generation/electricity charges on these bills varied by season and time of use

Fig. 4.1: Essential Tribal Facility Summary

Facility	Essential Purpose	Essential Electric Loads	Square Footage	Electric Load (kWh/year*)
Tribal Administration	Red Cross evacuation center; emergency public shelter; tribal management command and control	HVAC, lighting, telecommunications	19,908	111,283
Housing & Security	First response (police); public safety and security monitoring	Telecom/IT, security camera monitoring, lighting	3,475	76,872
Fire Department	First response (residential fire station); 911 emergency dispatch	Telecom/IT, lighting, overhead door operation	5,362	38,944
Education Building	Emergency public shelter	HVAC, food storage, food service, lighting	10,279	44,239
Preschool	Emergency public shelter	HVAC, lighting	2,874	17,144
Total - Five Facilities			**41,898**	**288,481**

**Load data derived from SDG&E interval metering data for 365 days beginning 1/2/2017.*

SDG&E Power Outages

- San Pasqual Government Buildings (Admin/Tribal Hall, Fire, Housing/Police, Education) experience multiple power outages each year
- Outages can extend for multiple hours; the longest outage in 2017 affected the five essential tribal facilities for a period of 19 to 20 hours
- Tribal Hall is a Certified Red Cross Emergency Shelter

Reasons for Power Outages

- Severe weather
- High winds (Santa Ana winds in the fall)
- Wildfires
- Earthquakes
- Localized physical damage to utility distribution systems
- SDG&E system upgrades (planned outages)

San Pasqual and Wildfire

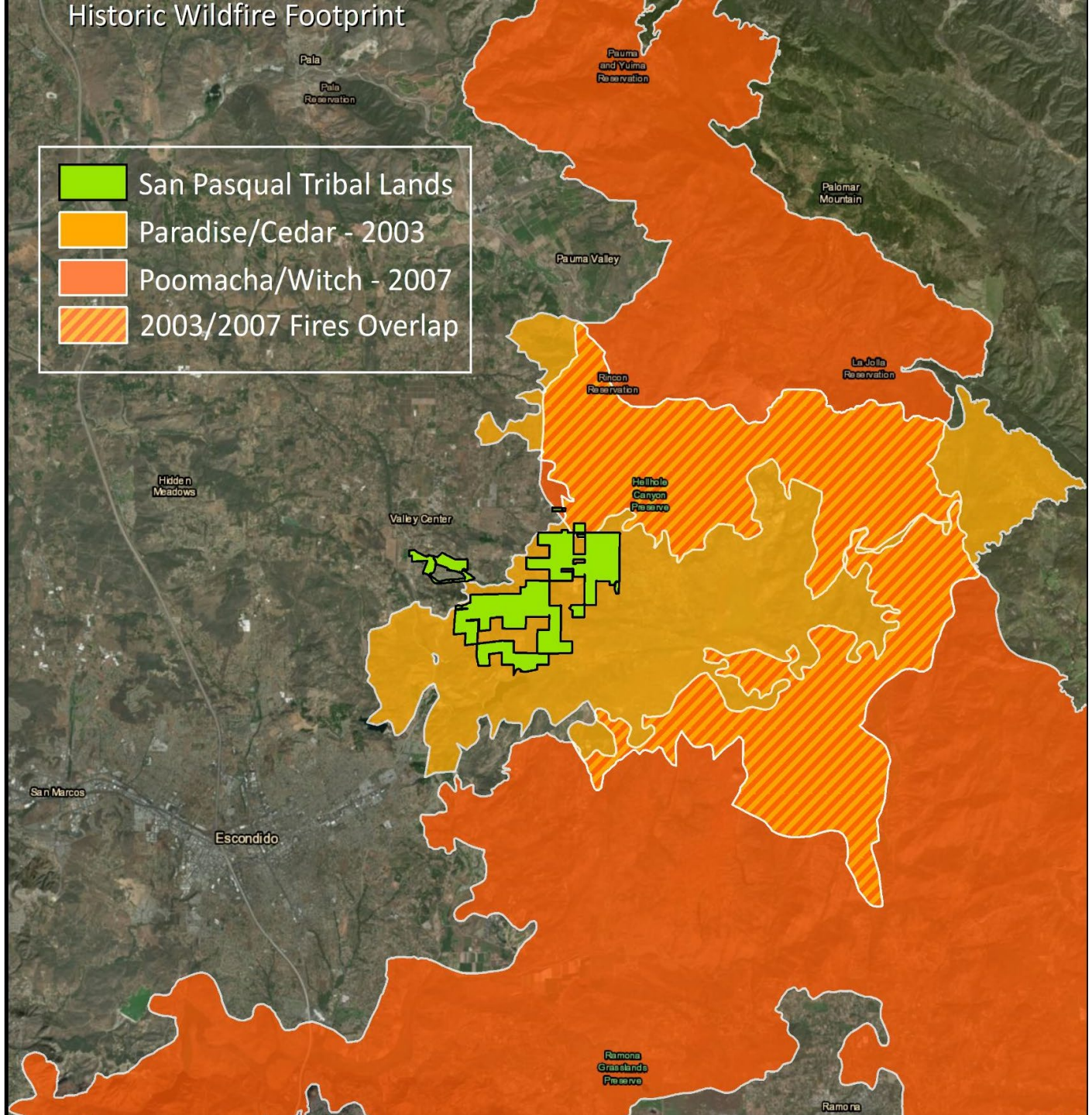

Fig. 4.2: Major Outages at Essential Tribal Facilities (2017)

Major* Outage Duration (2017)	Tribal Admin Offices	Housing/ Security	Fire Station	Education	Preschool
Outage Minutes	2,040	2,040	1,275	1,260	1,260
Outage Hours	34	34	21	21	21
Longest Outage - Minutes	1,200	1,200	1,125	1,110	1,110
Longest Outage - Hours	20	20	19	19	19

**Outage duration derived from 15-minute interval metering data for seven SDG&E electric meters serving five buildings. This data excludes frequent outages lasting less than 15 minutes.*

Tribal Benefits

- Strengthening the tribal administration's ability to provide critical public services including first response (both fire and police), reservation security, emergency sheltering and evacuation capacity, and administration command and control capabilities
- Saving approximately $45,190 in electric energy costs per year on average, or $1.13 million over the system's 25-year useful life.
- Reducing net electric energy imports to the reservation by approximately 278,481 kWh per year
- Producing approximately 6.5 GWh of renewable electricity over the system's lifetime to offset about 96% of the tribe's grid electricity consumption for the five facilities served.

Tribal & Environmental Benefits

- Reducing the environmental footprint by approximately 1,954 tons of carbon dioxide (CO2), 275 lbs. of sulfur oxides (SOX), and 1,648 lbs. of nitrogen oxide (NOX) over the system's lifetime
- Enabling the safe installation of 4 electric-vehicle (EV) charging stations at the Tribal Administration building parking lot
- Backup propane gensets to provide standby capacity in the event of an outage at a time when the batteries are depleted from daytime load
- Upgrading San Pasqual Government electrical infrastructure to 3-phase service
- First and only tribe in San Diego County with a microgrid.

Fig. 4.3: SPBMI Microgrid Resource Portfolio

Asset	Nameplate Capacity		Estimated Production
	kW (DC)	kW (AC)	kWh/yr
Carport PV (New)	114.6	97.4	172,879
Rooftop PV (New)	69.9	59.4	105,421
New PV	**184.5**	**156.8**	**278,300**
Rooftop PV (Existing 1)	9.6	8.6	11,269
Rooftop PV (Existing 2)	14.4	12.7	18,019
Existing PV	**24.0**	**21.3**	**29,288**
Battery Energy Storage System	150kW/300kW		
LP-Fueled Gensets	44 kW		

**Existing 24 kW (DC) system located on Education building will be integrated into the system, but its output is excluded from system economic and environmental modeling to avoid double-counting its production, which already is offsetting onsite loads.*

Economics for SPBMI Microgrid

- **Total installed cost:** $1,396,636; DOE $698,318; SP $500,000 (cash), $198,318 (in-kind)
- **Life of the proposed system:** 25 years (with 15-year BESS and controller replacement)
- **Payback period:** 20.89 years (12 years for the tribal investment)
- **Sources of financing:** DOE grant matched by tribal cash and in-kind investment. The tribe intends to apply for California Self-Generation Investment Program (SGIP) rebates applicable to in-state storage investments. SGIP rebates are expected to contribute $120,000 to project cash flow over a period of six years
- **Cash-flow analysis:** The tribe's investment is expected to begin producing a positive internal rate of return (IRR) in the 12th year of operation. The net 25-year IRR for the tribe's investment is expected to be 7.5 percent, producing a cumulative return to the tribe of approximately $1.13 million.
- **Financing terms:** The tribe intends to invest its own equity in the project. Seeking tax-equity financing for solar and storage assets, as an untaxed entity with sovereign immunity, are difficult and costly to arrange
- **Equipment purchasing:** The tribe anticipates purchasing equipment, materials, and services on a tax-free basis

Questions and Comments

Thank you

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