San Pasqual Band of Indians Microgrid Project

John Flores

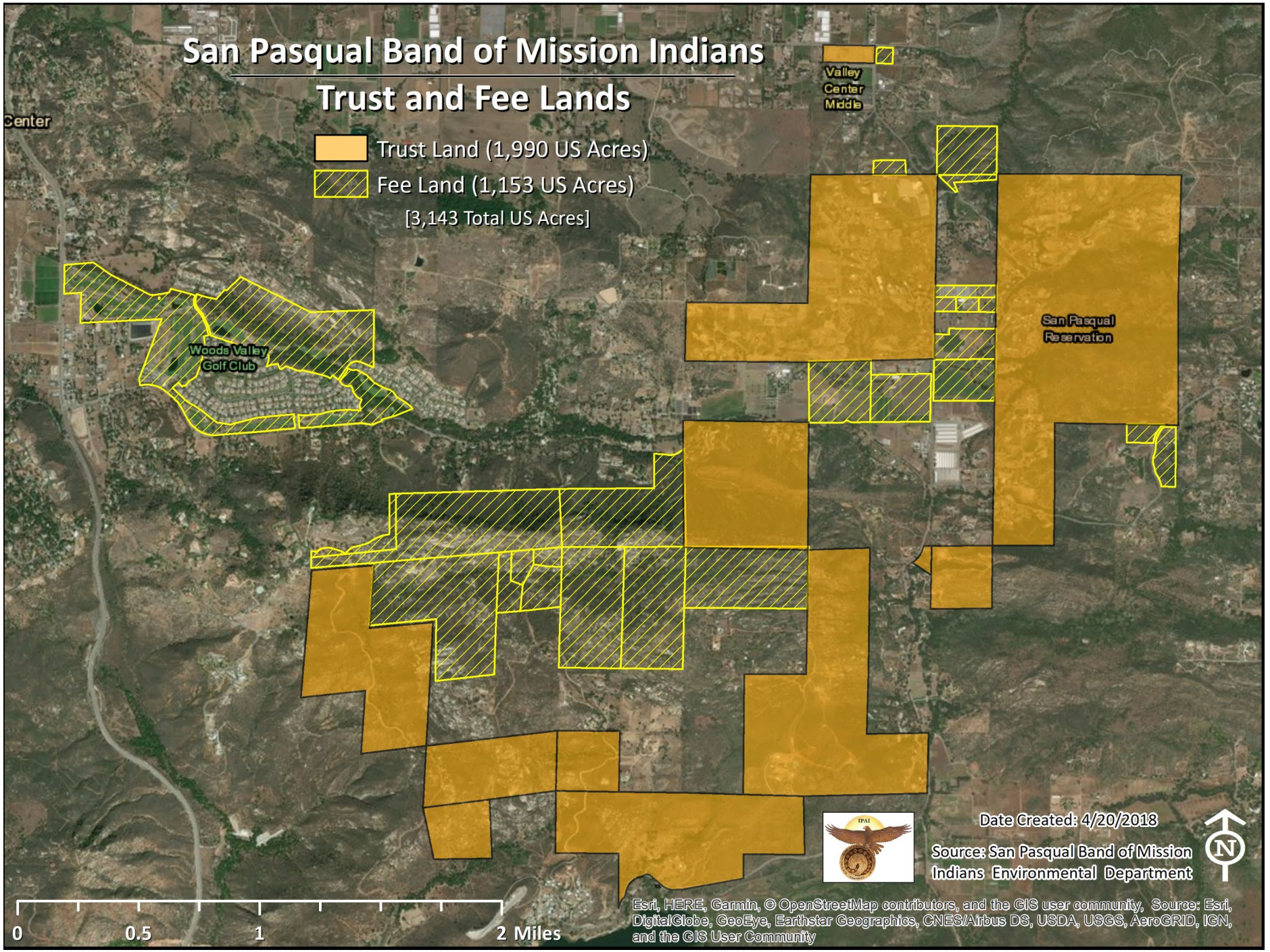
Environmental Director & Domestic Water Manager,

San Pasqual Band of Mission Indians

November 19, 2019

San Pasqual General Information

- Reservation was established in 1910
- The current Reservation encompasses approximately 3,143 acres (Trust 1,990; Fee 1,153)
- 280 Tribal members and over 1,400 lineal descendants
- Reservation population is 1,600
- Installed PV on our Education Buidling (2017; DOE Grant)
- 425 homes on the reservation
- 83 homes have solar (19.5%)
  - 55 GRID Alternatives
  - 23 DOE Grant (2016 - 2019 DOE Grant)
  - 5 private solar companies
  - First residential PV install in August 2011 (GRID)


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

Microgrid Project Grants & Budget

DOE Grant & DOE Match (2018), GRID Grant (2019) = $1,606,070

- $728,035 DOE grant, $728,035 DOE match, $150,000 GRID Tribal Solar Accelerator Grant

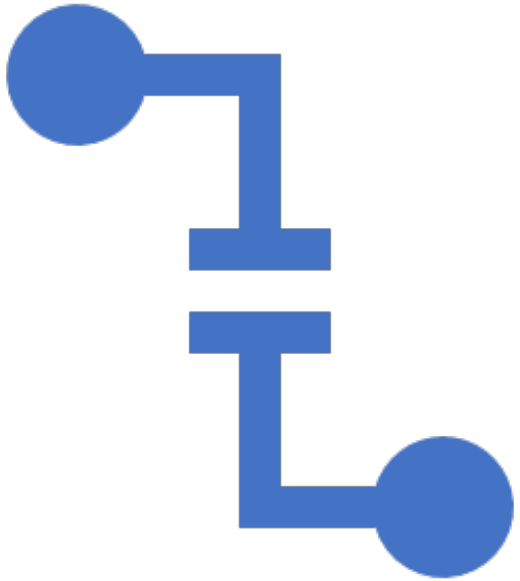
Non-Cash Match = $210,487

- SPBMI Personnel & Fringe: $104,030
- SPBMI Public Works Equipment: $31,450
- Indirect Costs: $39,507
- Volunteer Labor: $30,000

Cash Match = $517,548

What is a Microgrid?

- Microgrid Definition
  - A group of interconnected loads and distributed energy resources within clearly defined electrical boundaries that acts as a single controllable entity with respect to the grid. A microgrid can connect and disconnect from the grid to enable it to operate in both grid-connected or island-mode.

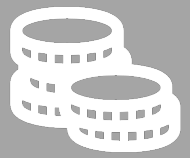


Proposed Microgrid Components

Solar PV Systems	160 kW DC (new) 24 kW DC (existing)
Propane Generators	
Battery Energy Storage Systems (BESS)	150 kW / 300 kWh
Microgrid Controls	
Energy Management Controls	

San Pasqual Microgrid Project Goals

Resilience: Maintain electric power during outages



Economic: Reduce electricity costs

Environmental:

- Achieve 100% Renewable Energy (net zero)
- Reduce GHG and other air pollutant emissions

SDG&E Outages

Power Supply Threats & Impacts

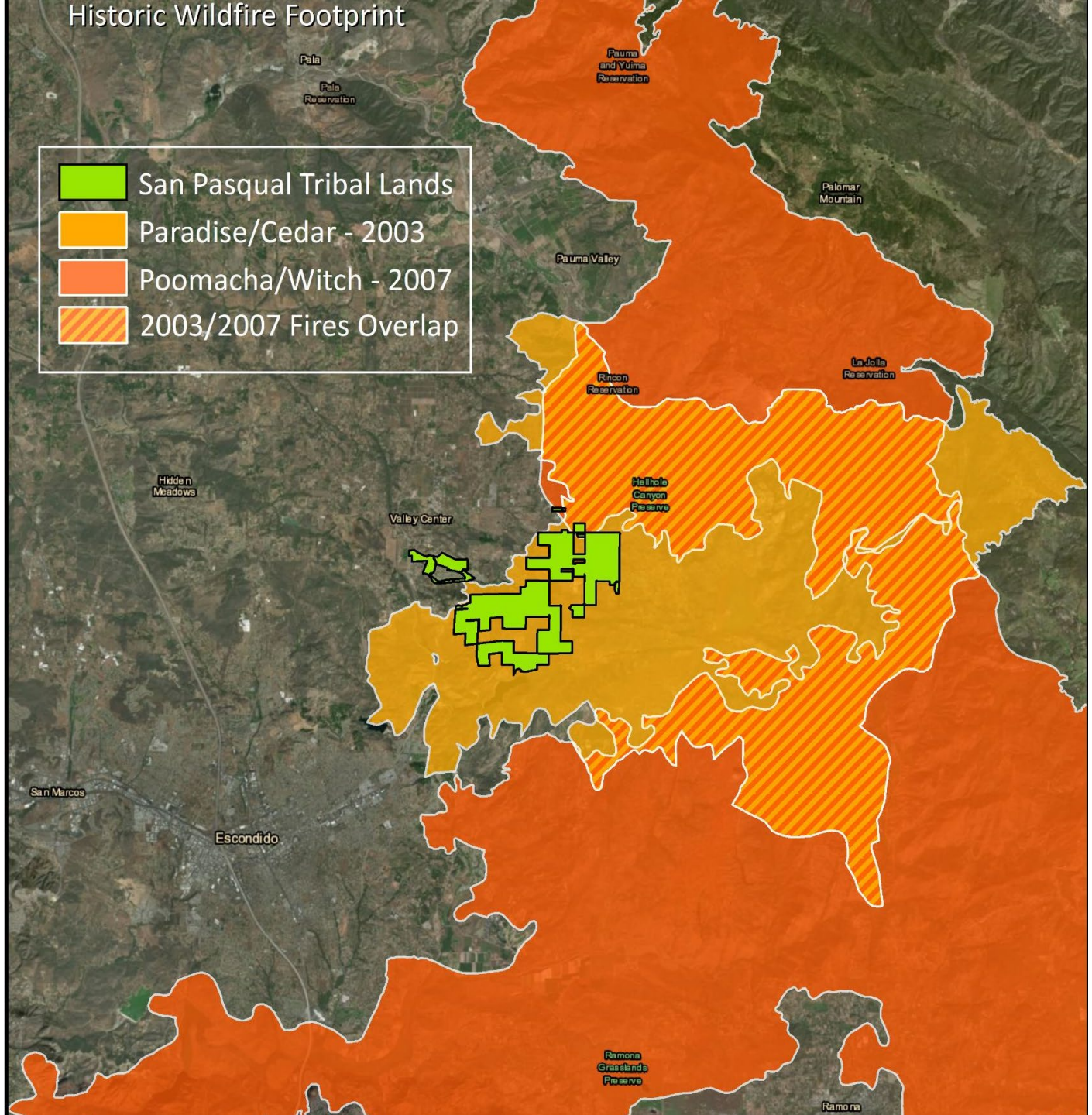
THREATS

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

IMPACTS

- 20+ hour outage in 2017
- Lost Productivity & Revenues
- Equipment Damage
- Inability to Use Facilities

San Pasqual and Wildfire



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

Public Safety Power Shutoff

- What is a Public Safety Power Shutoff? As defined by PG&E:
- For public safety, it may be necessary for us to turn off electricity when gusty winds and dry conditions, combined with a heightened fire risk, are forecasted. This is called a “Public Safety Power Shutoff” or “PSPS.”
- While customers in high fire-threat areas are more likely to be affected, any of PG&E’s more than five million electric customers could have their power shut off. This is because the energy system relies on power lines working together to provide electricity across cities, counties and regions.
- This has now been adopted by all California investor owned utilizes (IOUs) (PGE, SDGE, SCE)

Resiliency

Priority/Critical Electricity Loads

Facility	Emergency Purpose	Critical Electric Loads
Tribal Administration	Red Cross evacuation center; emergency public shelter; tribal command and control; first aid	HVAC, lighting, telecom/IT, food storage, food service
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, lighting, overhead door operation
Education Building	Emergency public shelter	HVAC, food storage, food service, lighting
Preschool	Emergency public shelter	HVAC, lighting
Wastewater Treatment Plant	Wastewater treatment for complex	Full load

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.*

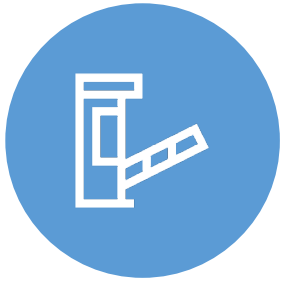
Economics

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

Tribal Benefits (Preliminary)

- 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.

Environment

Tribal & Environmental Benefits (Preliminary)

- 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 tribe in San Diego County with a microgrid

Project Accomplishments

Project Consultant Team

Josh Simmons
President, Principal Consultant
Prosper Sustainably
www.prospersustainably.com

Michael Burr
Director, Principal Consultant
Microgrid Institute
www.microgridinstitute.org

Dustin Jolley
Associate Principal, Engineer
Sage Renewables
www.sagerenewables.com

Project Completion (Pre-Construction)

- Project Team held a stakeholders meeting on September 18, 2019
- Completed SDGE application for 3-phase service in September 2019
- Completed the project RFP and released it on November 4, 2019
- Completed the bid/job walk with interested contractors on November 13, 2019
- All bids are due December 16, 2019

Stake Holder Meeting

SPBMI Business Committee

SPFD Chief

SPPD Chief

SP Public Works Director

SP Planning Director

SP Education Department

SDG&E (Separate individual meeting with Tribal Laiason)

Outage Scenarios & Resilience Targets

How long should microgrid support full operations?

How long should microgrid support critical operations?

SPBMI Concept Examples:

- Short-duration outage (<1 day) – Transition to microgrid mode; maintain operations w/ modest load shedding/management; primary power via solar PV and BESS; supplement with LPG Generator if needed in evening hrs.
- Longer-duration outage (>1 day) – after first day, implement more aggressive load shedding and prioritize critical loads. Assess anticipated outage duration and LPG fuel supply.
  - Solar PV will be adequate to power near full operations during the daytime hours.
  - LPG Fuel supply example – w/ 2000 gal onsite storage; 100kW genset consumes ~15 gal/hr; at ~8hrs/day (morning and evening hrs), may be adequate to supply ~2 weeks of stand-alone operations.

Other Considerations

Microgrid Black Start v. Seamless Transition

- What is an acceptable time gap for the microgrid to restore power (and vice versa)? How long does it take to start generators currently?

Some manual curtailment of electricity loads may be required in certain scenarios

- Will be automated to the extent possible, but may be limited

Multiple operational settings

- Maximum Resilience ← → Maximum Cost Savings
- Adjustable: to account for outage risk and economic objectives

Upgrading to 3 phase power

Underground microgrid power lines

Other Considerations

Meters may be reconfigured

- E.g. single point of interconnection w/ master and sub meters

Propane (LP) Gensets v. Battery Energy Storage Systems (BESS)

- BESS are more expensive than LP gensets, but eco-friendly and can be utilized continuously
- LP gensets are less expensive than BESS, but less eco-friendly and only for outages
- How strong is the desire to minimize propane usage during an outage?

Scope and Role of San Pasqual Public Works Department

- May impact contractor warranty, schedule, and performance guarantees

Anything else?


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

San Pasqual Tribal Government
Complex Microgrid Project
CONCEPTUAL DESIGN

- Master Meter
- Existing/Sub Meter
- New Solar PV Site
- Existing Solar PV System
- BESS Location
- LP Genset Location
- Point of Interconnection
- Structure to be removed
- Underground Cable Run
- Building Cable Run
- Existing Propane Tank
- New Propane Tank

Project Steps and Timeline

Finalize conceptual design and requirements	9/30/2019
Prepare and release RFP	11/04/2019
Review and evaluate proposals	12/31/2019
Negotiate design build contract	1/31/2020
Finalize engineering design*	3/30/2020
Construct and deploy microgrid*	9/30/2020

*Timing is approximate and will be updated during negotiation with design build contractor(s).

Thank you

Questions and Comments

John Flores: (760) 310 – 6697 (cell)
johnf@sanpasqualtribe.org