

# Alternatives to Diesel Temp Gen for Primary Voltage

**Debbie Powell**

*Vice President of Asset, Risk Management & Community Wildfire Safety*

**Jason Regan**

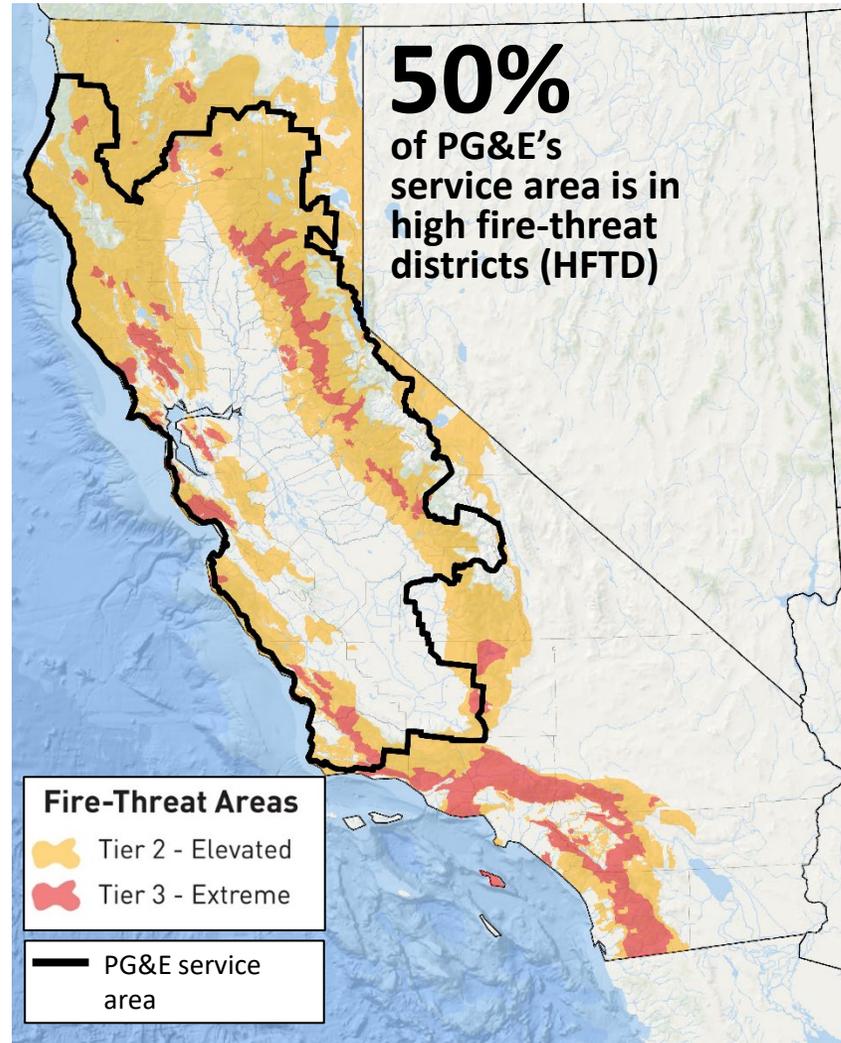
*Director of PSPS Mitigations Execution Team*

**Fong Wan**

*Senior Vice President of Energy Policy & Procurement*



# Wildfire Risks Across PG&E's Service Area



Source: California Public Utilities Commission

Electric customers served	<b>5.1M</b>
Electric metered customers in HFTD	<b>505,600</b>
Counties served (electric)	<b>47</b>
Overhead distribution line miles	<b>81,000</b>
Overhead distribution line miles in HFTD	<b>25,500</b>
Overhead transmission miles	<b>18,200</b>
Overhead transmission miles in HFTD	<b>5,500</b>

Numbers are approximate

# What Weather Could Lead To A PSPS?

We initiate a PSPS when the **weather forecast is for such severe weather** that people's **safety, lives, homes and businesses may be in danger of wildfires.**

Each weather situation is unique, we carefully review a combination of factors when deciding if power must be turned off. These factors include:



**A RED FLAG WARNING** declared by the National Weather Service



**LOW HUMIDITY LEVELS** generally 20% and below



**A FORECAST OF HIGH WINDS** particularly sustained winds above 25 miles per hour and wind gusts above 45 miles per hour



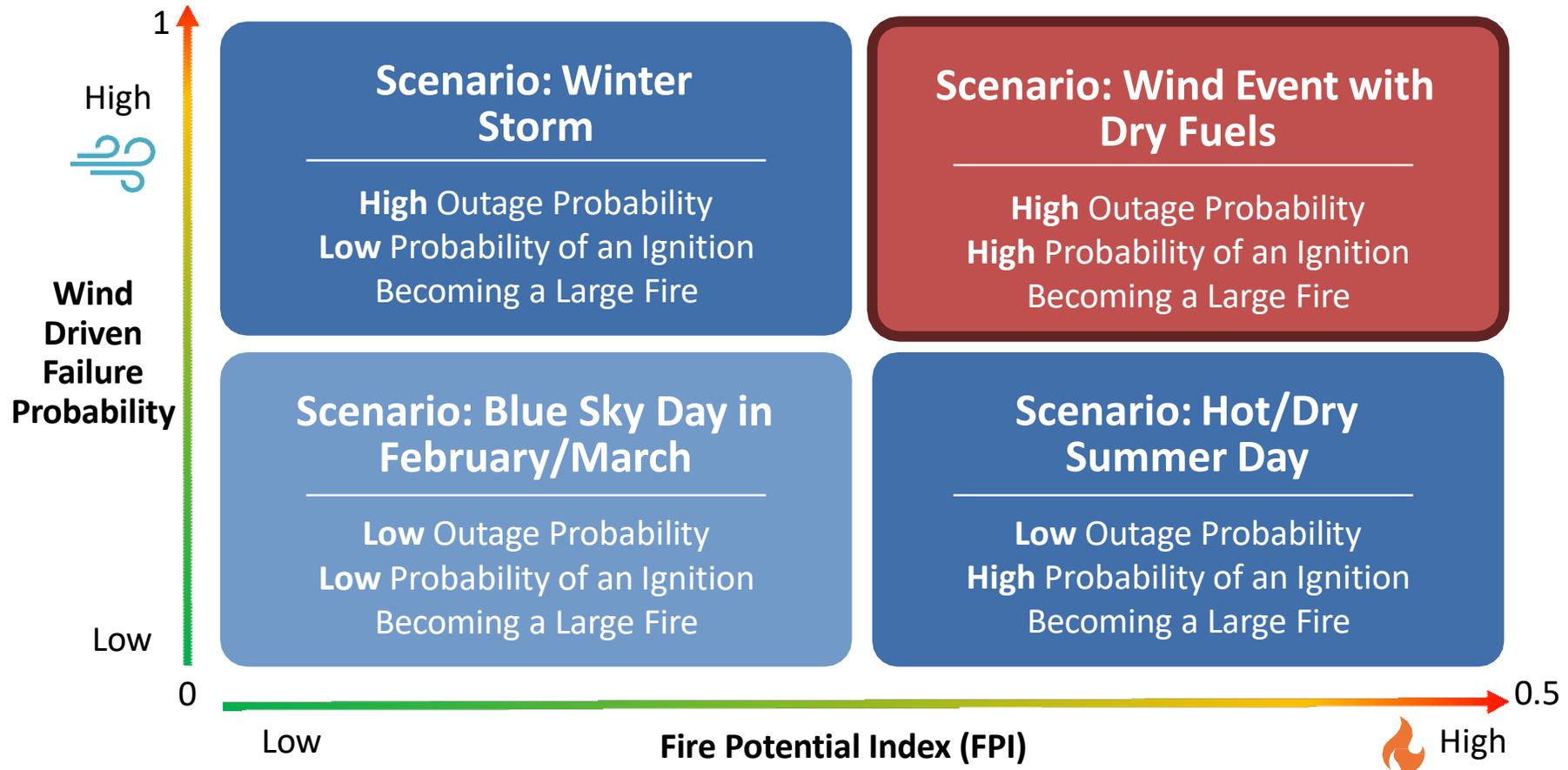
**DRY MATERIAL** on the ground and low moisture content in live vegetation



**REAL-TIME GROUND OBSERVATIONS** from our Wildfire Safety Operations Center and from our crews working across the service territory

# PSPS Weather Condition Analysis

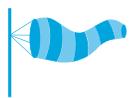
The **Utility Fire Potential Index** and **Wind Driven Failure Probability** analyses are used in unison to analyze what conditions existed during the most catastrophic fires in California history to forecast when ignitions are most likely to intensify into catastrophic fires.



## 30-Year Weather Analysis

**PG&E analyzed 30 years of high-resolution data** covering ~80 billion data points, as well as **26 years of wildfire data** in our service area to help **determine the average likelihood and frequency of a PSPS event.**

The following weather model data points were analyzed:



Wind Speed



Relative Humidity



Dead Fuel Moisture  
(4 Types)



Wind Gust



Precipitation



Live Fuel Moisture



Temperature



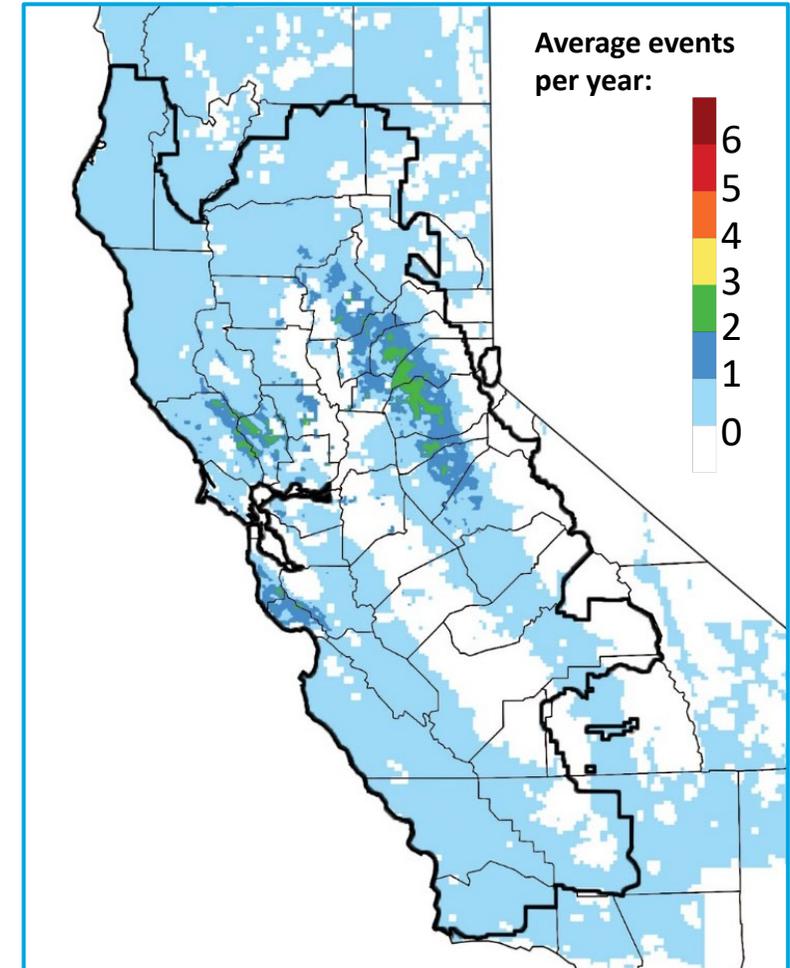
Fosberg Fire  
Weather Index



National Fire Danger  
Rating System Outputs  
(4 Main Outputs)

Regional webinars with county-specific maps can be accessed at:

[pge.com/wildfirewebinar](https://pge.com/wildfirewebinar)



# 2019 PSPS Overview – System-wide

Some substations **de-energized in 2019** due to **transmission outages** had **safe-to-energize load**:

➤ 10/9 – 58 substations

➤ 10/26 – 68 substations

EVENT DETAILS	JUNE 8 - 9	SEPT 23 - 26	OCT 5 - 6	OCT 9 - 12	OCT 23 - 25	OCT 26 - NOV 1	NOV 20 - 21
CUSTOMER ACCOUNTS IMPACTED	~22,000	~49,000	~12,000	~735,000	~179,000	~968,000	~49,000
PEAK WIND GUSTS	63 mph	58 mph	51 mph	77 mph	80 mph	102 mph	75 mph
DAMAGE/HAZARDS	5	4	2	116	26	554	15
AVG. OUTAGE DURATION AFTER ALL CLEAR	5 HRS	7 HRS	4 HRS	25 HRS	5 HRS	22 HRS	10 HRS
AVG. OUTAGE DURATION TOTAL	16 HRS	16 HRS	14 HRS	37 HRS	24 HRS	55 HRS	25 HRS

**Note:** All data is subject to change based on ongoing data reconciliation.

\*Substations de-energized due to transmission level outages with a safe-to-energize load defined as 100+ safe-to-energize customer accounts.

## SMALLER

**33% FEWER**  
IMPACTED CUSTOMERS

- Secured over 450 megawatts of temporary generation to support substations and critical customers
- Adding ~600 sectionalizing devices and line switches to limit the size of outages
- Increased weather model resolution for more precise events

Fewer Customers Impacted



## SHORTER

**50% FASTER**  
RESTORATION TIMES

- Secured more than 30 additional aircraft, for faster and around-the-clock patrols
- Using infrared equipment to enable night inspections
- Expanded mutual assistance program

Faster Inspections



## SMARTER

**BETTER COMMUNICATIONS, RESOURCES AND ASSISTANCE** BEFORE, DURING AND AFTER A PSPS EVENT

- Improved coordination with local agencies and critical service providers
- Improved and strengthened PSPS event website
- Enhanced customer notifications with more detailed information
- Coordinated county-specific and COVID-19 CRC plans
- Increased support for customers with Access and Functional Needs
- Using AI to improve data collection and analysis for better event management and situation reports
- Trained leadership and EOC staff in Standard Emergency Management System

Support for Customers and Communities





# Sectionalization and Temporary Microgrids

We are working to lessen PSPS impacts by installing sectionalizing devices throughout our service territory that separate the grid into smaller parts to reduce the number of customers affected during a PSPS event.

**2020 TARGET**

**600 DEVICES**

We're also establishing additional temporary microgrids that can utilize backup generation sources to keep portions of communities energized.

In 2020, PG&E will have a **portfolio of temporary generation assets** that will support some of these microgrid locations across our service area.

**70+**

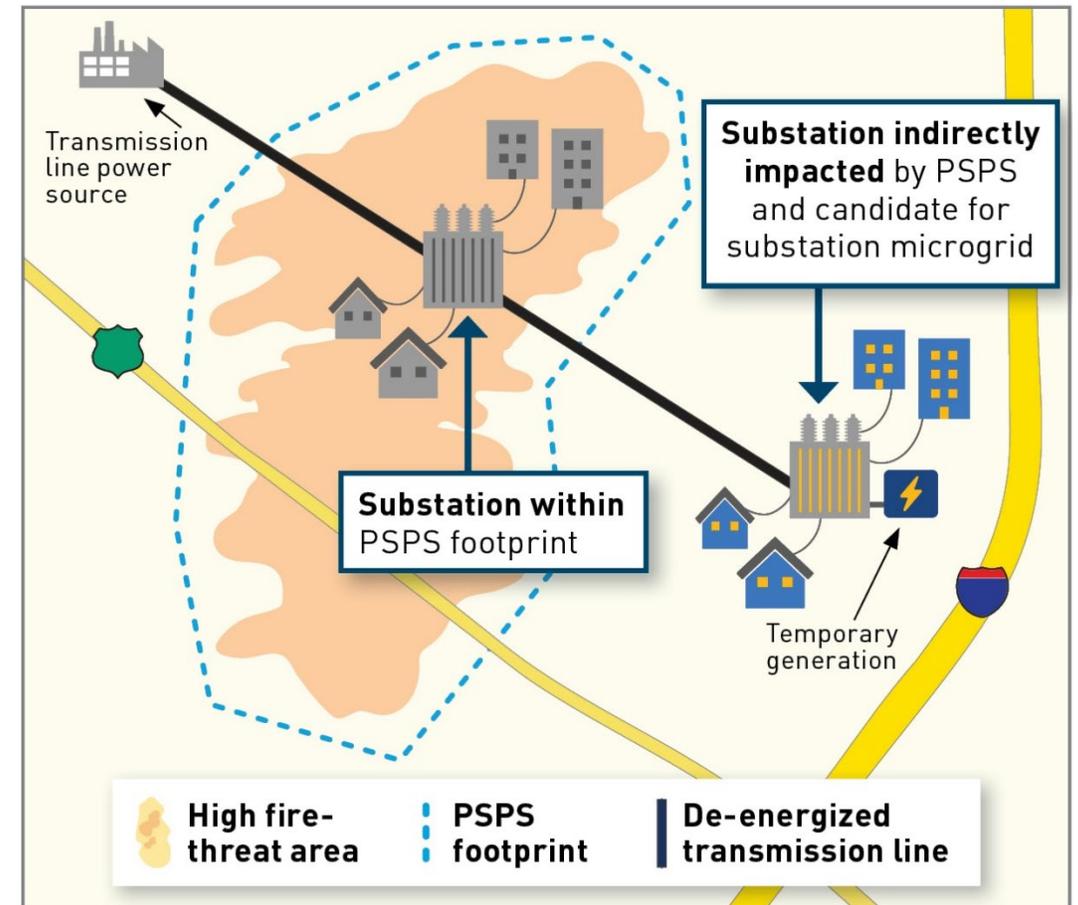
Temporary microgrid sites currently being prepared across PG&E's service area

MWs of Temporary Generation reserved to support PSPS events in 2020

**450+**

**2020 PROGRESS**

**527 DEVICES**



All data is preliminary and based on early 2020 work planning. Data as of July 2020.

Some of the measures included in this presentation are contemplated as additional precautionary measures intended to further reduce the risk of wildfires.

After the 2020 PSPS / Wildfire season PG&E will be performing an updated analysis to determine the scale of feasible improvements for PSPS in 2021 and the activities needed to support those improvements

Each year PG&E will capture the lessons learned and deploy improvements to **continuously make PSPS events smaller, shorter and smarter**

The existing tools we will be deploying to drive reduction in PSPS event scopes include:

<p>Improved Asset Risk Analysis</p>	<p>System Hardening</p>	<p>Increased Grid Flexibility, Automation &amp; Sectionalization</p>
<p>Continued enhancement of meteorology &amp; situational awareness</p>	<p>Microgrid Development</p>	<p>Islanding / generation sources</p>



# Temp Gen During a PSPS Event

Readiness Posture to Playbook C (approx. T-48)

Playbook C to De-Energization (T=0)

T=0 to Weather All Clear

All Clear to Local Restoration

Temp Gen Phase:

## Preliminary planning

**EOC Plans (Meteorology)** produces weather polygon and Playbook A

**EOC Ops (Temp Gen)** creates preliminary plan and estimates resources required for event

## Mobilization

**EOC Ops (Temp Gen) coordinates first wave of mobilization** for distribution-impacted sites and, if needed, for hardened Community Resource Centers.

**EOC Ops (Temp Gen) coordinates subsequent waves** of deployments to transmission-impacted sites and to address changes to the weather polygon.

## Re-Scoping & Adaptation

**EOC Plans** finalizes Playbooks A-D

**EOC Ops (Temp Gen)** adapts event plan as needed after each playbook is published. Some prior mobilizations may be canceled as scope changes.

## Energization & Maintenance

**EOC Ops (Temp Gen)** coordinates with **Field Person(s) in Charge, EDEC, OECs, and Contractors** to energize mobilized sites

After energization, **Contractors** manage refueling and any necessary maintenance

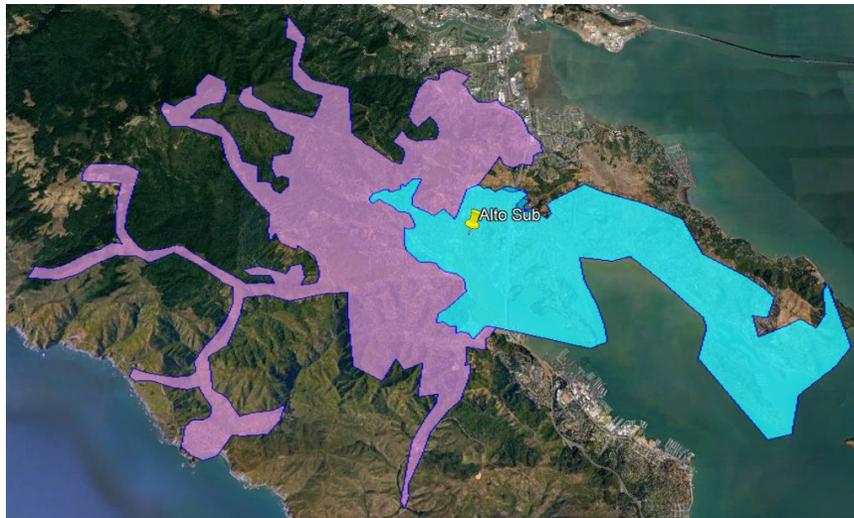
## Demobilization

**EOC Incident Commander** confirms weather All-Clear following guidance from **Meteorology**  
  
**Field crews** lead local restoration

**EOC Ops (Temp Gen)** coordinates demobilization sequence with **Field Person(s) in Charge, EDEC, OECs, and Contractors**

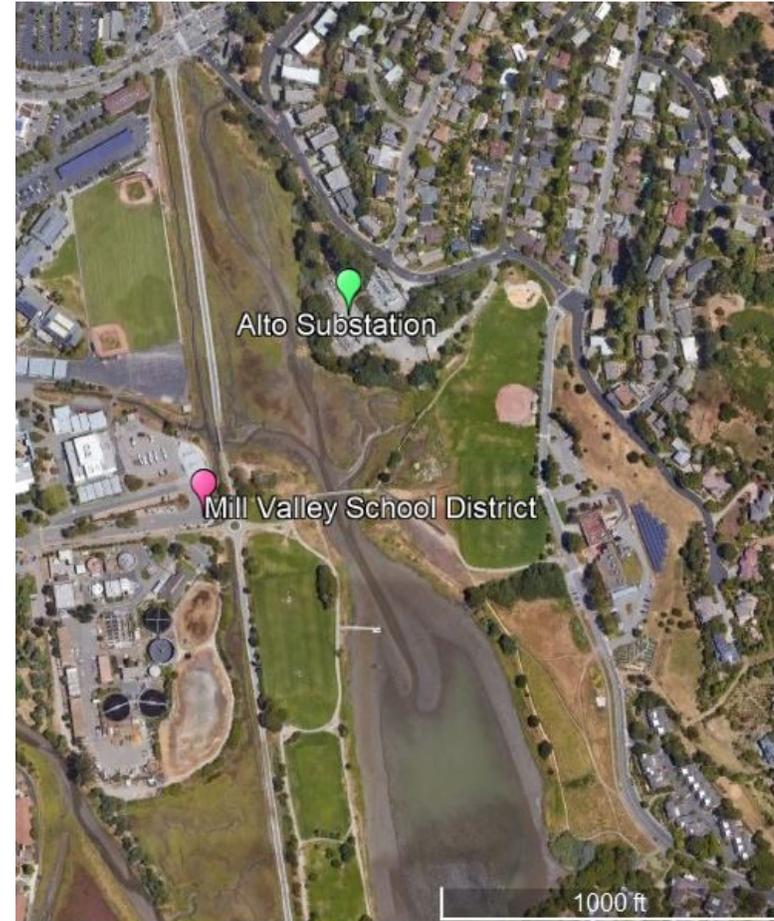
# Alto Substation

Marin	Blue sky	Islandable in 2019
PEAK LOADING	<b>32</b> MW	<b>26</b> MW
CUSTOMERS	<b>23k</b> 91% res	<b>18.5k</b>
PROXIMITY TO GAS	<b>&lt; 1000</b> FEET	<b>&lt; 1000</b> FEET



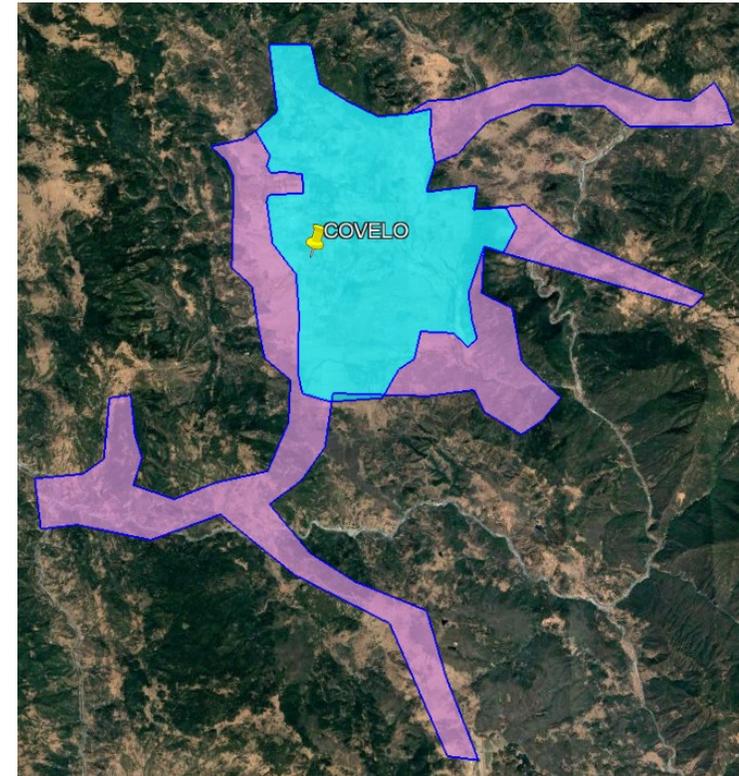
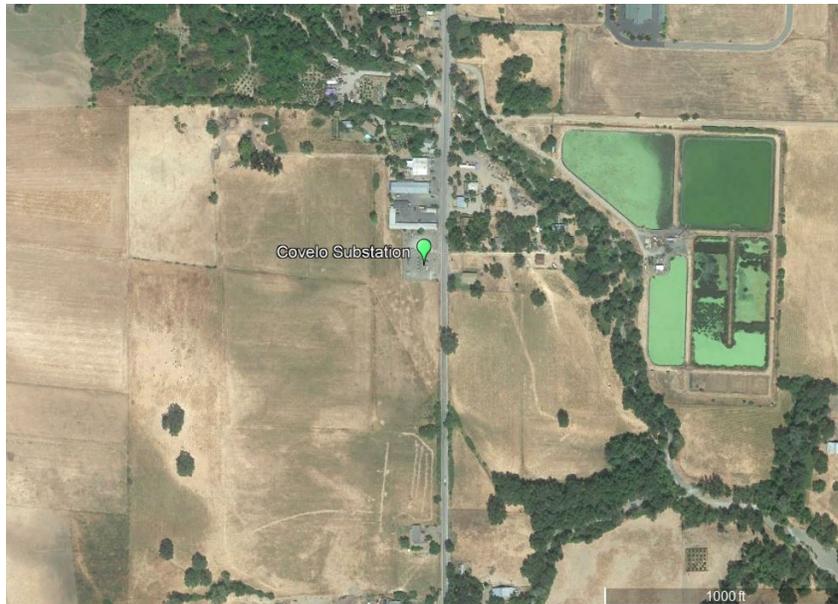
 Safe-to-energize area in the 10/26/19 PSPS event

 Area not safe-to-energize in 10/26/19 PSPS event



# Covelo Substation

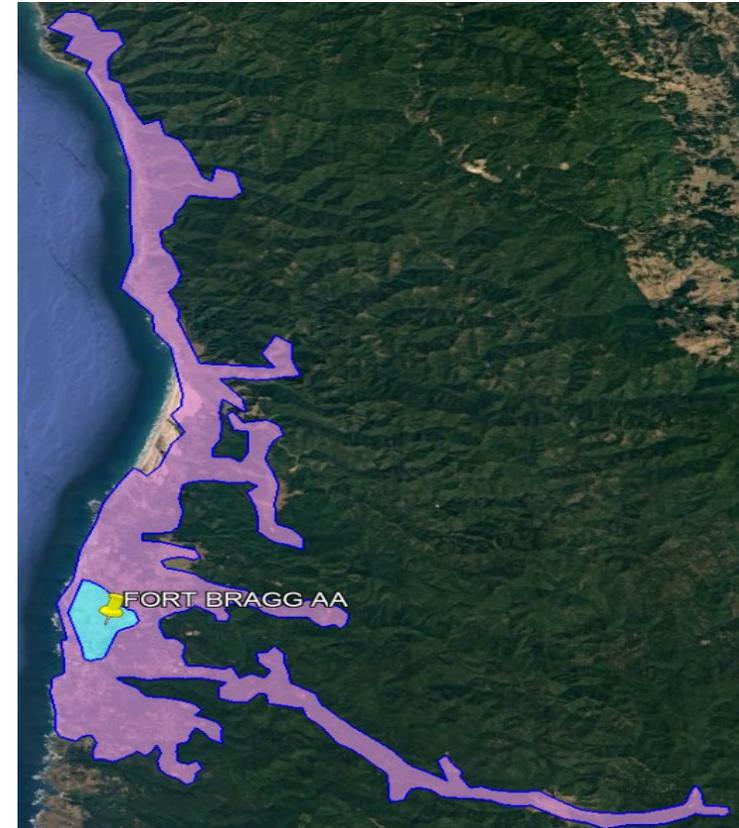
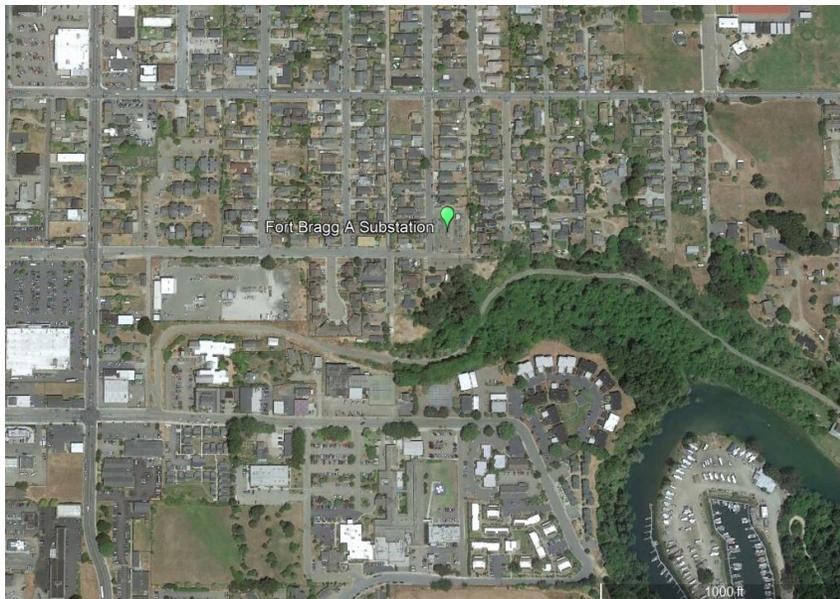
Mendocino	Blue sky	Islandable in 2019
PEAK LOADING	<b>2.5</b> MW	<b>2.4</b> MW
CUSTOMERS	<b>1.4k</b> 80% res	<b>1.3k</b>
PROXIMITY TO GAS	<b>&gt; 20</b> MILES	<b>&gt; 20</b> MILES



	Safe-to-energize area in the 10/26/19 PSPS event		Area not safe-to-energize in 10/26/19 PSPS event
---	--	---	--

# Fort Bragg Substation

Mendocino	Blue sky	Islandable in 2019
PEAK LOADING	<b>13.75</b> MW	<b>13.5</b> MW
CUSTOMERS	<b>8.4k</b> 85% res	<b>8.2k</b>
PROXIMITY TO GAS	<b>&gt; 20</b> MILES	<b>&gt; 20</b> MILES



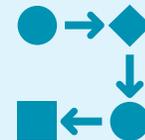
	Safe-to-energize area in the 10/26/19 PSPS event		Area not safe-to-energize in 10/26/19 PSPS event
---	--	---	--

**Starting in 2013**, PG&E began exploring the use of temp gen to reduce customer impact during planned and emergency outages

## Key Early Challenges



PEOPLE

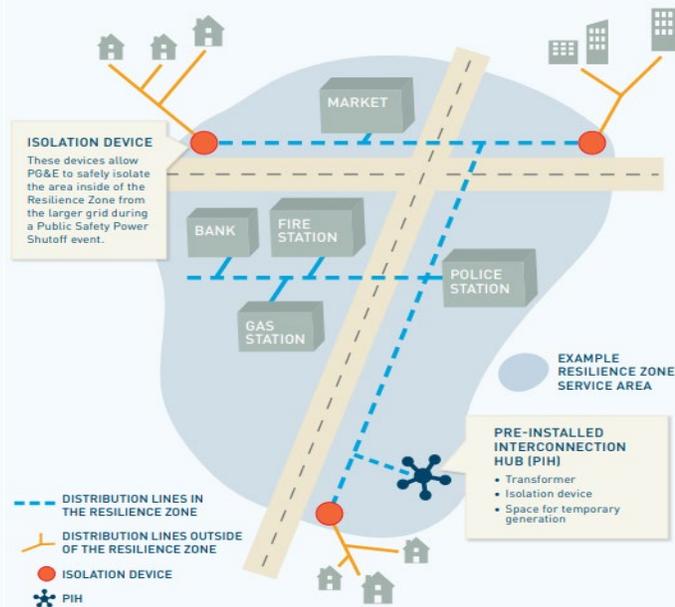


PROCESSES

In 2019, PG&E began to leverage its temp gen program to mitigate the impacts of PSPS

## Temporary Microgrids

PG&E energized four **islanded zones**, enabling **community resources** to continue serving customers in Angwin, Grass Valley, Placerville, and Calistoga



## Back Up Power Support

PG&E responded to exceptional circumstances impacting **public safety** due to the imminent failure or lack of customer-operated backup generation systems

Peak deployment at one time was **41MW for 26 sites across 12 counties.**





# Temp Gen: 2020 Program Overview

In 2020, PG&E is **scaling** its temp gen program to include **~470MW** across **four workstreams**

## Substation Microgrids

- › Keep **safe-to-energize customers** impacted by upstream transmission level PSPS outages energized

## Temporary Microgrids

- › Keep **safe-to-energize “main street”** commercial corridors with shared community services energized

## Back Up Power Support

- › Support emergent needs to **protect public safety**, stand up emergency operations, avert environmental hazards

## Community Resource Centers

- › Provide a **safe location** where community members can access basic resources and up-to-date information

*Note: we are adapting our approach to CRCs to reflect appropriate COVID-19 public health considerations*

PG&E has reserved **350MW** for use across **62 substations** in **19 counties**

## Deployment Strategy

**50%**  
of MW

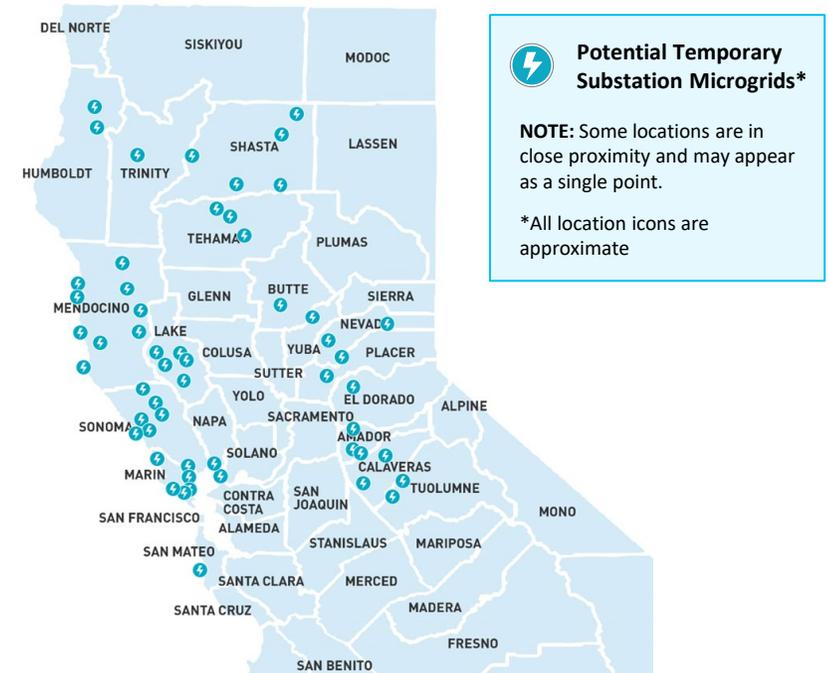
### Ready to energize

Substations that have generation interconnected, tested, and released in advance of a PSPS event

**50%**  
of MW

### Hub-and-spoke

Substations that have an engineering guide to interconnect generation during a PSPS event. Generators are staged at yards, and dispatched to subs as needed





# Temp Gen Operational Requirements

Meeting operational requirements allows generation technologies to **safely and reliably mitigate the impacts of PSPS** when called upon

## REQUIREMENT

---

- |   |                            |   |
|---|----------------------------|---|
| 1 | <b>Frequency Following</b> | Generation must maintain frequency at 60 Hz and a frequency response of +/- 1% from min to max load   |
| 2 | <b>Load Following</b>      | Generation must maintain voltage within 1% of the setpoint for setpoints within PG&E specified range  |
| 3 | <b>Black start</b>         | Generation must demonstrate black start capability without parallel operation to the electric grid  |
| 4 | <b>Fault Protection</b>    | System must have the ability to generate and detect short circuit fault duty for various fault types to isolate itself from the grid              |
| 5 | <b>Deploy Time</b>         | Contractors must be able to deploy generation and labor to site for construction within 48 hours' notice<br><i>(for hub-and-spoke model only)</i> |

**PG&E is committed to moving towards a cleaner portfolio of temp gen**



**Expand the pool of contractors and technologies**



**Pilot viable non-diesel technologies in 2021**



**Explore opportunities to build a portfolio of non-fossil solutions**