Community Wildfire Safety Program

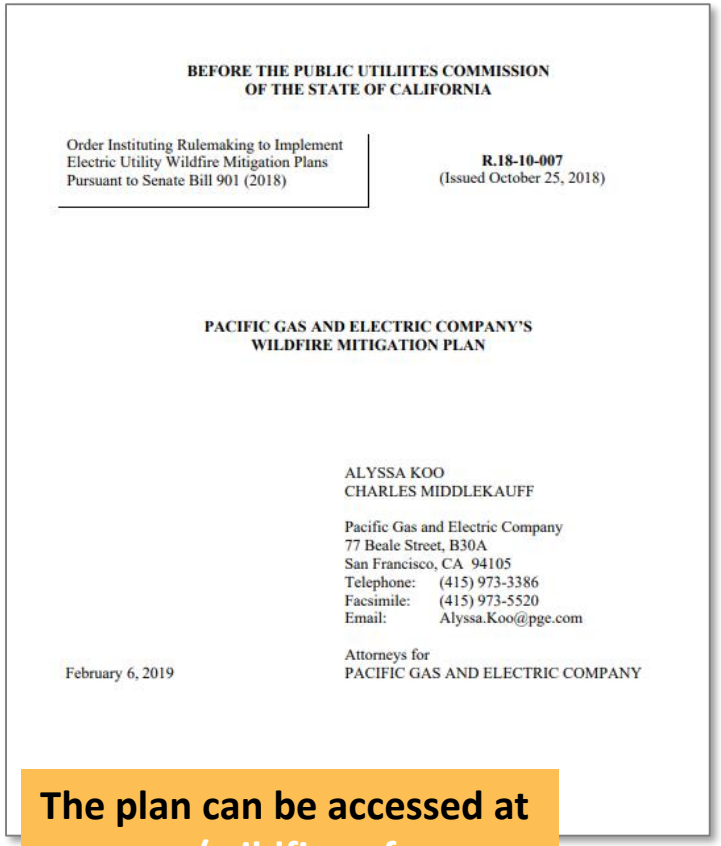
WILDFIRE MITIGATION PLAN

September 17, 2019

2019 Wildfire Safety Plan

PG&E's 2019 Wildfire Safety Plan was submitted on February 6 to the California Public Utilities Commission (CPUC) as part of our ongoing commitment to reducing wildfire risk. The Plan was further corrected on February 12 and amended February 14.

- The objective of PG&E's Plan is to act with urgency to **reduce the risk of electrical lines and equipment causing potential catastrophic wildfires.**
- **The plan describes forecasted work and investments in 2019** to help further reduce the potential for wildfire ignitions associated with our electrical equipment in high fire-threat areas.
- **The safety plan builds on our comprehensive Community Wildfire Safety Program,** launched in March 2018.
- **The plan is subject to open and transparent public review** and annual approval by the CPUC.



BEFORE THE PUBLIC UTILIITES COMMISSION
OF THE STATE OF CALIFORNIA

Order Instituting Rulemaking to Implement Electric Utility Wildfire Mitigation Plans Pursuant to Senate Bill 901 (2018)

R.18-10-007
(Issued October 25, 2018)

PACIFIC GAS AND ELECTRIC COMPANY'S
WILDFIRE MITIGATION PLAN

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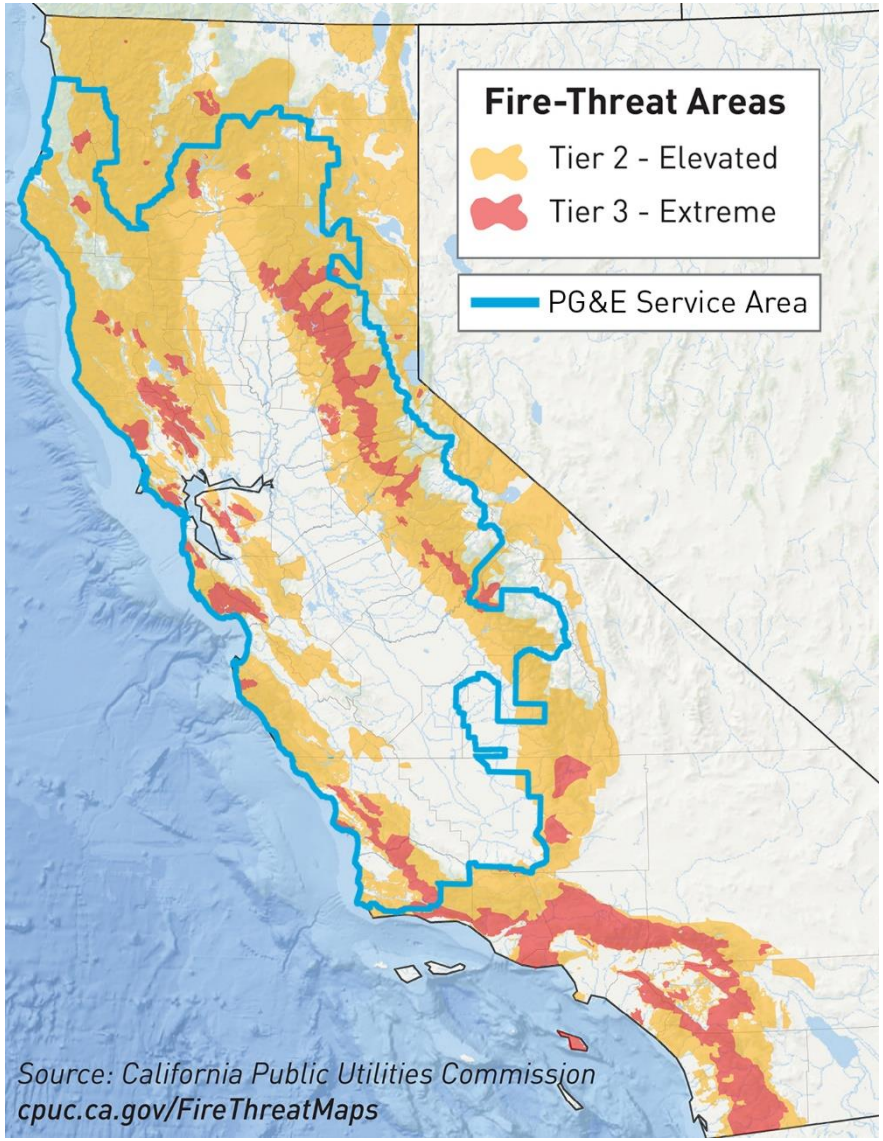
February 6, 2019

The plan can be accessed at pge.com/wildfiresafey

Following the wildfires in 2017 and 2018, some of the changes included in this presentation are contemplated as additional precautionary measures intended to further reduce future wildfire risk.

Wildfire Threats in PG&E's Service Area



The Wildfire Safety Plan reflects the unique size and geography of PG&E's 70,000-square-mile service area.

More than half of PG&E's service area is in extreme or elevated fire-risk areas as designated by the California Public Utilities Commission's High Fire-Threat District map.

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Program Risks and Challenges

PG&E recognized that there would be significant execution risks, arising from sources both external and internal to PG&E, to accomplishing the expanded and accelerated scope of planned work including:

- **Inclement weather**
- **Availability of equipment, materials, and qualified personnel**
- **Scheduling of transmission outages** (customer impacts and clearance process)
- **Access/permitting delays** (e.g., objections from property owners or governmental agencies and environmental permitting requirements)

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Community Wildfire Safety Program

REAL-TIME MONITORING AND INTELLIGENCE

- Coordinating prevention and response efforts by monitoring wildfire risks in real time from our **Wildfire Safety Operations Center**
- **Expanding our network of PG&E weather stations** to enhance weather forecasting and modeling
- Supporting the **installation of new high-definition cameras** in high fire-threat areas

NEW AND ENHANCED SAFETY MEASURES

- Further enhancing vegetation management efforts to **increase focus on vegetation that poses a higher potential for wildfire risk**
- **Conducting accelerated safety inspections** of electric infrastructure in high fire-threat areas
- **Disabling automatic reclosing of circuit breakers and reclosers** in high fire-risk areas during wildfire season
- **Proactively turning off electric power for safety (Public Safety Power Shutoff)** when gusty winds and dry conditions combine with a heightened fire risk

SYSTEM HARDENING AND RESILIENCY

- Installing **stronger and more resilient poles** and **covered power lines**, along with **targeted undergrounding**
- **Upgrading and replacing electric equipment and infrastructure** to further reduce wildfire risks
- **Working with communities to develop new resilience zones** to provide electricity to central community resources during a Public Safety Power Shutoff event

Following the wildfires in 2017 and 2018, some of the changes included in this presentation are contemplated as additional precautionary measures intended to further reduce future wildfire risk.

Wildfire Safety Plan Progress and Scope

CATEGORY	MITIGATION	YEAR-TO-DATE COMPLETE	SCOPE	PERCENT COMPLETE
Wildfire Safety Inspections (Data as of 8/31)	**Transmission** (Visual Inspections)	**39,703** structures*	**39,805** structures*	**99.7%**
	Transmission (Aerial Inspections)	**49,321** structures	**49,760** structures	**99%**
	Distribution	**694,250** poles	**694,250** poles	**100%**
	Substations	**222** substations	**222** substations	**100%**

*9,955 structures inspected in 2018

CATEGORY	MITIGATION	YEAR-TO-DATE COMPLETE	SCOPE	PERCENT COMPLETE
Wildfire Safety Repairs (Data as of 7/31)	**Transmission** (A and B Tags)	**3,623** tags	**5,350** tags	**67.7%***
	Distribution (A and B Tags)	**4,793** tags	**4,946** tags	**96.9%**
	Substations (A and B Tags)	**735** tags	**738** tags	**99.6%**

*The remaining A-tags on transmission are on deenergized lines and have been made safe.

Note: Results from our inspections are subject to an ongoing review and quality assessment process and may change.

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Wildfire Safety Plan Progress and Scope

CATEGORY	MITIGATION	YEAR-TO-DATE COMPLETE	SCOPE	PERCENT COMPLETE
Enhanced Vegetation Management (EVM)	**EVM Tree Work**	**639** miles	**2,455** miles	**26%**
	Catastrophic Event Memorandum Account (CEMA) Inspections	**39,386** trees	**50,253** trees	**78%**
	CEMA Tree Work	**18,984** trees	**50,253** trees	**38%**
Situational Awareness	**Weather Stations**	**393** stations	**400** stations	**98%**
	High-Definition Cameras	**75** cameras	**71** cameras	**105%**
Operational Practices	**Recloser Operations**	**287** reclosers	**287** reclosers	**100%**
	Safety and Infrastructure Protection Teams (SIPT)	**28** trucks + **63** employees	**25** trucks + **60** employees	**100%**
	Aviation Resources (heavy-lift helicopters)	**4** helicopters	**4** helicopters	**100%**
System Hardening	**System Hardening**	**75** miles	**150** miles	**50%**
	Equipment (non-exempt fuses/cutouts)	**0**	**625** fuses	**0%**
Public Safety Power Shutoff	**Resilience Zones**	**0** zones*	**1** zone	**0%**
	System Sectionalizing (locations installed)	**181** locations	**N/A**	**N/A**

*Pre-installed interconnection hub complete. Grid hardening near completion. Resilience Zone expected operational by October.

Data as of 8/31

Following the wildfires in 2017 and 2018, some of the changes included in this presentation are contemplated as additional precautionary measures intended to further reduce future wildfire risk.

Wildfire Safety Inspection Program (WSIP)

INSPECTIONS

We conducted accelerated safety inspections of electric infrastructure in areas of higher wildfire risk

- This includes **comprehensive inspections of electric towers, poles and substations** in high fire-threat areas through **ground, climbing or helicopter inspections** and, in some cases, by using **drones**

INSPECTIONS OF DISTRIBUTION POLES

100% COMPLETE

of **~700,000 structures**

over **25,000+ miles**

INSPECTIONS OF TRANSMISSION STRUCTURES

99.7% **VISUAL INSPECTIONS**

99% **AERIAL INSPECTIONS**

of **~50,000 structures** over **5,500+ miles**

INSPECTIONS OF SUBSTATIONS

100% COMPLETE

of **222 substations**

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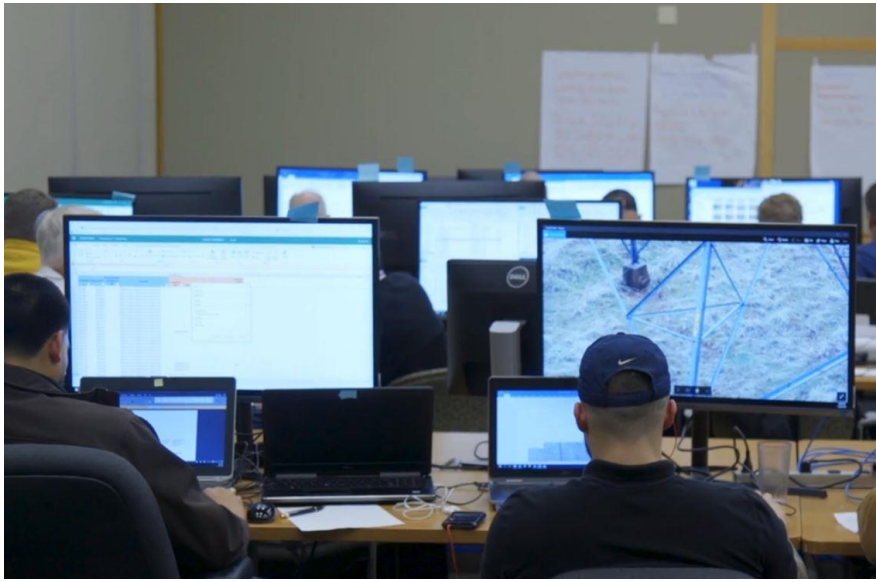
Wildfire Safety Inspection Program (WSIP)

CENTRALIZED INSPECTION REVIEW TEAM (CIRT)

Inspection findings are reviewed by the Centralized Inspection Review Teams (CIRT), composed of individuals with experience in system maintenance and engineering to evaluate conditions for necessary repairs and timing.

- The CIRT helps to further **improve prioritization while establishing a greater level of consistency and accuracy.**
- The CIRT **evaluates the identified conditions** applying the guidance from the Electric Transmission Preventative Maintenance (ETPM) Manual (TD-1001M) and Electric Distribution Preventative Maintenance (EDPM) Manual (TD – 2305M) and associated job aids to **prioritize repairs and associated corrective actions.**



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Wildfire Safety Inspection Program (WSIP)

REPAIRS

To date, 100% of the highest-priority conditions have been repaired or made safe.

- When inspections determine that repairs are needed, but **there is not an immediate safety risk, preventative maintenance procedures, consistent with state guidelines** for high fire-threat areas, will guide repair time.
- **Repairs range** from installing new electrical components to replacing poles or towers and are dependent on field observations.

TRANSMISSION

TYPE	IDENTIFIED	RESOLVED	% COMPLETE
A	113	97*	85.8%
B	5,237	3,526	67.3%

***Note:** the remaining A-tags on transmission are on deenergized lines and have been made safe.

DISTRIBUTION

TYPE	IDENTIFIED	RESOLVED	% COMPLETE
A	1,000	1,000	100%
B	3,946	3,793	96.1%

SUBSTATIONS

TYPE	IDENTIFIED	RESOLVED	% COMPLETE
A	101	101	100%
B	637	634	99.5%

Data as of 7/31

To see this information broken out by city and county, and for a more detailed breakdown including descriptions of the conditions, please visit **pge.com/wildfireinspections** and click on the "What We're Doing in Your Community" tab.

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Wildfire Safety Inspection Program (WSIP)

Challenges

- **Access to infrastructure –** This includes snow levels in high elevations, road access, and property owner refusals
- **Permitting –** Delays due to timing of local government and environmental permits
- **Data –** Identified inaccuracies to pole database that delayed field inspections and repair work
- **Resources –** Limited qualified personnel. The inspections program created a high volume of repair work and many of the available resources were already involved in other important wildfire risk reduction programs

Improvements

- **Developed More Intuitive, Risk-based and Advanced Inspection Tools –** (ex. Pronto forms) informed by an analysis of fire ignition risk factors to ensure consistency across inspectors
- **Implemented Helicopter Inspections –** To support drone inspections
- **Ensured Every Structure Received At Least One Method Of Inspection –** Includes via ground/climbing, drone or helicopter
- **Stood Up an Incident Command Structure –** To support the urgency and magnitude of the inspections and repairs
- **Identified and Brought on Additional Out-of-state Resources –** Supported by In-depth Training

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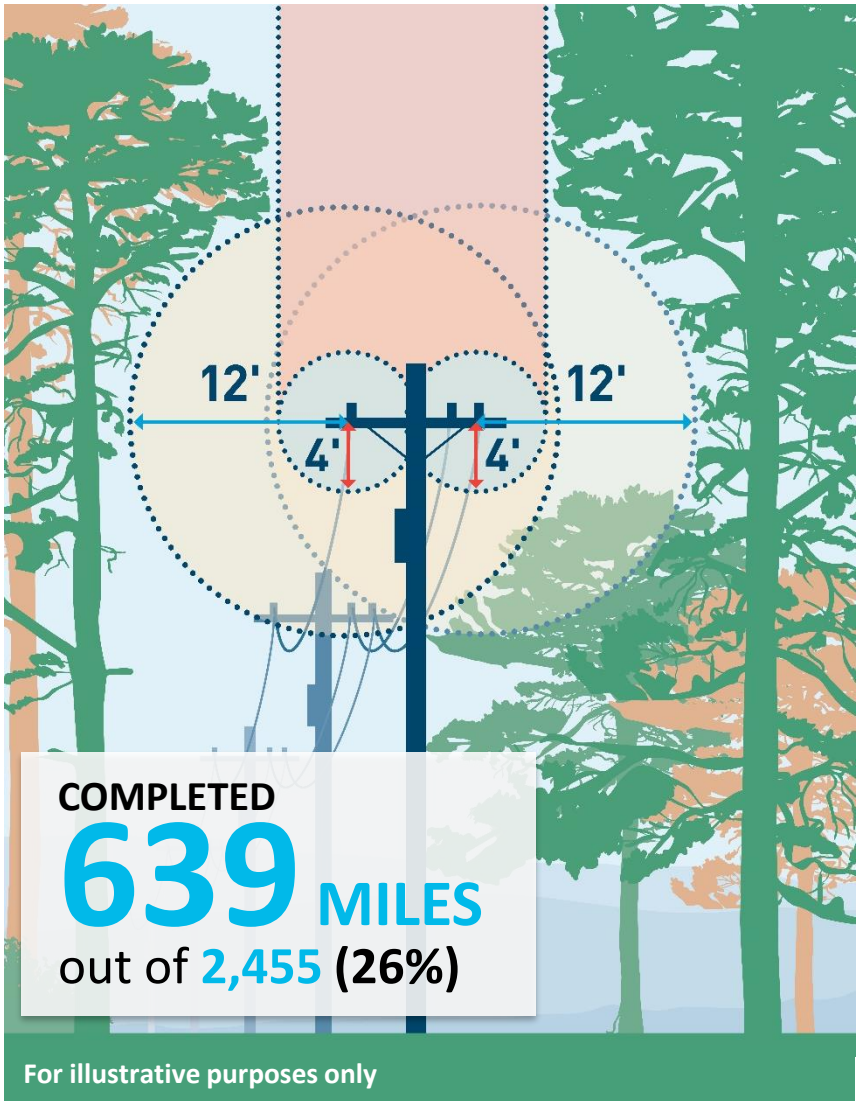
Enhanced Vegetation Management

We are expanding and enhancing vegetation management to further reduce wildfire risk. Efforts include:

- **Meeting state standards** for minimum clearances around power lines
- **Addressing overhanging limbs and branches** directly above and around the lines
- **Removing hazardous vegetation such as dead or dying trees** that pose a potential risk to the lines
- **Trimming around lower voltage secondary lines**, when needed
- **Evaluating the condition of trees that may need to be addressed** if they are tall enough to strike the lines



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Drought and Tree Mortality Response (CEMA)

PG&E's service area includes an estimate of **more than 100 million trees** with the potential to grow or fall into our overhead power lines

INSPECTED

~78% **OF CEMA AREAS**

planned for **2019**

COMPLETED REMEDIATION OF

18,984 **DEAD OR DYING TREES**

out of **50,253** **(38%)** forecasted in 2019

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Enhanced Vegetation Management

Challenges

- **Resources –** Limited qualified resources available to support all wildfire risk reduction priorities (including, vegetation work for WSIP, system hardening and Paradise reconstruction)
- **Magnitude –** Significantly increased scope of inspection and tree work over prior years
- **Certified Arborist Requirement –** Issued with the Wildfire Mitigation Plan approval, this requirement created the need for program scope to be approved by a certified arborist, which required additional training and instruction and delayed work timeline
- **Weather –** Prolonged winter storm season
- **Property Owner Refusals**

Improvements

- **Recalibrated the Entire Program:**
  - Leveraged process redesign
  - Identified greater efficiencies across programs (ex. Routine Veg)
  - Deployed enhanced operational technology and alternate tools
  - Onboarded additional qualified personnel and field resources
  - Brought on additional PG&E field oversight and leadership
- **Scope Change –** Readjusted scope to target all trees with strike potential and ensure greater consistency in implementation
- **Risk-Based Schedule –** Realigned the schedule to target highest-priority circuits

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Situational Awareness

We are **expanding our network of PG&E weather stations** to enhance weather forecasting and modeling and **installing new high-definition cameras** in high fire-threat areas

INSTALLED

393 **WEATHER STATIONS**

out of **400** **(98%)**

Data available at **pge.com/weather**

INSTALLED

75 **HIGH-DEFINITION CAMERAS**

out of **71** **(105%)**

Images available at **pge.com/weather** or **alertwildfire.org**

Data as of 8/31/19

Additional Situational Awareness Measures

- Deployed enhanced **PG&E Operational Mesoscale Modeling System (POMMS)**
- Operationalized **Fire Spread Modeling**, to allow improved understanding of catastrophic fire risk
- Deployed a **Satellite Fire Detection Toolset** to detect and track new fires as they occur, issue alerts and simulate potential spread of new and existing fires; next phase of modeling is underway
- Operationalized **Storm Outage Prediction Model (SOPP)**
- Integrated multiple technological tools, data sources, and human resources into the **Wildfire Safety Operations Center (WSOC)** to increase situational awareness to respond more effectively to wildfires

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Situational Awareness

Challenges

- **Ability to Share Data Externally –** High public interest in sharing of weather and camera data and insights in formats that all users can easily access
- **Refining Methodology –** Incorporating changing weather patterns into system asset analysis and standards
- **Equipment Availability –** Increased demand for weather stations resulted in delays by third-party vendor

Improvements

- **Launched Public-facing Website –** Providing weather and camera data in real-time alongside a PSPS 7-Day Forecast
- **Updated methodology:**
  - **Weather Stations –** Revisiting the pole selections for weather stations
  - **Satellite Fire Detection Systems –** Working on incorporating with the next phase of more sophisticated fire spread modeling
- **Technology Updates / Increase Staffing (WSOC) –** Updating tools and increasing resources to increase situational awareness to respond more effectively to wildfires

Following the wildfires in 2017 and 2018, some of the changes included in this presentation are contemplated as additional precautionary measures intended to further reduce future wildfire risk.

Operational Practices

COMPLETED SCADA-ENABLING OF

287 **LINE RECLOSERS**

out of 287 **(100%)**

SECURED **28** **TRUCKS** and **HIRED** **63** **EMPLOYEES**

for **Safety and Infrastructure Protection Teams (SIPT) (100%)**

PROVIDING

4 **HEAVY-LIFT HELICOPTERS**

to aid in **fire suppression** and **restoration efforts**

Personnel Work Procedures
in Conditions of Elevated Fire Risk

- PG&E has **updated the standard (TD-1464S) regarding operational practices** during elevated fire risk conditions and is **actively training field crews**
- As of June 30, 2019, PG&E has begun the process of **implementing the updated standard with operational teams** throughout the company, including through **in-person Wildfire Season Readiness Kick-off Meetings**

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Operational Practices

Challenges

- **Resources –** Limitations with identifying, testing and onboarding available qualified personnel
- **Equipment Availability –** Experienced delays in the delivery of trucks and pumps, as well as the need for additional vehicle preparation before fully operation
- **Government Reviews (Aviation Resources) –** The extended government shutdown delayed FAA inspection and issuance of the certifications need for the helicopters

Improvements

- **Resources –** Identified and onboarded 63 field personnel and continuing to build in longer lead time for the employee onboarding
- **Safety and Infrastructure Protection Teams (SIPT) –** Challenges have been worked through and teams are operational

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System Hardening and Resiliency

Installing stronger and more resilient poles and covered power lines across approximately **150 line miles** of highest fire-risk areas

Replacing ~625 non-exempt fuses/cutouts to further reduce risk to our system and tailoring upgrades based on terrain and weather conditions using more granular analysis of fire-prone regions

COMPLETED

75 **LINE MILES**

of **system hardening** out of **150** **(50%)**

DESIGN COMPLETED FOR

625 **NON-EXEMPT FUSES/CUTOUTS**

construction planning underway

Following the wildfires in 2017 and 2018, some of the changes included in this presentation are contemplated as additional precautionary measures intended to further reduce future wildfire risk.

System Hardening and Resiliency

Challenges

- **Permitting –** Delays due to timing of local government and environmental permits
- **Resources –** Limited qualified resources (e.g., Construction, Estimating, Project Management) available to support competing wildfire risk reduction priorities

Improvements

- **Reducing Cycle Times –** Working on parallel paths to clear dependencies alongside design completion
- **Engage with Federal and State Agencies –** Early engagement with key agencies regarding approval and leveraging of programmatic permits
- **Contracting Resources –** Leveraging multiple contracting resources, including estimators, to reduce cycle time and support increase in demand
- **Process Redefined –** Streamlined design preparation of fuses for replacement

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Public Safety Power Shutoff (PSPS)

We **monitor conditions** across our system and evaluate whether to proactively turn off electric lines for safety **when gusty winds and dry conditions combine with a heightened fire risk**

While no single factor will drive a Public Safety Power Shutoff, some factors include:

A RED FLAG WARNING
declared by the National Weather Service

LOW HUMIDITY LEVELS
generally 20% and below

FORECASTED SUSTAINED WINDS GENERALLY ABOVE 25 MPH AND WIND GUSTS IN EXCESS OF APPROXIMATELY 45 MPH, depending on location and site-specific conditions such as temperature, terrain and local climate

CONDITION OF DRY FUEL
on the ground and live vegetation (moisture content)

ON-THE-GROUND, REAL-TIME OBSERVATIONS
from PG&E's Wildfire Safety Operations Center and field observations from PG&E crews

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Public Safety Power Shutoff (PSPS)

Piloting new resilience zones to allow us to provide electricity to central community resources serving local customers during a Public Safety Power Shutoff (PSPS) event; **Construction is underway in Angwin and targeting completion by October**

Installing sectionalizing devices to reduce PSPS impacts to customers where de-energizing the line will not result in a realized wildfire risk reduction

INSTALLED

181 **TOTAL LOCATIONS**

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Public Safety Power Shutoff

Challenges	Improvements
• **Land Rights (Resilience Zones)** • **Change in Design Standard –** Modifications to resilience zone design strategy including undergrounding the majority of distribution conductors resulted in delays in operational readiness • **Advanced PSPS information to Public Safety Partners –** After the June event, PG&E identified lessons learned, such as working together with public safety partners to determine the information needed in advance of and during an event (ex: format of maps)	• **More Advance Coordination with Government Agencies –** To align on optimal resilience zone locations and design • **Improvements Made to PSPS Processes Including Notifications –** Being discussed in further depth through the PSPS OIR

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Additional Technologies and Initiatives

Rapid Earth Fault Current Limiter Pilot Project: Developing pilot project for operational deployment; anticipated for 2020.

Enhanced Wires Down Detection Project: Phase 1 complete; SmartMeter Partial Voltage (PV) alert functionality was deployed on **4.5M single-phase SmartMeters** to provide situational awareness of single-phasing conditions that may indicate the occurrence of a wire-down event. Phase 2 will expand to three-phase SmartMeters.

Post Incident Recovery, Restoration, and Remediation Activities: PG&E's Service Planning department has a dedicated team and documented processes in place to support rebuilds as necessary.

Plan Performance and Evaluation

Quality of Transmission and Distribution Inspections: 98% transmission and 93% distribution

Quality of the Miles of System Hardening HFTD Areas: All miles reported as complete have been 100% quality reviewed and internal audit verified

Vegetation Management Quality Assurance Results in HFTD Areas: ~50% EVM quality performance YTD; 100% of EVM work is being verified, all trees identified as missed or improperly completed will be reworked before miles are reported as complete

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Wildfire Preparedness and Outreach

CITY/COUNTY OUTREACH

888 MEETINGS COMPLETED
with cities, counties, agencies, first responders and participation in community events

287 OUT OF 287 CITIES/ COUNTIES INFORMED about CWSP and PSPS

COMMUNITY RESPONSES

252 RESPONSES TO STAKEHOLDERS
with up to **30** QUESTIONS per response

MAIL/EMAIL SENT

18.8M+
PSPS-RELATED DIRECT MAIL PIECES

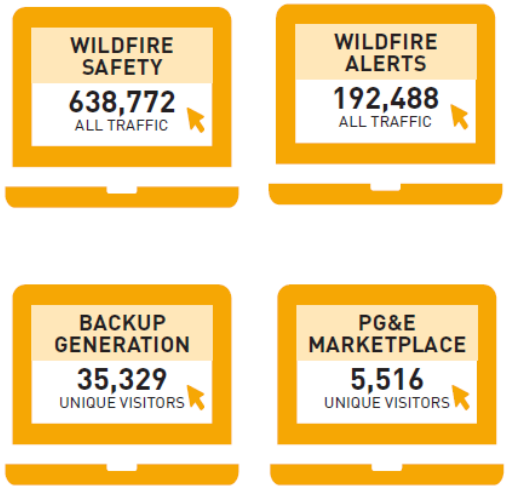
17.7M+
PSPS-RELATED EMAILS

OPEN HOUSE/WEBINARS AND WORKSHOPS

26 OPEN HOUSES/ WEBINARS COMPLETE
~5,340 total attendees

18 WORKSHOPS COMPLETE
~990 total attendees

WEBSITE HITS
(MARCH 2019 TO PRESENT)



CUSTOMER CONTACT UPDATES

226,334
CUSTOMER CONTACT INFO UDPATES

9,987
MEDICAL BASELINE CUSTOMER CONTACT INFO UDPATES

CUSTOMER CONTACT INFORMATION ON FILE

~5.4M
TOTAL CUSTOMER ACCOUNTS

~193,900
TOTAL MEDICAL BASELINE ACCOUNTS

95% PHONE ON FILE

60% EMAIL ON FILE

99.9% CONTACT INFORMATION ON FILE

Note: Additional webinars and workshops are being held with critical service providers, education stakeholders and representatives of Access and Functional Needs communities.

Data as of 8/31

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Lessons Learned

As we begin to develop our wildfire safety plan for 2020, the following are key takeaways from this year that will inform our overall planning.

	Key Takeaways
Prioritization	• Continued need to prioritize across wildfire risk reduction initiatives • Utilizing the "three pillars" as a framework for developing work plan • Aligning plan and initiatives with total resources available
Logistics and Planning	• Build more flexibility into work plan to incorporate lessons learned • Establish a better understanding of available resources at the onset • Factor in external dependencies such as weather, customer refusals and permits • Work with key permitting agencies on opportunities to streamline the process
Benchmarking	• Continue to coordinate with other IOUs and utilities to build on best practices • Continue to leverage experiences throughout the industry (ex: Australia)
Stakeholder Outreach	• Continue broad outreach and engagement campaign regarding wildfire preparedness • Gather and incorporate feedback from communities and stakeholders • Look for opportunities to partner on shared initiatives (ex: defensible space)
Third-Party Partnerships	• Leverage third-party partnerships to develop better statewide forest management practices • Coordinate with environmental agencies re: permitting

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