PG&E Tree Overstrike Workshop

Proposed Implementation of Probation Conditions 11 and 12

April 20, 2021

California Public
Utilities Commission

Agenda

Background	**9:00 am – 9:30 am**
PG&E Proposal	**9:30 am – 11:00 am**
PG&E's Proposed Implementation of Conditions 11 and 12	20 min
Identify and Define Impact Metrics	20 min
Impacts of PG&E's Proposal	20 min
Panelist Q&A	30 min
Communication and Mitigation of Incremental Impacts	**11:00 am – 11:10 am**
Panelist Q&A	**11:10 am – 11:20 am**
Oversight and Evaluation of Tree Overstrike Factor Implementation	**11:20 am – 11:30 am**
Panelist Q&A	**11:30 am – 11:40 am**
Public Comment *(Call in and Press ***1** to make a comment)*	**11:40 am – 1:00 pm**

Background

- PG&E is under ongoing probation stemming from PG&E's felony conviction for its involvement in the deadly 2010 San Bruno gas pipeline explosion.
- As a condition of this ongoing probation, the court may order PG&E to implement new probation conditions 11 and 12, which would require PG&E to de-energize additional distribution lines during Public Safety Power Shutoff (PSPS) events based on the number of trees tall enough to fall on the line (i.e. the *tree overstrike exposure*).
- If ordered, PG&E would implement these conditions for the 2021 fire season, by July 1.
- The CPUC has notified the court about its concern that these conditions would increase the scope and frequency of PSPS.

Workshop Purpose

- The workshop is a forum to present, develop, and comment on PG&E's proposal to fulfill probation conditions 11 and 12.
- These probation conditions are currently proposed; they are not yet ordered by the Federal court.
- PG&E will explain its proposed methodology to implement conditions 11 and 12.
- PG&E will also explain the impacts of this proposed implementation on the estimated size and number of PSPS events.
- Commission Staff will pose questions to PG&E for their response, after which Public Comment will be held at the end of today's agenda.
- Interested parties may serve written comments 5 business days after today's workshop to the 3 Service Lists noticed about this workshop.

Tree Overstrike Workshop

Pacific Gas and Electric Company

April 20, 2021

Background

Evolution of the Public Safety Power Shutoff Program

We are continuing to refine our Public Safety Power Shutoff (PSPS) Program, evolving the scoping process and modifying operations, communications and coordination before, during and after PSPS events.

2018

Launch Community Wildfire Safety and PSPS Programs

- PSPS scope included **Tier 3 distribution lines and low-voltage transmission lines** (potential to impact ~500K total customers)

Key Learning: program scope too limited

2019

Expand PSPS Program Scope

- Expanded PSPS scope to **all distribution and transmission lines in Tier 2/Tier 3 areas**
- **Public awareness campaign** rolled out for more than 5M customers

Key Learning: customer support and event execution must improve

2020

Target PSPS Events to Highest Risk Areas

- Top to bottom re-engineering of entire PSPS operation
- Developed more granular meteorological scoping capabilities
- Developed a structure-by-structure analysis of the transmission system to allow more targeted scoping
- Improved local partnerships and customer support

Key Learning: program must continue to evolve to capture catastrophic wildfire risk

2021

Continuous Improvement & Further Risk Reduction

- Update distribution scoping analysis to further incorporate tree overstrike exposure potential
- Focus on opportunities to support repeatedly impacted customers (e.g., backup power rebates, other offerings)
- Continue to increase resiliency to offer other wildfire risk mitigations in lieu of PSPS

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

Federal Court's Proposed Conditions for PSPS Criteria

EXCERPT FROM PROPOSED CONDITION 11 (2/4/21)

In determining which distribution lines in Tier 2 or Tier 3 to de-energize during a PSPS, PG&E must take into account all information in its possession and in the possession of its contractors and subcontractors concerning the extent to which trees and/or limbs are at risk of falling on those lines in a windstorm. In determining which distribution lines to de-energize during a PSPS event, PG&E will implement this condition by July 1, 2021, by considering the existence of all outstanding vegetation management work tagged "Priority 1" or "Priority 2" within PG&E's service territory that is subject to potential de-energizations. PG&E shall also consider the approximate number of trees tall enough to fall on the line irrespective of the health of the tree and irrespective of whether the tree stands outside or inside prescribed clearances. The latter may be done by simply rating the total approximate number of such tall trees along a line as "None," "Few," "Average" or "Many," and by treating the "Many" category as posing a greater risk than the "Average" category and the "Average" category as posing a greater risk than the "Few" category and so on.

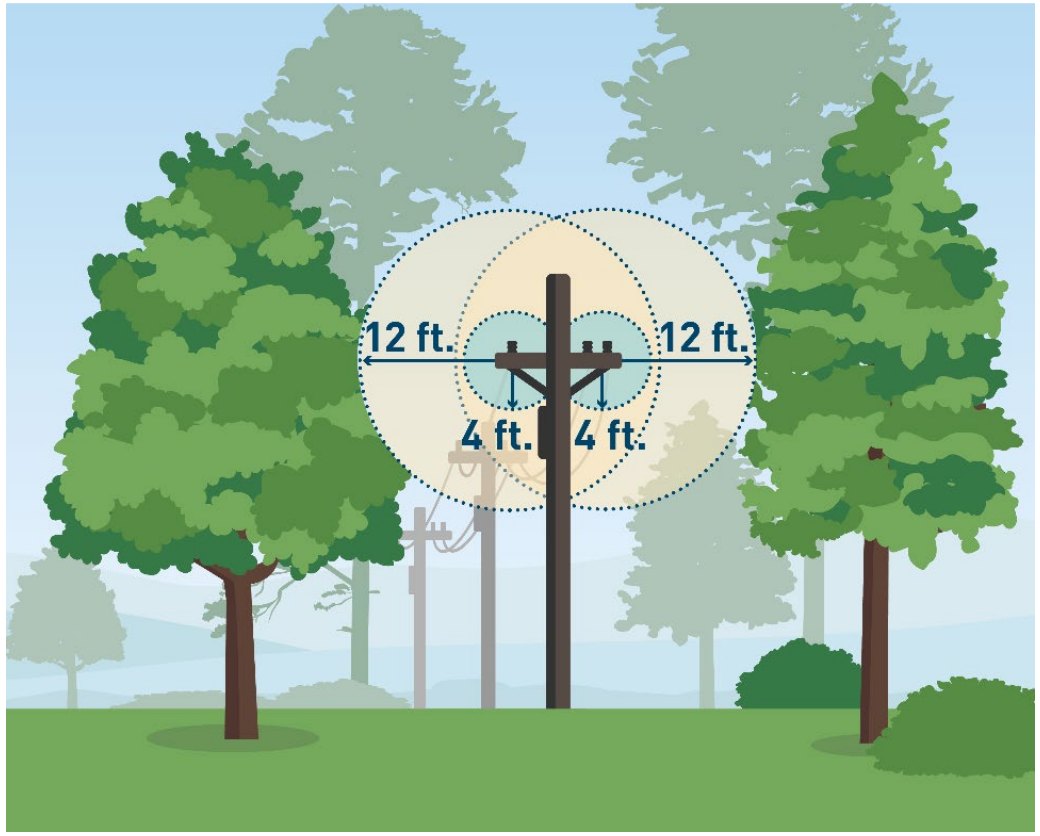
EXCERPT FROM PROPOSED CONDITION 12 (2/4/21)

To the extent that such information shows that such trees and limbs present a safety hazard in the event of a windstorm, PG&E must make a specific determination with respect to that distribution line and it must de-energize it unless PG&E finds in writing that there are specific reasons to believe that no safety issue exists. PG&E will implement this condition by July 1, 2021.

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

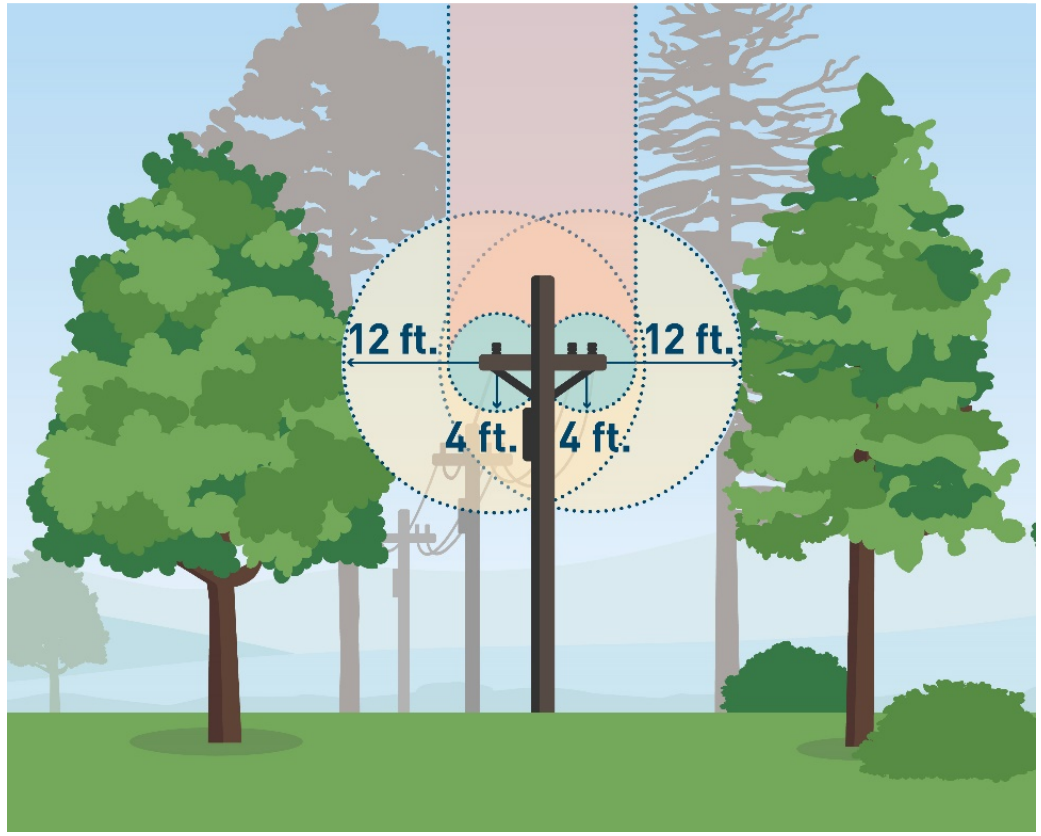
Routine/Enhanced Vegetation Management Around Power Lines

Routine Vegetation Management



Clearing 4 feet around distribution power lines in high fire-threat areas with recommended **minimum clearances of 12 feet** to ensure year-round compliance and assessing trees for hazards.

Enhanced Vegetation Management



Increasing safety clearances between power lines and surrounding vegetation and **assessing trees** with overstrike potential on distribution lines in high fire-threat areas to mitigate higher-risk trees.

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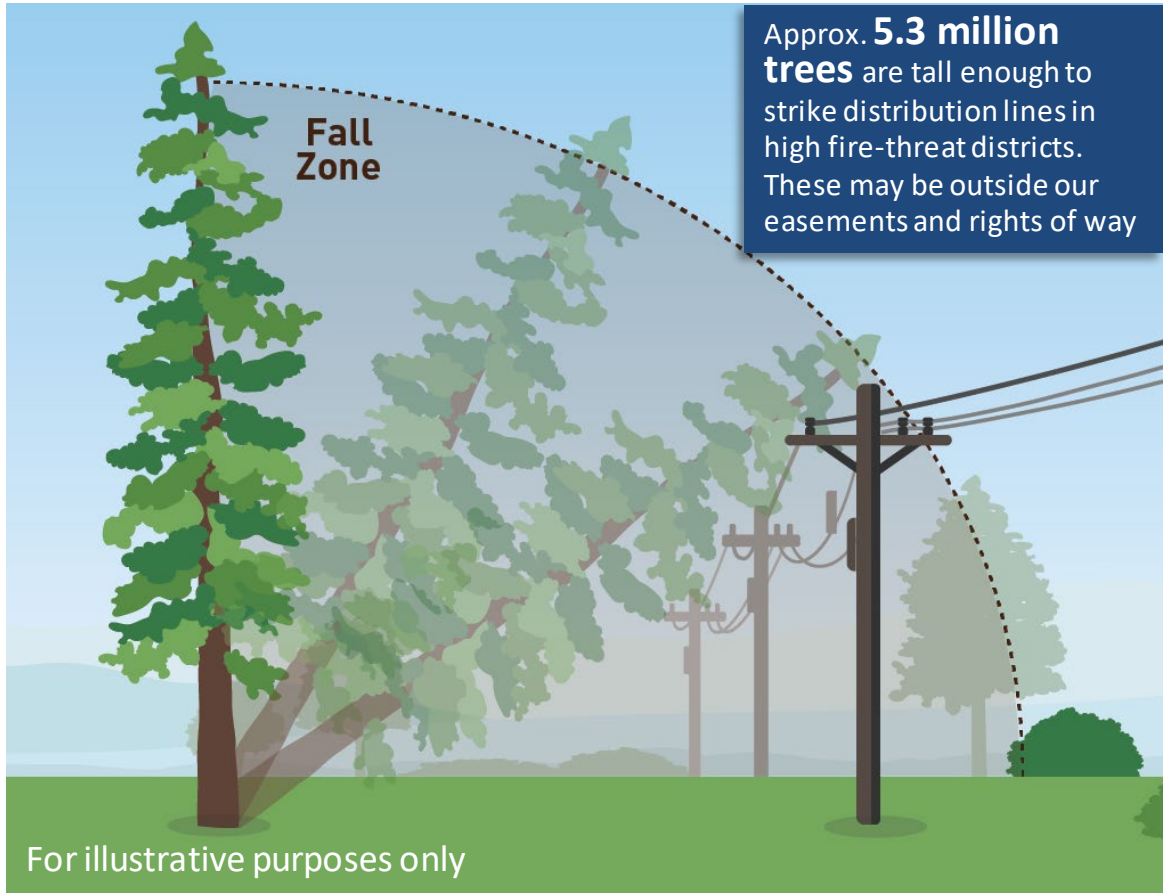
Tree Overstrike Exposure and Potential PSPS Decision-Making

The safety of our customers and communities is our most important responsibility. After last year's wildfire season and the drier than average weather we are experiencing, we have developed proposed additional criteria for our PSPS program, consistent with the proposed conditions of the federal court.

To reduce the risk of major wildfires, PG&E may turn off power on distribution lines* where there are large amounts of trees tall enough to fall into electric lines during severe weather.

- **Customers who live in areas of the highest wildfire risk may experience more frequent PSPS events** compared to last year's weather conditions.
- **We are sharing community-specific information** regarding these potential impacts with customers, cities, counties and tribes.

*Does not include transmission lines (which are considered to be ≥ 60 kV)



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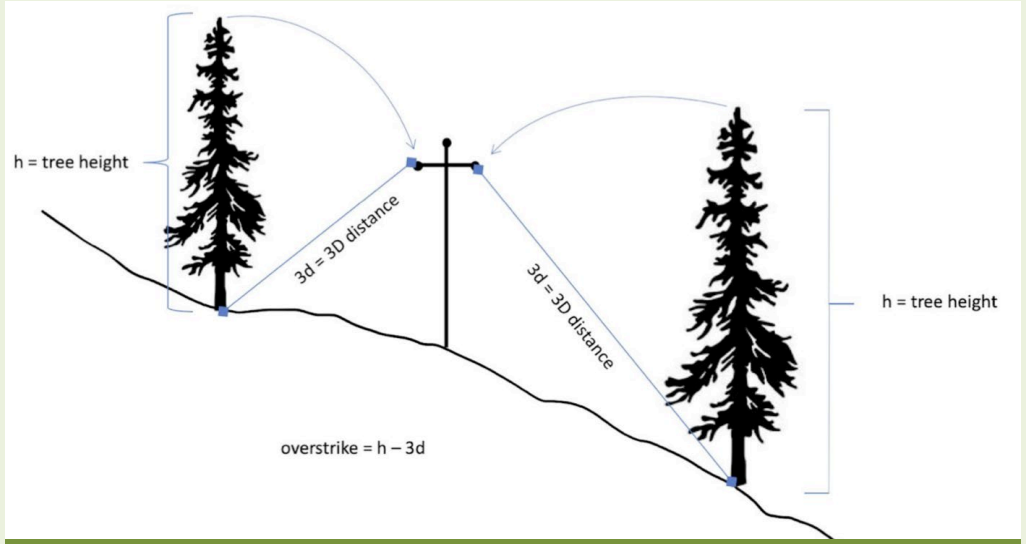
What Trees May Be Covered By the Proposed Criteria

A fall-in tree is a tree that may fall over the nearest wire when measured in 3D distance from the tree ground level to the nearest phase of conductor wire.

The **greater the tree overstrike exposure**, the **greater range of angles the tree could fall at and still hit the line.**

Tree Overstrike = Tree Height - 3D Distance



There are **7.3 million trees detected** through LiDAR in PG&E's HFTD distribution corridors, **of which 5.3 million trees could strike** the line.

70TH PERCENTILE OVERSTRIKE EXPOSURE

Areas with a higher aggregate amount of tree overstrike exposure potential.

PRIORITY 1 TREES

- In contact or showing signs of previous contact with a primary conductor;
- Actively failing or at immediate risk of failing and which could strike PG&E's facilities; or
- Presenting an immediate risk to PG&E's facilities

Priority 1 trees must be addressed within 24 hours

PRIORITY 2 TREES

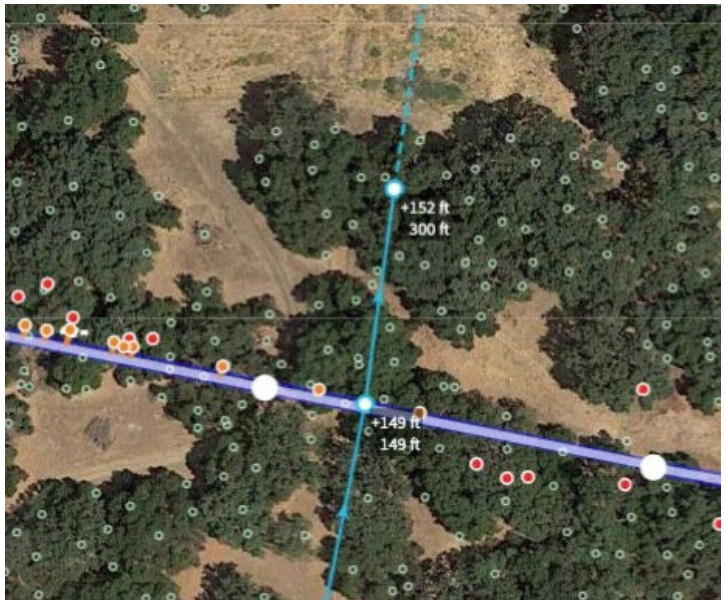
- Encroached within the PG&E minimum clearance requirements; or
- Having any other identifiable potential safety issues, including the ability to strike PG&E facilities, requiring expedited work

Priority 2 trees must be addressed within 30 days

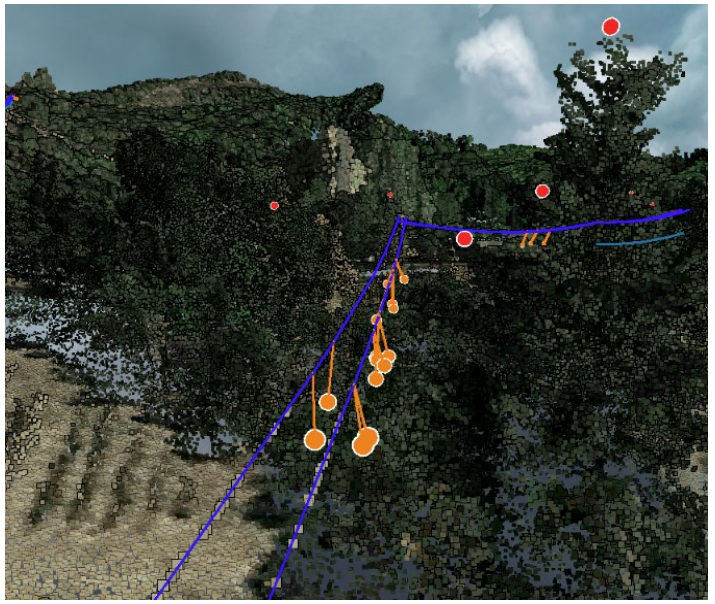
Some of the measures included in this presentation are contemplated as additional precautionary measures intended to further reduce the risk of wildfires.

How is Overstrike Exposure Being Assessed?

LiDAR data was collected in 2019 and early 2020 for all ~25,000 line miles of distribution circuit corridors in high fire-threat districts (HFTDs).



LiDAR generally **covers 150ft** for both sides of the utility corridor (typically ~500ft captured).

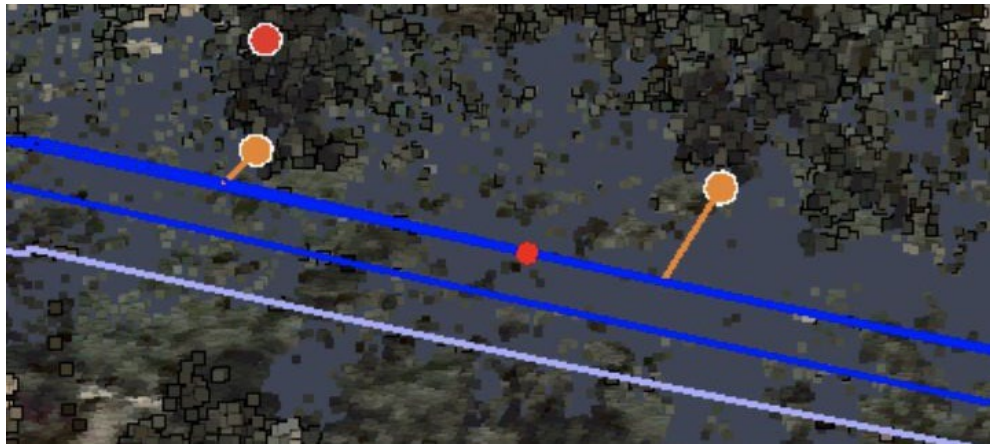


LiDAR point cloud rendering with **red dots marking fall-in treetop detects**, and orange dots marking detects of radial clearance vectors of nearest vegetation point to nearest line.

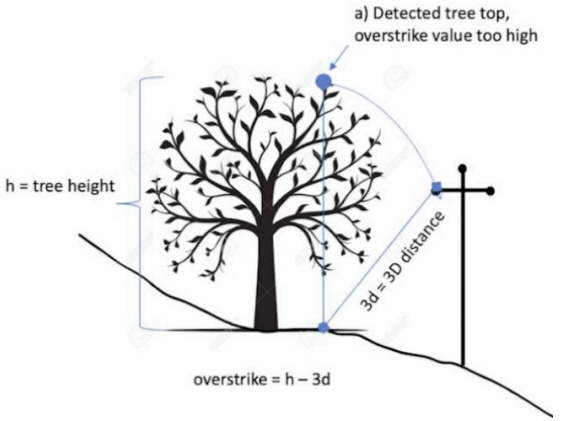
Some of the measures included in this presentation are contemplated as additional precautionary measures intended to further reduce the risk of wildfires.

LiDAR Review of Dense Tree Canopies

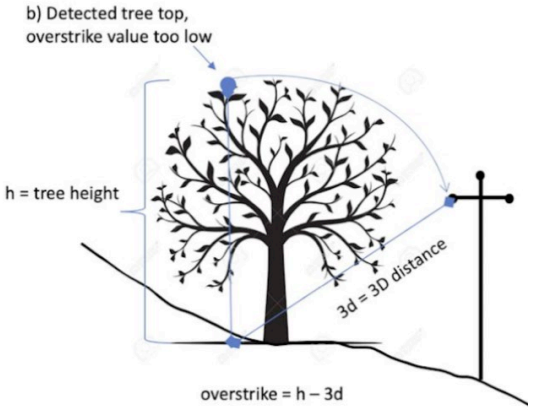
Aerial LiDAR data is a sophisticated tool that we can use to measure the three-dimensional distance between trees and power lines. In certain instances of dense tree canopies, the analysis may overestimate or underestimate overstrike exposure potential.



Detection of tree trunks from aerial LiDAR under tree canopies can be challenging to identify accurately due to point cloud data, **so trees are detected through their treetops**.



Tree top could be **detected closer** to wire compared to the actual tree trunk which **over-estimates overstrike.**



Tree top could be detected **further from** wire compared to the actual tree trunk, which **under-estimates overstrike**.

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PG&E Proposal

Identifying Potential Wildfire Risks When Considering PSPS

The Fire Potential Index (FPI) is a key factor in the PSPS decision-making process.

Datasets included in current FPI:

- PG&E 30-year weather and fuels climatology
- Fire occurrence dataset from USFS: 1992 – 2018

Analysis / Results of current FPI:

- Benchmarked FPI against agencies and utility best-practices
- Evaluated dozens of parameters to determine best predictors of large fires
- Constructed over 4,000 FPI models for accuracy evaluation

PG&E's Utility FPI

Outputs the probability of observing a large fire based on weather, fuel moisture and land-type

Weather

- Wind Speed
- Temperature
- Relative Humidity

+

Fuels

- Dead Fuel Moisture
- Live Fuel Moisture

+

Land Type

- Forest
- Shrub/Brush
- Grass

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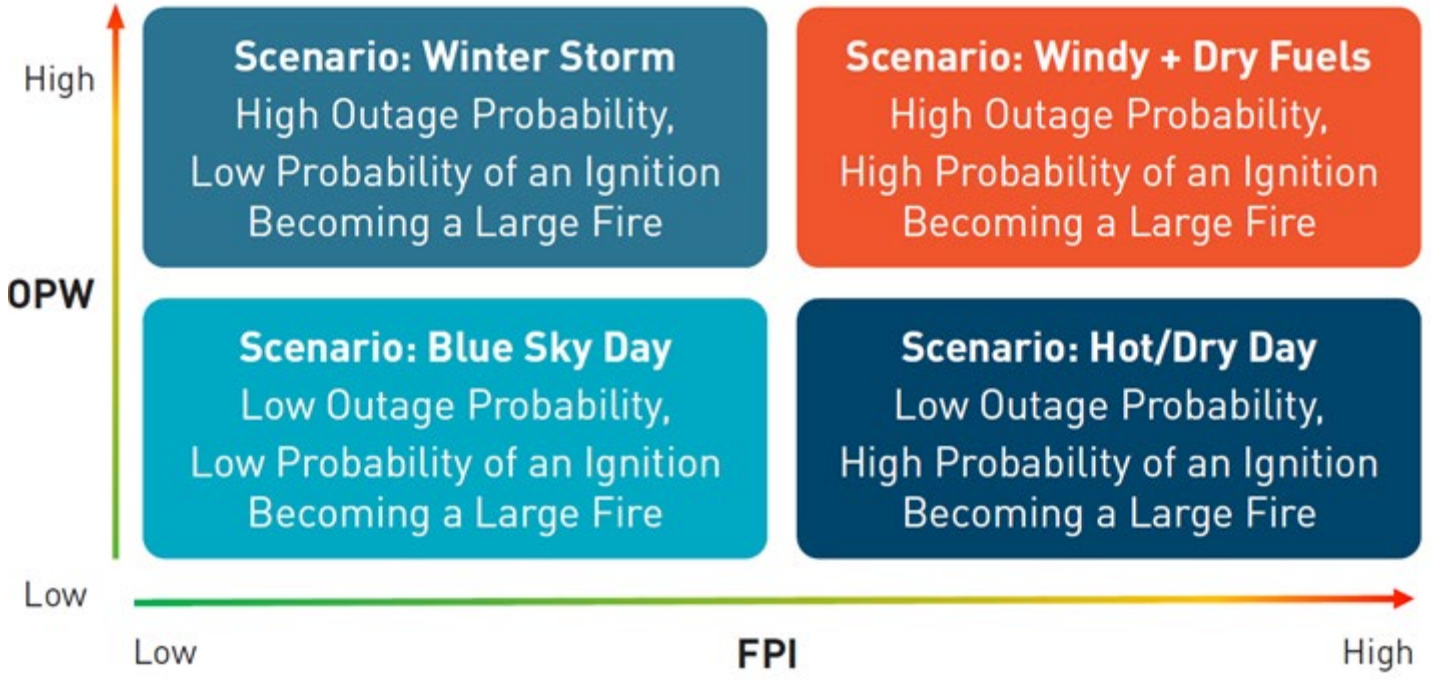
General PSPS Decision-Making Criteria

We use FPI in unison with an Outage Producing Winds (OPW) model to analyze weather, outage potential and fuel drivers to identify conditions that could lead to catastrophic wildfires.

PG&E's Distribution Large Fire Probability (LFP) Model:

OPW 2.0
Probability of Outages (sustained and momentary)

FPI
Probability of Large Fire (weather + fuels + land type)



Note: Similar model for transmission that combines FPI and Operability Assessment (OA)

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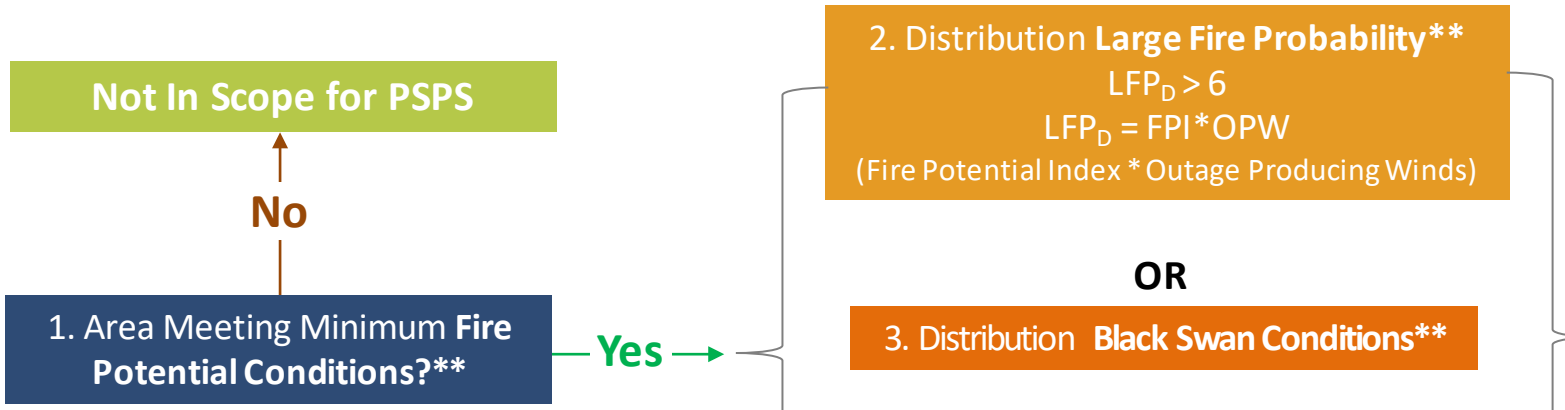
Implementation of Proposed 2021 PSPS Decision-Making Process

Distribution PSPS scope is proposed to follow the decision-making diagram below with the additional PSPS criteria under consideration shown in Box 4 in blue.



1. Minimum Fire Potential Conditions (FPI)**

Logic	Variable	Sign	Value
&	Fire Potential Index (FPI)	>	0.2
&	Sustained Wind Speed mph	>	20
&	Dead Fuel Moisture (DFM) 10hr	<	9%
&	Dead Fuel Moisture (DFM) 100hr	<	11%
&	Dead Fuel Moisture (DFM) 1000hr	<	11%
&	Relative Humidity (RH)	<	30%

3. Distribution Black Swan Conditions**

Logic	Variable	Sign	Value
&	Fire Potential Index (FPI)	>	0.3
&	Sustained Wind Speed mph	>	30
&	Dead Fuel Moisture (DFM) 10hr	<	9%
&	Dead Fuel Moisture (DFM) 100hr	<	11%
&	Dead Fuel Moisture (DFM) 1000hr	<	11%
&	Relative Humidity (RH)	<	20%

* Note: Direct vegetation considerations were not part of 2020 Distribution PSPS decision criteria.
** Note: May be revised based on cont. 2021 studies (t.b.d.)

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Identifying Potential PSPS Impact Metrics

PG&E studied 11 years of weather data from 2010 to 2020 to analyze the potential impact of the proposed criteria. The study found:

- **Reduced risk** of catastrophic wildfires
- **Additional PSPS events**, increased customers impacted and increased event duration
- **Customer impacts** are higher for smaller events and smaller for larger events

Potential Customer Impacts	BASELINE	WITH PROPOSED CRITERIA	INCREASE
Event **Frequency**	~3 events per year	~5 events per year	**61%**
Average Event **Duration** (excludes restoration time)	~24 hours	~29 hours	**18%**
Average Event **Customer Count***	~98K customers	~125K customers	**28%**
Largest Event **Customer Count***	~345K customers	~368K customers	**6%**

***Customer counts** are distribution service points and are estimated at **circuit level,** and do not include customer impacts from Transmission PSPS.*

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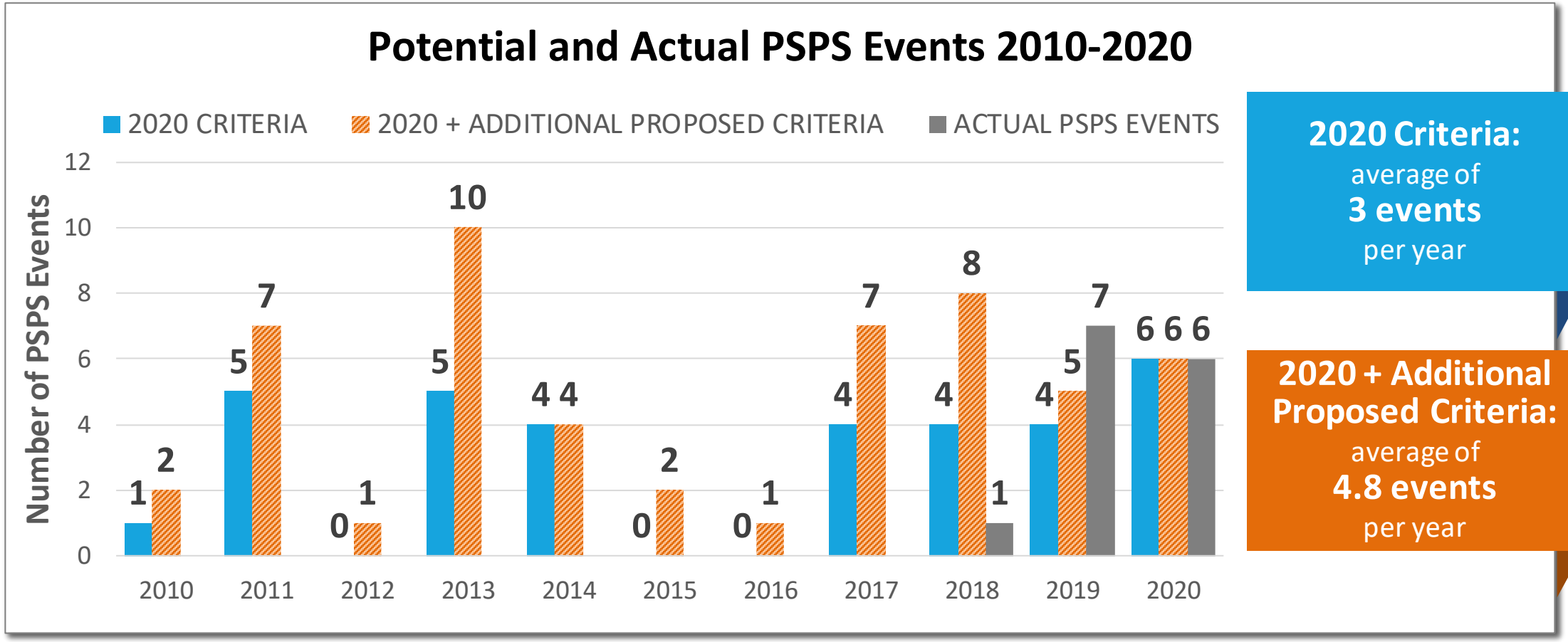
PSPS Lookback Utilizing Proposed Criteria – Systemwide

The chart below uses 11 years of weather data to show the number of potential PSPS events based on 2020 PSPS criteria compared to the additional proposed criteria.

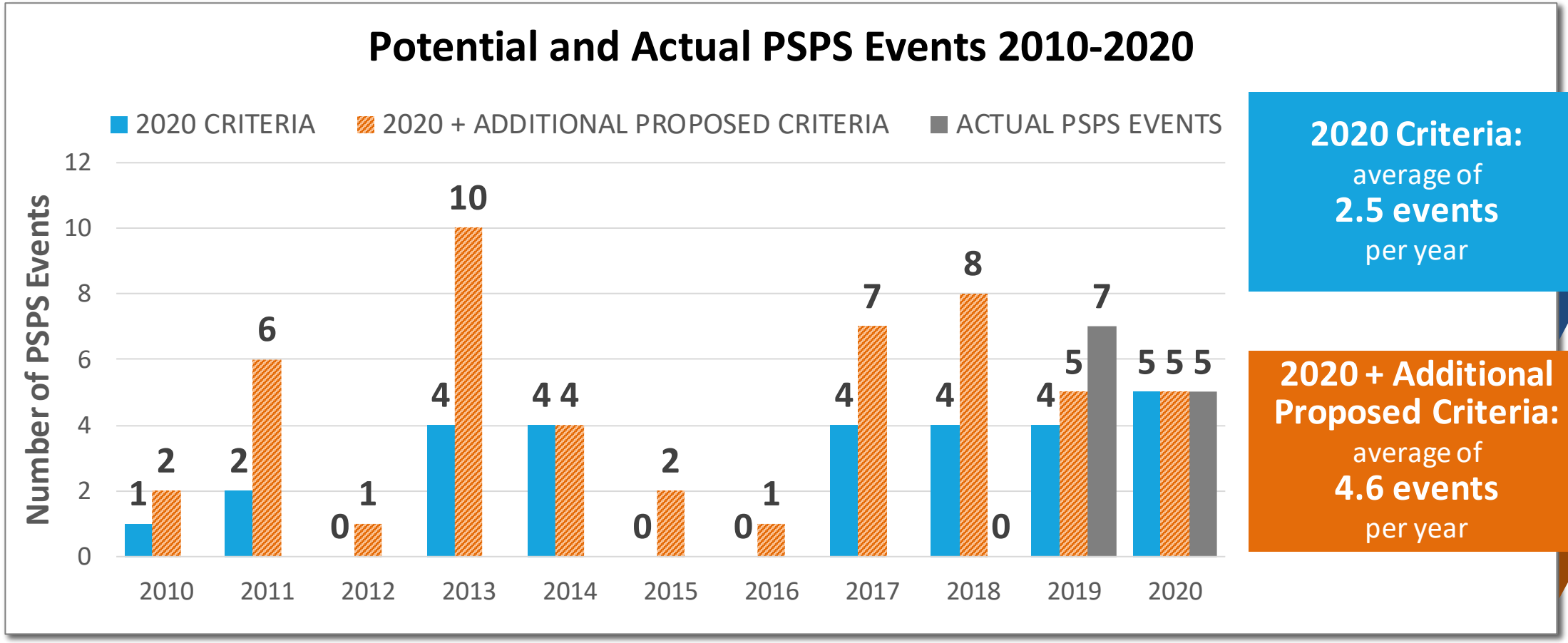


Note: This information is for planning purposes only and additional data analysis is underway. Future events will be dependent on weather conditions.

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

PSPS Lookback Utilizing Proposed Criteria – Butte County

As an example, the following chart shows what these proposed criteria could mean for Butte County.



Note: This information is for planning purposes only and additional data analysis is underway. Future events will be dependent on weather conditions.

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

Staff Q&A

Commission Staff will direct questions to PG&E for response.

Communication and Mitigation of Incremental Impacts

Communicating Potential Impacts to Customers and Communities

Customers and Partners

- Public Safety Town Halls
- Customer Wildfire Safety Webinars
- Information sharing with community-based organizations
- Regional and statewide Access and Functional Needs (AFN) Council meetings & AFN webinars
- Social media (Twitter, Next Door, Instagram, Facebook)
- Large commercial customer/critical facility briefings
- Industry-specific informational webinars

Agencies and Tribes

- Emergency Manager Coordination Meetings
- Regional Working Groups
- Emergency Manager Advisory Committee
- Ongoing Stakeholder Meetings
  - Cities
  - Counties
  - Tribes
  - Critical facilities
  - Telecoms

Note: Details on the proposed conditions are being added to the PSPS outreach efforts already underway

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

Customer Support Programs to Reduce PSPS Impacts

We are planning to integrate proposed criteria into existing customer support strategies and programs while expanding coverage and resources.

PROGRAM	2021 TARGET	ADDITIONAL INCREMENTAL IMPROVEMENTS
Community-Based Organization Partnerships	▪ 35+ additional CBOs targeted	▪ **Targeting additional CBOs in more heavily impacted areas** ▪ **Working with resource partners to prepare for additional customer support**
Food Resource Partnerships	▪ Meal replacement options for customers in 46 counties ▪ 10 new partnerships	▪ **Completing gap analysis to inform the need for additional partnerships**
Portable Batteries	▪ ~11,500 batteries available	▪ **Covering all interested low-income Medical Baseline customers in high fire-threat areas**
Community Resource Centers	▪ Targeting 370 total ADA-accessible sites ▪ Locations in partnership with county and tribal agencies	▪ **Preparing for additional deployment due to increased event frequency**
Well Water Rebates	▪ Continue well water rebate pilot program	▪ **Expand program promotion in areas likely to see higher event impacts**

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Staff Q&A

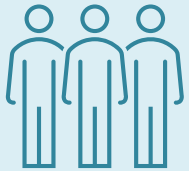
Commission Staff will direct questions to PG&E for response.

Oversight and Evaluation of Tree Overstrike Factor Implementation

PSPS Event Reporting and Proposed Condition Metrics

To help determine the effectiveness of the proposed conditions, we will include additional information about any circuit section pulled into scope due to the proposed conditions as part of our post-season reporting to the CPUC.

This includes:



Number of customers impacted

Customer impact frequency

Customer impact duration

Damages/hazards found

We would like to work with the Commission on the most appropriate metrics and reporting timing for the proposed conditions.

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Staff Q&A

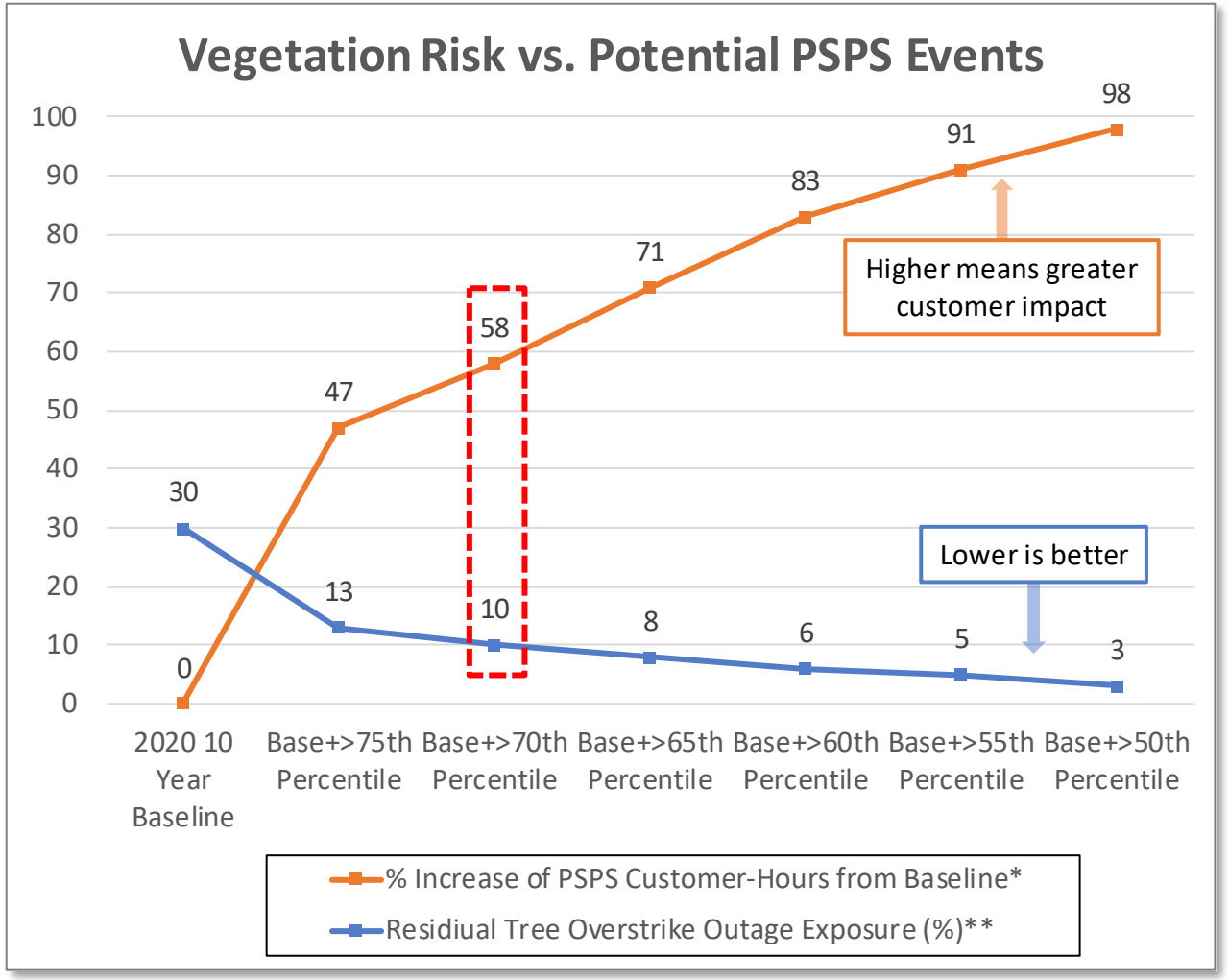
Commission Staff will direct questions to PG&E for response.

Appendix

Risk Analysis of Potential Overstrike Trees

For each step down in the scenarios of a 10-year study (2010-2019) from the 2020 Base Line to the >50th Percentile shows:

- **Diminishing rate** of additional HFTD vegetation caused outages captured
- **Additional PSPS events**, increased customers impacted and increased event duration
- **Percentage increase in event duration and customer impacts** is higher for smaller events, with less percentage increase for the largest events



* Customer-Hours impacted is based on event duration multiplied by the customer count for each event and then summed across all events to calculated total customer-hours.
** % Residual of HFTD Vegetation Caused Outages 2008-2020, based on outages not captured by >70th percentile OPW with input sustained wind speed of 20mph and net new cells greater than respective percentile tree overstrike.

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PG&E's Proposed Modifications to Condition 11

Response to Court's Post-Hearing Additional Request for Condition 11

(3/29/21)

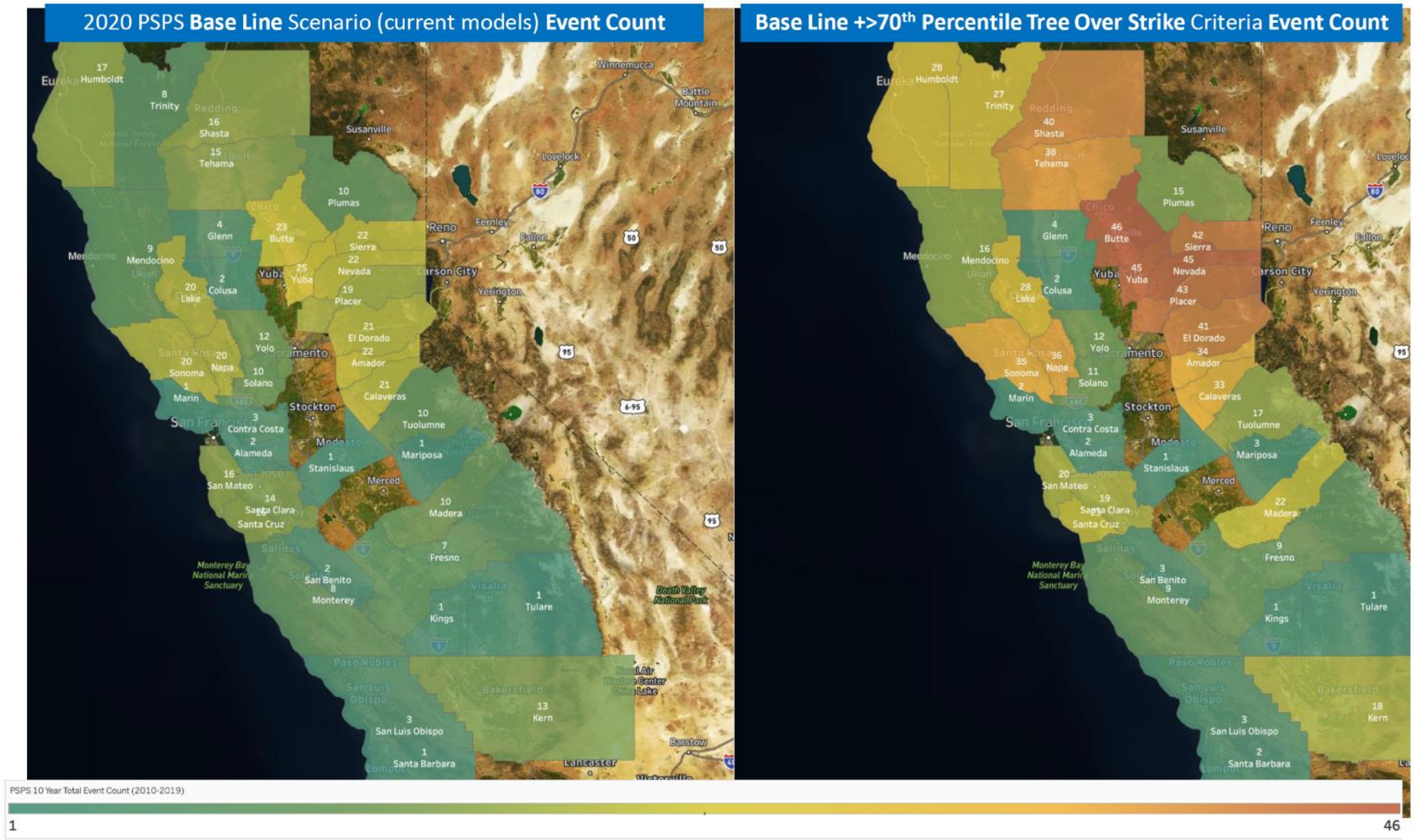
. . . . In determining which distribution lines to de-energize during a PSPS event, PG&E will implement this condition by July 1, 2021, by considering the existence of all outstanding vegetation management work tagged Priority 1 or Priority 2 within PG&E's service territory that is subject to potential de-energizations and which is forecast to satisfy PG&E's minimum fire potential conditions. [Subject to the approval of the California Public Utilities Commission,] PG&E shall also consider the approximate number of trees tall enough to fall on the line by using LiDAR, or other remote sensing and data-capture methods, to approximate the relative amount of tree-overstrike exposure in areas that are subject to potential de-energizations and forecast to satisfy PG&E's minimum fire potential conditions and, in particular, by considering whether the area is in the 70th percentile or greater of tree-overstrike exposure as compared with other areas subject to potential de-energization. ~~*irrespective of the health of the tree and irrespective of whether the tree stands outside or inside prescribed clearances. The latter may be done by simply rating the total approximate number of such tall trees along a line as 'None,' 'Few,' 'Average' or 'Many,' and by treating the 'Many' category as posing a greater risk than the 'Average' category and the 'Average' category as posing a greater risk than the 'Few' category and so on.*~~

NOTE: *Text shown is PG&E's proposed clarifications to Condition 11 that are being considered by the federal court and are not final.*

Potential Impacts of Proposed Criteria by County

County 10 Year Event Count

County	Version baseli	70th..
Butte	23	46
Yuba	25	45
Nevada	22	45
Placer	19	43
Sierra	22	42
El Dorado	21	41
Shasta	16	40
Tehama	15	38
Napa	20	36
Sonoma	20	35
Amador	22	34
Calaveras	21	33
Lake	20	28
Humboldt	17	28
Trinity	8	27
Santa Cruz	16	23
Madera	10	22
San Mateo	16	20
Santa Clara	14	19
Kern	13	18
Tuolumne	10	17
Mendocino	9	16
Plumas	10	15
Yolo	12	12
Solano	10	11
Monterey	8	9
Fresno	7	9
Glenn	4	4
San Luis Obispo	3	3
San Benito	2	3
Mariposa	1	3
Contra Costa	3	3
Santa Barbara	1	2
Marin	1	2
Colusa	2	2
Alameda	2	2
Tulare	1	1
Stanislaus	1	1
Kings	1	1



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Public Comment

Call in at 1-800-857-1917, *and press* ***1*** *to make a comment*

Written Comment

Stakeholders may send written comment by serving the 3 Service Lists:

- *R.18-12-005;*
- *R.18-10-007;*
- *I.19-11-013.*

by 5:00pm April 27, 2021.

https://ia.cpuc.ca.gov/servicelists/sl_index.htm