PACIFIC GAS AND ELECTRIC COMPANY

RESPONSE OF PACIFIC GAS AND ELECTRIC COMPANY TO ENERGY SAFETY REMEDY PG&E-21-29 AND CHANGE ORDER REPORT

SEPTEMBER 30, 2021

Response to Remedy PG&E-21-29 Per Office of Energy Infrastructure Safety (OEIS) Action Statement on 2021 Wildfire Mitigation Plan (WMP)

Utility #: PG&E-21-29

Issue Title:

PSPS targets and projections set to expire

Issue Description:

Pacific Gas and Electric Company (PG&E or the Company) states that its Public Safety Power Shutoff (PSPS) approach will likely change in August 2021. When PG&E updates its approach, the PSPS targets and projections presented in its WMP Update and Revision Notice response will become obsolete.

Remedies Required and Alternative Timeline if Applicable:

As soon as practicable, and no later than September 30, 2021, PG&E must submit a Change Order Report:

1) *Describing in full and complete detail its updated PSPS protocols.*
2) *Showing how its updated PSPS protocols affect PSPS projections (Table 11).*
3) *Showing how its updated PSPS protocols affect all quantitative and qualitative target for reducing the scale, scope, and frequency of PSPS.*
4) *Meeting all requirements for a Change Order Report set out in Section 7 of this Action Statement.*

Introduction to PG&E-21-29 Response:

In Sections 8.2.2 and 8.2.6 of our Revised 2021 WMP submitted on June 3, 2021, we outlined our tactical and decision-making protocols for initiating PSPS de-energization events.[1] In the Revised 2021 WMP, we explained that, at that time, we were continuing to evaluate and improve the models and protocols that we use to inform PSPS decisions and described the 2020 PSPS Protocols Plus Tree Overstrike Criteria Potential and Priority Tags, which were the Distribution protocols deployed at the time.[2]

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1 See Revised 2021 WMP, p. 950 (Section 8.2.2) and p. 978 (Section 8.2.6).

2 Revised 2021 WMP, pp. 979-982.

In August 2021, we completed the development of our 2021 PSPS Protocols and discontinued using the 2020 PSPS Protocols Plus Tree Overstrike Criteria Potential and Priority Tags. Therefore, as of August 2021, we are using the updated 2021 PSPS Protocols to assess PSPS events.

In the Revised 2021 WMP, we were describing our PSPS Distribution Protocols, which were referred to as "PSPS Protocols." However, in September 2021, we also completed the development of our 2021 PSPS Transmission Protocols. In our response to Remedy PG&E-21-29, we will address both the 2021 PSPS Distribution and Transmission Protocols and refer to them jointly as the "2021 PSPS Protocols." Whenever we address just a subset of the protocols (i.e., Distribution or Transmission) we will specify this subset as either the 2021 PSPS Protocols (Distribution) or the 2021 PSPS Protocols (Transmission).

For clarity, we are also providing in Table PG&E-Remedy-21-29-1 below the naming convention that we will use for each of these protocols and the time periods that protocols were or that we expect the protocols to be in effect.

TABLE PG&E-REMEDY-21-29-1:
PSPS PROTOCOLS AND TIME PERIOD IN EFFECT

PSPS Protocol Name	Time Period in Effect
2020 PSPS Protocols	June 2020 – May 2021
2020 PSPS Protocols Plus Tree Overstrike Potential and Priority Tags[(a)]	May 2021 – August 2021
2021 PSPS Protocols	
• 2021 PSPS Protocols (Distribution)	August 2021 – Fall 2022
• 2021 PSPS Protocols (Transmission)	September 2021 – Fall 2022

(a) The update on the 2020 PSPS Protocols Plus Tree Overstrike Potential and Priority Tags was associated with the 2020 PSPS Distribution protocols.

As part of our PSPS continuous improvement process, PG&E plans to develop 2022 PSPS Protocols in early 2022 and operationalize them in advance of the 2022 PSPS season.

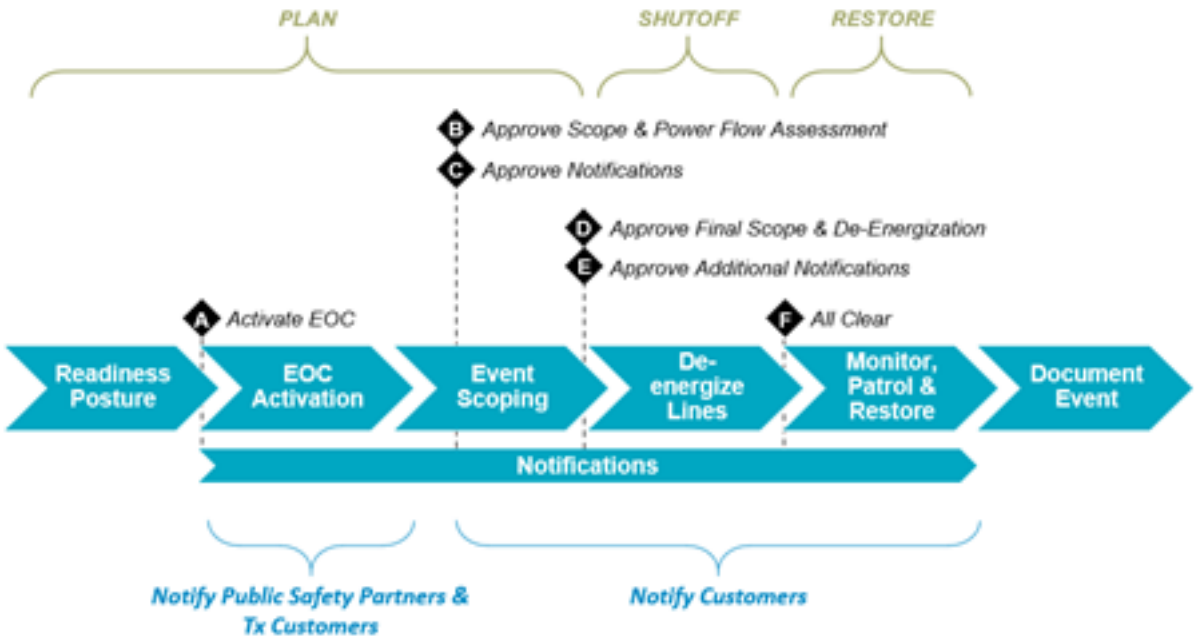
In the remainder of this response to Remedy PG&E-21-29, we will focus on describing the 2021 PSPS Protocols and providing the requested information, including information for a Change Order.

1. 2021 PSPS Process and Protocols Description

1.1. 2021 PSPS Preparation and Scoping Process

This section provides an overview of the process for determining when to initiate a PSPS event under the 2021 PSPS Protocols. Figure PG&E-Remedy-21-29-1 provides a high-level overview of the process to prepare for and conduct a PSPS event.

FIGURE PG&E-REMEDY-21-29-1:
PG&E'S HIGH LEVEL PSPS PROCESS STEPS



PG&E considers implementing a PSPS event when the combination of strong, gusty winds and critically low humidity and fuel moisture levels lies over areas with dry vegetative fuel loads, creating a high risk that vegetation blown into a power line or a spark from a power line could cause an ignition that could lead to a catastrophic wildfire.

Assessments begin several days before the weather event is forecasted to take place. PG&E identifies the weather conditions that could create severe fire risk using high-resolution internal and external weather forecasting models, as well as data from federal agencies. As part of this process, we use external forecasting services and sources, including the European Center for Medium-Range Weather Forecasts (ECMWF), the Global Forecast System (GFS), the Northern and Southern Operations Predictive Services, and the National Weather Service (NWS). Our thresholds and guidance for identifying critical fire risk are determined by analyzing three decades of

historical weather data in and around California combined with key external partnerships and extensive academic research.

No single factor drives the determination that a PSPS is necessary, as each situation is dynamic and unique. The main drivers considered for PSPS events under the 2021 PSPS Protocols are described below. External forecast information from the NWS (e.g., Red Flag Warnings (RFW)) and other forecast agencies is examined carefully; furthermore, PG&E coordinates with these agencies during high-risk periods to ultimately decide to de-energize portions of the grid for public safety.

1.2. Overview of 2021 PSPS Protocols

The 2021 PSPS Protocols include enhancements to our Outage Producing Wind (OPW) Model, our Fire Potential Index (FPI) Model, and the integration of Technosylva Fire modeling into our PSPS Protocols. In addition to the model enhancements described above, the 2021 PSPS Protocols also incorporate tree overstrike and high-risk vegetation and asset tags.

FPI Model Enhancements:

To understand the potential for large and catastrophic fires to occur across the PG&E service territory, we first developed the FPI in 2015 and have enhanced the model several times. From 2015 to 2021, we evaluated new features, new datasets and new model configurations with the goal of improving FPI predictions. The 2021 FPI Model combines fire weather parameters (wind speed, temperature, and vapor pressure deficit); dead and live fuel moisture data; and topography and fuel type data to predict the probability of large and/or catastrophic fires. The 2021 FPI Model was trained on an enhanced fire occurrence dataset that combines agency fire information with sub-daily growth from satellite fire detections. We partnered with Sonoma Technology, Inc. to build this enhanced dataset. This was an important development as we can correlate fire growth in sub-daily timeframes to environmental data. Data scientists, meteorologists, and fire scientists tested dozens of new model features for the 2021 FPI Model and various model configurations and types. Among the model-types tested were logistic regression and multiple machine-learning models. Model results were tested using a train-test split ratio of 70 percent-30 percent. This involved training the model with 70 percent of the input data and testing predictions with the remaining 30 percent of fires. We ultimately chose a Balanced Random Forest Classification Machine Learning model for the 2021 FPI Model based on model performance. The

2021 FPI Model has been significantly enhanced with Machine Learning capabilities, environmental and fire occurrence datasets through 2020, new model features, and an enhanced fire occurrence dataset.

OPW Model Enhancements:

The OPW Model forecasts the probability of a wind-driven outage on our system based on forecast windspeeds for each grid cell associated with our distribution lines for every hour of a forecast. As we explained in the Revised 2021 WMP,[3] we recalibrated our OPW Model using the 2km climatology extended to capture outage events in 2020. In the 2021 PSPS Protocols, the OPW output is also enhanced to produce an Ignition Probability using historical outages and ignitions in our service area. This new ignition model is called the Ignition Probability Weather (IPW) Model. Utilizing the IPW Model further helps PG&E pinpoint the areas where the probability of ignition is greatest. When modeled with the 2021 FPI Model, we can more accurately pinpoint the areas of greatest fire risk. In addition, we incorporated tree overstrike risk directly into the IPW Model to further inform vegetation-based outage risk and increase the model's efficacy.

Integration of Technosylva Fire Spread Modeling:

After testing fire spread simulations across historical and forecast time-horizons, we added Technosylva fire spread outputs into the 2021 PSPS Protocols. Utilizing Technosylva Fire Spread Modeling allows us to review millions of simulated ignitions to identify the areas where the risk of an ignition growing into a catastrophic wildfire is greatest. In addition, bringing in a third-party vendor to help produce PG&E's PSPS scope allows us to highlight areas where the models do and do not overlap for forecast corroboration and additional insights.

Incorporation of Tree Overstrike:

Overstrike is defined by the amount of timber in which one tree could strike our lines. For example, a taller tree next to our lines would have a higher amount of overstrike than a shorter tree in the same location. This is a function of the Tree Height minus the 3D distance (shortest path from tree to conductor) as illustrated in Figure PG&E-Remedy-21-29-2 below. As discussed in Sections 8.2.2 and 8.2.6 of the Revised 2021 WMP, PG&E worked to further integrate Tree Overstrike as a part of our

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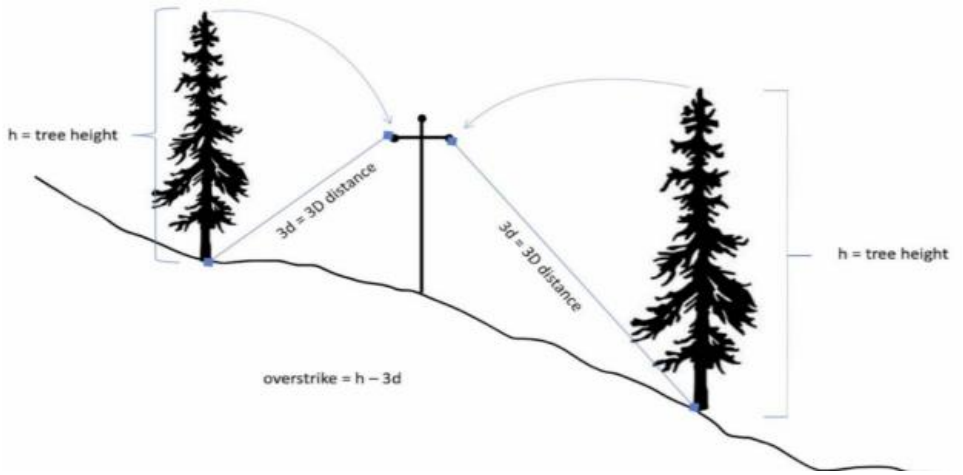
3 Revised 2021 WMP, p. 983.

2021 PSPS Protocols (Distribution). Instead of incorporating areas that surpass 70 percent of tree overstrike risk, our 2021 PSPS Protocols (Distribution) now utilize a machine learning model to integrate overstrike directly into our IPW Model. Using a machine learning model helps us more accurately incorporate the risk by analyzing risk posed by the approximately 150 million feet of overstrike in PG&E's service territory at 2x2 km area.

FIGURE PG&E-REMEDY-21-29-2:
DIAGRAM SHOWING TREE OVERSTRIKE POTENTIAL
AS A FUNCTION OF TREE HEIGHT MINUS 3D DISTANCE



Incorporation of High-Risk Vegetation and Asset Tags:

Similar to our 2020 PSPS Protocols plus Tree Overstrike Potential and Priority Tags, our 2021 PSPS Protocols (Distribution) have continued to incorporate any Priority 1 or Priority 2 tree tags[4] that meet our Minimum Fire Potential Conditions (mFPC). In addition to Priority Tags, we are also including any circuits with high-risk compliance tags that meet our mFPCs as part of our PSPS. Figure PG&E-Remedy-21-29-3 below shows a schematic of our current Vegetation and Asset Hazard Considerations.

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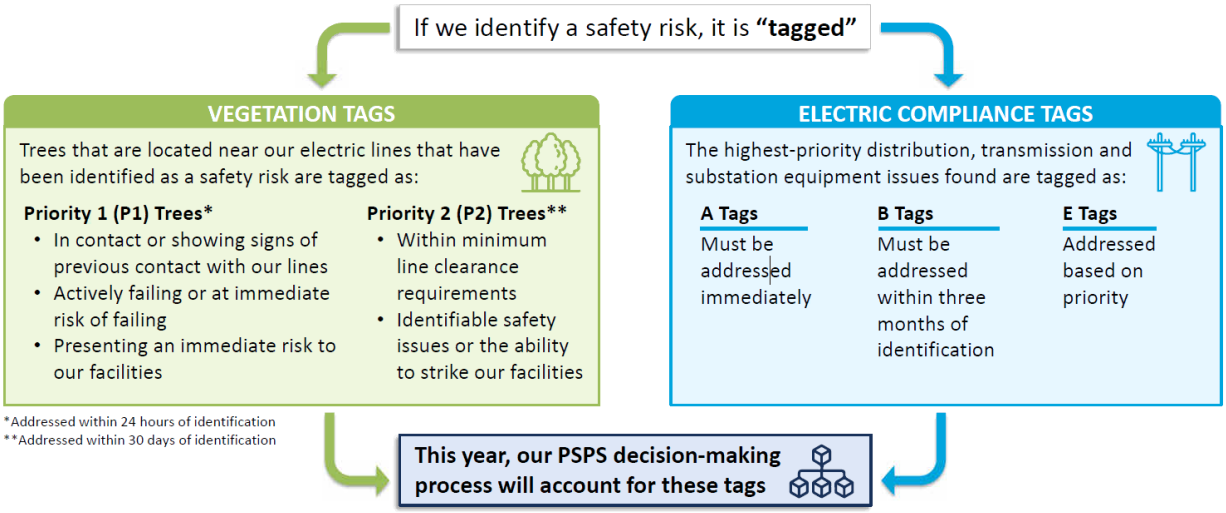
4 "Priority 1" and "Priority 2" vegetation tags are created when trained vegetation inspectors identify trees or limbs that currently present elevated risk and must be worked on an expedited basis. Inspectors use Priority 1 tags for vegetation: (1) in contact or showing signs of previous contact with a primary conductor; (2) actively failing or at immediate risk of failing and which could strike PG&E's facilities; or (3) presenting an immediate risk to PG&E's facilities. Inspectors use Priority 2 tags for vegetation that does not rise to the level of Priority 1 but has encroached within the PG&E minimum clearance requirements or has an identifiable potential safety issue requiring expedited work.

FIGURE PG&E-REMEDY-21-29-3:
VEGETATION AND ASSET HAZARD CONSIDERATIONS



In the following part of this section, we describe the 2021 PSPS Protocols (Distribution) and 2021 PSPS Protocols (Transmission) followed by our PSPS process once the Distribution and Transmission event scope has been defined.

1.3. 2021 PSPS Protocols (Distribution)

This section describes the 2021 PSPS Protocols for the distribution system. There are three key inputs of meteorological and fuels analysis to determine minimum PSPS criteria for the distribution system:

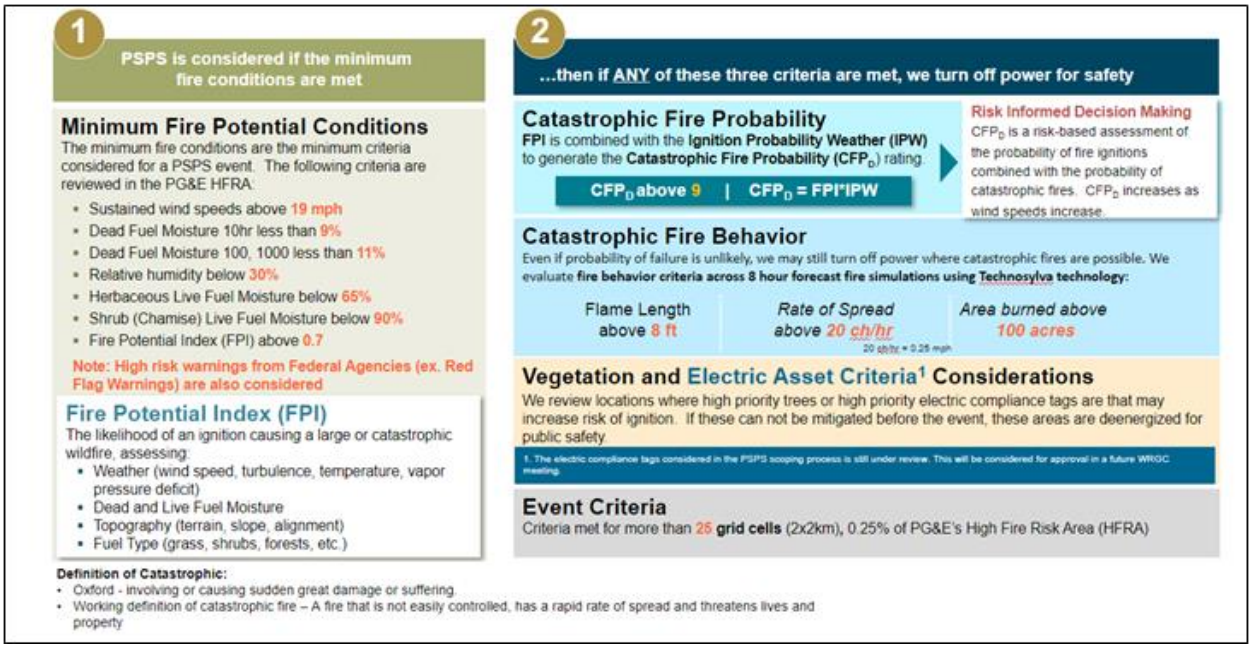
Minimum Fire Potential Conditions:

- Catastrophic Fire Probability (CFP_D) comprised of the following:
  - Ignition Probability Weather;
  - Utility FPI;
- Catastrophic Fire Behavior (CFB) (via fire spread simulations from Technosylva); and
- Consideration of known high-risk vegetation and electric compliance tags.

In addition to the meteorological models, we also evaluate the impacts of de-energization against the risk of wildfire should de-energization not occur. This information is reviewed at key decision points in the PSPS process and informs the ultimate decision to de-energize our customers and our communities. Figure

PG&E-Remedy-21-29-4 below provides a quantitative summary of our 2021 PSPS Protocols (Distribution).

FIGURE PG&E-REMEDY-21-29-4:
2021 PSPS PROTOCOLS (DISTRIBUTION)



The mFPCs are the minimum weather and fuels filter based on relative humidity values, wind speed, and fuel moisture values that must be exceeded for a PSPS event to be considered.

The machine learning IPW and FPI Models are combined in both space and time to form CFP_D output at a 2 x 2 km resolution. CFP_D provides hourly outputs and highlights locations that have concurrence of an increased probability for large fires and increased probability of wind-related ignitions on the distribution system. Additionally, the CFB criteria are used to identify locations that may have a lower probability of ignition but could result in fires that are not easily suppressed and have potentially high consequences.

Below, we describe the steps in the 2021 PSPS Protocols (Distribution).

Step 1 – mFPCs/FPI

The first step of determining the scope of a PSPS event for distribution is evaluating the mFPCs. These conditions serve as a first review of weather conditions for a PSPS

event to be considered. A PSPS event will only be evaluated if ALL of the following mFPCs are true in a High Fire Risk Area (HFRA):[5]

- Sustained wind speeds above 19 miles per hour;
- Dead fuel moisture 10-hr less than 9 percent;[6]
- Dead fuel moisture 100-hr., 1000-hr. less than 11 percent;[7]
- Relative Humidity below 30 percent;
- Herbaceous live fuel moisture below 65 percent;
- Shrub (Chamise) Live Fuel Moisture below 90 percent; and
- FPI (the probability of large or catastrophic fires given an ignition) above 0.7.

These values were established from an examination of historical fire occurrences in our service area, PSPS sensitivity studies using historical data viewed through the lens of both customer impacts and wildfire risk mitigated, and information published by federal agencies regarding fire behavior and criteria used to issue warnings to the public.

Step 2 – In-depth Review of Fire Risk

If all the mFPCs in Step 1 are met, we conduct an in-depth review of fire risk using three separate measures. If the criteria for any of the measures are met, then PG&E may need to turn off power to preserve safety:

1) Catastrophic Fire Probability – PG&E uses machine learning to assess the likelihood of equipment failing during a given weather event, and the subsequent risk of catastrophic wildfires if a failure occurs. This model uses a combination of the IPW and FPI Models. It is a risk-based assessment that evaluates the probability of an ignition against the probability of catastrophic fires. The CFP model accounts for changes over time based on actual performance data. Thus, the model will address positive and negative trends in grid performance and reliability year-over-year, incorporating grid improvements such as system

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5 Revised 2021 WMP, pp. 85-89.

6 10-hr. Dead fuel moisture represents the modeled moisture content in dead fuels in the .25 to 1-inch diameter class and the layer of the forest floor about one inch below the surface.

7 100-hr. Dead fuel moisture represents the modeled moisture content of dead fuels in the 1-to-3-inch diameter class. It can also be used as a very rough estimate of the average moisture content of the forest floor from three-fourths inch to 4 inches below the surface.

hardening and enhanced vegetation management based on their performance mitigating outages over time.

2) Catastrophic Fire Behavior – PG&E may de-energize customers where the consequence of a potential wildfire starting would be extreme, even if the probability of a power line or equipment failure is low.
3) Vegetation and Electric Asset Criteria Considerations – PG&E reviews locations from recent inspections where high-priority trees or electric compliance issues are present that may increase the risk of ignition.

Step 3 – Determining the Outage Area

If weather forecasts indicate a high likelihood of severe fire risk (Step 2), PG&E first identifies the meteorological footprint of severe fire weather and then identifies the distribution lines and other assets within that footprint. Power is turned off if any of the criteria listed on Step 2 above are met over a certain geographic area. This happens if the criteria also meet an area coverage criterion of more than 25 2x2 km grid cells, or 0.25 percent of PG&E's HFRAs.

For distribution lines, the PG&E team determines which circuits are impacted and evaluates the ability to sectionalize circuits to limit the de-energization scope and resulting customer impact.

1.4. 2021 PSPS Protocols (Transmission)

This section describes the 2021 PSPS Protocols for the transmission system. In addition to analyzing distribution circuits that may need to be de-energized for safety, we also review transmission lines and individual structures for risk of igniting a catastrophic wildfire. Like the 2021 PSPS Protocols (Distribution), there is no single factor or threshold that will require shutting off power to a transmission circuit.

The Transmission PSPS decision-making process follows a similar framework as the distribution process, but utilizes transmission-specific models. There are four key inputs of the meteorological and fuels analysis to determine minimum PSPS criteria for the transmission system:

Minimum Fire Potential Conditions:

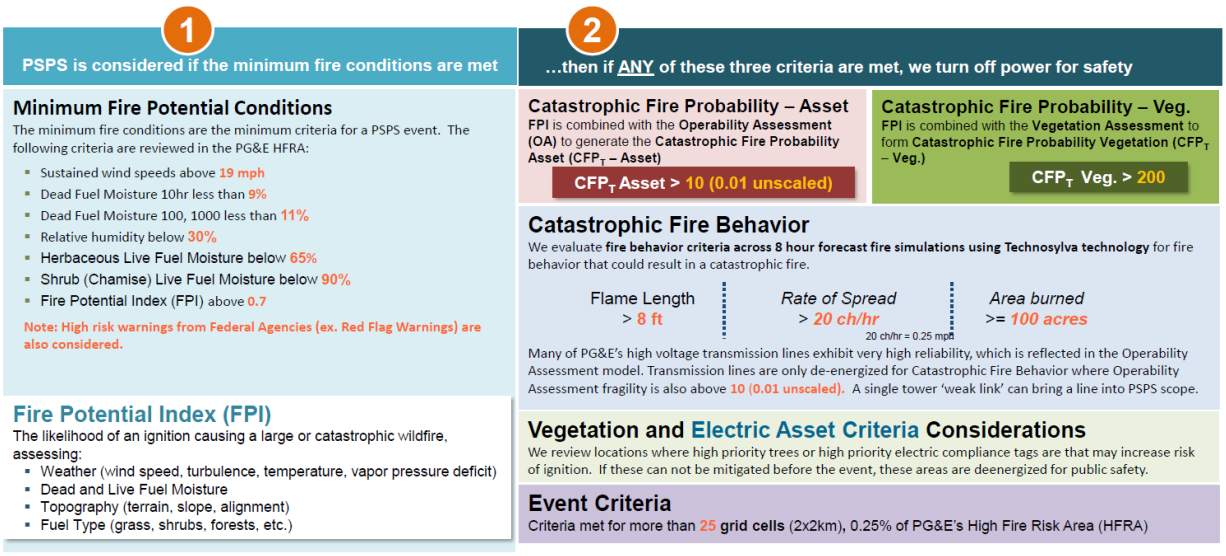
- CFP_D from Asset Failures (CFP_T – Asset) comprised of the following:
  - Transmission Operability Assessment (OA);

  - Utility FPI;

- CFP_D from Vegetation (CFP_T – Veg) comprised of the following:
  - Transmission Vegetation Risk Model;
  - Utility FPI;
- CFB (via Fire Spread Simulations from Technosylva); and
- Consideration of known high-risk vegetation and electric compliance tags.

Figure PG&E-Remedy-21-29-5 below provides a quantitative summary of our 2021 PSPS Protocols (Transmission).

FIGURE PG&E-REMEDY-21-29-5:
2021 PSPS – PROTOCOLS (TRANSMISSION)



Step 1 – Minimum Fire Conditions

The first step of determining the scope of a PSPS event on the transmission system is evaluating the mFPCs at the transmission structure level. The same criteria used for the distribution system also apply to the transmission system. These conditions serve as a first review of the weather conditions necessary for a PSPS event to be considered. Once the mFPCs are met, an in-depth review of risk models and other factors is performed.

Step 2 – In-Depth Review of Fire Risk

If all the mFPCs in Step 1 are met, we conduct an in-depth review of fire risk using four separate measures. If the criteria for any of the measures are met, then PG&E may need to turn off power to preserve safety:

1) Catastrophic Fire Probability: Asset – PG&E uses machine learning to assess the likelihood of equipment failing during a given weather event, and the subsequent risk of catastrophic wildfires if a failure occurs. This model uses a combination of the OA and FPI Models, both in time and space, at every transmission structure to form the Transmission CFP_D model for asset failures. (CFP_T - Asset). The OA Model combines historical wind speeds for each structure, historical outage activity, Bayesian updating, and the condition of assets based on inspection programs to help understand the wind-related failure probability of each structure. The OA Model can be driven with forecast wind speeds to output the probability of failure at the structure level.
2) Catastrophic Fire Probability: Vegetation – The transmission-specific vegetation risk model was derived by a collaborative effort between PG&E vegetation management and external contractors such as NV5 and Formation Environmental. This model leverages aerial LiDAR data to map the location and attributes of trees near transmission lines. The transmission vegetation risk model is based on several factors such as overstrike, the amount of unobstructed fall paths to a wire, the slope between tree and conductor, and tree exposure. The transmission vegetation risk model is combined with the FPI Model in space and time to form CFP_T – Veg.
3) Catastrophic Fire Behavior – PG&E may de-energize customers where the consequence of a potential wildfire ignition would be extreme, even if the probability of a power line or equipment failure is low.
4) Vegetation and Electric Asset Criteria Considerations – PG&E reviews locations from recent inspections where high-priority trees or electric compliance issues are present that may increase the risk of ignition.

Step 3 – Determining the Outage Area

Based on the criteria above, transmission lines meeting the criteria pass to the next stage of review for PSPS. PG&E conducts a Power Flow Analysis on the in-scope transmission lines (if applicable) to analyze any potential downstream impacts of load

shedding, coordinates this with the California Independent System Operator, and confirms solution feasibility with Transmission System Protection. The de-energization of transmission lines may result in some downstream impacts on substations, transmission lines and distribution lines that may also lose their source.

1.5. After Determining Outage Area (Distribution and Transmission)

After determining the outage area both for Distribution and Transmission, we review the forecasted customer impacts of each circuit against the forecasted wildfire risk of each circuit should an ignition occur on that circuit during the forecasted period of risk for both the distribution and transmission circuits brought into scope from the meteorology models. PG&E then shares this analysis internally during key decision-making points to inform PSPS decision making and further risk modeling.

Starting at 12 hours before an event, PG&E switches from forecasting to observing the weather in real time. Based on real time observations and analysis, we continually evaluate all the outage areas identified in the previous steps to determine whether to call a PSPS event. We also use external tools and analysis to provide input to the decision to call a PSPS event, as described below.

1.6. External Tools and Analysis

During high-risk periods, PG&E meteorologists participate in daily interagency conference calls that commonly include multiple NWS local offices, the NWS western region headquarters, and representatives from the Geographic Area Coordination Center (GACC). This call is hosted by the Northern California or Southern California GACC offices. Agreements with California Department of Forestry and Fire Protection and United States Forest Service leadership allow participation on these calls (although PG&E participation does not influence any forecasts issued by these independent agencies). During these calls, the agencies present their expert assessment on the upcoming periods and locations of risk, wind speeds and fuel moisture levels, and any other relevant factors to consider. PG&E greatly appreciates these conference calls and the opportunity to coordinate with external and independent forecast agencies on upcoming risk periods. During PSPS events, the lead meteorologist for the event, called the Meteorologist in Charge, summarizes these forecasts and discussions for the Officer in Charge (OIC), who ultimately makes the decision to execute a PSPS event. If external agencies are not in agreement with PG&E analysis and do not see an

upcoming event as high risk for large fires, the OIC may use this intelligence to decide if a PSPS event is warranted.

In addition to this information, PG&E carefully reviews and considers the location of existing fires and where new fires are detected using the Satellite Fire Detection and Alerting System (FDAS), which uses data from six National Oceanic and Atmospheric Administration (NOAA)/National Aeronautics and Space Administration satellites to detect fires, and other information compiled by PG&E's Hazard and Awareness Warning Center, such as intel from field observers. If an active fire may require imminent community evacuations, we would consider how best to support those efforts in relation to PSPS decisions. In addition, the following sources and tools are considered before initiating a PSPS event:

- Fire Weather Watches and RFW (NWS – Federal);
- Significant fire potential for wind (GACC – Federal);
- Storm Prediction Center (Federal, part of NOAA);
- Daily interagency conference call with agencies during high-risk periods;
- Field observer information;
- Live weather data from weather stations;
- Location of existing fires;
- New fires detected – Satellite Fire Detection and FDAS;
- ECMWF model;
- North American Mesoscale model;
- High-Resolution-Rapid Refresh model;
- GFS American global model; and
- Other weather models.

Based on the above analyses, we can determine how many customers may be subject to de-energization, and further investigate mitigation options—such as advanced switching solutions, sectionalization, the use of islanding, alternative grid solutions, and temporary generation—to support customers who could lose transmission power sources but are in areas that may be safe to keep energized.

PG&E monitors and forecasts weather over a multi-day horizon, so the Company can anticipate when a PSPS event may be needed and activate its Emergency Operations Center ahead of any PSPS event whenever possible. The PG&E Meteorology team updates weather forecasts approximately four times a day to monitor for changes in

weather event timing, strength, and potential locations impacted. Weather shifts may force changes to PSPS scope and impacts at any point in time during PSPS planning and execution; this may allow the Company to avoid de-energization in some areas if fire-critical conditions lessen, but can also cause some areas and customers to move into de-energization scope late in the process if forecasted fire-critical weather footprints change or increase. This is driven by the inherent uncertainty in weather forecast models.

1.7. Risk Tools and Risk Assessment

In addition to the 2021 PSPS Protocols, we also use risk assessment tools in evaluating PSPS events. These are not part of the 2021 PSPS Protocols but are considered in addition to the Protocols when evaluating the need to call a PSPS event.

The PSPS Risk-Benefit tool addresses the regulatory requirements presented in California Public Utilities Commission (CPUC or Commission) Decision 21-06-014, which requires California investor-owned utilities to quantify the risk/benefits associated with initiating or not initiating a PSPS event for our customers. We incorporate this risk-benefit analysis to help inform the PSPS decision-making process. The output of the tool is a ratio that compares the PSPS potential benefit from initiating an event (i.e., mitigation of catastrophic wildfire risk) to the induced risks associated with an event (i.e., impact to customers resulting from a PSPS outage). To produce this analysis PG&E inputs the results of Technosylva wildfire simulations on the circuits in scope for de-energization and the forecasted number of customers de-energized and customer hours forecasted per circuit.

The PSPS Risk-Benefit tool utilizes the Multi-Attribute Value Function (MAVF) framework, as defined through the Safety Model Assessment Proceeding. The tool's calculations for risk use an industry-wide standard, non-linear scaling MAVF, reflecting our focus on low-frequency/high-consequence risk events without neglecting high-probability/low-consequence risk events. The MAVF, a unitless number that captures the safety, reliability, and financial impact of these risk events, is used to calculate the risk scores for the risk events in PG&E's Enterprise Risk Register.[8] MAVF

[8] Full details of the MAVF methodology are provided through the Risk Assessment and Modeling Phase (RAMP) Report RAMP Report, pp. 3-3 to 3-15 and General Rate Case (GRC) workpapers in response to Energy Division GRC-2023-PhI_DR_ED_001_Q01Supp01.

scores outputted by the PSPS Risk-Benefit tool are used to compare the risk from a PSPS event to the risk of wildfires on the potentially impacted circuits being considered for PSPS de-energization.

To estimate the potential in-event PSPS and Wildfire Risk Scores, the following information is required and is used in calculations to build MAVF risk scores for PSPS events and wildfires, which are ultimately weighed against one another:

- Forecasted Circuits and Customers Impacted – Identification of the final list of the distribution and transmission circuits in-scope for PSPS, the number of customers impacted, and the estimated outage duration the customers will face.
- Technosylva Wildfire Simulation Data – Fire spread simulation forecasts on the consequence of a potential wildfire's impacts on population and buildings on each circuit for every three hours for the next approximately five days. These values are based on Technosylva's sophisticated wildfire modeling, using real-time weather models, state-of-the-art live fuel moisture models, and 8-hour fire spread modeling.

  Once the above data is made available, the modeling considerations described below are used to estimate the consequence of the: (1) potential wildfire risk; and (2) PSPS risk, at the circuit level. The consequence considerations are included in Table PG&E-Remedy-21-29-2 below and summarized in a visual on Figure PG&E-Remedy-21-29-6.

TABLE PG&E-REMEDY-21-29-2:
2021 PSPS RISK BENEFIT MODEL CONSIDERATIONS

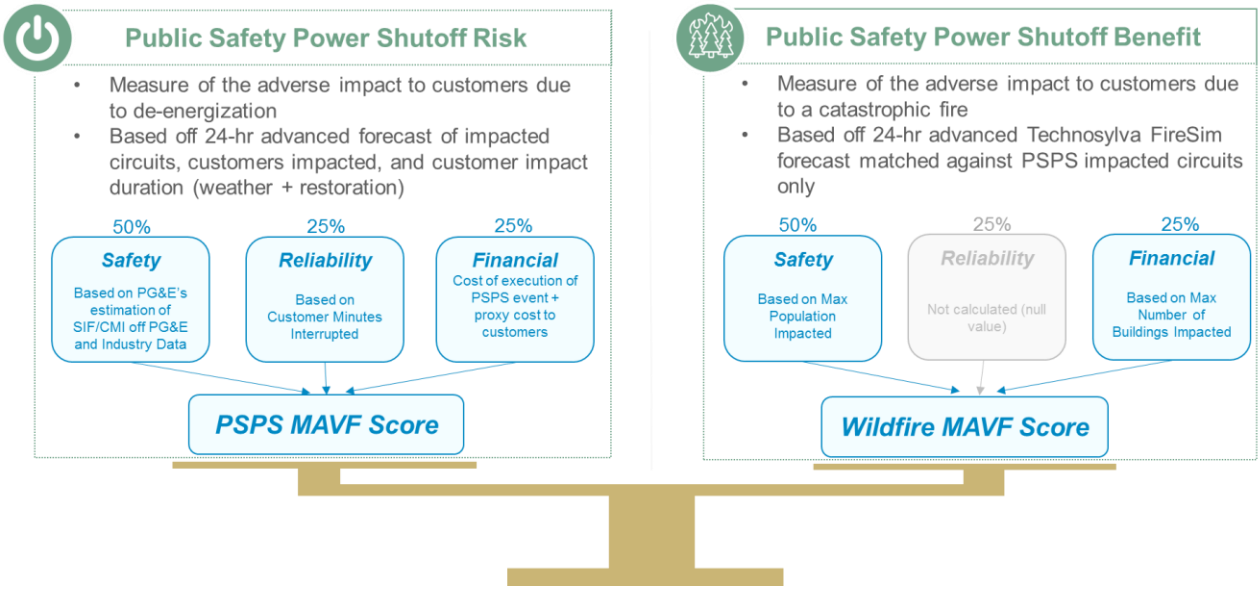
Consequence Type	Wildfire Consequence Considerations	PSPS Consequence Considerations
Safety	Calculated based on maximum population impacts derived from Technosylva wildfire simulation models and a fatality ratio based on National Fire Protection Association data.	Calculated from an estimate of Equivalent Fatalities (EF) per million Customer Minutes Interrupted (MMCI). EF/MMCI ratio is estimated from previous PG&E PSPS and other large external outage events.[(a)]
Reliability	N/A	Calculated directly from the potential number of customers impacted and outage duration based on customer minutes interrupted.
Financial	Calculated based on maximum building impacts derived from Technosylva wildfire simulation models and a cost per structure burned previously evaluated in 2020 RAMP Report.[(b)]	Calculated based on two financial estimates: (1) distribution of a lump sum cost of execution across all relevant circuits, and (2) an estimated proxy cost per customer per PSPS event.[(c)]

(a) Previous PG&E PSPS events include 2019-2020 events, and other large external outage events include 2003 Northeast Blackout in New York City, 2011 Southwest Blackout in San Diego, 2012 Derecho Windstorms, 2012 Superstorm Sandy, and 2017 Hurricane Irma.

(b) See Application 20-06-012.

(c) The assumptions used in these calculations, including the proxy cost per customer per PSPS event, are subject to be updated and are not intended to prejudge or create precedent with regard to the development of more precise values of resiliency or cost of PSPS metrics being considered in other ongoing proceedings at the CPUC, such as the Risk-Based Decision-Making Rulemaking [R.20.07.013] and the Microgrid and Resiliency Strategies.

FIGURE PG&E-REMEDY-21-29-6:
VISUAL REPRESENTATION OF PSPS RISK BENEFIT TOOL



This assessment provides the ability to compare the associated risks between the two scenarios. Once the risk-benefit model calculates the impacts between the PSPS event and a wildfire, it is summarized by indicating if the adverse impact from a PSPS event outweighs the risk of a wildfire.

1.8. Validation of 2021 PSPS Protocols and Thresholds

This section addresses PG&E's examination of the adequacy of the 2021 PSPS Protocols and the determination of the guidance thresholds for the 2021 PSPS Protocols. At the end of this section, we describe how we used many different resources and tools to verify and test our 2021 PSPS Protocols and its guidance thresholds.

To evaluate if the 2021 PSPS Protocols captures large, catastrophic wind-driven fires, PG&E built a verification dataset by extracting the PSPS guidance for recent fires that have occurred in PG&E's service territory from 2012 to 2020. Based on the historical review of incidents, verification of event dates, and the guidance sensitivity and calibration analysis, a CFP_D value of nine was chosen as the quantitative threshold guidance value to consider for PSPS on the distribution system. The mFPCs and CFP_D guidance that is determined from Technosylva was also evaluated in this fashion.

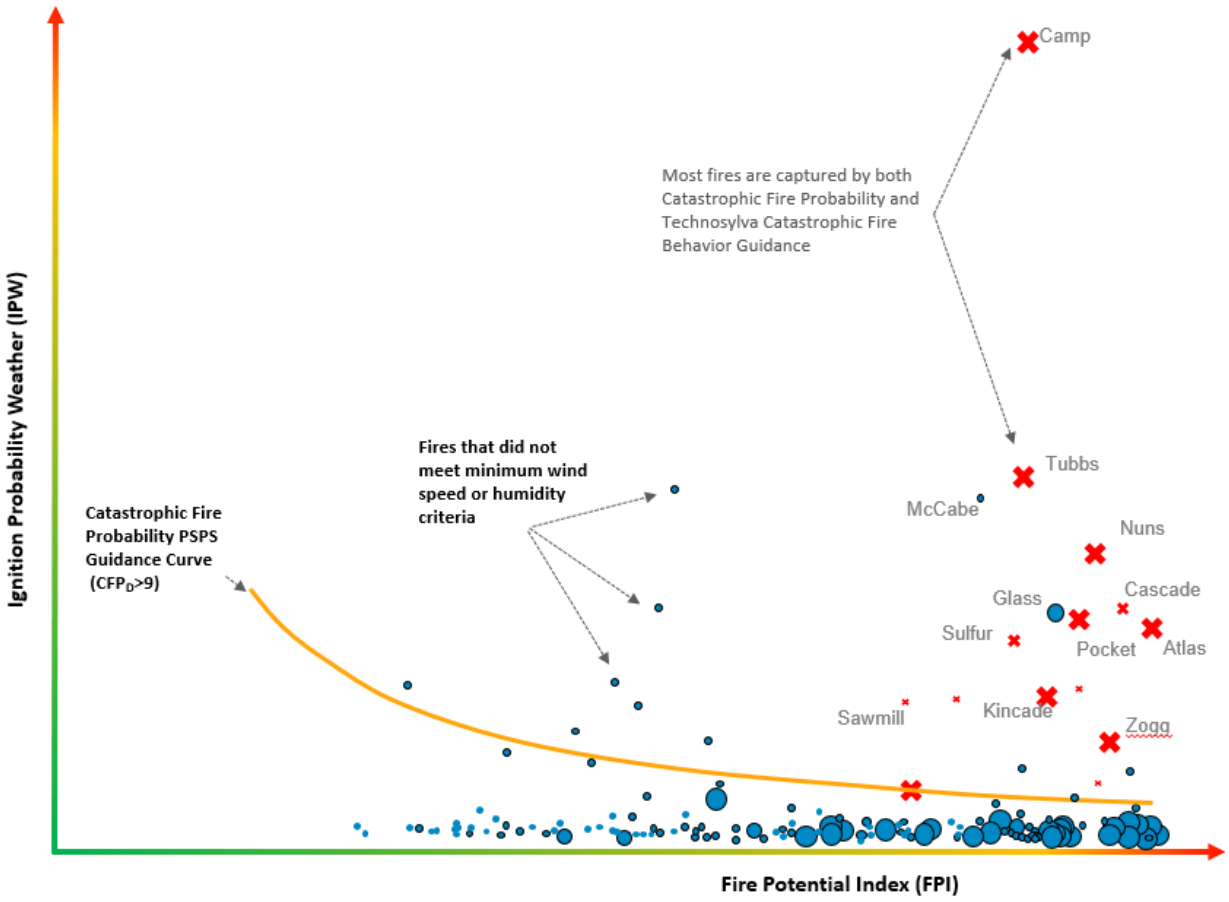
To establish the PSPS threshold of nine, we performed numerous sensitivity studies in backcast mode for calibration and validation. In 2021, this involved running 68 different versions of the combined distribution PSPS guidance through hourly historical data from 2008 to 2020 to calibrate PSPS guidance. This included simulating and learning from more than 2,500 simulated PSPS events. Through this "lookback" analysis, we can evaluate the potential size, scope, and frequency of PSPS events (including potential customer impacts), the days PSPS events would have occurred, as well as whether utility infrastructure would have qualified for de-energization during the time period of prior fires.

The CFP_D guidance value of nine is shown in Figure PG&E-Remedy-21-29-7 below with respect to recent large fires since 2012. Any fires above the nine line that met the basic mFPCs indicate PSPS would have been executed had these models and guidance been in use during these historic events. The historical results show that had this model been deployed and implemented since 2012, the new PSPS protocols would have prevented wildfires such as the Camp, Tubbs, Nuns, Atlas, Kincade, and Zogg fires. Please note that the inclusion of a fire in this analysis does not indicate that PG&E is

directly responsible for and/or caused a fire. Instead, the fires are included for the purposes of analyzing the impact of the 2021 PSPS Protocols.

The red "x" symbols in Figure PG&E-REMEDY-21-29-7 below represent fires that were captured by the both the CFP_D and Technosylva CFB. The blue dots under the line represent fires below the CFP_D Guidance. Blue dots above the line represent events that did not meet the mFPC.

FIGURE PG&E-REMEDY-21-29-7:
CFP_D GUIDANCE



The analysis was a critical step to ensure the most catastrophic incidents of the past are being identified by PSPS guidance while considering the significant impacts to customers from PSPS events across multiple dimensions (e.g., duration and frequency). Furthermore, this step helps ensure that future PSPS events will capture conditions similarly present during the most catastrophic fires of the past while also balancing impacts to customers. To execute the analysis, we utilize cloud computing resources to run PSPS model guidance for every hour at every 2 x 2 km grid cell across

the historical data set to determine the number of times and locations PSPS guidance is exceeded. Each location exceeding guidance is then grouped into events to determine the location and size of each PSPS event given the weather and fuels present at that time under the parameters of the study version. This allows us to determine if synoptic-driven events (e.g., Diablo wind events) are being identified, and if historical fires attributable to PG&E equipment may have been mitigated.

In addition to the sensitivity studies presented above, PG&E also performed extensive verification of the 2021 PSPS Protocols using several internal and external datasets. The goal of these analyses was to first determine if certain weather events are being captured (e.g., Diablo and offshore wind events), and second, to determine if lines that have been implicated in historic catastrophic fires would have been identified by the guidance. The following datasets were used in the analysis:

- National Center for Environmental Prediction North American Regional Reanalysis Archive (NARR) synoptic weather maps [external];
- Climatology of Diablo wind events [internal];
- Historical fire occurrence data compiled by federal agencies [external];
- Hourly high-resolution wind maps from the climatology data set [internal];
- Distribution and transmission outage history [internal];
- RFWs from the NWS [external];
- High risk of potential large fires due to wind from the GACC [external];
- The weather signal database [internal]; and
- Exploratory and dynamic dashboards created with internal and external data [internal].

The paragraphs below explain how we leveraged external and internal data to verify its 2021 PSPS Protocols guidance thresholds.

NARR Archive:

PG&E has acquired the NARR archive data dating back to 1995 and produced over 2 million maps that can be utilized to study past events. These maps are also useful to study the antecedent conditions leading up to the event such as the extent (or lack thereof) of precipitation events and heat waves. When the PSPS models are run through the climatology, each event identified is compared against the NARR archive by a meteorologist to determine the large-scale atmospheric features present for each event.

Climatology of Diablo Wind Events:

PG&E also leverages the latest academic research on Diablo Wind events that use surface-based observations to create a climatology of Diablo wind events. We adapted the criteria and processed it hour-by-hour through the 31-year weather climatology to determine the frequency, magnitude, and timing of Diablo winds. The output of this analysis was a 31-year calendar of Diablo wind events experienced in the PG&E territory. As it relates to PSPS directly, the strongest Diablo wind events were evaluated to verify if PSPS guidance also selects these days for potential PSPS events. Using the days identified by PSPS guidance and the Diablo event list, a high-level comparison was completed to evaluate overlap of the events. Any events that did not meet PSPS guidance were evaluated further using additional data sources described in this section. For example, the NARR archive proved useful, as antecedent conditions such as rainfall before an event and the magnitude of the event could be evaluated.

PG&E's Weather Signal Database:

PG&E's Meteorology team built, and continues to maintain, a 'weather signal' database that flags each day from January 1, 1995 to present that experienced any weather-related outages on the distribution system and the main weather driver (e.g., heat, low-elevation snow, northeast wind, winter storm, etc.) for these outages. If distribution outage activity is not driven by weather, the day is classified as a "Blue Sky"[9] day, meaning that weather was not a main driver of outage activity. This dataset combines weather and distribution outage activity that allows rapid filtering of events based on the main weather drivers. To validate PSPS guidance, we used a combination of "Northeast"[10] wind days and "Blue-Sky" days.

The PSPS guidance was validated against all Northeast wind days in the database. This is similar, but complimentary to the Diablo event analysis as it also accounts for outage activity observed on those days. Events were also compared against Blue Sky

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9 The definition of a Blue Sky day is as follows: "Blue Sky Day is defined the same as a non-weather impact day (no or very limited impacts due to weather)".

10 Our definition of a Northeast wind day is as follows: "Weather type used when strong offshore (northerly or northeast winds) result in elevated outage activity. This includes Diablo and Santa Ana wind events. An example are the classic offshore winds events where surface high pressure develops in the Upper Great Basin."

days to ensure that PSPS would not be recommended for a high percentage of non-weather-impact days where little to no outage activity was observed.

Red Flag Warnings from the NWS:

PG&E also validated PSPS guidance against RFWs from the NWS. A RFW means warm temperatures, very low humidity, and stronger winds are expected to combine to produce an increased risk of fire danger. These RFWs were collected for the past six years (2015-2020) in shapefile format and used to evaluate the timing and spatial extent of historical RFWs against PSPS guidance. It should be noted that each NWS office in the PG&E territory has different RFW criteria, making direct and quantifiable comparison challenging. However, this dataset is used to evaluate whether RFWs were issued when PSPS guidance was met. Based on historical PSPS analysis, RFWs are expected to occur more frequently and cover a broader area than the area covered by PSPS events.

High Risk of Potential Large Fires Due to Wind From the GACC:

PG&E also validated PSPS guidance against historical “High Risk” days from the GACCs, also known as Predictive Services. The GACCs issue High Risk Day alerts when fuel and weather conditions are predicted that historically have resulted in a significantly higher than normal chance for a new large fire or for significant growth on existing fires. Examples of critical weather conditions are high winds, low humidity, an unstable atmosphere, and very hot weather. Similar to the RFW analysis, this dataset was used to evaluate if High Risk days were issued when PSPS guidance was high. Similar to RFWs, based on historical PSPS analysis, High Risk Days are expected to occur more frequently and cover a broader area than PSPS.

Hourly High-Resolution Wind Maps From PG&E Climatology Data Set:

PG&E created hourly maps from high-resolution climatology and a web-based application to display any hour across 30 years. For each event that meets PSPS guidance in the climatology, these maps were evaluated by a meteorologist to better understand the nature of the event, wind speeds, antecedent conditions, and the spatial extent of strong winds. Importantly, forecast wind speeds are available in the same exact format, allowing operational meteorologists to put forecast events in perspective with historical events using the same model.

Detailed Event Dashboards:

Meteorologists and data scientists utilized the data sources described above to evaluate historical PSPS events hour-by-hour to verify the locations and times that are being flagged as meeting PSPS guidance. These dashboards are very useful to determine if historical fire events would have been flagged by PSPS guidance. Meteorologists evaluated these data sources hourly to verify model performance of the IPW model and suitability for operations. The PSPS guidance can be evaluated spatially using the dashboard map integration, while the size and timing of the event can be evaluated using the timeseries integration.

2. 2021 PSPS Protocols Effect on Scope, Duration, and Frequency

Below, we describe our estimated, quantitative targets regarding the scope, frequency, and duration of forecasted PSPS events in 2021 considering both the 2020 PSPS Protocols and the current 2021 PSPS Protocols. The information included in this analysis is based on the best available data that PG&E has and is subject to further updates in accordance with further analysis.

This section directly compares the 2020 and 2021 PSPS Protocols with the objective to show the expected impacts of updating our PSPS Protocols without including the mitigation initiatives proposed in our Revised 2021 WMP. The cumulative impacts of both the updated 2021 PSPS Protocols and 2021 WMP mitigations relative to 2020 PSPS are presented in Section 3 of the response to Remedy PG&E-21-29.

Quantitative Targets Assuming No Additional Decision Criteria – 2020 PSPS Protocols:

To determine the impacts of our 2021 PSPS Criteria on scope, duration, and frequency, we performed a look-back analysis to identify where and when PSPS events would have occurred in the past four years. The 4-year look-back study was developed using the years 2017-2020 to simulate events using the 2021 PSPS Protocols (Distribution). The estimated quantitative targets for scope, frequency, and duration are the 4-year average of the simulated events. Due to the timing of the look-back analysis, the impacts of the 2021 PSPS Protocols (Transmission) and the priority tags are not included in the analysis. To account for transmission protocols and priority tags, multipliers were applied to the 4-year average of the quantitative targets for the 2021 PSPS Protocols (Distribution).

We also utilized the estimated potential impacts to our PSPS scope, duration, and frequency as a result from the 2021 planned mitigations and process improvements outlined in our Revised 2021 WMP. To review the methodology for calculating these estimated reductions, please see the 2021 WMP Supplemental Filing filed on February 26, 2021 in PGE-11 (Class B). It is important to note that these forecasted reductions are estimates and not WMP commitments. As discussed throughout the Revised 2021 WMP, PSPS impacts in any given year are ultimately dependent on weather patterns and events experienced.

We had previously used a 10-year look-back study to compare the forecasted PSPS events impacts from the different PSPS Protocols. We are currently using the 4-year lookback because we consider the 4-year timeframe more representative of expected near-term future PSPS impacts for the purpose of establishing PSPS Protocols. In Tables PG&E-Remedy-21-29-4 and PG&E-Remedy-21-29-5 below, we provide a comparison of the quantitative targets due to the different PSPS Protocols and the mitigation initiatives adopted in the Revised 2021 WMP. We show both the 10-year and the 4-year lookbacks separately to show the variability caused by the weather can have among the scenarios and to tie the numbers back to those submitted in previous WMP submissions.

Quantitative Targets Assuming Decision Criteria Based on 2021 PSPS Protocols:

- Scope – Based on the lookback analysis, the average scope of each PSPS event decreased as a result 2021 PSP Protocols. When comparing the 2020 PSPS Protocols events to the 2021 PSPS Protocol, the average event size of the PSPS events was 34 percent smaller. The average event size was reduced due to the inclusion of machine learning for the FPI and IPW Models and HFRA[11] updates which resulted in scopes that further covered rural/less populated areas when compared to the 2020 PSPS Protocols. Incorporating Revised 2021 WMP mitigations will further decrease scope relative to 2020 PSPS Protocols, as shown in Table PG&E-Remedy-21-29-3.
- Duration – The average duration per event decreased as a result of the 2021 PSPS Protocols. When comparing the 2020 PSPS Protocols events to the 2021 PSPS Protocols the average duration of the PSPS events incorporating the 2021 PSPS

[11] For more information about HFRAs, please see Revised 2021 WMP, pp. 85-89.

Protocols was 6 percent shorter. The average event duration decreased partly due to the different factors in the 2021 PSPS Protocols.

- Frequency – This 4-year look-back analysis resulted in the 2020 PSPS Protocols producing 18 total PSPS events from 2017 to 2020. Under the same lookback analysis, the 2021 PSPS criteria lookback analysis produced 19 events. Thus, the 2021 PSPS criteria increased the amount of PSPS events by 1, which represents a 6 percent increase in PSPS frequency over the 4-year look-back.

TABLE PG&E-REMEDY-21-29-3:
EVENT-LEVEL COMPARISON OF PSPS PROTOCOLS BASED ON A 4-YEAR LOOKBACK

	Event Frequency	Average Event Duration[(a)]	Average Event Customer Count	Largest Event Customer Count
2020 PSPS Protocols	4.5 events per year	39.6 hours	160 thousand customers	553 thousand customers
2021 PSPS Protocols	4.75 events per year	37.1 hours	105 thousand customers	530 thousand customers

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Note: This analysis contains both PSPS transmission and distribution effects, which is different than the information shared with the Commission on August 31, 2021 which only included PSPS distribution impacts.

(a) Includes 10.7 hours of total of restoration and switching time.

In Table PG&E-Remedy-21-29-4 and Table PG&E-Remedy-21-29-5 below, we provide a systemwide comparison of the 2020 PSPS Protocols, 2020 PSPS Protocols with 2021 WMP mitigations and Tree Overstrike and Priority Tags, 2021 PSPS Protocols, and 2021 PSPS Protocols with 2021 WMP mitigations. The comparison is of the quantitative targets due to the different PSPS Protocols and the mitigation initiatives adopted in the Revised 2021 WMP. We show both the 10-year and the 4-year lookbacks separately to lay out a fair and logical comparison among the scenarios.

TABLE PG&E-REMEDY-21-29-4:
SYSTEMWIDE COMPARISON OF PSPS PROTOCOLS AND HOW THEY AFFECT PSPS SCOPE, DURATION, AND FREQUENCY BASED ON 4-YEAR LOOKBACK AND AVERAGE (2017-2020)

	Frequency (Events Per Year)	Scope (Thousands of Customers Impacted Per Year)	Duration (Millions of Customer Hours Per Year)
2020 PSPS Protocols[(a)]	4.50	1,147	54.9
2020 PSPS Protocols with 2021 Planned WMP Mitigations and with Tree Overstrike Inclusion and Priority Tags[(b)]	7.88	1,522	69.2
2021 PSPS Protocols	4.75	497	18.8
2021 PSPS Protocols with 2021 Planned WMP Mitigations	4.75	457	17.0

(a) 2021 Wildfire Mitigation Plan Report, February 5, 2021, Attachment 1 – All Data Tables Required by 2021 WMP Guidelines.

(b) 2021 Wildfire Mitigation Plan Report – Revised, June 3, 2021, Attachment 1 – All Data Tables Required by 2021 WMP Guidelines.

TABLE PG&E-REMEDY-21-29-5:
COMPARISON OF PSPS PROTOCOLS AND HOW THEY AFFECT PSPS SCOPE, DURATION, AND FREQUENCY BASED ON 10-YEAR LOOKBACK AND AVERAGE (2011-2020)

	Frequency (Events Per Year)[(a)]	Scope (Thousands of Customers Impacted Per Year)	Duration (Millions of Customer Hours Per Year)
2020 PSPS Protocols	2.94	566	25.9
2020 PSPS Protocols with 2021 Planned WMP Mitigations and with Tree Overstrike Inclusion and Priority Tags	5.11	844	36.9
2021 PSPS Protocols	2.91	204	7.4
2021 PSPS Protocols with 2021 Planned WMP Mitigations	2.91	187	6.7

(a) When using the 10-year lookback data set the average event count for the 2020 PSPS Protocols is higher than the 2021 PSPS protocols. The inverse is observed when comparing the 4-year lookback data sets, even with close results. The variance occurs because the 10-year lookback contains additional springtime PSPS events that meet the 2020 PSPS Protocols thresholds but do not meet the 2021 PSPS Protocols thresholds. We attribute the variance to the inclusion of a minimum requirement for Herbaceous live fuels in the 2021 PSPS Protocols model.

In order to describe the impacts of the Revised 2021 WMP mitigations and changes to 2021 PSPS protocols, we are providing as Attachment "2021WMP_OEISRemedy_PGE-21-29_Atch01" an update to Table 11 that compares PSPS forecasts based on the 2021 PSPS Protocols, and the 2021 PSPS Protocols with the 2021 WMP Planned mitigations. Please see 2021WMP_OEISRemedy_PGE-21-29_Atch01.

3. Effects of 2021 PSPS Protocols and Revised 2021 WMP Mitigations Relative to 2020 PSPS Protocols

Section 2 directly compared the 2020 and 2021 PSPS Protocols with the objective to show the expected impacts of updating our PSPS Protocols. As described in our Revised 2021 WMP, PG&E has also committed to expanding the reach of our PSPS mitigations, which is expected to further reduce the impacts of PSPS on our customers. This section illustrates the potential cumulative impacts of both the updated 2021 PSPS Protocols and 2021 WMP mitigations relative to 2020 PSPS Protocols with the goal to provide a more holistic view of the total change in PSPS impacts. Therefore, the reductions in PSPS scope and duration shown in Table PG&E-Remedy-21-29-6 are slightly larger in magnitude than those shown in the protocols-only comparison in Section 2 above.

With the updated 2021 PSPS Protocols, PG&E now estimates the following changes over the 2020 PSPS Protocols. To calculate the effects of the Revised 2021 WMP mitigations combined with 2021 PSPS Protocols we analyzed two years of PSPS events and identified which customers and circuits could have remained energized had the mitigations been in place. The Revised 2021 WMP mitigations would have resulted in the 2021 PSPS scope being reduced by 8 percent and duration by 2 percent when compared to the 2021 PSPS scope without WMP Mitigations. This analysis also indicated that the effects of the Revised 2021 WMP mitigations combined with 2021 PSPS Protocols would have reduced PSPS scope by 40 percent, duration by 8 percent, and increased frequency by 6 percent when compared to 2020 PSPS protocols without the Revised 2021 WMP mitigations. To illustrate the effect of our Revised 2021 WMP mitigations and the updated 2021 PSPS Protocols we have developed the following four scenarios:

- Scenario 1 – Scenario 1 is based off the 2020 PSPS Protocols and our planned Revised 2021 WMP mitigations and is compared to our 2021 PSPS Protocols

without the Revised 2021 WMP mitigations. The reductions were calculated based on 2020 PSPS Protocols and illustrate the effect of the planned mitigation, infrastructure and process work as outlined in Remedy 3.b, Remedy 4 and the workpapers attached as 2021 WMP_Revision_PGE_01_Atch01 in the Revised 2021 WMP.

- Scenario 2 – Scenario 2 illustrates the difference between our 2020 PSPS Protocols and our 2020 PSPS Protocols Plus Tree Overstrike Potential and Priority Tags. This scenario is also compared to our 2020 PSPS Protocols without Revised 2021 WMP mitigations. Note that the average event size and scope shrink as there are more comparatively small events with the added overstrike and priority tree criteria which brings the overall averages down while frequency of events increases.
- Scenario 3 – Scenario 3 illustrates the effects of the Revised 2021 WMP mitigations with our current 2020 PSPS Protocols Plus Tree Overstrike Potential and Priority Tags in comparison to the 2020 PSPS Protocols only and is compared to our 2021 PSPS Protocols without the Revised 2021 WMP mitigations. This forecast best estimates the expected scope of PSPS impacts as a result of our current PSPS protocols assuming all Revised 2021 WMP mitigations were completed.
- Scenario 4 – Scenario 4 illustrates the effects of the Revised 2021 WMP mitigations with our current 2021 PSPS Protocols and is compared to our 2021 PSPS Protocols without the Revised 2021 WMP mitigations. This forecast best estimates the expected scope of PSPS impacts as a result of our current PSPS protocols assuming all Revised 2021 WMP mitigations were completed.

TABLE PG&E-REMEDY-21-29-6:
SCENARIO ANALYSIS FOR REDUCTION IN PSPS SCOPE, DURATION, AND FREQUENCY AS A RESULT OF PLANNED 2021 PSPS MITIGATIONS WHEN COMPARED TO 2020 PSPS PROTOCOLS WITHOUT 2021 WMP MITIGATIONS AS A BASELINE

	Scenario 1:	Scenario 2	Scenario 3:	Scenario 4:
	2020 PSPS Protocols with 2021 WMP Mitigations	2020 PSPS Protocols Plus Overstrike Potential and Priority Tags in Comparison to 2020 PSPS Protocols[(a)]	2020 PSPS Protocols Plus Tree Overstrike Potential and Priority Tags and2021 WMP Mitigations in Comparison to our 2020 PSPS Protocols	2021 PSPS Protocols and 2021 WMP Mitigations
Average PSPS Scope per Event	8 percent Reduction	7 percent Reduction	14 percent Reduction	40 percent Reduction
Per-Customer Duration Per Event	2 percent Reduction	2 percent Reduction	4 percent Reduction	8 percent Reduction
Event Frequency	No Impact Relative to 2019 and 2020	74 percent Increase	74 percent Increase	6 percent Increase

(a) When compared to the 2020 PSPS Protocols, the scope and duration of the 2020 PSPS Protocols Plus Tree Overstrike and Priority Tags decrease, on average, as a result smaller size and shorter duration of the additional events.

The results displayed in Table PG&E-Remedy-21-29-6 show the Per-Customer Event duration decreasing by 8 percent as the PSPS events are forecasted to decrease duration.

In order provide the effects of the 2021 PSPS Protocols on mitigation initiatives we are providing as Attachment "2021WMP_OEISRemedy_PGE-21-29_Atch02" an updated version of the 2021 Revised WMP TABLE PG&E-REVISION NOTICE-8.3-1 to 8.3-3[12] with the estimated quantitative reductions to frequency, scope, and duration based on the current 2021 PSPS Protocols. Please see 2021WMP_OEISRemedy_PGE-21-29_Atch02.

4. 2021 PSPS Protocols Whitepaper

To provide additional information about our current 2021 PSPS Protocols, we are attached to this response to Remedy PG&E-21-29 a whitepaper we developed to

[12] Revised 2021 WMP, pp. 1003-1018.

explain the primary steps in our 2021 PSPS Protocols. Please see 2021WMP_OEISRemedy_PGE-21-29_Atch03.

5. Attachment List

- Attachment 1 – 2021WMP_OEISRemedy_PGE-21-29_Atch01
- Attachment 2 – 2021WMP_OEISRemedy_PGE-21-29_Atch02
- Attachment 3 – 2021WMP_OEISRemedy_PGE-21-29_Atch03

6. Change Order Report

In this section, we provide a Change Order Report consistent with the direction provided in Remedy PG&E-21-29 and using the Change Order Report outline provided in Office of Energy Infrastructure Safety's Final Action Statement issued September 22, 2021.

i. The proposed change

a. The initiative being altered with reference to where in the WMP the initiative is discussed

PG&E is proposing a Change Order to update its 2021 PSPS Protocols. The 2020 PSPS Protocols Plus Tree Overstrike Potential and Priority Tags were described on pages 979-982 of the Revised 2021 WMP. The 2021 PSPS protocols replace the 2020 PSPS Protocols Plus Tree Overstrike Potential and Priority Tags described in the Revised 2021 WMP. The 2021 PSPS Protocols are described in detail above in Sections 1-4 of this response to Remedy PG&E-21-29. This Change Order modifies and updates the following sections of the Revised 2021 WMP:

(1) Sections 8.2.2, 8.2.6, 8.2.7, and 8.2.9
(2) Table 11 - PSPS Projections
(3) Tables 8.3-1, 8.3-2, and 8.3-3 – PSPS Impact Mitigation Commitments

b. The planned budget of that initiative

PG&E does not expect the change of our PSPS Protocols to alter the planned financial budget projections for any of the mitigation initiatives included in the Revised WMP 2021. In addition, we are not proposing to update the planned budget for any initiative.

c. The type of change being proposed, reported as one of the following:

i. Increase in scale
ii. Decrease in scale

iii. Change in prioritization
iv. Change in deployment timing
v. Change in work being done
vi. Other change (described)

The expected impact from the 2021 PSPS Protocols on the PSPS scale (scope, duration, and frequency) can be seen in Table PG&E-Remedy-21-29-3 to Table PG&E-Remedy-21-29-5 above. PG&E deployed the 2021 PSPS Protocols (Distribution) in August 2021 and the 2021 PSPS Protocols (Transmission) in September 2021. The 2021 PSPS Protocols (Distribution and Transmission) were approved by the Wildfire Risk Governance Steering Committee in July 2021, and September 2021, respectively. We do not expect any changes in prioritization and work being done due to the update of the 2021 PSPS Protocols.

d. Detailed Description of The Proposed Change

Please refer to Section 1 above which describes in detail PG&E's 2021 PSPS Protocols.

ii. Justification for the Proposed Change

We are proposing to change the PSPS Protocols to more accurately forecast catastrophic wildfire risk based on the most up to date resources we have developed. PG&E's PSPS decision-making models and protocols have evolved since the PSPS program inception in 2018. After each PSPS season, we evaluate the lessons learned from the previous season and worked to improve the input data sets and weather prediction, as well as to test new models to inform better when PSPS should be applied.

a. In what way, if any, does the change address or improve:

i. Completeness
ii. Technical feasibility of the initiative
iii. Effectiveness of the initiative
iv. Resource use efficiency over portfolio of WMP initiatives

We do not expect the update to our 2021 PSPS Protocols to modify the completeness, technical feasibility, or resource use efficiency over the portfolio of WMP initiatives. In terms of effectiveness, our 2021 PSPS Protocols are more granular, and we expect them to be more accurate at capturing wildfire risk. Please see Sections 1-3 above for

more details concerning the potential impact on PSPS events as a result of using the 2021 PSPS Protocols.

iii. Change in expected outcomes from the proposed change

a. What outcomes, including quantitative ignition probability and PSPS risk reduction, was the changed initiative expected to achieve in the 2021 WMP Update?

The update to the 2021 PSPS Protocols is expected to improve our effectiveness in capturing wildfire risk and reduce customer impacts. Please see Section 3 above for more details.

b. What outcomes, including quantitative ignition probability and PSPS risk reduction, will the initiative deliver with the proposed adjustment?

We expect the updated 2021 PSPS Protocols to be more accurate at capturing wildfire risk. For the impact of the 2021 PSPS Protocols on frequency, scope and duration of events please see Sections 2 and 3 above.