

QUANTITATIVE AND QUALITATIVE FACTORS FOR PSPS DECISION-MAKING

Revision: October 2026

The severity and frequency of wildfires in California continue to grow, with 15 of the 20 most destructive fires in California's history occurring between 2015 and 2025.¹ In response, Southern California Edison has implemented Public Safety Power Shutoffs to reduce the risk of electrical infrastructure igniting a significant wind-driven fire. PSPS is an important “measure of last resort”² that is authorized by the California Public Utilities Commission, with the CPUC acknowledging that “proactively de-energizing power lines can save lives.”³

The quantitative and qualitative factors that inform deenergization decisions for distribution, transmission and subtransmission circuits are the subject of this technical paper.

PSPS OBJECTIVES

SCE's core objective is to keep the maximum number of customers safely energized, while deenergizing only when and where necessary for community safety. We establish thresholds for dangerous wind speeds, low humidity and dry fuels as the basis of our decision-making. For each event, SCE refines these baseline thresholds to protect community safety by using information specific to the forecasted weather and to the circuits in scope, including event size and complexity, fire consequence, circuit health and fire suppression availability.

We mitigate customer impacts by deenergizing only when and where necessary based on real-time weather reporting. When feasible, we isolate those distribution circuits or circuit segments that present significant risk, moving customers between circuits and turning off specific segments while keeping other segments of the same circuit energized. Simultaneously, grid hardening efforts (see box, right) help reduce wildfire risk.

GEOGRAPHY OF PUBLIC SAFETY POWER SHUTOFFS

Most PSPS events occur on circuits that are located within or adjacent to an SCE High Fire Risk Area (HFRA). These areas generally align with the CPUC High Fire-Threat Districts. Customers outside HFRA boundaries may experience PSPS if they are fed by a circuit that traverses HFRA. In the rare circumstance that SCE deenergizes at the transmission level, a PSPS event will likely have a larger footprint.

The SCE service area is divided into 14 Fire Climate Zones, which are areas with similar vegetation, weather, topography and fire history. SCE uses these zones to group areas with similar fire ecology and to support fire weather analysis (Figure 1).

IMPROVING GRID RESILIENCY

We use grid hardening measures to reduce the chance of equipment causing wildfires while increasing system reliability. These measures help reduce the impact of PSPS events.

Since 2018, SCE has replaced more than 7,100 circuit miles of bare wire with covered conductor in high fire risk areas, with additional miles in progress. Covered conductor significantly reduces the possibility of power lines arcing or sparking from contact with objects, vegetation or other wires.

Additional grid hardening activities since 2018 include the installation of more than 160 sectionalizing devices, more than 7,500 fire-resistant poles and more than 14,200 fast-acting fuses.

SCE's Wildfire Mitigation Plan provides more information about our grid hardening activities. This plan can be found at [sce.com/wildfire-safety](https://www.sce.com/wildfire-safety).

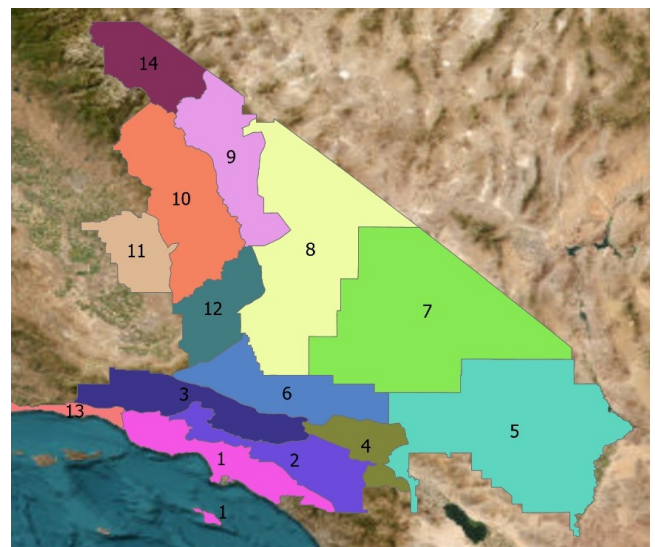


Figure 1: SCE Fire Climate Zones

DECISION-MAKING CADENCE

During times when fire weather conditions, including low humidity, strong winds and dry vegetation are present, SCE identifies the potential to exceed wind speed thresholds up to seven days prior to a possible period of concern (POC). In some cases, weather patterns emerge within seven days of an event, which will shorten the timeline. Occasionally, “rogue circuits” will hit deenergization wind speeds without advance forecasting and will need to be deenergized immediately to protect community safety.

Prior to the start of the POC, the PSPS team moves from forecasting to real-time weather monitoring, using SCE’s pole-top weather stations and public (third-party) weather stations. Every 10 minutes, SCE weather station readings are updated for each circuit. The team monitors actual conditions to confirm if wind speeds are meeting deenergization criteria.

FORECASTING

Custom weather models, run by SCE’s four supercomputers, produce forecasts of weather and fuel moisture. These models incorporate both public and proprietary data to create granular, localized forecasts within SCE’s many microclimates. SCE uses these forecasts to set the scope and duration of the POC.

WEATHER MODELING

SCE uses a suite of high-resolution models that are calibrated using historical weather station data from its network of approximately 2,000 pole-top weather stations located on or near most circuits, as well as from third-party weather stations. These models, including machine learning models, have lower predictive errors than public models. As the number of SCE weather stations recording point-specific weather data increases, we improve the accuracy and granularity of our forecasts.

Weather data includes wind speeds, wind gusts, wind direction, temperature, humidity, dew point and precipitation. Wind speeds, gusts, direction and dew point measurements are calculated as inputs to the weather component of relative fire risk (Fire Behavior Matrix, below). Temperature, dew point, precipitation and humidity are used in fuel-moisture modeling.

Individual components are forecast hourly for each 1 km-by-1 km grid cell. The 1-km square resolution allows the models to more accurately assess weather in California’s microclimates.

FUEL MOISTURE MODELING

To model fuel moisture, SCE uses two fuel moisture inputs that measure the amount of water contained in vegetation, expressed as a percentage of dry weight. Live fuel moisture is the amount of moisture within living vegetation that derives its moisture content from the soil. Dead fuel moisture is categorized by the time that dead vegetation takes to respond to the cumulative effects of atmospheric conditions based on the size of the fuel.

Live fuel moisture is modeled using standardized data collected by fire agencies and augmented by SCE at 25 sites in seven fire-prone areas (Figure 2). This data is publicly available on the Fire Environment Mapping System (FEMS) website.⁴

Samples of native vegetation from each of the sites are weighed, dried and then weighed again to determine the vegetation’s moisture content.

Dead fuel moisture forecasts are generated using mathematical algorithms that account for the effects of precipitation, temperature and relative humidity on the vegetation.

Figure 2: SCE's 25 Fuel Sampling Sites



FIRE BEHAVIOR MATRIX

The data collected from the weather and fuel modeling are used to generate the Fire Behavior Matrix (FBM). The FBM is a visualization that presents the relative fire risk of the weather event. The fuels component comprises four rows, and the weather component comprises four columns, creating a grid of 16 cells (Figure 3).

Red cells represent extreme combinations of critical weather and dry fuels that are historically associated with significant wind-driven wildfires specific to each Fire Climate Zone (FCZ). If weather and fuel conditions fall within these red cells and forecast wind speeds exceed a circuit's activation wind speed threshold (see next page), the circuit will be in scope for PSPS.

The relative fire risk visualized in the FBM generally relates to the rate of spread, flame length (the distance between the flame tip and the midpoint of the flame depth at the base of the flame) and fireline intensity (a measure of the heat transfer per unit time at the head of the fire) of wildfires, as well as the suppression tactics needed to achieve containment objectives.

Fire Behavior Matrix				
Red cells indicate PSPS conditions.				
Fuels Component ↑ Very Dry ↓ Very Moist	1D	2D	3D	4D
	1C	2C	3C	4C
	1B	2B	3B	4B
	1A	2A	3A	4A
		Light Winds ← → Extreme Winds		
Weather Component				

Figure 3: Fire Behavior Matrix

Figure 3: Fire Behavior Matrix

Weather Component:

The weather component is calculated using measures of wind speed and the dryness of the air near the ground. The windier and drier the air is, the more likely the vegetation will dry out and become increasingly flammable if an ignition were to occur. The weather component is calculated using the following formula:

$$\text{Weather Component} = \frac{\text{Wind Speed}^2 \times \text{Dryness of the air}}{1,000}$$

Wind speed is weighted twice in the formula because of its strong influence on fire spread even when other conditions, such as less dry fuels, would otherwise reduce the overall fire threat. Dewpoint depression is used as a measure of the dryness of the air; the greater the dewpoint depression, the drier the air is.

Fuels Component:

The fuels component is a measure of the flammability of the vegetation based on its moisture content, using the formula below:

$$\text{Fuels Component} = (\text{Dead Fuel Moisture} + \text{Live Fuel Moisture}) \times \text{Greenness}$$

Greenness is a measure of how green or how cured the vegetation is using the Normalized Difference Vegetation Index.⁵

IN-EVENT DECISION-MAKING

Prior to the start of the POC, the PSPS team moves from forecasting to real-time weather monitoring. Every 10 minutes, SCE weather station readings are updated for each circuit to determine if wind speeds meet deenergization criteria. These readings are publicly available.⁶

WIND SPEEDS FOR DISTRIBUTION CIRCUITS

The **baseline criteria** for distribution circuits is the starting wind speed for determining when to deenergize. SCE sets baseline activation limits for each circuit or fully isolatable circuit segment based on circuit construction and conductor type:

- Bare wire circuits: Set at the lower of the National Weather Service's (NWS) Wind Advisory level, defined as sustained wind speeds of 31 mph and gusts of 46 mph; or the 99th percentile of historical wind speeds for the circuit (which represents extreme and unusual wind activity for the area). At a wind speed of 31 mph, debris or vegetation may become airborne, as described by the Beaufort Wind Scale.⁷
- Covered conductor (100% coverage): Set at 40 mph for sustained winds and 58 mph for gusts. This aligns with the NWS high wind warning level for wind speeds at which infrastructure damage might occur.
- Legacy (outage-informed) circuits: Set below the NWS advisory level because these circuits have a history of outages at lower wind speeds.

For more information on circuit segmentation, see the box on page 9.

Circuit-specific factors are used to adjust baseline criteria to determine **activation wind speed thresholds**. These factors include both fire consequence, as determined by fire spread simulations, and circuit health conditions based on existing documented potential hazards and findings from patrols within the seven days leading up to the POC.

After discounts, the minimum activation thresholds are forecast sustained wind speeds of 25 mph or gusts of 35 mph, although these criteria are subject to review during the event, based on circuit-specific factors.

Event-specific factors are used to determine **deenergization wind triggers**. These factors include:

- Anticipated fire suppression resource availability.
- Event size, including the number and type of circuits in scope for the event.
- Event complexity, including resource availability and operational requirements to manage the event.
- Declarations by NWS of Red Flag Warning with Particularly Dangerous Situation (PDS).
- High Risk Status Events that include risk of urban conflagration or potentially susceptible system configurations (see High Risk Decision-Making).

The PSPS operations team initiates actions to deenergize the applicable circuits when circuits either meet criteria or reach a percentage of wind speed triggers and are trending upward.

After discounts, the minimum deenergization triggers are observed sustained wind speeds of 23.7 mph or gusts of 35.2 mph, although these criteria are subject to review during the event, based on circuit and event-specific factors. Refer to Figure 4 for a flowchart of decision-making criteria for distribution circuits.

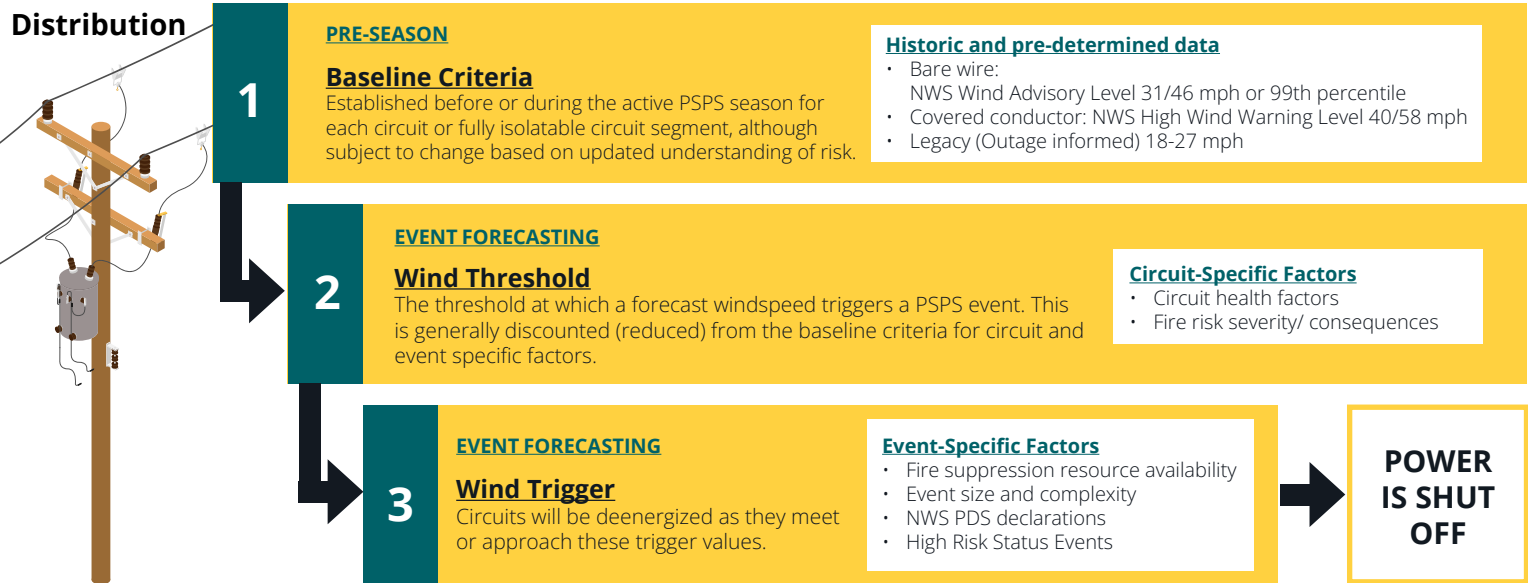


Figure 4: Flowchart of Decision Criteria for Distribution Lines

WINDSPEEDS FOR TRANSMISSION AND SUB-TRANSMISSION CIRCUITS

For transmission and subtransmission circuits, the baseline criteria are informed by the engineering and structural design ratings for each circuit. For subtransmission lines, the baseline wind criteria are 56 mph for sustained winds and 68 mph for gusts. For transmission lines, the baseline wind criteria are 68 mph or higher for sustained winds and 82 mph or higher for gusts, based on structural design standards.

Circuit-specific factors are used to adjust baseline criteria to determine **activation wind speed thresholds** for transmission and subtransmission. These factors include both fire consequences, as determined by fire spread simulations and circuit health conditions based on existing documented potential hazards and findings from patrols within the seven days leading up to the period of concern.

After discounts, the minimum activation thresholds are forecast sustained wind speeds of 50.4 mph or gusts of 61.2 mph, although these criteria are subject to review in-event, based on circuit-specific factors.

Event-specific factors are used to determine **deenergization wind triggers** for transmission and subtransmission circuits. These factors include:

- Anticipated fire suppression resource availability.
- Declarations by NWS of PDS Red Flag Warning.
- High Risk Status Events that include risk of urban conflagration or potentially susceptible system configurations (see High Risk Decision-Making).

After discounts, the minimum deenergization triggers are observed sustained wind speeds of 47.8 mph or gusts of 58.1 mph, although these criteria are subject to review in-event, based on circuit- and event-specific factors.

Subtransmission and transmission monitoring are similar to distribution monitoring; once the PSPS IMT is activated for the event, actual wind speeds are continuously monitored, and the PSPS operations team initiates actions to deenergize the applicable circuits when circuits either meet criteria or reach a percentage of wind speed triggers and are trending upward. Refer to Figure 5 for a flowchart of decision-making criteria for transmission and subtransmission.

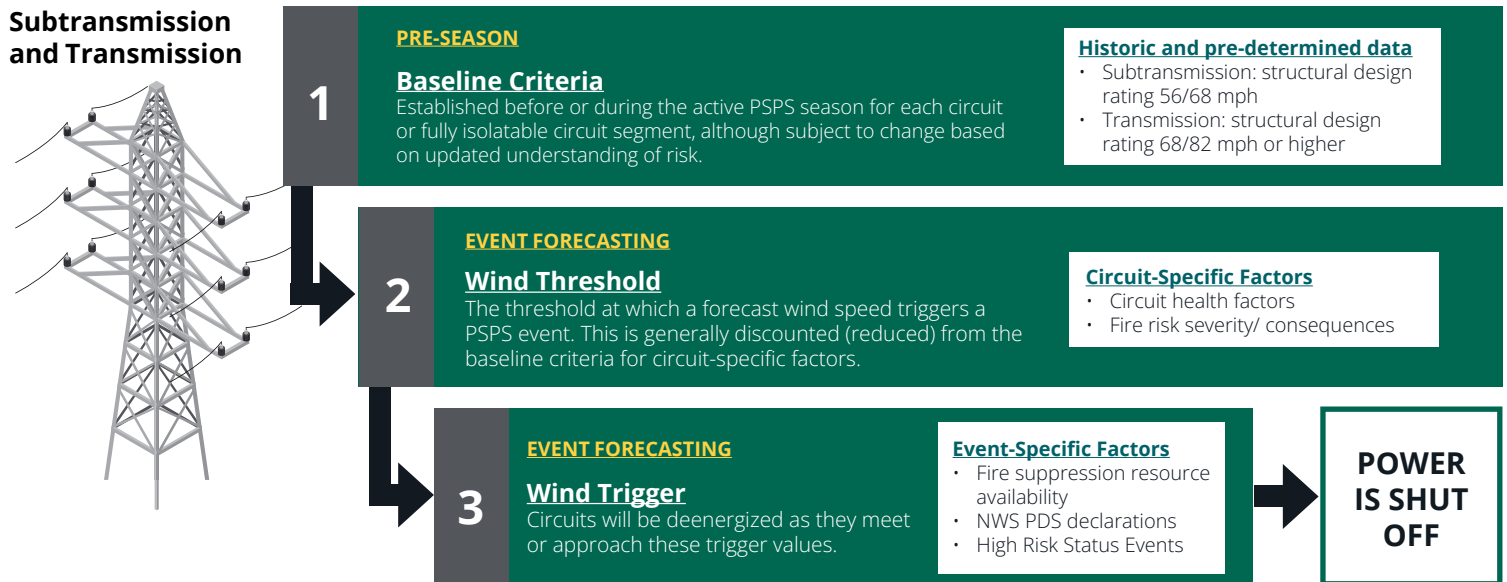


Figure 5: Flowchart of Decision Criteria for Subtransmission and Transmission Lines

HIGH RISK DECISION-MAKING

Most deenergization decisions are based on real-time weather observations within the POC. However, there are two categories of PSPS decision-making that are based on forecasting, in which deenergization of a circuit or segment could occur near the start of the POC, before real-time wind speeds have reached the deenergization trigger for the circuit. Both types of high risk deenergizations will occur only within PSPS activations (although they could be triggered for rogue circuits or changes in weather with little or no advance warning).

1. High Risk Status Events (Urban Conflagrations)

Through updated risk modeling, SCE has identified a subset of HFRA circuits that have a heightened potential to generate an urban conflagration at sustained wind speeds in excess of 40 mph for distribution and 56 mph for subtransmission and transmission lines. If wind speeds at or above these thresholds are forecast, distribution circuits or segments may be deenergized when wind speeds are trending upward and have reached 25 mph sustained or 35 mph gusts. For high risk status transmission lines, those lines will be deenergized near the start of the POC.

2. High Risk Status Equipment

Certain distribution circuit segments and transmission and subtransmission lines may undergo review for potentially susceptible system conditions or configurations that could sustain damage at PSPS thresholds. On a temporary basis, until those issues can be appropriately assessed and, if necessary, remediated, distribution circuits or segments may be deenergized when wind speeds are trending upward toward PSPS thresholds and have reached 25 mph sustained or 35 mph gusts. High risk status transmission and subtransmission lines will be deenergized near the start of the POC.

In both categories, these circuits or segments of lines will remain deenergized until after patrol and inspection at the end of the event.

MANAGING PSPS EVENTS

SCE monitors conditions around the clock. If the forecast indicates a 40% or greater probability of reaching deenergization thresholds, SCE will activate an Incident Management Team (IMT) for the PSPS event. The IMT will manage operations, notifications, customer mitigations and communications, under the direction of an Incident Commander.

If fewer than four circuits are forecast to reach thresholds, PSPS might not be necessary. A leadership team evaluates whether there is significant fire spread risk and determines whether PSPS is required.

ESTABLISHING EVENT SCOPE AND TIMING

The meteorologists produce the monitored circuit list and an associated POC table. The table includes a specific forecast start and end time for each circuit, broken down into three-hour time blocks. Initial notifications are sent to all customers and public safety partners.

IN-EVENT RISK CALCULATION

The wildfire risks that are reduced through PSPS must be balanced against the potential public safety risks that are introduced by a temporary loss of power. An event-based quantitative comparison of risk scores (the in-event risk calculator) is used to inform deenergization decision-making. The PSPS risks and the benefits of deenergization (wildfire risk) are modeled independently. These calculations are provided in SCE's post-event reports.

PRE-PATROLS IN THE FIELD

Where possible, every circuit in scope is patrolled before the arrival of the forecast POC, unless it was already patrolled within the previous seven days. Crews visually inspect the entire length of each circuit to find any imminent hazards and provide additional intelligence on field conditions. If maintenance concerns are discovered on a circuit in scope, repairs are expedited before the impending wind event.

PUBLIC SAFETY COORDINATION

SCE communicates with public safety partners to inform them about the event. This includes providing details on the location of circuits within their jurisdictions and discussing any public safety concerns that need to be considered.

The liaison officer manages the deployment of agency representatives (AREPs) to emergency management partners' emergency operations centers upon request.

Information is provided to public safety partners through a notification sequence and enhanced by access to Public Safety Partner Portal resources. The online portal provides these partners with enhanced and simplified near-real-time access to event information.

Starting on the first full day of activation, SCE typically also provides dedicated daily briefings to:

- State agencies
- County and tribal representatives
- Critical facilities and critical infrastructure
- Community-based organizations

CUSTOMER NOTIFICATIONS

Notifications begin 48-72 hours ahead of the POC, when possible. Because initial notifications are based on three-day-ahead forecasting at the circuit level, they lack the precision of in-event notifications. Circuits might be removed or added to the monitored circuit list as the POC gets closer and forecast certainty increases.

LIVE FIELD OBSERVATIONS

Live field observers are stationed in the field at least two hours before the forecasted start of the event (when feasible). Observers are trained SCE employees who monitor circuits for any possible signs of failure and for environmental conditions that could accelerate the need to turn off power, such as potential for damage from wind gusts, airborne vegetation or other flying debris. Crews use handheld weather stations to provide readings to supplement information from fixed weather stations and assist with switching operations.

PSPS OPERATIONS TEAM DECISION-MAKING PROCESS

Real-time weather station and electric grid information is gathered by the Integrated PSPS Event Management System (iPEMS) and compared with the deenergization triggers. This information is generally auto-populated every 10 minutes with updated wind speed and weather information. Field conditions are provided to the operations team in real time. As a circuit or segment approaches its deenergization trigger, it is deenergized.

The PSPS operations team executes circuit-switching plans when possible to reduce the number of customers impacted.

ADDRESSING PUBLIC SAFETY CONCERNS

Requests to delay deenergization or reenergization of circuits are addressed on a case-by-case basis. Potential reasons to delay the deenergization of a circuit could include the need to power water pumps for fire suppression or evacuations in progress. These requests may come from fire agencies or from other emergency management officials during an event. SCE maintains a full-time team of fire management advisors who are deployed to fire agency incident command posts as requested to assist in collaboration during wildfires.

Given that PSPS deenergization involves entire circuits or circuit segments, it may not be possible to isolate individual customers, locations or portions of a circuit that are underground.

PATROL AND RE-ENERGIZATION

The PSPS operations team monitors all circuits that are deenergized as well as circuits that have not met the deenergization triggers throughout the event. On a circuit-by-circuit basis, when winds decrease below criteria, the operations team, in consultation with weather services, will recommend reenergization after the line is patrolled.

As the winds abate, field crews begin restoration patrols. Restoration is typically accomplished within eight hours following the end of the POC. However, some circuits require foot or helicopter patrol and can only be safely patrolled in daylight. As such, these circuits might remain deenergized overnight, especially in the fall and winter months. When possible, customers on these difficult-to-patrol circuits are switched to more accessible circuits for restoration, so that circuits with no customers on them will be the last in line for restoration.

For multiday events, with gaps of several hours or more, field crews will attempt to restore customers before the subsequent POC begins, even if this is temporary and will require a repeat deenergization. This is only possible when there is enough time between local POCs for a complete patrol and restoration effort.

POST EVENT REPORTS

After the conclusion of every PSPS event, SCE files a post-event report with the CPUC. These reports are required under CPUC Resolution ESRB-8 and use a CPUC-mandated template. Post-event reports identify the reasons for any shutoffs, the areas affected, the number of customers impacted, the actual weather conditions and the methods used to notify the public. All post-event reports are available on the CPUC's [Utility PSPS Reports: Post-Event, Pre-Season and Post-Season webpage](#), and are typically filed 10 business days after the conclusion of the event. Each report includes after-action recommendations, if there are any, and categorizations of any customer complaints received during the event.

PSPS PREPAREDNESS

PSPS preparedness activities take place year-round. Pre-planning work includes reviewing circuits for fuel risk and developing process and tool enhancements, such as updating circuit switching plans for circuits in high fire risk areas.

CIRCUIT SEGMENT REVIEWS

Circuit segments are removed from consideration for PSPS when the wildfire risk is temporarily or permanently abated, using an exception review process. Circuit segment exceptions are identified when SCE begins preparing detailed designs for grid hardening activities or through specific feedback received from field teams with knowledge of changing conditions in specific areas. An example of a circuit segment that is removed from consideration would be a segment traversing a recent burn scar where there is little or no vegetation posing an ignition risk. Segments that are upstream from segments at risk and that cannot be switched to other circuits might still be in scope for PSPS.

SWITCHING PLAN DEVELOPMENT

SCE develops switching plans for all circuits in scope for each specific event to determine whether circuit segments could be transferred to other circuits not in scope using field isolation devices. Customers can be switched either before or during events to isolate segments for PSPS. In some cases, switching is not possible. For example, adjacent segments could also be in scope for PSPS, or the segment could be at the end of the circuit, reducing options for switching.

Switching plans can be used in some situations to remove critical infrastructure from circuits under consideration for shutoff (if the infrastructure is not located on a segment at immediate risk).

PSPS TERMINOLOGY

PROCESS TERMS

California Public Utilities Commission (CPUC): California regulatory agency with oversight responsibilities for California's investor-owned utilities (IOUs).

Consequence score: Used to quantify risk in decision-making.

Emergency Operations Center (EOC): Command center for emergency management. For PSPS, SCE typically uses a virtual EOC based in Microsoft Teams.

Fire Climate Zone (FCZ): SCE has 14 Fire Climate Zones, which are areas with similar vegetation, weather, topography and fire history. These zones are helpful in relating weather and fuels with fire activity as these types of datasets are more useful when aggregated over larger areas.

High Fire Risk Area (HFRA): A region in our service area where the risk of significant wildfires is elevated. These areas are identified and monitored to inform decision-making. The map is reviewed annually and circuits can be added or removed.

Incident Management Team (IMT): Team structure to carry out PSPS and other emergency operations. Used by all government agencies and most leading utilities to ensure common terms, structures, processes and forms.

In-Event Risk Calculator: A decision-making tool that assesses and compares potential public safety risk (PSPS risk) and the benefits of de-energization (wildfire risk).

In scope: Circuits at risk are deemed to be in scope when they have a reasonable chance of de-energization.

Monitored circuit list (MCL): List of all in scope circuits including a specific timeframe for when they are expected to meet de-energization criteria.

Period of concern (POC): The timeframe when a circuit is forecast to meet de-energization criteria.

Post event report: CPUC-mandated report filed after the conclusion of each event and available for viewing on the CPUC website.

Urban conflagration: Urban conflagrations are destructive fires that spread from structure to structure in urban areas, rather than primarily through wildland fuels.

PSPS TERMINOLOGY (CONTINUED)

MODELING AND DECISION-MAKING TERMS

Dead fuel moisture: The amount of moisture in dead vegetation, categorized by size and time lags.

- **One-hour dead fuel moisture:** The amount of time it takes for grasses and similar sized fuels to respond to changes in air temperature and relative humidity.
- **10-hour dead fuel moisture:** The amount of time it takes for small twigs and sticks to respond to changes in air temperature and relative humidity.
- **100-hour dead fuel moisture:** The amount of time it takes for small branches to respond to changes in air temperature and relative humidity.
- **1,000-hour dead fuel moisture:** The amount of time it takes for logs and other large dead material to respond to changes in air temperature and relative humidity.

Dew point depression: The difference between the air temperature and the dew point temperature at 2 meters above ground level.

Dew point temperature: The temperature to which air must be cooled to reach saturation.

Fireline intensity: A measure of the heat transfer per unit time at the head of the fire.

Flame length: The distance between the flame tip and the midpoint of the flame depth at the base of the flame.

Live fuel moisture: A measure of the amount of moisture within living vegetation.

Normalized Difference Vegetation Index (NDVI): A metric used to quantify the health and density of vegetation based on remote sensing.⁶ Used to determine greenness factor.

Rate of spread (ROS): The rate at which a fire moves away from the point of origin.

Wind speed: A sustained wind velocity at 6 meters above ground level.

REFERENCES

1. California Department of Forestry and Fire Protection (CAL FIRE). (2025, October 9). Top 20 largest California wildfires fire.ca.gov/stats-events
2. California Public Utilities Commission. (2019, May 30). Decision 19-05-042: Phase 1 PSPS guidelines (Appendix A, "Overarching Guidelines"). Page A1 [docs.cpuc.ca.gov/PublishedDocs/Published/G000/M296/K598/296598822.PDF]
3. California Public Utilities Commission. (2019, May 30). Decision 19-05-042: Phase 1 PSPS guidelines. Page 69
4. U.S. Department of Agriculture, Forest Service. (n.d.). Fire Environment Mapping System (FEMS): Field sample data. fems.fs2c.usda.gov/ui?FieldSample/Shrub/Chamise/3/topo/0/12120/None/None
5. U.S. Geological Survey. (n.d.). Landsat normalized difference vegetation index (NDVI) usgs.gov/landsat-missions/landsat-normalized-difference-vegetation-index
6. Southern California Edison. (n.d.). Weather and fire detection sce.com/outages-safety/wildfire-safety/weather-and-fire-detection
7. National Weather Service. (2013). Beaufort wind scale. weather.gov/mfl/beaufort