

Exh. ALB-4
Docket UE-230172
Witness: Allen L. Berreth

**BEFORE THE WASHINGTON
UTILITIES AND TRANSPORTATION COMMISSION**

WASHINGTON UTILITIES AND
TRANSPORTATION COMMISSION,

Complainant,

v.

PACIFICORP dba
PACIFIC POWER & LIGHT COMPANY

Respondent.

Docket UE-230172
(Consolidated)

In the Matter of

ALLIANCE OF WESTERN ENERGY
CONSUMERS'

Petition for Order Approving Deferral of
Increased Fly Ash Revenues

Docket UE-210852
(Consolidated)

PACIFICORP

EXHIBIT OF ALLEN L. BERRETH

Washington Wildfire Mitigation Plan

October 2023



Washington Wildfire Mitigation Plan

Pre-Rulemaking Draft

April 15, 2022



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Introduction

Due to the growing threat of catastrophic wildfire in the western United States, Pacific Power has developed a comprehensive plan for wildfire mitigation efforts in all of its service territories. This plan specifically guides the mitigation strategies that will be deployed in Washington. These efforts are designed to reduce the probability of utility related wildfires, as well to mitigate the damage to Pacific Power facilities because of wildfire.

Wildfire has long been an issue of notable public concern. Electric utilities have always needed to be concerned with the potential of a fire starting because of sparks that could be emitted from an electrical facility, generally during a fault condition. Decades of disturbing trends in the growth of wildfire size and intensity have magnified these concerns. Regardless of the causes, or political debates surrounding the issue, the reality is stark. Despite effective fire suppression agencies and increased suppression budgets, wildfires have grown in number, size and intensity. Increased human development in the wildland-urban interface, the area where people (and their structures) are intermixed with, or located near, substantial wildland vegetation has increased the probability and exacerbated the costs of wildfire damage in terms of both harm to people and property damage. A wildfire in an undeveloped area can have ecological consequences – some positive, some negative – but a wildfire in an undeveloped area will not, generally, directly affect large numbers of people. A wildfire engulfing a developed area, on the other hand, has catastrophic consequences on people and property.

The relationship between wildfire and public utilities has been brought to the fore by recent developments in California. The loss of human life and property damage in 2017 and 2018 highlighted that wildfire is not constrained to southern California, whether associated with electric utilities or not. Wildfire risk in other states, including Washington, cannot be ignored. The general trend toward larger and more destructive fires is not unique to California, but has been recognized, for several decades, in the western United States. In 2018, for example, multiple western states had wildfires exceeding 100,000 acres, including Washington (Klondike Fire and Boxcar Fire), Nevada (Martin Fire and Sugarloaf Fire), and Utah (Pole Creek Fire). Accordingly, Pacific Power is committed to making long-term investments to reduce the chances of catastrophic wildfire.

The measures in this Wildfire Mitigation Plan (WMP) describe those investments to construct, maintain and operate electrical lines and equipment in a manner that will minimize the risk of catastrophic wildfire. In evaluating which engineering, construction and operational strategies to deploy, Pacific Power was guided by the following core principles:

- Frequency of ignition events related to electric facilities can be reduced by engineering more resilient systems that experience fewer fault events.
- When a fault event does occur, the impact of the event can be minimized using equipment and personnel to shorten the duration to isolate the fault event.

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- Systems that facilitate situational awareness and operational readiness are central to mitigating fire risk and its impacts.
- A successful plan must also consider the impact on Washington customers and Washington communities, in the overall imperative to provide safe, reliable, and affordable electric service.

A successful plan must also consider the impact on Washington customers and communities, in the overall imperative to provide safe, reliable, and affordable electric service. Currently, Pacific Power’s Wildfire Mitigation Plan includes an increased investment of approximately \$17.2 million, \$16 million capital and \$1.2 expense, between 2019-2023, with an expectation of continued evaluation of additional investment beyond 2023. The following table presents a summary of the planned mitigation activities and the planned timeframe for implementation.

Table 1: System Hardening Summary, 2020- 2023

Mitigation Program	Total Units	2020 Actuals	2021 Actuals	2022 Plan	2023 Plan
System Hardening: Installation of Covered Conductor (miles) ¹	27	0	0	9	18
System Hardening: Distribution Relays	2	0	0	2	0
System Hardening: Circuit Breakers	1	0	0	1	0
System Hardening: Distribution Recloser	5	0	0	5	0
Situational Awareness: Weather Stations ²	8	3	0	5	2

Table 2: Incremental Capital Investment Per Mitigation Program, 2020-2023

Mitigation Program	Total	2020 Actuals	2021 Actuals	2022 Plan	2023 Plan
Line Rebuild: Installation of Covered Conductor, Pole Replacements, Fuse Replacements	\$14.46	\$0.19	\$0.38	\$5.51	\$8.38
Installation of System Automation Equipment (Relays/Reclosers/Circuit Breakers)	\$1.35	\$0.01	\$0.24	\$1.10	\$0.00
Situational Awareness: Weather Stations	\$0.21	\$0.05	\$0.00	\$0.11	\$0.05
Total	\$16.02	\$0.25	\$0.62	\$6.72	\$8.43

¹ Covered conductor line miles will be installed during both 2022 and 2023 as part of one, complex project. The line miles completed in 2022 is dependent on the approval of the required permits and yet unknown limits on construction dates due to protected plants and wildlife.

² 2020 weather station units include one weather station installed in late 2019.

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Table 3: Incremental Planned Expense Per Mitigation Program, 2020-2023

Mitigation Program	Total	2020 Actuals	2021 Actuals	2022 Plan	2023 Plan
Vegetation Management	\$0.58	\$0.00	\$0.00	\$0.29	\$0.29
Asset Inspections	\$0.27	\$0.00	\$0.09	\$0.09	\$0.09
Situational Awareness / Weather Station Maintenance	\$0.35	\$0.00	\$0.00	\$0.05	\$0.30
Total	\$1.20	\$0.00	\$0.09	\$0.43	\$0.68

The strategies embodied in this plan are evolving and are subject to change. As new analyses, technologies, practices, network changes, environmental influence or risks are identified, changes to address them may be incorporated into future iterations of the plan.

1. Risk Analysis and Drivers

1.1 Methodology for Identifying and Evaluating Risk

This risk evaluation process employs the concept that the risk is essentially the product of the likelihood of a specific risk event multiplied by the impact of the event. The likelihood, or probability, of an event is an estimate of a particular event occurring within a given time frame. The impact of event is an estimate of the effect when an event occurs. Impact can be evaluated using a variety of factors, including considerations centered on health and safety, the environment, customer satisfaction, system reliability, the company’s image and reputation, and financial implications. As discussed below, the risk analysis in this plan focuses on the potential impact in harm to people and damage to property.

1.1.1 Modeling Pacific Power’s Wildfire Risk

A disruption of normal operations on the electrical network, called a “fault” in the industry, could be a possible ignition source for wildfire. Under certain weather conditions and in the vicinity of wildland fuels, an ignition can grow into a harmful wildfire, potentially even growing into a catastrophic fire causing great harm to people and property. This general relationship is shown in the Venn diagram below.

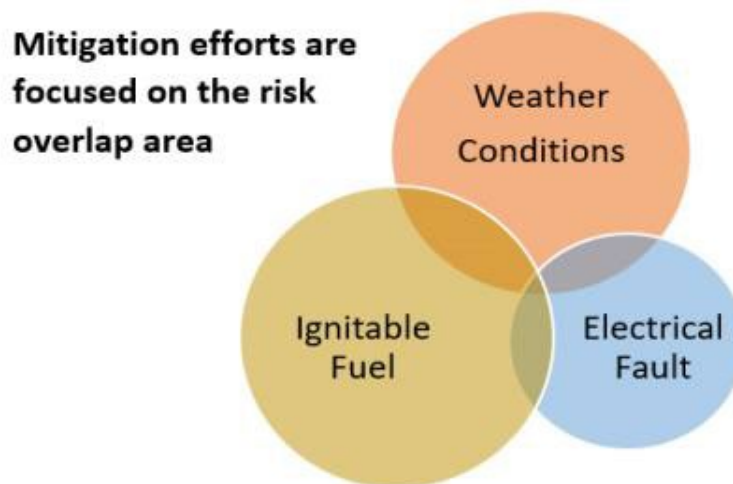


Figure 1: Utility Fire Risk Conceptual Model

Pacific Power’s risk analysis first concentrates on weather conditions and ignitable fuels, to identify the geographic areas in Pacific Power’s service territory at the greatest risk of catastrophic fire. The analysis also explores Washington’s fire history, its recorded causes, the acreage impact of the fires, and the seasonality of fires. The analysis further considers historical outage data, reflecting the best available data regarding the potential for faults on the electrical system.

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Pacific Power’s analysis of the wildfire risk in Washington took advantage of a larger Pacific Power effort involving other states.³ In 2018 and 2019, Pacific Power completed a wildfire risk analysis for its service territories that was patterned after the methodology developed after a long and iterative process in California. To take advantage of that experience, Pacific Power engaged fire-science engineering firm REAX Engineering Inc. to identify areas of elevated wildfire risk, which were ultimately designated with the name of Fire High Consequence Areas (FHCA).

Pacific Power and REAX first identified the general geographic areas subject to the risk analysis, which included all of Pacific Power’s service territory and a 25-mile radius study area around all Pacific Power-owned transmission lines, as shown below:

Topography (elevation, slope, aspect) segmented into 2-km-square cells,

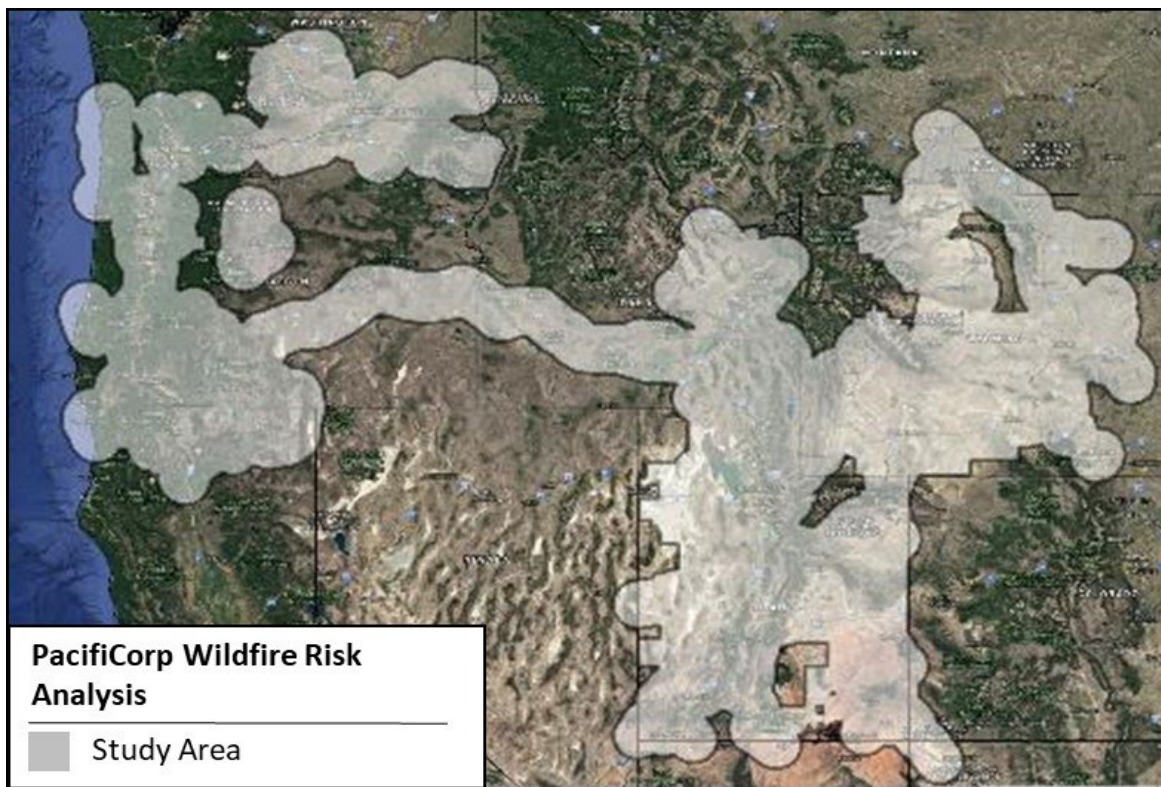


Figure 2: Study Area for Fire Risk Mapping Project

³Pacific Power is the division of Pacific Power that has service territory in Oregon, Washington, and California, Rocky Mountain Power is the division of Pacific Power that has service territory in Utah, Idaho, and Wyoming.

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REAX then conducted a wildfire risk analysis on this area. REAX used the following data and processes:

1. Topography of the land, including elevation, slope and aspect
2. Fuel data (from a dataset known as LANDFIRE⁴) with 30 m pixel resolution, calibrated against one of 40 “fuel models⁵,” which quantify fuel loading, fuel particle size and other quantities needed by fire models to calculate rate of spread.
3. Weather Research and Forecasting (WRF), resulting in climatology derivative from North American Regional Reanalysis (NARR) with resolution at 32 km, which is a hybrid of weather modeling and surface weather observations (including temperature, relative humidity, wind speed/direction, and precipitation, weather balloon observations of wind speed/direction and atmospheric, sea surface temperatures from buoys, satellite imagery for cloud cover and precipitation).⁶
4. Historic fire weather days spanning the period from January 1, 1979 through December 31, 2017, determined by calculating the Fosberg Fire Weather Index, modified to recognize off-season moisture, as measured by Schroeder’s ember ignition probability Pign.⁷
5. Estimated live fuel moisture.
6. Ignition modeling, using Monte Carlo-simulated ignition scenarios.
7. Fire spread modeling, Eulerian Level Set Model for Fire Spread (ELMFIRE), which is software for modeling wildland fire spread; ELMFIRE is used to run Monte Carlo-simulated burn scenarios that incorporate impacts to populations (by using the proxy of structures involved in any burn scenario, based on census tract data⁸), climatology, using spread algorithms developed in Eulerian Level Set Model for Fire Spread (ELMFIRE), conducted over a six-hour burn period, where fire type (surface, passive crown or active crown fire) in combination with flame length is critical to quantify

⁴<https://www.landfire.gov/datatool.php>

⁵<https://www.landfire.gov/fbfm40.php>

⁶ Essentially, a weather model similar to WRF assimilates/ingests several thousand weather observations over a three-hour period and then uses that information to create a 3D representation of the atmosphere every three hours. This includes not only surface (meaning near ground level) quantities but also upper atmosphere quantities as well. The NARR dataset is available from 1979 (when modern satellites first became available) to current day (with a lag of a few weeks).

⁷This metric MFFWI, was calculated in three-hour intervals for the time period of 1979–2017, and averaged over a six-hour period, since the early hours of a large fire are significant predictors for most catastrophic fires. The largest values were extracted, which involved about 200 days of hourly climatology inputs.

⁸http://www2.census.gov/geo/tiger/TIGER2010/TABBLOCK/2010/tl_2010_06_tabblock10.zip,
ftp://ftp2.census.gov/geo/tiger/TIGER2010BLKPOPHU/tabblock2010_06_pophu.zip

output metrics including fire size (acres), fire volume (acre-ft) and the number of structures within the fire perimeter.

Through this process, individual blocks of geographic area, each 2 kilometer square, received a grid score corresponding to its relative wildfire risk. To establish the Fire High Consequence Area (FHCA), REAX used the prior California mapping project for calibration and assigned cell scores correlating with California statewide cell scores. This approach enabled an “apples-to-apples” comparison to the results of that prior project, so that the relative degree of wildfire risk in areas of other states could be compared to the risk in areas of California. REAX then used geographic information system (GIS) software algorithm “Jenks natural breaks” to segment areas into 33 families of risk areas⁹, so that all cell areas were given a score from 0 to 32, as shown in [Figure 3](#). Cell values do not imply direct mathematical relationships, but rather indicate bins of relative catastrophic wildfire risk, when population density is factored into the weighting process.

⁹<https://www.spatialanalysisonline.com/extractv6.pdf>

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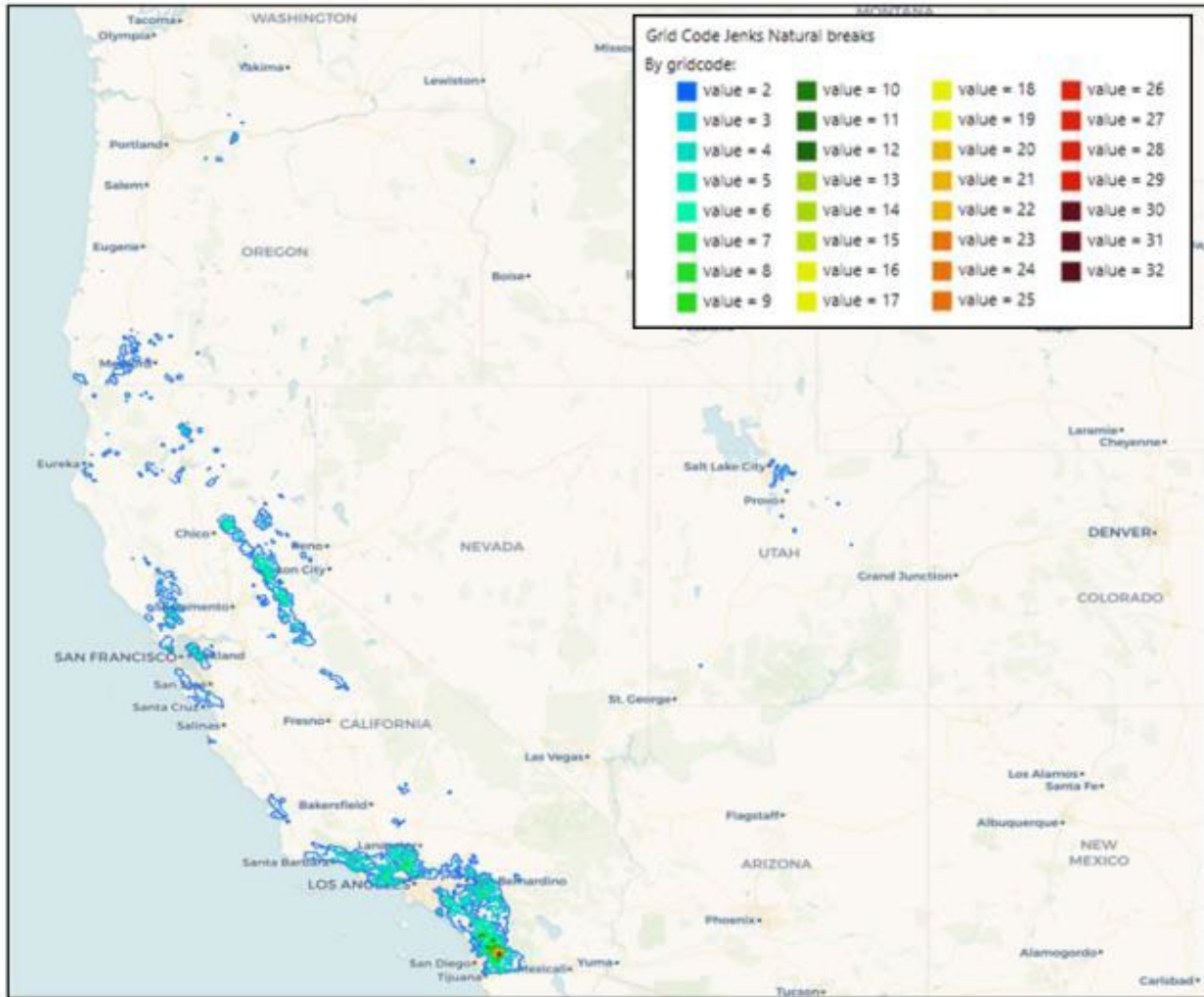


Figure 3: Grid Code of Jenks Natural Breaks

After REAX completed the computer modeling, a “ground-truthing” activity was completed by evaluating historic fire perimeters, existing Pacific Power facility equipment, and local conditions. The ground-truthing exercise generally validated the modelling performed by REAX and resulted in some relatively minor adjustments to the preliminary boundaries. Pacific Power plans to make an annual review of the FHCA boundaries and may make adjustments, based on updated modeling, integration of other risk assessment tools, and knowledge of local conditions.

The resulting Washington FHCA, together with magnified views on certain FHCA areas, is shown in the following figures.

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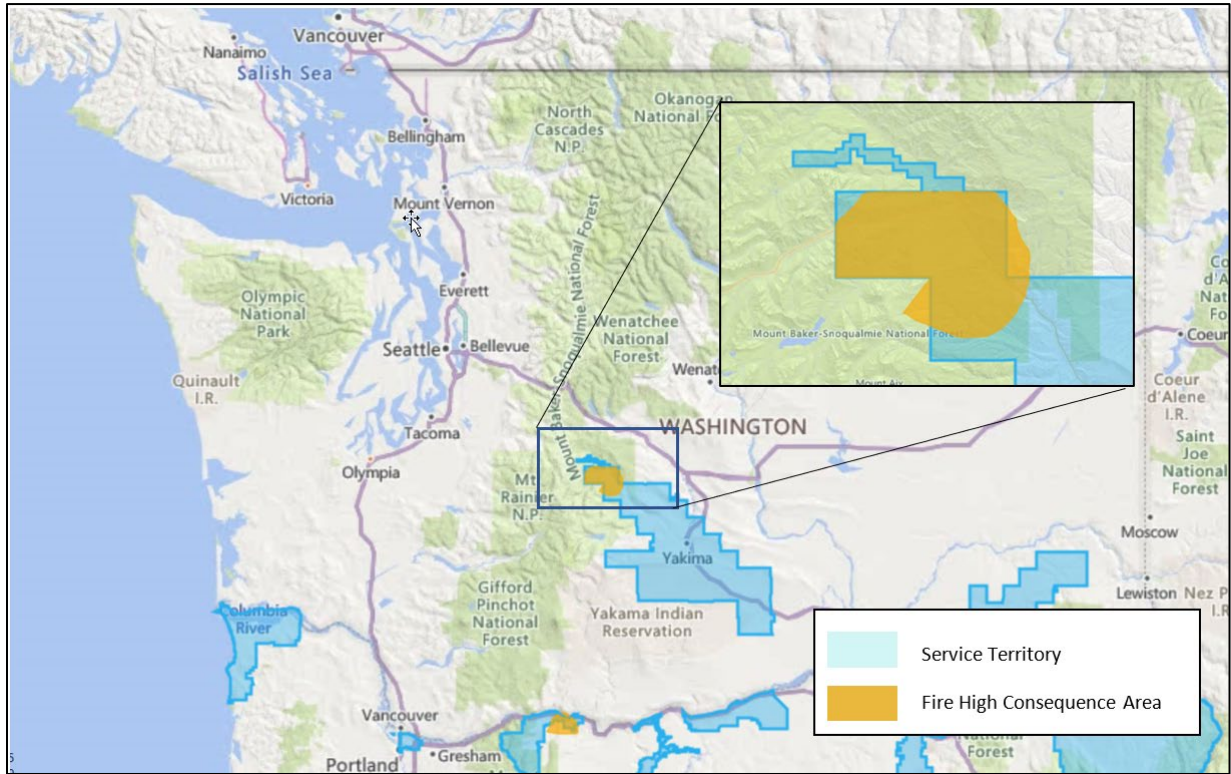


Figure 4: Washington Statewide FHCA Perimeters

1.3 Asset Inventory in the FHCA

In Washington, Pacific Power provides electricity to approximately 138,000 customers via 49 substations and 4,000 miles of transmission and distribution lines, across a service territory encompassing nearly 2,800 square miles in Washington. The three primary categories of assets subject to wildfire mitigation treatment are described as follows:

Table 4: Primary Asset Categories

Asset Classification	Asset Description
Transmission Line Assets	Include conductor, transmission structures, and switches operating at a higher level voltage (typically, any line operating at or above 46 kV is a transmission line).
Distribution Line Assets	Include overhead conductor, underground cabling, transformers, voltage regulators, capacitors, switches, line protective devices, operating at a lower voltage (again, typically less than 46 kV).
Substation Assets	Include major equipment such as power transformers, voltage regulators, capacitors, reactors, protective devices, relays, open-air structures, switchgear and control houses.

Many wildfire mitigation strategies are focused on assets located in the FHCA. The following table includes the breakdown of Pacific Power’s assets in the FHCA.

Table 5: Breakdown of Washington Assets in the FHCA

Asset	Total	FHCA	
	Line-Miles	Line-Miles	% of Total
OH Transmission	615.3	0.0	0.0%
69kV Transmission Lines	169.4	0.0	0.0%
115 kV Transmission Lines	204.1	0.0	0.0%
230 kV Transmission Lines	241.7	0.0	0.0%
OH Distribution	3397.1	19.8	0.6%
OH Lines - Miles	4012.4	19.8	0.5%
Substations	49	0	0.0%

1.4 State-Specific Fire History and Causes

To further develop an understanding of wildfire risks in both the state and company service territory, Pacific Power analyzed Washington fire history and ignition sources from 2007 through 2016, using data from the United States Forest Service. Ignition sources, both by number of ignitions in a given category, and by the amount of acres burned by ignitions in a particular category, are shown in the figures below. Whether assessed by the number of ignitions or by the acres burned from a particular cause, lightning was the leading cause of wildfire in Washington over the prior decade. The miscellaneous category is the next largest category. The miscellaneous category includes ignition causes attributed to others not classified and generally includes fireworks, firearms and others.

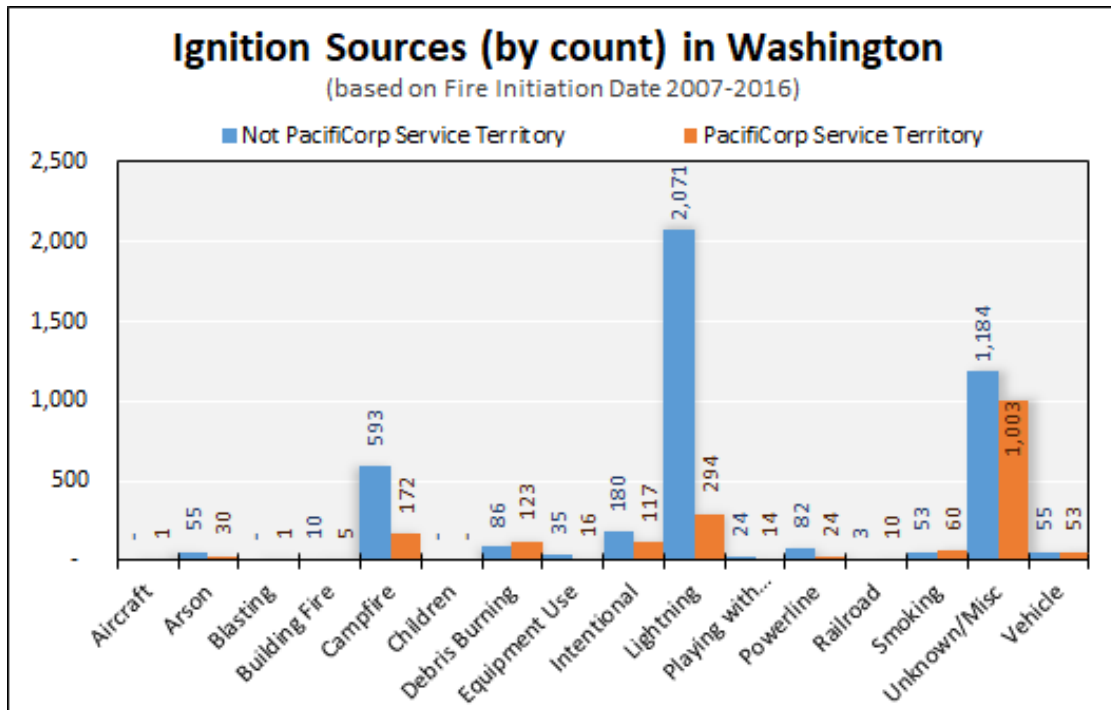


Figure 5: Fire History Ignition Source in Pacific Power's Washington Service Territory by Fire Threat Designation

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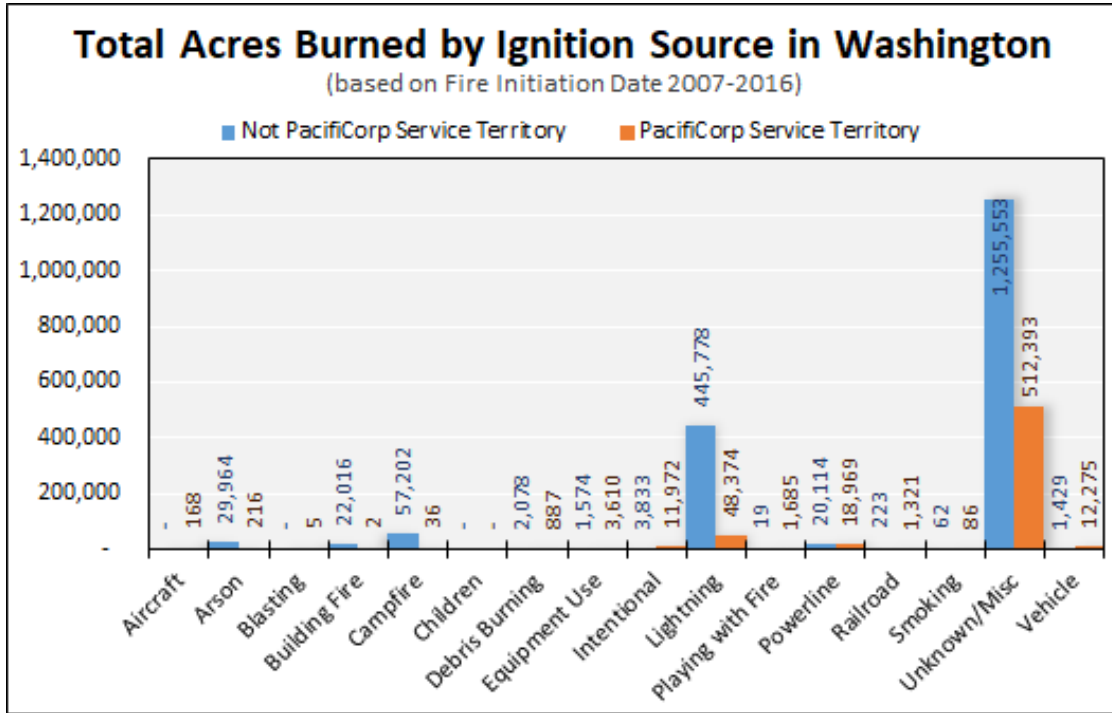


Figure 6: Fire History Total Acres Burned in Pacific Power’s Washington Service Territory by Ignition Fire Threat Designation

The same data for the entire state of Washington, expressed as a percentage of the total in a pie chart format, is shown in the figures below.

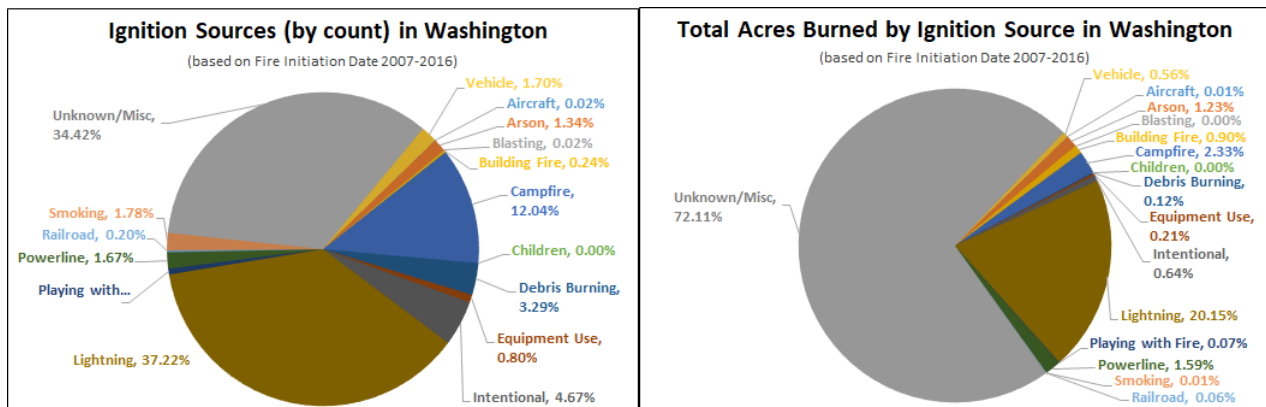


Figure 7: 2007 – 2016 Fire History Ignition Sources for the state of Washington; Percentages of Count and Total Acreage Burned

While the history outlined in the figures above shows that powerlines are not one of most significant causes of wildfire history in the state, it does indicate that powerlines reflect a category of appreciable risk to wildfires. In addition, consistent with similar studies in other states, it does appear that wildfires associated with powerlines may burn more acres as compared to other ignition categories. Wind is a major driver behind wildfire spread; wind is also

an important cause of electrical faults on a system of overhead wires. Therefore, it is important that the company evaluates its asset performance and alters its strategies as it discovers strategies in which it can deliver safer and more reliable service.

1.4.1 Determining Historic Fire Season

Pacific Power plotted the cumulative acres burnt against the day of the year for the period from 2007 to 2020. While it does not mean that a wildfire cannot occur outside of fire season, the following figure supports the general conclusion that June 1 through October 1 is a good representation for when fire risk is elevated for the state as a whole, and more particularly in Pacific Power’s Washington service territory.

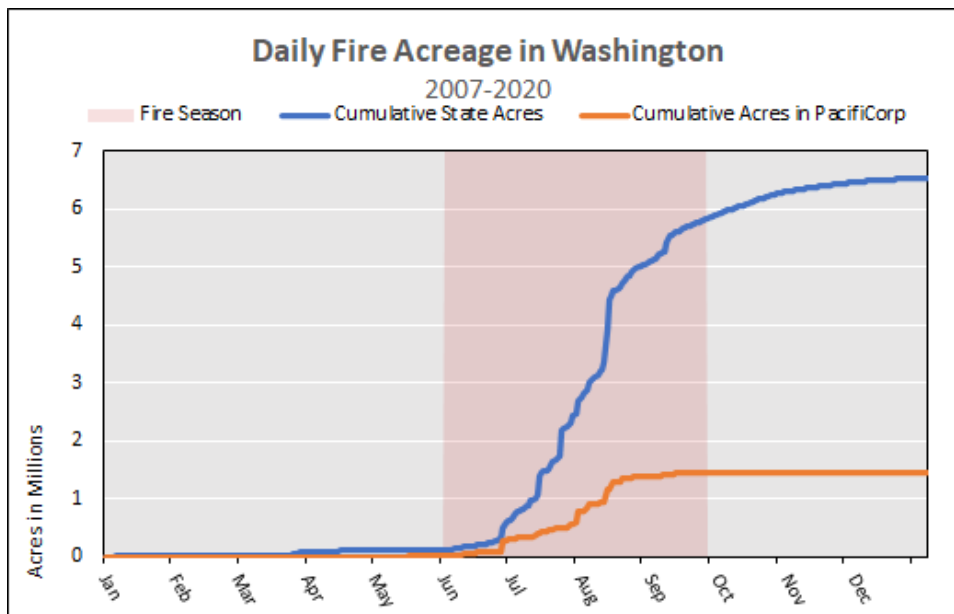


Figure 8: 2007–2020 Cumulative Acres Burned by Day of the Year in Washington

1.5 Assessment of Electric Utility-Related Fire Ignition Risk

Outage data is the best available data to utilities to correlate an identifiable event on the electrical network to the risk of a utility-related wildfire. There is a logical physical relationship, when a fault occurs it could result in a spark, thus there is a risk of fire, therefore these events are classified as ignition risk drivers. An unplanned outage – which is when a line is unintentionally de-energized – is most often rooted in a fault. Accordingly, the company has closely analyzed the causes and frequency of outages. This analysis is designed to determine which mitigation strategies are best suited to minimize fault events, thereby reducing the risk of fire.

1.5.1 General Outage Categories

Pacific Power maintains outage records in the normal course of business, as part of Pacific Power’s historic efforts to assess and improve service reliability. These records document the frequency, duration and cause of outages. Outage events experienced within Pacific Power’s service territory were organized into categories included in Table 6; these are not necessarily the outage classification provided by field employees but are organized based on ignition risk drivers. As indicated in the table, three of the outage categories do not implicate the potential of a spark, and, therefore, were not classified as ignition risk drivers.

Table 6: Pacific Power's Outage Category Identification and Description

Outage Category/ Ignition Source	Ignition Risk Driver	Description	Potential Ignition Source?
ANIMALS	Object Contact (Sub Class: Animal)	Animals making unwanted direct contact with energized assets.	YES
ENVIRONMENT	Contamination	Exposure to environmental factors, such as contamination	YES
EQUIPMENT DAMAGED/FAILURE	Equipment Failure (Sub-Class by Equipment Type)	Broken equipment from car hit-poles, vandalism or other non-lighting weather related factors. Failure of energized equipment due to normal deterioration and wear, such as a cross arm that has become cracked or the incorrect operation of a recloser, circuit breaker, relay, or switch	YES
LIGHTNING	Lightning	Outage event directly caused by lightning striking either (i) energized utility assets or (ii) nearby vegetation or equipment that, as a result, makes contact with energized utility assets	YES
OTHER EXTERNAL INTERFERENCE	Object Contact (Sub-Classes: Balloon, 3 rd)	External factors not relating in damaged equipment such as mylar balloons, hay or other interference resulting in a potential ignition source	YES

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Outage Category/ Ignition Source	Ignition Risk Driver	Description	Potential Ignition Source?
	Party Contact, Unknown)		
NOT CLASSIFIABLE	Unknown	Outage event with unknown cause or multiple potential possible causes identified	YES
OPERATIONAL	Utility Work	Outage event resulting from improper operating practice or other human error	YES
OTHER	Other	Outage event with other cause	YES
TREE	Object Contact (Sub-Class: Vegetation)	Outage attributed to vegetation, except when trees interfere as a result of public action (such as when a logger drops tree damaging equipment).	YES
VARIOUS	Wire-to-wire Contact	When outage records indicate in the course of the outage that wire-to-wire contact had occurred (such wind driven contact).	YES
VANDALISM OR THEFT	Vandalism/Theft	Outage event resulting from non-utility personnel operating or damaging utility equipment.	YES
NOT A FAULT OPERATION	N/A	This category is used to signal outage events in which no fault operation occurred, and is generally due to mis-classification of the outage cause, for instance actually a planned outage, but identified as some other cause.	NO
LOSS OF SUPPLY	N/A	Loss of upstream transmission supply resulting in non-energized circuits and an outage	NO
PLANNED	N/A	Planned outage to performed scheduled maintenance or repairs resulting in non-energized circuit	NO

Using these outage categories, Pacific Power performed a multi-year look back in the outage records and focused on outages occurring during fire season (June 1 through October 1), contrasted against those occurring outside fire season. Figure 9 shows the annual cumulative ignition risk drivers in and out of fire season segmented by cause category. It further evaluates the two larger ignition risk drivers, specifically equipment failure (and analyzes this by components that failed or were damaged) in Figure 10 and contact from object to determine the initiators of the risk, such as vegetation, animals or vehicle in Figure 11.

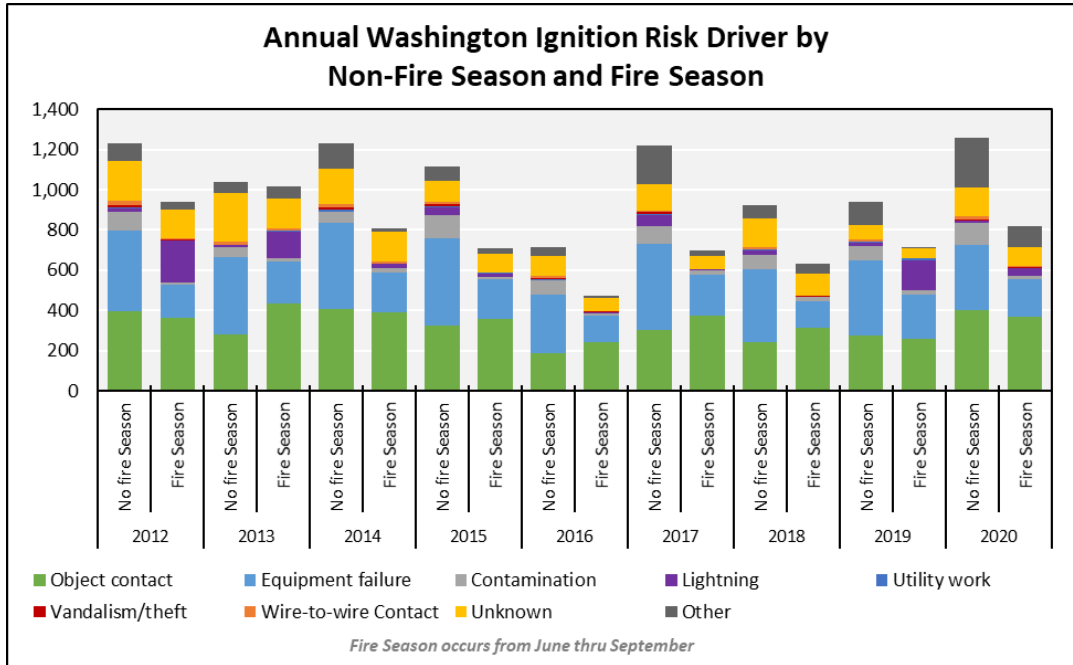


Figure 9: Cumulative Annual Distribution of Pacific Power’s Washington Ignition Risk Drivers by Fire Season 2012-2020

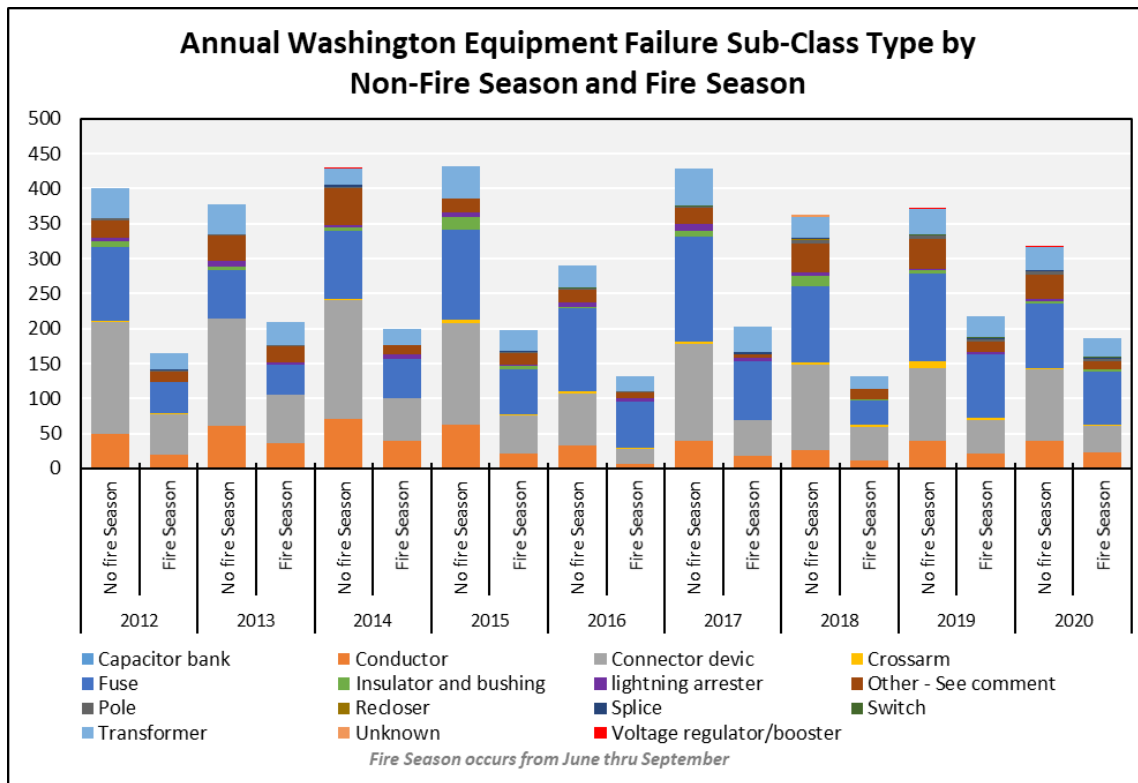


Figure 10: Detailed Breakdown of Equipment Failure Sub-Classes for Pacific Power’s Washington Cumulative Annual Distribution by Fire Season 2012-2020

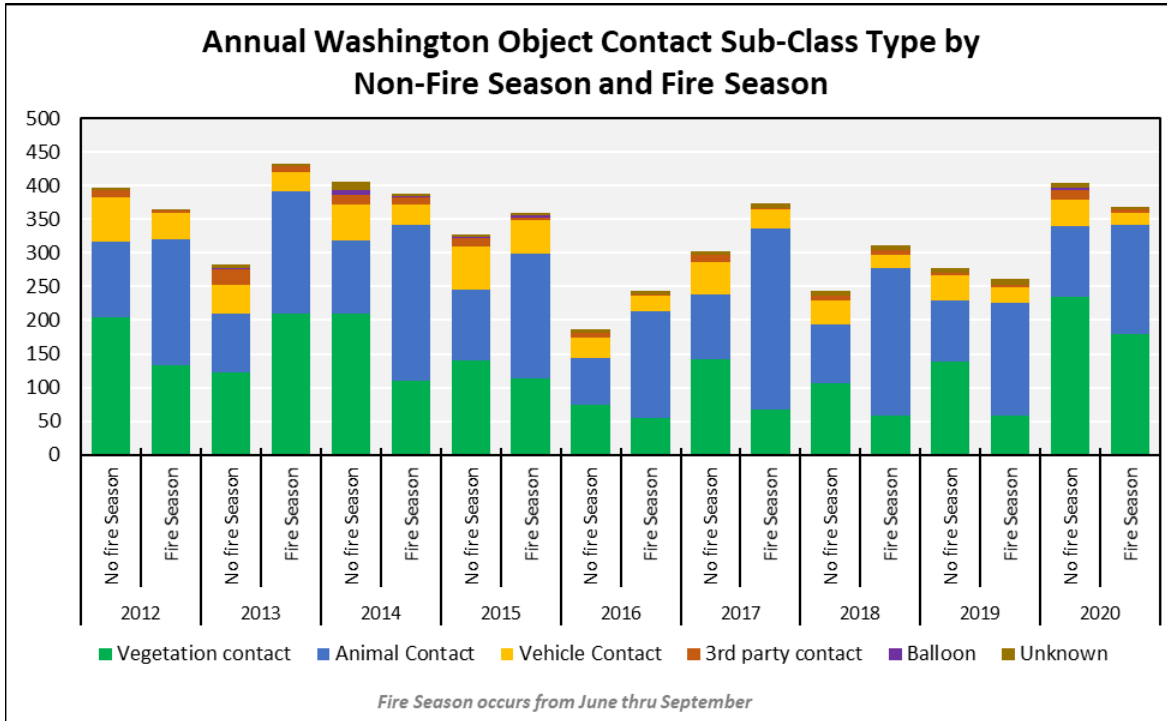


Figure 11: Detailed Breakdown of Object Contact Sub-Classes for Pacific Power’s Washington Cumulative Annual Distribution by Fire Season 2012-2020

Pacific Power also analyzed the outages within the Fire High Consequence Areas (FHCA)¹⁰, however due to the small footprint of FHCA in its Washington service territory it is unable to produce a meaningful comparison of inside/outside HFCA ignition risk drivers, shown in Table 7, below.

Table 7: Pacific Power’s Washington Frequency of Potential Ignition Source by Outage Cause Category from 2012-2020, inside and outside FHCA

Potential Ignition Risk Driver by Outage Cause Category	2012-2020 Total Number of Events During Fire Season in Washington							
	Outside FHCA				Inside FHCA			
	Rank	Total Events	% Contribution	Events/Year	Rank	Total Events	% Contribution	Events/Year
Object contact	1	3,081	46%	342	1	21	54%	2.3
Equipment failure	2	1,632	24%	181	2	9	23%	1.0

¹⁰ There are some constraints on tying outage records to the FHCA. The determination of an FHCA outage is based on the downstream topology within the operating device’s Zone of Protection (ZOP). The ZOP of a device is all lines downstream from but not beyond any downstream auto isolating devices. It is to say that some portion of the ZOP touches the FHCA boundary, and may not be entirely encompassed within.

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Potential Ignition Risk Driver by Outage Cause Category	2012-2020 Total Number of Events During Fire Season in Washington							
	Outside FHCA				Inside FHCA			
	Rank	Total Events	% Contribution	Events/Year	Rank	Total Events	% Contribution	Events/Year
Contamination	6	152	2%	17	5	1	3%	0.1
Lightning	4	580	9%	64	4	2	5%	0.2
Utility work	9	18	0%	2	6	0	0%	0.0
Vandalism/theft	8	22	0%	2	5	1	3%	0.1
Wire-to-wire Contact	7	41	1%	5	5	1	3%	0.1
Unknown	3	910	13%	101	3	3	8%	0.3
Other	5	327	5%	36	5	1	3%	0.1
Total	-	6,763	-	751	-	39	-	4.3

The following data is structured based on outage cause and evaluates year to year trends based on fire season. The company postulates that “wire down” events are the situation most likely to ignite ground fuels, and as such, tracking and diagnosing components which are involved in wire down events is important. For this reason, wire down events are overlaid in Figures 12 and 13 evaluating during fire season and non-fire season.

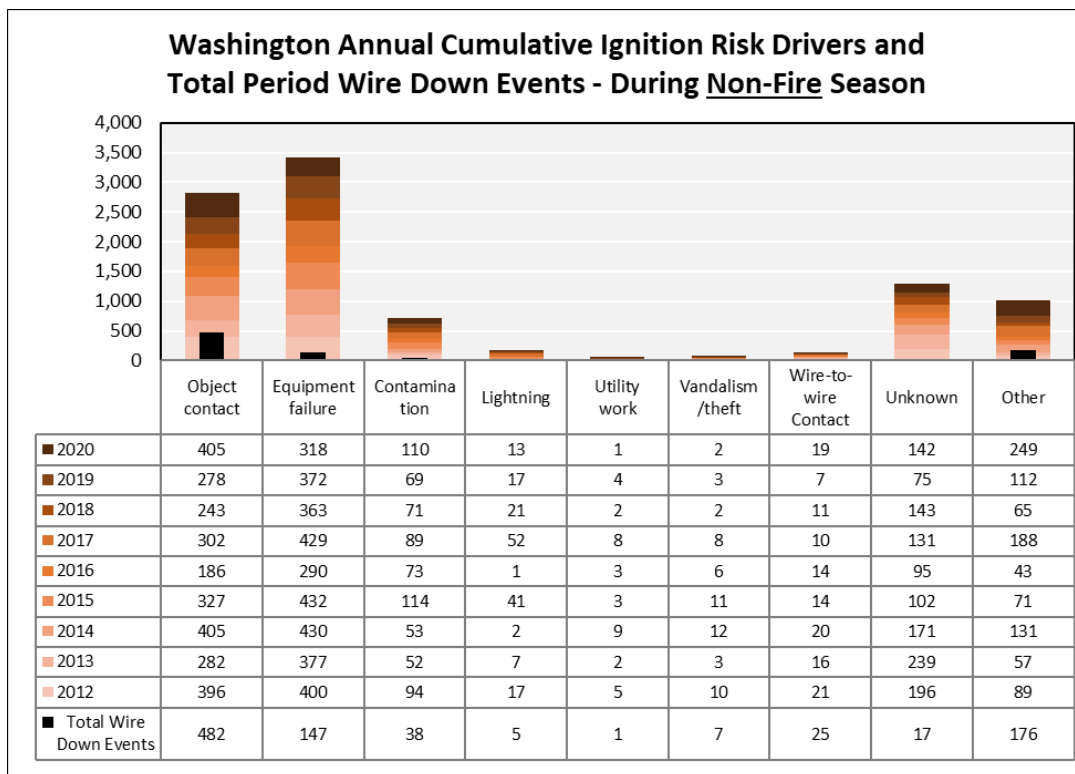


Figure 10: Cumulative Annual Ignition Risk Driver Events and Total Period Wire Down Events During Non-Fire Season

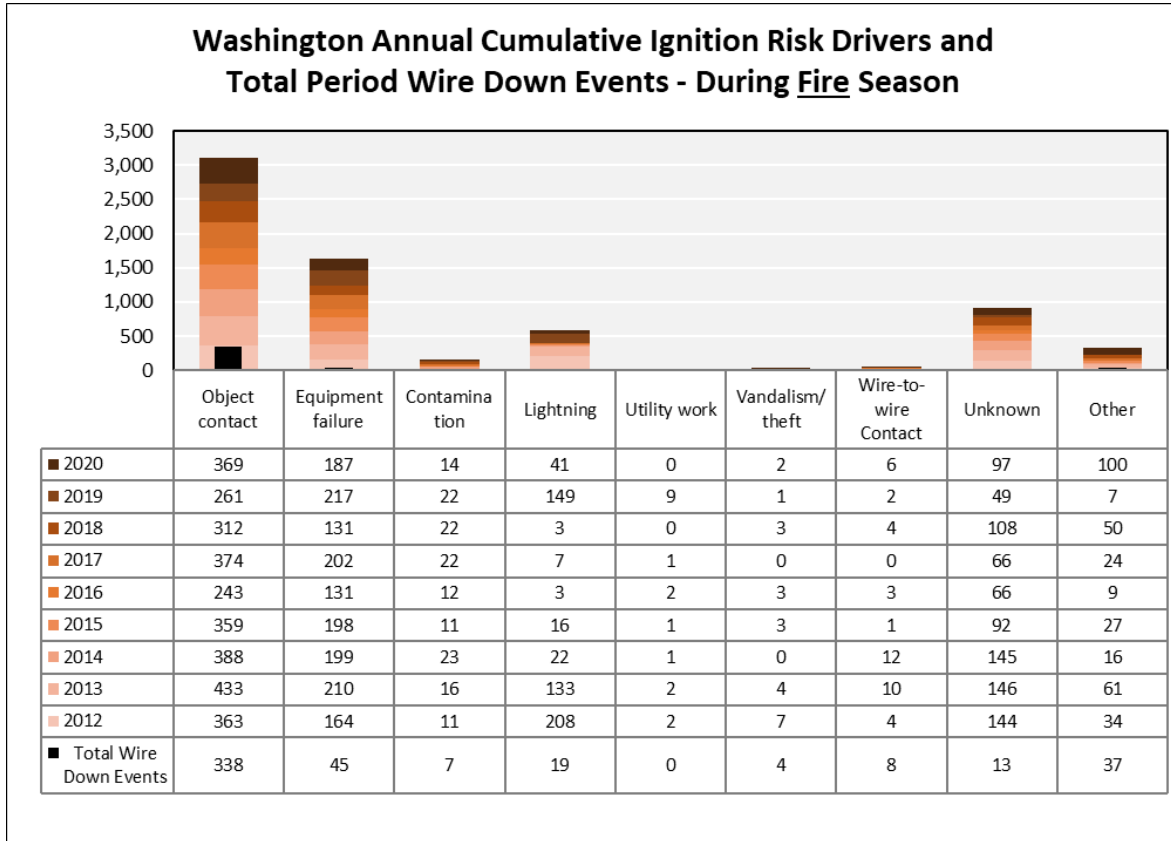


Figure 11: Cumulative Annual Ignition Risk Driver Events and Total Period Wire Down Events During Fire Season

Finally, wire down analysis during both fire season and non-fire season was performed to identify those components possibly leading to the wire down event, which is shown in Figure 14. Note the detailed percent variations between non-fire season and fire season is shown parenthetically in the graphic’s legend below. There appears to be no significant difference in equipment types based on fire seasons.

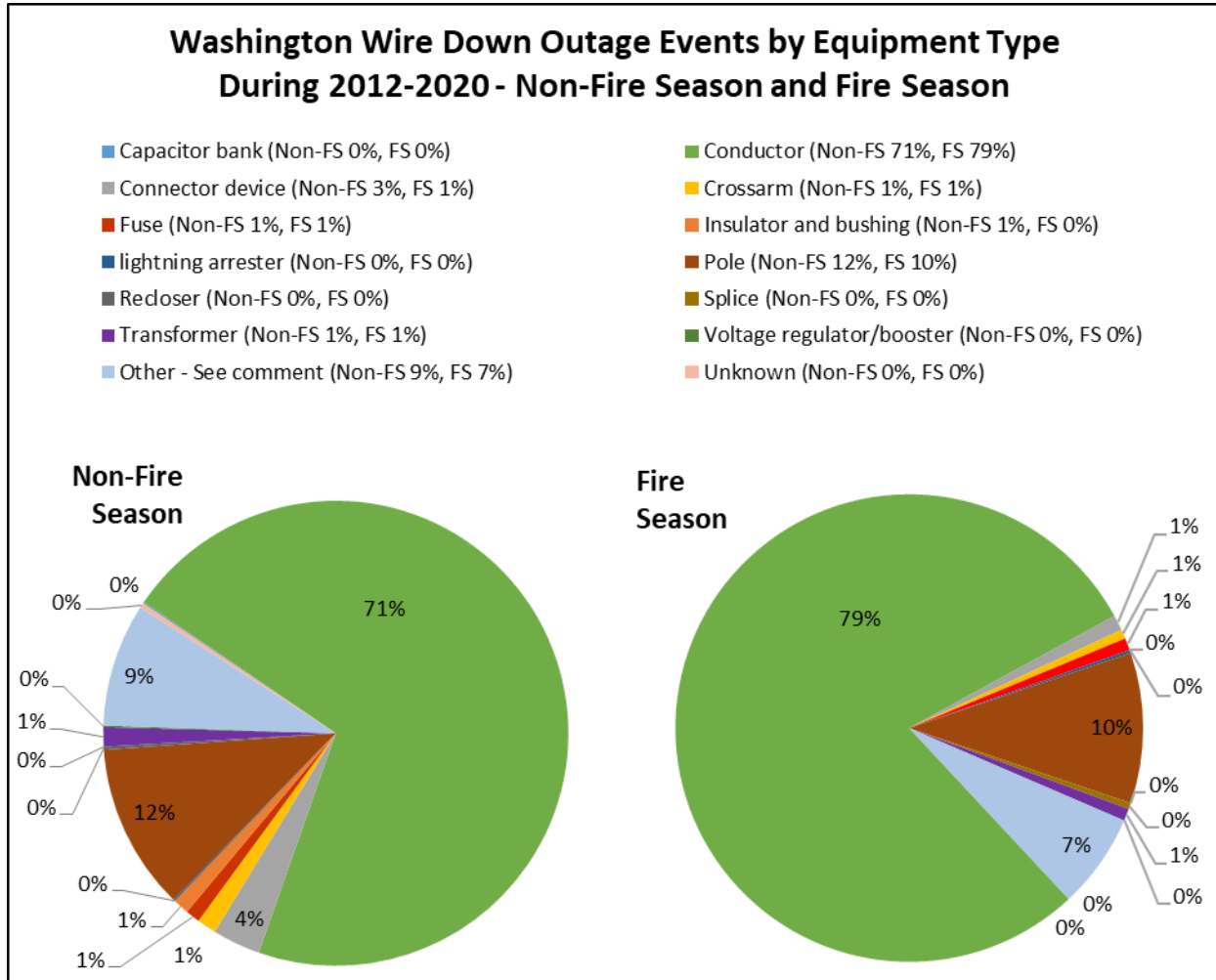


Figure 14: Wire Down Equipment Type Analysis During Non-Fire Season and Fire Season

1.6 Risk Assessment Conclusions

While a relatively small number of wildfires are attributable to powerlines, the potential magnitude of any wildfire event warrants significant wildfire mitigation efforts. The history of outages on the electrical network, and the faults underlying those outages, reflects the best available data for the wildfire risk assessment. Contact from Object presents the greatest utility related fire risk to Pacific Power’s Washington service territory (at 42%), followed by Equipment Failure/Damage (at 21%), then Unknown, then Lightning. These top four categories account for 92% of all ignition risk drivers. As demonstrated by the data, areas inside and outside the FHCA do not seem to experience any statistically different frequency (based on the small dataset). Specific mitigation strategies designed to address these risks are discussed throughout the rest of this plan.

2. *Situational Awareness*

Situational awareness involves knowledge of the conditions that impact the potential for wildfire ignition and spread. Increasing its situational awareness of such conditions helps an electric utility implement operational strategies, respond to local conditions, and minimize the wildfire risk by making mitigation strategies more effective.

Pacific Power uses the FHCA, the company's baseline risk map, layered with a risk driver analysis to inform strategic asset inspections, vegetation maintenance practices, and long-term system hardening solutions. However, as climate and weather patterns change, extreme weather events are predicted to become more frequent, and the potential exists for seasonal, dynamic, and/or isolated risk events to occur that compound or deviate from this baseline risk. Therefore, having an additional sophisticated, dynamic risk model grounded in situational awareness is pertinent to ensure electric utilities know when, where, how, and why to take abnormal action to mitigate the risk of wildfire.

Pacific Power's approach to situational awareness includes the acquisition of data to forecast and assess the risk of potential or active events to inform operational strategies, response to local conditions, and decision making. These key components, as outlined below, rely on a core team of utility meteorologist to guide, execute, and continuously evolve.

Meteorology

The ability to gather, interpret, and translate data into an assessment of utility specific risk and inform decision making is key component of Pacific Power's situational awareness capability. To support this effort, Pacific Power has developed an experienced meteorology department within the company's broader emergency management department. This new team consists of four experienced professionals and one manager. The objectives of this department are to supplement the company's longer term risk analysis capabilities with a real time risk assessment and forecasting tool, identify and close any forecasting data gaps, manage day to day threats and risks, and recommend changes to operational protocols during periods of elevated risk.

Weather Stations

Data captured from weather stations serve at least two purposes, notably creating a view of routine weather patterns within a specific area, in addition to providing data that can be mined to determine when extreme periods of risk are being experienced. The assessment of these extreme periods of risk and modelling of impacts to utility infrastructure and surrounding landscape is a key component of situational awareness to inform decision making and operational protocols. Generalized public weather data is and has been available for many years. However, in particularly dynamic situations, which pose an increased wildfire risk, this data may not be sufficient or granular enough to understand localized risks posed to utility infrastructure, particularly in rural locations with less development. Additionally, public weather data can be less reliable or less frequently calibrated than company owned and collected data. Therefore, in

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2019, Pacific Power began building out its own weather station network to capture temperature, humidity, wind speed and direction, rainfall and fuel moisture data to fill in weather data gaps that may have existed with the publicly available data. Because of the need to inform decision making, Pacific Power initially prioritized deployment of weather stations within PSPS Zones. Looking forward, Pacific Power will build out its weather station network beyond established PSPS Zones, ensure appropriate coverage to assess risk, and target any “blind spots” to weather phenomenon identified and increase visibility across Pacific Power territory. Pacific Power currently operates 3 weather stations across the state of Washington, with a plan to increase weather station count to approximately 8 weather stations in 2022.

The image below depicts the company’s planned weather stations additions for 2022.

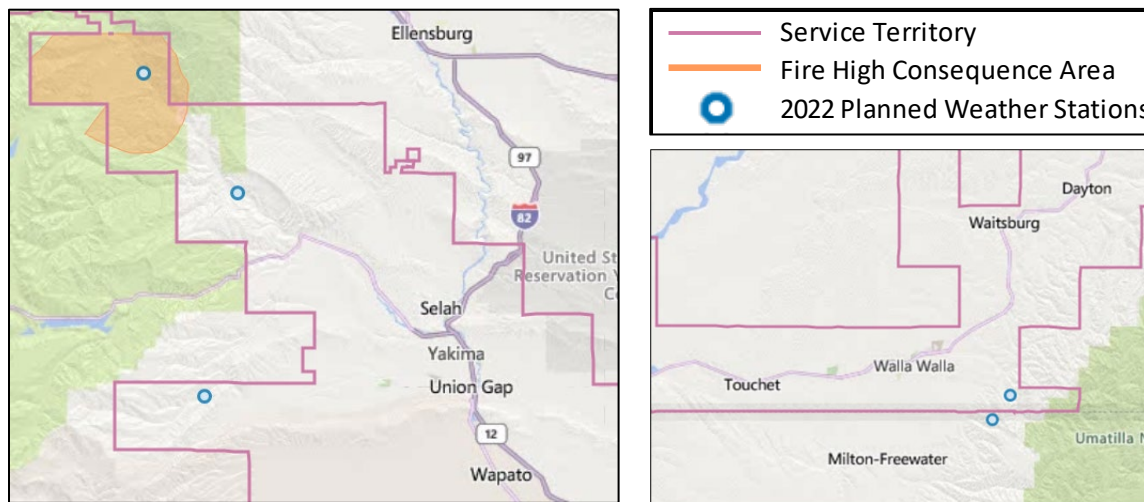


Figure 12: 2022 Planned Weather Station Locations

Forecasting & Risk Assessment

During times of elevated fire risk Pacific Power needs the capability to determine the potential impact of rapidly changing environmental situations, from the ignition of a fire to the change in a strong wind. Currently, Pacific Power uses a multi-day forecasting tool developed throughout 2021 to inform its situational awareness.

To do this, Pacific Power employs a validated, real-time analysis model of wildfire behavior and simulation to generate maps and reports. Situational awareness reports are generated daily by the meteorology department and inform the PSPS decision- making process, system operations practices and field operations’ work practices. These reports identify where fuels (dead and live vegetation) are critically dry, where and when critical fire weather conditions are expected (gusty winds and low humidity), and where and when the weather is forecast to negatively impact system performance and reliability. It is the intersection of these three triggers that result in the potential for a change to field operations, operational work practices, or a PSPS event.

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Pacific Power's daily forecasting tool and process are effective at informing decision making today at a macro level. However, evolution to a real time, mature fire modelling program that complements the forecasting tool will provide additional insight into factors such as fire size potential, population impacted, buildings impacted and additional fire behavior. This insight can be used to better characterize real time risk and inform decision making at the micro-level to facilitate a surgical approach.

The real time fire modelling program is planned to evolve to enhance available information and a more discrete characterization of risk quickly on the micro level.

This multi-year effort, which will pull heavily from experience in California, will incorporate fire spread analysis and modelling with existing data, align with the Integrated Reporting of Wildland Fire Information (IRWIN) federal active wildfire incident reporting tool and ALERT wildfire cameras, and leverage enhanced inputs such as updated climate data and satellite mapping of vegetation.

Application & Use

Functional, thorough, and robust situational awareness allows Pacific Power to make timely, informed wildfire mitigation decisions in advance of severe weather to reduce restoration times and mitigate risk. While data acquired through situational awareness can be integrated with existing utility data to prioritize system hardening infrastructure programs, situational awareness is predominantly used to provide daily and real time insight into the conditions of the company's service territory to inform system operations, field operations, and PSPS decision making, as discussed in the next sections.

3. Inspection and Correction

Inspection and correction programs are the cornerstone of a resilient system. These programs are tailored to identify conditions that could result in premature failure or potential fault scenarios, including situations in which the infrastructure may no longer be able to operate per code or engineered design, or may become susceptible to external factors, such as weather conditions.

Pacific Power performs inspections on a routine basis as dictated by both state-specific regulatory requirements and Pacific Power-specific policies. When an inspection is performed on a Pacific Power asset, inspectors use a predetermined list of condition codes (defined below) and priority levels (defined below) to describe any noteworthy observations or potential noncompliance discovered during the inspection. Once recorded, Pacific Power uses condition codes to establish the scope of and timeline for corrective action to make sure that the asset is in conformance with National Electric Safety Code (NESC) requirements, state-specific code requirements and/or Pacific Power specific policies. This process is designed to correct conditions while reducing impact to normal operations.

Key terms associated with Pacific Power's Inspections & Corrections Program are defined as follows:

- **Detailed Inspection.** A careful visual inspection accomplished by visiting each structure, as well as inspecting spans between structures, which is intended to identify potential nonconformance with the NESC or other applicable state requirements, nonconformance with Pacific Power construction standards, infringement by other utilities or individuals, defects, potential safety hazards, and deterioration of the facilities that need to be corrected to maintain reliable and safe service.
- **Pole Test & Treat.** An inspection of wood poles to identify decay, wear or damage, which may include pole-sounding, inspection hole drilling, and excavation tests to assess the pole condition and identify the need for any repair, or replacement and apply remedial treatment according to policy.
- **Visual Assurance Inspection.** A brief visual inspection performed by viewing each facility from a vantage point allowing reasonable viewing access, which is intended to identify damage or defects to the transmission and distribution system, or other potential hazards or right-of-way-encroachments that may endanger the public or adversely affect the integrity of the electric system, including items that could potentially cause a spark.
- **Condition.** The state of something with regard to appearance, quality, or working order that can sometimes be used to identify potential impact to normal system operation or clearance, which is typically identified by an inspection.
- **Condition Codes.** Predetermined list of codes for use by inspectors to efficiently capture and communicate observations and inform the scope of and timeline for potential corrective action.

- **Correction.** Scope of work required to remove a condition within a specified timeframe.
- **Priority Level.** The level of risk assigned to the condition observed, as follows:
 - Imminent – imminent risk to safety or reliability
 - Priority A – risk of high potential impact to safety or reliability
 - Priority B – low to moderate risk to safety, reliability or worker safety
 - Priority D – issues that are not NESC conformance issues that are recorded for informational purposes
 - Priority G – grandfathered conditions that conformed to NESC requirements that were in place when construction took place but do not conform to more current code revisions

3.1 Legacy Inspection and Correction Programs

Pacific Power’s asset inspection program involves three primary types of inspections: (1) visual assurance inspection; (2) detailed inspection, and (3) pole test & treat. Inspection cycles, which dictate the frequency of inspections, are set by Pacific Power asset management. In general, visual assurance inspections are conducted more frequently, to quickly identify any obvious damage or defects that could affect safety or reliability, and detailed inspections are performed less frequently, with a more detailed scope of work. The frequency of pole test & treat is based on the age of wood poles, and such inspections are typically scheduled in conjunction with certain detailed inspections. The inspector conducting the inspection will assign a condition code to any conditions found and the associated priority level in Pacific Power’s facility point inspection (FPI) system. Corrections are then scheduled and completed within the correction timeframes established by Pacific Power asset management, as discussed below. While the same condition codes are used throughout Pacific Power’s service territory, the timeframe for corrective action is different in different state jurisdictions. In all cases, the timeline for corrections takes into account the priority level of any identified condition. An A priority level condition is addressed on a much shorter timeframe than a priority B condition.

3.2 Augmented Inspection and Correction Programs

The existing inspection and correction programs are effective at maintaining regulatory compliance and managing routine operational risk. They also mitigate some wildfire risk by identifying and correcting Conditions which, if uncorrected, could ignite a fire. Recognizing the growing risk of wildfire, Pacific Power is supplementing its existing programs to further mitigate the growing wildfire specific operational risks and create greater resiliency against wildfires. There are three primary elements to this proposal: (1) creating a fire threat classification for specific Condition Codes; (2) increasing inspection frequencies in Fire High Consequence Areas; and (3) reducing Correction timeframes for fire threat Conditions.

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Fire Threat Conditions. Pacific Power designates certain conditions as “fire threat conditions.” Each condition is still assigned a condition code (e.g., CONDFRAY for a damaged or frayed primary conductor) – but certain condition codes are categorically designated as a fire threat condition. Accordingly, if a condition is designated under a particular condition code associated as a fire threat, the condition will also be designated as a fire threat condition. To this end, a review was performed on all existing condition codes to determine whether the condition code could have any correlation with fire ignition. Condition codes reflecting an appreciable risk of fire ignition were designated as fire threat conditions. For example, if a damaged or frayed primary conductor was observed during an inspection, the inspector would record condition code CONDFRAY, which is designated as a fire threat condition because the condition could eventually result in an ignition under certain circumstances. In contrast, the observation of a missing or broken guy marker would result in the condition code GUYMARK, which is not designated as a fire threat condition.

Inspection Frequency. Pacific Power’s plans include an increase to the frequency of certain inspections types for assets located in the FHCA as well as detailed inspections of overhead distribution throughout all of Washington. Consistent with industry best practices, inspections are Pacific Power’s preferred mechanism to identify conditions. An increase in the frequency of inspections will result in more timely identification of potential fire risk conditions. Inspection frequencies for Washington asset types are summarized in the following table:

Table 8: Legacy and Augmented Inspection Frequency in the FHCA

Inspection Type	Legacy Frequency (in years)	Augmented Inspection Frequency- non FHCA (in years)	Augmented Inspection Frequency- FHCA (in years)
OH Distribution (Less than 46 kV)			
Visual	2	2	1
Detailed	20	10	5
Pole Test & Treat	20	20	20
OH Local Transmission (more than 46 kV and Less than 200 kV)			
Visual	2	2	1
Detailed	10	10	5
Pole Test & Treat	10	10	10
OH Main Grid (More than 200 kV)			
Visual	1	1	1
Detailed	2	2	2
Pole Test & Treat	10	10	10

Correction Timeframe. Pacific Power will further mitigate wildfire risk by reducing the time allowed for correction of fire risk conditions in the FHCA. As expressed above, certain types of conditions have been identified as having characteristics associated with a higher risk of wildfire potential. Accordingly, Pacific Power is prioritizing those conditions for correction. Because of the risk of catastrophic wildfire in the FHCA, Pacific Power proposes an aggressive correction schedule for fire threat conditions in the FHCA, requiring that Priority A conditions be corrected on a 30-days and that B fire risk conditions be corrected within 12 months. Correction timeframes for fire threat conditions in the FHCA are summarized in the following table:

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Table 9: Legacy and Augmented Correction Timeframes for Fire Threat Conditions in the FHCA

Condition	Legacy Correction Timeframes	Augmented Correction Timeframes
A – imminent	Immediate	Immediate
A – fire risk and in the FHCA	120 days	30 days
B – fire risk and in the FHCA	Not specified	12 months

4. Vegetation Management

Vegetation management is generally recognized as a significant strategy in any Wildfire Protection Plan. Vegetation contacting a power line is a potential source of fire ignition. Thus, reducing vegetation contacts reduces the potential of an ignition originating from electrical facilities. While it is impossible to eliminate vegetation contacts completely, at least without radically altering the landscape near power lines, a primary objective of Pacific Power's existing vegetation management program is to minimize contact between vegetation and power lines by addressing grow-in and fall-in risks. This objective is in alignment with core Wildfire Protection Plan efforts, and continuing dedication to administering existing programs is a solid foundation for Pacific Power's Wildfire Protection Plan efforts. To supplement the existing program, Pacific Power vegetation management is implementing additional Wildfire Protection Plan strategies in FHCA.

4.1 Regular Vegetation Management Program

The focus of Pacific Power's vegetation management efforts is different for distribution lines and transmission lines. In both cases, typical work functions include pruning and tree removals. Pacific Power prunes trees to maintain a safe distance between tree limbs and power lines. Pacific Power also removes trees that pose an elevated risk of falling into a power line. Pacific Power uses significantly more restrictive clearance protocols under transmission lines and typically has wider rights-of-way that allow it to remove vegetation. Similar to other utilities, Pacific Power contracts with vegetation management service providers to perform the pruning and tree removal work for both transmission and distribution lines.¹¹

Distribution

Vegetation management on distribution circuits is completed on a cycle basis every three years. Circuits are inspected and where work is identified, vegetation is pruned to comply with defined minimum clearance specifications. Because some trees grow faster than others, minimum clearance specifications vary depending on the type of tree being pruned. For example, faster growing trees need a greater minimum clearance to maintain clearance throughout cycle. The minimum clearance specifications consider tree growth rates and duration of the work cycle.

Pacific Power also integrates spatial concepts to distinguish between side clearances, under clearances, and overhang clearances. Recognizing that certain trees grow vertically faster than other trees, it is appropriate to use an increased clearance when moderate or fast growing trees

¹¹ Pacific Power's vegetation management program is described in detail in Pacific Power's Transmission & Distribution Vegetation Management Program Standard Operating Procedures, which guides the work done by vegetation contractors.

are under a conductor. Increasing overhang clearances also reduces the potential for any contacts due to falling overhang.

The minimum clearance specifications are designed so that regulatory mandated clearance with primary lines will be maintained throughout the cycle. The specific lengths for the minimum clearance specifications are set forth in Section 5.2 of the Standard Operating Procedures as follows:

Table 10: Distribution Minimum Vegetation Clearance Specifications for a Three-Year Cycle

Three-Year Cycle			
	Slow Growing (< 1 ft. /yr.)	Moderate Growing (1-3 ft./yr.)	Fast Growing (>3 ft./yr.)
Side Clearance	8 ft.	10 ft.	12 ft.
Under Clearance	10 ft.	12 ft.	14 ft.
Overhang Clearance	12 ft.	12 ft.	12 ft.

When a tree is pruned, natural target pruning techniques are used to protect the health of a tree. Natural targets are the final pruning cut location at a strong point in a tree’s disease defense system, which are branch collars and proper laterals. Pruning at natural targets protects the joining trunk or limb.¹² Consequently, an actual cut is typically beyond the minimum clearance distance listed in the table above.

Pacific Power also removes high-risk trees as part of distribution cycle work, to minimize vegetation contact. High-risk trees are defined in the Standard Operating Procedures as “dead, dying, diseased, deformed, or unstable trees that have a high probability of falling and contacting a substation, distribution conductor, transmission conductor, structure, guys or other [Pacific Power] electric facility.”¹³ Inspections are performed on distribution lines in advance of distribution cycle maintenance work, to identify which trees will be worked in the cycle, including high-risk trees subject to removal. To identify hazard trees, Pacific Power uses the practices set forth in ANSI A300 (Part 9); and Smiley, Matheny and Lilly (2011), Best Management Practices: Tree Risk Assessment, International Society of Arboriculture. In summary, Pacific Power identifies high-risk trees for removal through a Level 1 visual assessment, as defined in ANSI A300 (Part 9), with particular attention to the prevailing winds and trees on any uphill slope. Suspect trees that require further inspection may be subjected to a Level 2 assessment, as outlined in ANSI A300

¹²This technique is drawn from ISA Best Management Practices: Tree Pruning (Gilman and Lilly 2002) and A300 (ANSI 2008). (See also Miller, Randall H., 1998. Why Utilities “V-Out” Trees. *Arborist News*. 7(2):9-16.)

¹³See Table 2 of FAC-003-04, available at <https://www.nerc.com/pa/Stand/Reliability%20Standards/FAC-003-4.pdf>

(Part 9), to further assess their condition. After the work is completed, Pacific Power conducts post-work inspections as part of an audit and quality review process.

Distribution cycle work also includes work designed to reduce future work volumes. In particular, volunteer saplings, small trees that were not intentionally planted, are typically removed if they could eventually grow into a power line. From a long-term perspective, this type of inventory reduction helps mitigate wildfire risk by eliminating a potential vegetation contact long before it could ever occur.

Transmission

Vegetation management on transmission lines is also focused on maintaining clearances, but the clearance distances are greater. Because of the nature of transmission lines, wider rights-of-way generally allow Pacific Power to maintain clearances well in excess of the required minimum clearances set forth in the “Minimum Vegetation Clearance Distance” (MVCD¹⁴). Accordingly, rather than scheduling vegetation management work for transmission lines on a fixed cycle timeframe, such work is scheduled on an as-needed basis, depending on the results of regular inspections and specific local conditions. To determine whether work is needed, an “Action Threshold” is applied, meaning that work is done if vegetation has grown within the action threshold distance. When work is completed, vegetation is cleared to the minimum clearance as specified in this table:

Table 11: Transmission Minimum Vegetation Clearance by Transmission Line Voltage

Transmission Clearance Requirements (in feet)								
	500 kV	345 kV	230 kV	161 kV	138 kV	115 kV	69 kV	45 kV
Minimum Vegetation Clearance Distance (MVCD)	8.5	5.3	5.0	3.4	2.9	2.4	1.4	N/A
Action Thresholds	18.5	15.5	15.0	13.5	13.0	12.5	10.5	5
Minimum Clearances Following Work	50	40	30	30	30	30	25	20

Taking advantage of greater legal rights to manage the vegetation in the right-of-way for transmission lines, Pacific Power employs “Integrated Vegetation Management” (IVM) practices to prevent vegetation growth from violating clearances. Rather than depending on pruning in regular work cycles, IVM seeks to prevent clearance issues from emerging, by managing the species of trees and other vegetation growing in the right-of-way. Under such an approach, Pacific Power removes tree species that could potentially threaten clearance requirements, while encouraging low growing cover vegetation, which would never implicate clearance issues.

¹⁴See Table 2 of FAC-003-04, available at <https://www.nerc.com/pa/Stand/Reliability%20Standards/FAC-003-4.pdf>

Line Patrolmen inspect most transmission lines annually and notify the vegetation management department of any vegetation conditions. Regional foresters in the vegetation management department and/or vegetation management contractors also conduct regular inspections of vegetation near transmission lines, including annual inspections of vegetation on all main grid transmission lines. Vegetation work is scheduled dependent on a number of local factors, which is consistent with industry standards and best management practices. Vegetation work on local transmission overbuild is completed on the distribution cycle schedule and inspected accordingly.

All of these strategies and techniques are described further in the Standard Operating Procedures. The current form of the Standard Operating Procedures was first published in 2008, and periodic updates to content have been made. The most current version is Revision 07, dated May 13, 2019, which incorporates provisions for the new mitigation strategies described below.

4.2 New Wildfire Mitigation Plan Strategies

Pacific Power's vegetation management specifically targets risk reduction in the FHCA with three distinct strategies. First, Pacific Power vegetation management will conduct annual vegetation inspections on all lines in the FHCA, with correction work also completed based on inspection results. Second, Pacific Power will use increased minimum clearance distances for distribution cycle work completed in the FHCA will be increased. Third, Pacific Power plans to complete annual pole clearing on subject equipment poles located in the FHCA.

Annual Vegetation Patrols. Pacific Power vegetation management is transitioning to annual vegetation inspections for all lines or portions of lines located in the FHCA. Pacific Power vegetation management believes that this tool is the most effective strategy to identify high-risk trees at the earliest stage possible. This strategy facilitates removal of high-risk trees before such trees could ever fall into a line and cause a wildfire. The annual inspection includes both on-cycle and off-cycle work to achieve an annual inspection of all line miles within FHCA

Extended Clearances. Pacific Power is transitioning to increased minimum post-work clearance specifications for any distribution cycle work in the FHCA. The new minimum post-work clearance specifications targets pruning to at least 12 feet, in all directions and for all types of trees, when work is identified as needed. As discussed above in the previous section, minimum clearance specifications dictate the distance achieved after pruning is completed. By increasing the minimum distance required at the time pruning is done, Pacific Power further minimizes the potential of vegetation contacting a power line at any time. The planned minimum clearance specifications for the FHCA are as follows:

Table 12: Distribution Minimum Vegetation Clearance Specifications in the FHCA

FHCA			
	Slow Growing (< 1 ft./yr.)	Moderate Growing (1-3 ft./yr.)	Fast Growing (>3 ft./yr.)
Side Clearance	12 ft.	12 ft.	14 ft.
Under Clearance	12 ft.	14 ft.	16 ft.
Overhang Clearance	12 ft.	14 ft.	14 ft.

Pole Clearing. Pacific Power vegetation management performs pole clearing on subject equipment poles located in the FHCA. Pole clearing involves removing all vegetation within a 10-foot radius cylinder (up to 8 feet vertically) of clear space around a subject pole and applying herbicides and/or soil sterilant to prevent any vegetation regrowth (unless prohibited by law or the property owner). This strategy is distinct from the clearance and removal activities discussed above because it is not designed to prevent contact between vegetation and a power line. Instead, pole clearing is designed to reduce the risk of fire ignition if sparks are emitted from electrical equipment. Pole clearing will be performed on wildland vegetation in the FHCA around poles that have fuses, air switches, clamps or other devices that could create sparks. After a pole has been cleared, a spark falling within the 10-foot radius would be much less likely to ignite a fire.

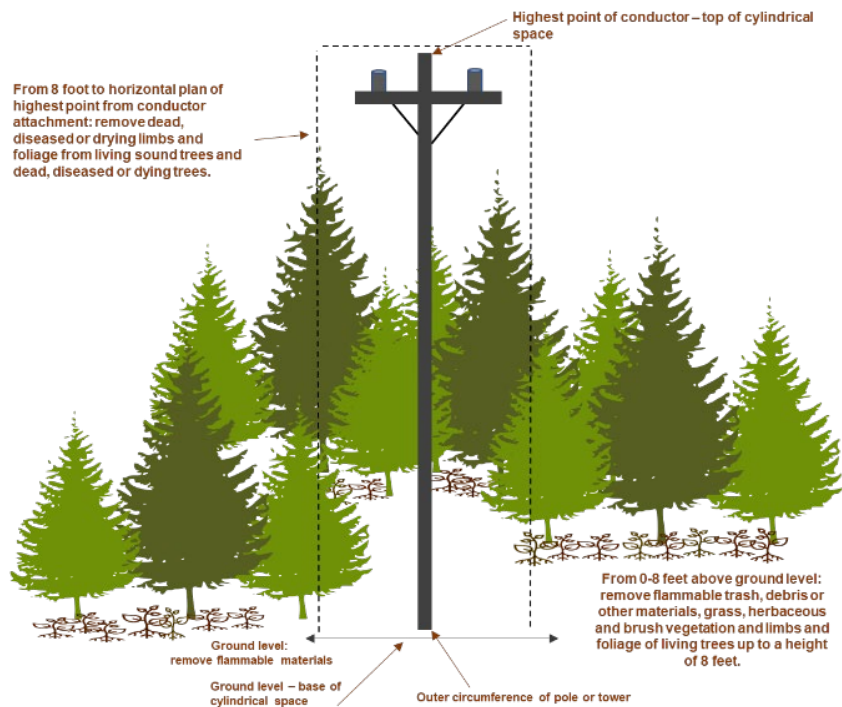


Figure 13: Pole Clearing Example Image

5. *System Hardening*

Pacific Power's electrical infrastructure is engineered, designed and operated in a manner consistent with prudent utility practice, enabling the delivery of safe, reliable power to all customers. When installing new assets, Pacific Power is committed to incorporating the latest technology and engineered solutions. When conditions warrant, Pacific Power may engage in strategic system hardening, which means replacing existing assets (or, in some circumstances, modifying existing assets using a new design and additional equipment) to make the assets more resilient. Recognizing the growing risk of wildfire, Pacific Power proposes to supplement existing asset replacement projects with system hardening programs designed to mitigate specific operational risks associated with wildfire.

System hardening programs are designed in reference to the equipment on the electrical network that could be involved in the ignition of a wildfire or be subject to an existing wildfire event. In general, system hardening programs attempt to reduce the occurrence of events involving the emission of sparks (or other forms of heat) from electrical facilities or reduce the impact of an existing wildfire on utility infrastructure. System hardening programs represent the greatest long-term mitigation tool available for use by electric utilities. The phasing and prioritization of such programs is therefore focused on locations that present the greatest risk.

No single system hardening program mitigates all wildfire risk related to all types of equipment. Individual programs address different factors, different circumstances and different geographic areas. Each program described below, however, shares the common objective of reducing overall wildfire risk associated with the design and type of equipment used to construct electrical facilities. In prioritizing particular design or equipment elements, these programs can also consider environmental factors impacting the magnitude of a wildfire. Dry and windy conditions pose the greatest degree of risk. Consequently, system hardening programs may specifically attempt to reduce the potential of an ignition event when it is dry and windy, by looking at equipment that is more susceptible to failure or contact with foreign objects when it is dry and windy.

It must be emphasized, however, that system hardening cannot prevent all ignitions, no matter how much is invested in the electrical network. Equipment does not always work perfectly and, even when manufactured and maintained properly, can age and fail; in addition, there are external forces and factors impacting equipment, including from third parties and natural conditions. Therefore, Pacific Power cannot guarantee that a spark or heat coming from equipment owned and operated by Pacific Power will never ignite a wildfire. Instead, Pacific Power seeks to reduce the potential of an ignition associated with any electrical equipment. To this end, Pacific Power plans to make investments with targeted system hardening programs.

Pacific Power developed new design standards applicable to new construction in areas of elevated wildfire risk, described in the construction standards section. The idea of "system hardening" applies in these contexts, as Pacific Power plans for new construction to be "hardened" against wildfire risk. This particular section on system hardening, however, is geared

toward specific programs aimed at making existing facilities more resistant to wildfire, even though those existing facilities are fully functional and do not require any corrective work under current utility practices.

5.1 FHCA Line Rebuild Program

Pacific Power has evaluated specific areas for system hardening work. The wildfire risk assessment, discussed in Section 0, is an important factor in evaluating where work is appropriate. Pacific Power has identified areas in Washington where bare overhead wire may be replaced with covered conductor. Where appropriate, poles will either be replaced or made more fire resilient (by fire protective treatment methods). Additionally, where conductor diameters do not support fault current properly (due to the limited arc energy they can tolerate), they will be replaced, generally with covered conductor. In all, the end effect will be more tolerant to incidental contact, while also being certain to tolerate fault event arc energy levels.

The company used different criteria to determine which lines are included within the line rebuild program. First, because of the heightened risk in the FHCA, all lines included in the rebuild program are located at least partially in the FHCA. Certain segments of a rebuild might extend outside the FHCA, based on the location of substations or protective devices. In general, however, the vast majority of rebuild is in the FHCA.

Covered Conductor. Historically, the vast majority of high voltage power lines in the United States – and in Pacific Power’s service territory – were installed with bare overhead conductor. As the name “bare” suggests, the wire is all-metal and exposed to the air. For purposes of wildfire mitigation, a new conductor design has emerged as an industry best practice. Most of the projects in the FHCA Line Rebuild Program will involve the installation of covered conductor. Sometimes, with some variations in products, covered conductor is also called spacer cable, aerial cable, or tree cable.

The dominant characteristic of covered conductor is that the metal conductor which actually carries electricity is sheathed in a plastic covering. As a comparison for the lay person, covered conductor is like an extension power cord that you might use in your garage. The plastic coating provides insulation for the energized metal conductor inside the plastic coating. To be clear, covered conductor is not insulated enough for people to directly handle an energized high voltage power line (as discussed below). But the principle is the same. The plastic sheathing provides an insulating effect. It is this insulating effect which reduces the risk of wildfire, by greatly reducing the number of faults that would have occurred had bare conductor been used.

Variations in covered conductor products have been used in the industry for decades. Due to many operating constraints, however, use of covered conductor tended to be limited to locations with extremely dense vegetation where traditional vegetation management was not feasible or efficient. Recent technological developments, however, have markedly improved covered conductor products, reducing the operating constraints historically associated with the design. These advances have improved the durability of the project and reduced the impact of thermal

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insulation (i.e. because bare wires are exposed to air, bare wires can cool easier). There are still logistical challenges with covered conductor. Above all, the wire is heavier, especially when carrying snow or ice, meaning that more and/or stronger poles may be required when using covered conductor. And the product itself is more expensive than bare conductor.

The wildfire mitigation benefits of covered conductor are significant. As discussed in the risk assessment section, a disruption on the electrical network, a fault, can result in emission of spark or heat that could be a potential source of ignition. Covered conductor greatly reduces the potential of many kinds of faults. For example, contact from object is major category of real-world faults which can cause a spark. Whether it is a tree branch falling into a line or a Mylar balloon carried by the wind drifting into a line, contact from those objects with energized bare conductor causes the emission of sparks. If those same objects contact covered conductor, the wire is insulated enough that there are no sparks. Likewise, many equipment failures are a wildfire risk because the equipment failure then allows a bare conductor to contact a grounded object. Consequently, covered conductor greatly reduces the risk of ignition associated with most types of equipment failure. For example, if a cross arm breaks, the wire held up by the cross arm often falls to the ground (or low and out of position, so that the wire might be contacting vegetation on the ground or the pole itself). In those circumstances, a bare conductor can emit sparks (or heat) that can cause an ignition. The use of covered conductor, in those exact same circumstances, would almost certainly not lead to an ignition, because the insulation around the wire is sufficient enough to prevent any sparks and limit energy flow, even when there is contact with an object.

Covered conductor is especially well-suited to reduce the occurrence of faults reasonably linked with the worst wildfire events. Dry and windy conditions pose the greatest wildfire risks. Wind, in particular, is the driving force behind catastrophic wildfire spread. At the same time, wind has distinct and negative impacts on a power line. The wind blows objects into lines; a strong wind can cause equipment failure; and even parallel lines slapping in the wind can cause sparks. Covered conductor specifically reduces the potential of a catastrophic ignition event, because covered conductor is especially effective at limiting the kinds of faults that occur when it is windy. Taken together, these substantial benefits warrant the use of covered conductor in areas with a high wildfire risk.

In sum, at a very basic level, covered conductor is safer overall compared to bare conductor. Not only does covered conductor reduce the risk of wildfire, it is less dangerous to contact a covered conductor compared to a similar voltage bare conductor. Combined with the substantial wildfire mitigation benefits, covered conductor is the preferred design for rebuild projects. There are, however, unique challenges implicated in making it harder to spot a low-hanging or downed line.

Pacific Power also evaluated the costs and benefits of underground design for the rebuild projects. The potential wildfire mitigation benefits are undeniable. While an underground design does not completely eliminate every ignition potential (i.e. because of above-ground junctions), it is the most effective design to most dramatically reduce the risk of any utility-related ignition. Unfortunately, because of cost and operational constraints, the functional realities of

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underground construction prevent widespread application as a wildfire mitigation strategy. Nonetheless, Pacific Power is using an underground design as part of the rebuild projects when functional and cost-effective. Through the design process, each individual rebuild project is assessed to determine whether sections of the rebuild should be completed with underground construction. As a practical matter, the great majority of the rebuilds will be covered conductor, which is true of planned investment in Washington. This outcome is consistent with emerging best practices. Utilities in geographic areas with extreme wildfire risk, including in California and Australia, are trending heavily towards use of covered conductor, with limited applications of underground construction where appropriate. Indeed, sourcing material for the planned projects is challenging because of the industry trend towards use of covered conductor as a primary wildfire mitigation strategy. On a related note, the company remains willing to consider additional underground applications. Some communities and landowners may prefer, for aesthetic reasons, to pursue a higher cost underground alternative. Consistent with governing electric service regulations, Pacific Power will work with communities or individual landowners who are willing to pay the incremental cost and obtain the necessary legal entitlements for underground construction, if covered conductor is the least cost option for a rebuild project.

Non-Wooden Poles. Traditionally, overhead poles are replaced or reinforced within Pacific Power's service territory consistent with state specific requirements and prudent utility practice. When a pole is identified for replacement, typically through routine inspections and testing, major weather events, or joint use accommodation projects, a new pole consistent with engineering specifications suitable for the intended use and design is installed in its place. Engineering specifications typically reflect the use of wooden poles which is consistent with prudent utility practice and considered safe and structurally sufficient to support overhead electrical facilities during standard operating conditions. However, the use of alternate non-wooden construction, such as steel or fiberglass, can provide additional structural resilience in high risk locations during wildfire events and, therefore, aid in restoration efforts.

In addition to the installation of non-wooden solutions as a part of standard replacement programs or mechanisms in priority locations with increased risk, certain wooden poles may also be replaced with non-wooden solutions in conjunction with other wildfire mitigation system hardening programs. For example, as a part of covered conductor installation, the strength of existing poles is evaluated. In many cases, the strength of existing poles may not be sufficient to accommodate the additional weight of covered conductor. In these instances, the existing wooden pole is upgraded to support the increased strength requirements and, when present in high priority locations, replaced with a non-wooden solution for added resilience.

Non-Expulsion Fuses. Overhead expulsion fuses serve as one of the primary system protection devices on the overhead system. The expulsion fuse has a small metal element within the fuse body that is designed to melt when excessive current passes through the fuse body, interrupting the flow of electricity to the downstream distribution system. Under certain conditions, the melting action and interruption technique will expel an arc out of the bottom of the fuse tab. To reduce the potential for ignition as a result of fuse operation, Pacific Power has identified alternate methodologies and equipment that do not expel an arc for installation within the FHCA.

Pacific Power plans to replace expulsion fuses with non-expulsion fuses as a part of the FHCA line rebuild program in conjunction with the installation of covered conductor.

5.2 Reclosers & Relays for Advanced System Protection Program

Pacific Power plans to replace electro-mechanical relays with microprocessor relays throughout the FHCA, initially prioritized in PSPS Zones.

Microprocessor relays provide multiple wildfire mitigation benefits. They are able to exercise programmed functions much faster than an electro-mechanical relay and above all, the faster relay limits the length and magnitude of fault events. After a fault occurs, energy is released, posing a risk of ignition, until the fault is cleared. Reducing the duration of a fault event reduces the risk that the fault might result in a fire.

Additionally, microprocessor relays also allow for greater customization to address environmental conditions through a variety of settings and are better able to incorporate complex logic to execute specific operations. These functional features allow for the company to use more refined settings for application during periods of greater wildfire risk.

Finally, in contrast to electro-mechanical relays, microprocessor relays retain event logs that provide data for fault location and later analysis. In certain circumstances, this information can help the company locate and correct a condition prior to the condition leading to a more serious event. At a minimum, such information facilitates better knowledge of the network, possibly shaping future mitigation strategies. As part of replacing an electro-mechanical relay, the associated circuit breaker or other line equipment may also be replaced, as appropriate to facilitate the functionality of a microprocessor relay.

Pacific Power's plan includes replacing 2 distribution relays, 1 circuit breaker, and 5 reclosers in 2022.

6. System Operations

Adjustments to power system operations can help mitigate wildfire risk. System operations adjustments include the disabling of recloser functions, as well as the modification of relay settings for protective devices on distribution lines or changes to line re-energization testing protocols described further in this section. These adjustments are not universally applied to power system operations because there are certain disadvantages in their use, especially because they may increase outage frequency and duration experienced by customers. In other words, a balance is required to provide customers with reliable power while still mitigating wildfire risk

6.1 Protection and Control Settings

Line protective devices, such as line reclosers, are currently deployed on various transmission and distribution lines throughout Pacific Power’s service territory. When a line trips open due to fault activity, reclosers can be programmed to momentarily open, allow the fault to dissipate, then reclose in an effort to test if the fault is temporary. The reclosing function gives the ability to restore service on a line that has tripped while maintaining the option to open again if the fault persists. If the fault is permanent, the recloser will operate and stay open (known as the “lock out” state) until the line has been deemed ready for re-energization. The image below generally depicts one potential configuration of a distribution circuit with multiple line reclosers installed.

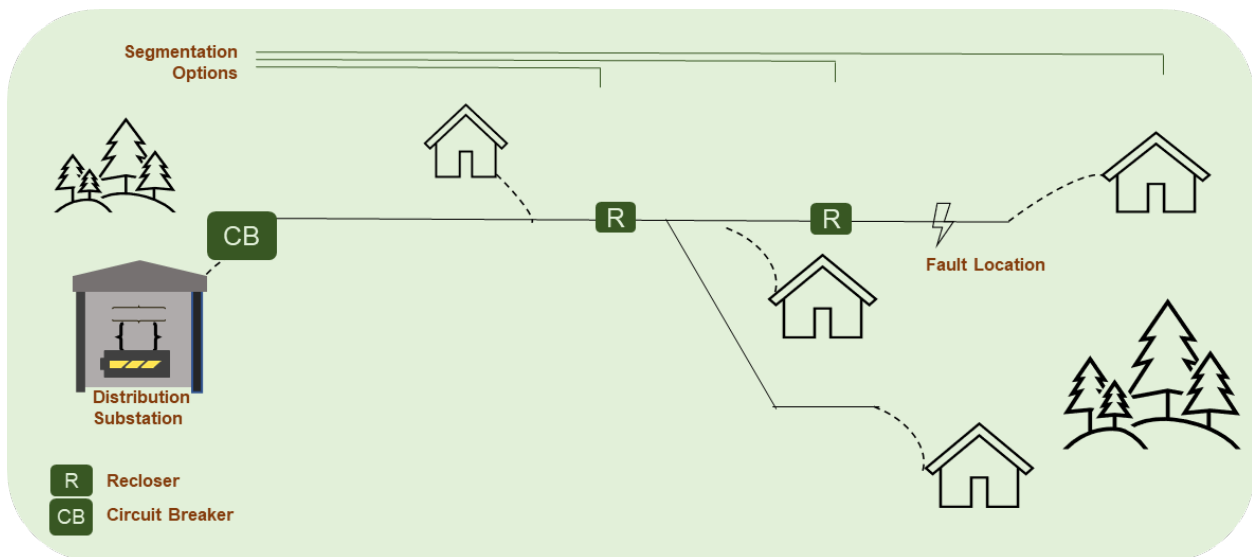


Figure 14: Example of Distribution Circuit with Multiple Reclosers

In general, recloser operation is beneficial because it reduces the number of sustained outages and improves customer reliability. The reclosing function, however, implicates some degree of ignition risk because additional energy can be released if a fault persists. When a fault is detected on the line, a recloser will trip and reclose based on predetermined settings to re-energize the line. If the fault is temporary in nature and is no longer present upon the reclose operation, the

line will re-energize resulting in limited impact to customers. If the fault persists, however, reclosing can, depending on the circumstances, potentially cause arcing or an emission of sparks. Accordingly, a strategic balance between customer reliability goals and wildfire mitigation goals is required.

Pacific Power has used recloser disabling strategies on transmission lines for many years, and it has employed more frequent disabling of reclosers on transmission lines in recent years because of the increased wildfire risk. On distribution circuits, Pacific Power requires a patrol prior to line testing during periods of elevated wildfire risk. In general, Pacific Power has been able to use these strategies without having too great of an impact on customer reliability. With wildfire risk continuing to increase, Pacific Power is implementing additional strategies on the distribution network, more frequently disabling distribution reclosers and employing modified relay settings, as discussed below. Such applications on the distribution network, however, tend to have a greater impact on customer reliability and Pacific Power is exploring different strategic combinations to find the right balance. For example, Pacific Power is experimenting with the use of fast trips settings, which will cause a device to trip faster. Fast trip settings can have a wildfire mitigation benefit, by reducing the amount of energy released into a fault; but such settings can also be harmful to customer reliability because of larger outages and longer patrol times as depicted in Figure 14.

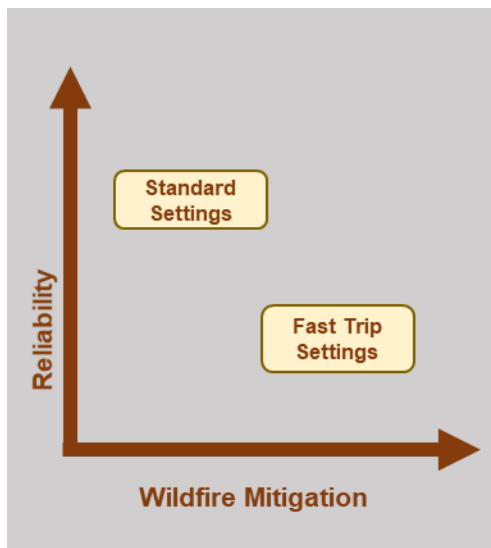


Figure 15: General Relationship between Settings, Reliability, and Wildfire Mitigation

In context of distribution applications, Pacific Power is mitigating impacts on customer reliability by transitioning recloser programming to multiple operating modes which are managed based on situational awareness of local wildfire conditions. For example, when meteorological conditions of increased wildfire risk occur, an alternative operating mode may sometimes be used to reduce the number of reclose attempts, increase the open interval time between trip and reclose operations, or set the recloser to lock out upon a single trip event. The diagram below illustrates one possible mode referenced above. Note, this mode does not directly define an operational mode that is programmed in a standard recloser control unit at Pacific Power but is shown to illustrate some of the elements used in defining an operational mode.

The diagram below illustrates one possible mode referenced above. Note, this mode does not directly define an operational mode that is programmed in a standard recloser control unit at Pacific Power but is shown to illustrate some of the elements used in defining an operational mode.

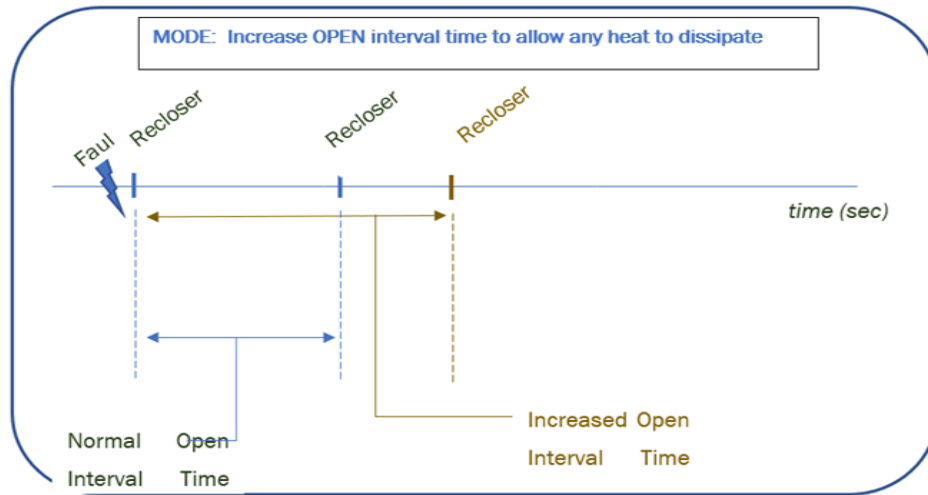


Figure 16: Visual Depiction of One Possible Relay Setting Mode

Pacific Power plans to review the risk level and set the operating mode commensurate with the risk level. There are multiple operating modes possibly used as a mitigation strategy, typically implemented by field operations, and Pacific Power is continuously evaluating situational awareness, customer outages and other information to further optimize the settings.

6.2 Re-Energization Practices

The risk associated with testing overhead lines by energization is very similar because it also requires a balance between customer reliability and wildfire mitigation. If a breaker or recloser has “locked-out” – meaning that it has opened and no longer conducts electricity – a system operator or field personnel will sometimes “test” the line. To test the line, the system operator or field personnel will close the device, thereby allowing the line to be re-energized. If the fault has cleared, then the system will run normally. If the fault has not cleared, the device will lock out again. If the device locks out again, the system operator then knows that additional investigation or work will be required before the line can be successfully re-energized. Because faults are often temporary, line-testing can be an efficient tool to maintain customer reliability. At the same time, line-testing can potentially result in arcing or an emission of sparks if a fault has not yet cleared when the line is tested. To mitigate this risk, Pacific Power requires an appropriate level of patrol prior to line testing, depending on local circumstances. In 2022, Pacific Power plans to further incorporate situational awareness reports, discussed in the previous section, to better inform specific patrol methods used prior to line testing.

7. *Field Operations*

During fire season, Pacific Power modifies the way it operates in the field to further mitigate wildfire risk. As a part of the forecasted effort and daily briefings performed by the meteorology department, field operations considers the local weather and geographic conditions that may create an elevated risk of wildfire. These practices are targeted to reduce the potential of direct or indirect causes of ignition during planned work activities, fault response and outage restoration.

Pacific Power personnel working in the field during fire season mitigate wildfire risk through a variety of tactics. Routine work, such as condition correction and outage response, poses some degree of ignition risk, and, in certain circumstances, crews modify their work practices and equipment to decrease this risk. In the extremely unlikely event that a fire ignition occurs while field crews or other Pacific Power personnel are working in the field (collectively “field personnel”), such field personnel are equipped with basic tools to extinguish small fires.

Work Restrictions

Pacific Power field operations is able to mitigate some wildfire risk by managing the way that field work is scheduled and performed. To effectively manage work during fire season, area managers regularly review local fire conditions and weather forecasts provided to them as part of Pacific Power’s monitoring program – discussed in the situational awareness section below.

During fire season generally, field operations managers are encouraged to defer any nonessential work at locations with dense and dry wildland vegetation, especially during periods of heightened fire weather conditions. If essential work needs to be performed in the FHCA and other areas with appreciable wildland vegetation, certain restrictions may apply, including:

Hot Work Restrictions. Field operations managers are encouraged to evaluate whether work should be performed during a planned interruption, rather than while a line is energized.

Time of Day Restrictions. Field operations managers are encouraged to consider using alternate work hours to accommodate evening and night work, when there may be less risk of ignition.

Wind Restrictions. Field personnel are encouraged to defer work, if feasible, when there are windy conditions at a particular work site.

Driving Restrictions. Field personnel are encouraged to keep vehicles on designated roads whenever operationally feasible.

Worksite Preparation. If wildland vegetation posing an ignition risk is prevalent at a worksite, and the work to be performed involves the potential emission of sparks from electrical equipment, field personnel working during fire season are encouraged to remove vegetation at the work site where allowed in accordance with land management/agency permit requirements, especially when there is dry or tall wildland grass. In addition to clearing work, the water truck

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resources, discussed below, are strategically assigned to sometimes accompany field personnel working in a wildland area during fire season, especially in the FHCA. Depending on local conditions, dry vegetation in the immediate vicinity may be sprayed with water before work as a preventative measure.

Vehicles

Vehicles can be a source of ignition. As discussed above, field operations personnel are instructed to stay on designated roads during fire season, as feasible, and to avoid vegetation which could contact the undercarriage of parked vehicle. To further mitigate any wildfire risk associated with the use of vehicles, field operations plan to convert, over time, the vehicle exhaust configuration of work trucks. To accomplish this objective, field operations will strategically convert some vehicles in districts with the greatest amount of FHCA. Long term, when new vehicles are purchased, Pacific Power plans to purchase trucks with a vehicle exhaust configuration which minimizes ignition risk.

Additional Labor Resources

Some wildfire mitigation activities require the time of field personnel, including in two key areas: (a) supporting system operations in administering the procedures generally discussed above in Sections 6 and responding to outages during fire season as discussed in 6.2.

Because faults are often temporary, line-testing can be an efficient tool to maintain customer reliability. At the same time, line-testing can result in the emission of sparks if a fault has not yet cleared when the line is tested

Under normal operating procedures, system operators and field personnel work together on a daily basis to manage the electrical network. In many situations, system operators depend on field personnel to gather information and assess local conditions. As discussed above, there are system operations procedures during wildfire season for disabling automatic recloser functions and limiting line-testing. Consequently, system operators need field personnel to gather information and assess local conditions during fire season more frequently than would otherwise be required under normal operating procedures. The requests from system operators may be varied, ranging from a simple phone call to confirm that it is raining in a particular area, to a much more time-intensive request, such as a full line patrol on a circuit.

Field personnel may also spend some additional time when responding to an outage during fire season. As discussed in Section 6.2, a heightened risk exists with traditional restoration practices. To mitigate this risk, field operations may perform some amount of line patrol on certain de-energized sections of the circuit, notably during fire season and particularly in the FHCA dependent on current conditions at the work site and the duration of the restoration work. Depending on the circumstances, this extra patrol might be done just before or just after re-energizing the line. Typically, this type of line patrol does not involve a close inspection of any particular facility; instead, it is a quick visual assessment specifically targeted to identify obvious foreign objects that may have fallen into the line during restoration work.

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Currently, the costs associated with this additional effort and labor resource is not uniquely tracked. However, as Pacific Power gains experience tracking and forecasting these specific expenditures, the company anticipates augmented future plans to increase transparency.

Basic Personal Suppression Equipment

Personal safety is the first priority, and Pacific Power field personnel are encouraged to evacuate and call 911 if necessary. Field personnel working in the FHCA maintain the capability to extinguish a small fire that ignited while they are working in the field. Field personnel should attempt suppression only if the fire is small enough so that one person can effectively fight the fire while maintaining their personal safety. All field personnel working in the FHCA during fire season will have basic suppression equipment available onsite, because field utility trucks typically carry the following equipment: (1) fire extinguisher; (2) shovel; (3) Pulaski; (4) water container; and (5) dust mask. The water container should hold at least five gallons and may be a pressurized container or a backpack with a manual pump (or other).

Water Trailer Resources

Pacific Power has water trailers that field operations use to mitigate against wildfire risk. For clarity, these resources are not dispatched to reported fires (i.e., like a fire truck). Instead, Pacific Power resources are strategically assigned to accompany field personnel if conditions warrant. For example, if it is necessary to perform work in the FHCA during a period in which there is a Red Flag Warning, Pacific Power field operations may schedule a water trailer to join field personnel working in the field. As discussed above, the water trailer can be used to help prep the site for work. By watering down dry vegetation in the work area, any chance of an ignition can be minimized. In the extremely unlikely event there was an ignition, the water trailer could be used to assist in the suppression of a small fire.

8. Public Safety Power Shutoff (PSPS)

Pacific Power is sensitive to the ramifications of a Public Safety Power Shutoff (PSPS). Turning off the power is contrary to an electric utility’s core mission and culture. And Pacific Power understands that turning off power can have negative consequences for customers and the public at large.

Pacific Power may de-energize power lines as a preventative measure during periods of the greatest wildfire risk. This practice is referred to as “proactive de-energization” or is more commonly known as a “Public Safety Power Shutoff” or “PSPS.” The decision to implement a PSPS is based on extreme weather and area conditions, including high wind speeds, low humidity, and critically dry fuels. A PSPS event is implemented as a last resort and is intended to supplement – not replace – existing wildfire mitigation strategies. The general process is described below.

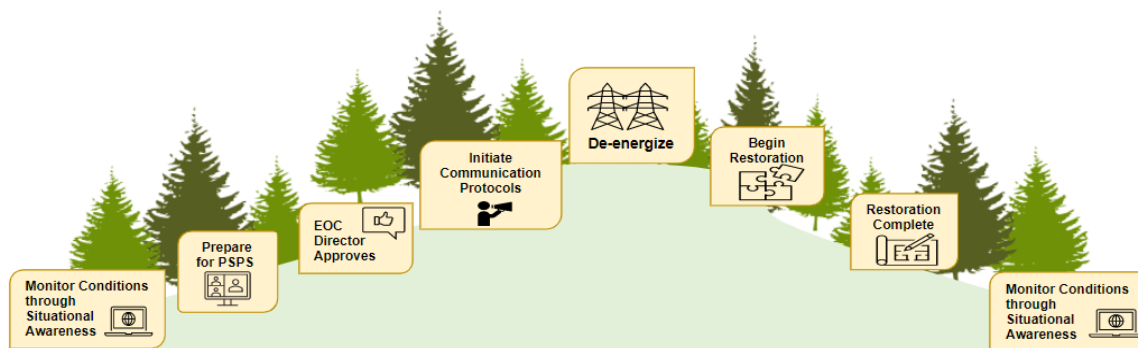


Figure 17: De-Energization Overview

Since initial development in 2019, Pacific Power has yet to implement an actual PSPS event in Washington. Pacific Power continues to meet with representatives of local government and the emergency response sector to review and refine PSPS protocols. For 2022 and beyond, the company is further evaluating the strengths and weaknesses in the PSPS plan and will make updates and revisions accordingly.

The following subsections describe Pacific Power’s program in greater detail. Many of the program elements revolve around the successful execution of a PSPS event, if needed as a measure of last resort, while other elements bolster decision-making, mitigate the potential impact of a PSPS event, or help to avoid use of the tool altogether.

8.1 Methodology for Selecting PSPS Zone

PSPS will only be implemented in the most extreme risk scenarios. As discussed in the risk assessment section above, Pacific Power identified Fire High Consequence Areas (FHCA) in its Washington service territory, reflecting areas of elevated wildfire risk. To develop its PSPS plan, Pacific Power further examined the FHCA, identifying areas of extreme risk due to wildfire to people and property, including where constraints on ingress and egress pose special concerns.

Pacific Power also considered the impact of other wildfire mitigation strategies, discussed throughout this plan, and their effectiveness in eliminating the risk of utility related ignition. As a result of this combined analysis, Pacific Power identified specific geographic areas that may be subject to PSPS as a starting point for plan development, as described in detail below. While these geographic areas in the FHCA have been predefined as potential PSPS areas, given extreme fire weather conditions, an emergency de-energization could take place anywhere in the service territory, including locations not pre-defined as a PSPS zone.

8.2 Maps/Zones

Pacific Power has identified 1 PSPS areas in Washington that may be subject to PSPS as shown in the following map:

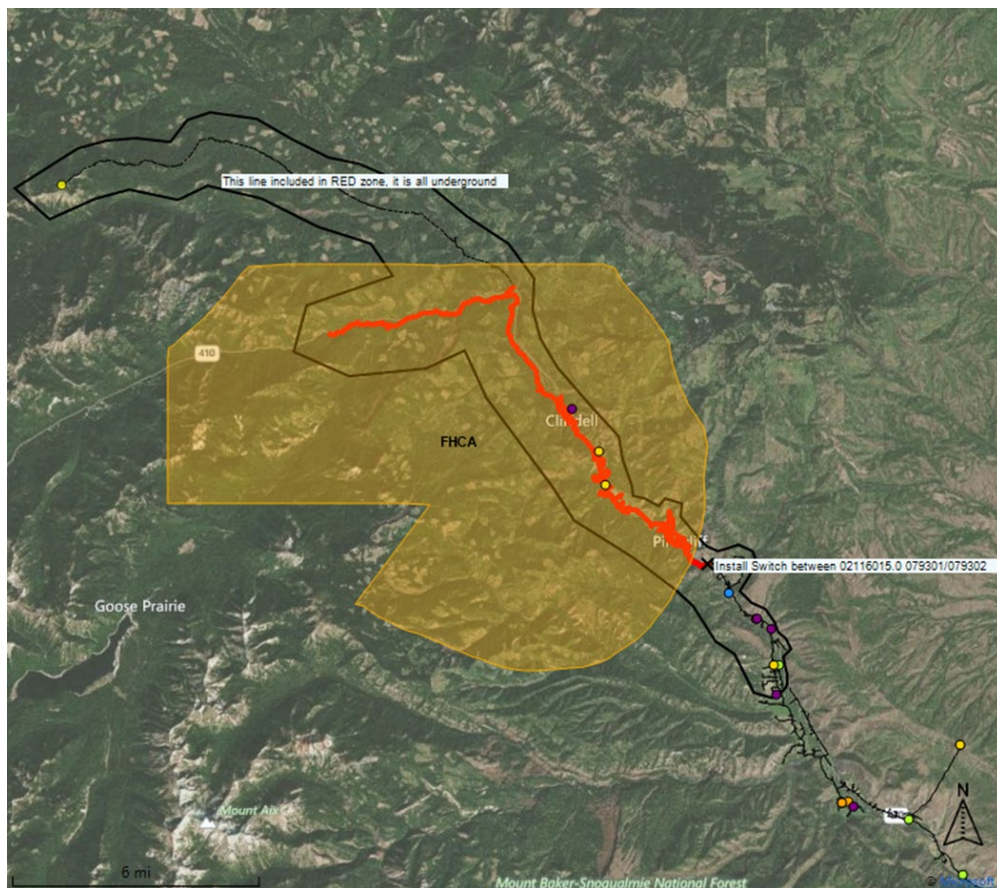


Figure 18: Map of Public Safety Power Shutoff Areas in Washington

The following is an inventory of distribution circuits in Washington impacted by the PSPS zone:

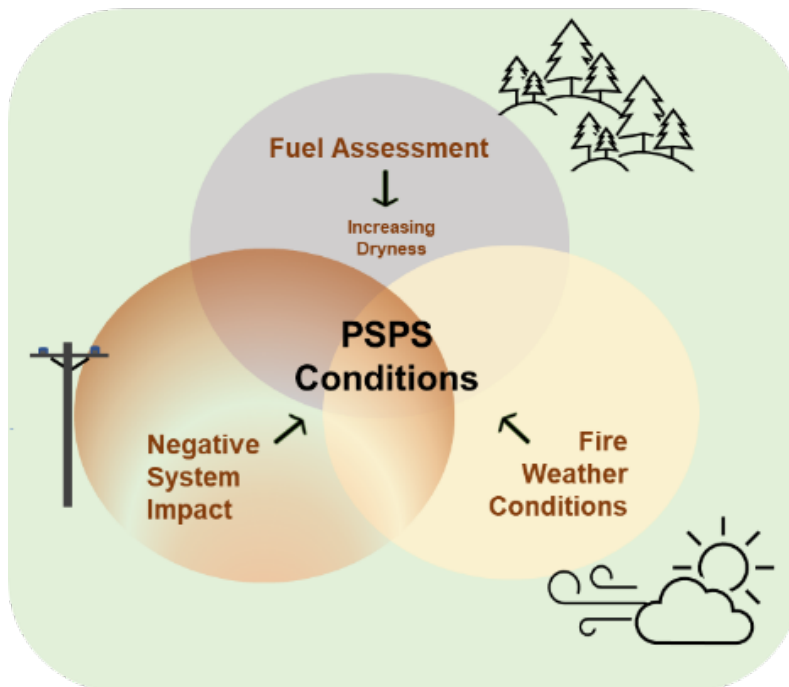
Table 13: Distribution Circuit Inventory in Washington Public Safety Power Shutoff Area

State	PSPS Area Name	Op Area	Substations	Circuit List	Customers	Dist. OH miles	Dist. UG miles
WA	Nile	Yakima	Tieton	4Y1	721	48	42

Pacific Power explored alternatives to minimize the impact of a PSPS on such customers. In conjunction with identifying PSPS areas, the company investigated engineering solutions to isolate portions of the distribution circuits in the PSPS areas that reflect substantially less risk of utility-related ignition of a wildfire, meaning that those sections may not need to be de-energized during a PSPS event. For example, if a section of a distribution circuit primarily consisted of underground electrical facilities, engineers reviewed whether those underground facilities could be isolated and kept energized. Likewise, if a portion of a circuit was in a high-risk FHCA, but another portion of the circuit was in a relatively low-risk area (i.e., a highly developed area with impervious surfaces and irrigated landscaping), engineers again reviewed whether those lower risk areas could be isolated and kept in service during a PSPS event. Through this detailed engineering review, Pacific Power was able to identify sections of the impacted distribution circuits that could be isolated and kept energized during a PSPS event.

8.3 Initiation

As discussed in Section 2, situational awareness reports are generated daily by the meteorology department to aid in decision making during periods of elevated risk such as PSPS assessment and activation.



These reports identify where fuels (dead and live vegetation) are critically dry, where and when critical fire weather conditions are expected (gusty winds and low humidity), and where and when the weather is forecast to negatively impact system performance and reliability. It is the intersection of these three triggers that result in the potential for a PSPS event.

Figure 19: PSPS Assessment Methodology

Fuels Assessment: Pacific Power relies on information from the Geographic Area Coordination Center (GACC), field observations, as well as output from its own in-house Weather Research and Forecast (WRF) model to determine when fuels are critically dry. This includes an assessment of dead fuel moisture (1, 10, 100, & 1,000 hour), live fuel moisture (herbaceous and woody), and Energy Release Component (ERC). Further, Pacific Power has on staff a former GACC meteorologist with considerable fire weather experience to help with this assessment.

Critical Fire Weather Assessment: Pacific Power relies on information from the National Weather Service (NWS) as well as output from its own in-house Weather Research and Forecast (WRF) model to determine when fire weather conditions will become critical and contribute to rapid fire spread. In general, fire weather conditions are considered critical when strong and gusty winds are accompanied by low relative humidity. It is not necessarily a requirement that the weather be hot as there are many examples of wind-driven wildfires that occurred during mild or even relatively cool temperatures. Critical fire weather criteria vary across Washington and is established by the National Weather Service. In 2021, Pacific Power hired a meteorologist with prior fire weather experience at both the National Weather Service and San Diego Gas & Electric to help with this assessment.

Assessing the Potential for Weather-Related System Impacts: Pacific Power has identified correlations between wind conditions and system performance through an analysis of historical observations and model data. Based on the early results of this analysis, Pacific Power can use weather forecast data from the High Resolution Rapid Refresh (HRRR) model and its own in-house WRF model to anticipate wind conditions that could lead to wind-related system impacts.

Pacific Power is on-track to produce a high resolution, 30-year WRF reanalysis dataset in 2022 to include hourly weather and fuels conditions across its entire service territory. This dataset will enable Pacific Power’s to further refine its PSPS decision thresholds and combine them into a single index or Wildfire Risk Score, such as in the example below.

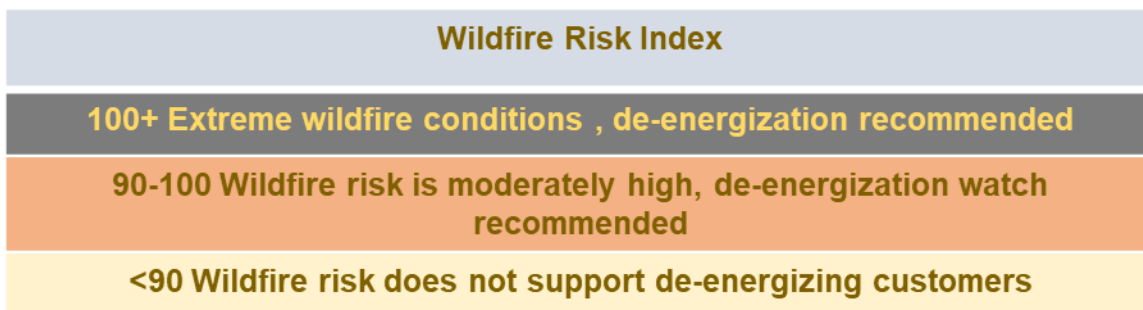


Figure 20: General Wildfire Risk Index

It is Pacific Power’s intent to further refine and begin using this Wildfire Risk Index in 2022 to assess risk and PSPS decision making. Pacific Power expects that this will be a somewhat iterative process each year as new information, methods, and industry best practices are incorporated. Additionally, Pacific Power expects to potentially refine this methodology as the company seeks

to find a balance between adequately warning the public of a potential PSPS event versus raising a false alarm too frequently or over-use of PSPS as a tool.

8.4 De-Energization Watch Protocol

Pacific Power actively monitors real-time weather conditions and endeavors to provide customers with additional notifications if de-energization is likely. When real-time observations and weather forecasts indicate that the three triggers for “de-energization watch” have been evaluated and the Wildfire Risk Index (WRI) is elevated, the de-energization watch protocol is initiated which includes activation of an “Emergency Coordination Center” (ECC), communication with local Public Safety Partners, and implementation of additional monitoring activities.

The ECC is staffed by a specialty group of company representatives who assemble during de-energization warning and implementation to provide critical support to operational resources through the collection and analysis of data. The ECC makes decisions to maintain the safety and reliability of the transmission and distribution system and helps facilitate cross-organization incident coordination. The ECC is led by an ECC Director and has the support of a safety officer, a joint information team, emergency management, meteorology and operational stakeholders representing field operations, system operations, vegetation management, engineering, and other specialties.

Upon activation of the ECC, Pacific Power emergency management gathers input from public safety partners to properly characterize and consider impacts to local communities and send notifications to the operators of pre-identified critical facilities, partner utilities, and adjacent local Public Safety Partners. The Pacific Power customer service team then coordinates through the ECC to confirm customer lists for the subject area to develop a communication plan for those customers potentially impacted.

Local patrol and inspection of lines during a PSPS watch can include a variety of methods depending on the accessibility of locations, the reliability of the line, area conditions and other factors. The ECC reviews these factors to determine necessary tasks such as the deployment of crews or remote monitoring by system operations.

Because of the public desire for reliable electric service, together with public safety concerns associated with de-energization, a PSPS is a measure of last resort and is disfavored. Nonetheless, consistent with existing regulations and the general mandate to operate the electrical system safely, the ECC has discretion to determine when a PSPS is appropriate. The ECC Director will consider all available information, including real-time feedback and other considerations from other ECC participants and field operations to determine whether PSPS should be executed. Additionally, the ECC Director may decide to further refine the PSPS areas described above. As a matter of practical reality, the ECC Director cannot know whether a PSPS will prevent a utility-related ignition. If a PSPS is not implemented and an ignition occurs, the ignition itself is not proof that a PSPS should have been implemented. Likewise, if a PSPS is implemented, the event itself does not prove that an ignition that would have otherwise occurred was prevented.

8.5 De-Energization Protocol

When a PSPS event is initiated, an action plan is prepared to include affected location details, event timing and projected event duration. Once approved by the ECC Director, an internal notification is sent to initiate appropriate notifications to customers, Public Safety Partners, regulatory organizations, large industrial customers and required field and system operations team members. Preparations also begin for the opening Community Resource Centers (CRC) as needed and additional field resources may be deployed or staged accordingly. Conditions are continually monitored; when PSPS conditions are no longer exceeded, the lines are patrolled and assessed for damage to begin the process of re-energization.

8.6 Communication Protocol

Pacific Power recognizes that adequate and clear communication is a key component to the successful implementation of a PSPS event and will always strive to provide as much notice as practical to impacted parties as described in the following section. However, it is critical to note that PSPS decisions are often made based on weather forecasts. Weather can often change quickly or dramatically with little forewarning, requiring some degree of balancing in communication protocols. When this occurs, advanced notice may not be possible to all parties as outlined in this plan.

Public Safety Partners and Critical Facilities

Public safety partners play a crucial role in the successful implementation of a PSPS event. Pacific Power's initial communication with local public safety agencies starts as early as possible when weather forecasts indicate a PSPS event is possible. Proactive communications to entities such as non-emergency dispatch centers, emergency management, fire agencies and law enforcement agencies allow those disciplines to prepare for anticipated operational impacts internally and mitigate any community-wide impacts that may occur as a result of de-energization. Collaboration with these agencies supports impact reduction of de-energization and communicates information regarding the impacted areas and expected event duration.

Upon activation of the ECC, emergency management resources coordinate, as appropriate, with local, county, tribal and state emergency management to provide information through the assigned representative of the agency. ECC assigned staff provide event details including estimated timing, event duration, and potential customer impacts. Throughout a PSPS event, Pacific Power's emergency management group maintains regular communication with local, regional and state emergency responders, mutual assistance groups, and tribal emergency managers. The company will support efforts to send out emergency alerts and status updates as appropriate until restoration efforts begin. Critical facilities are particularly vulnerable to the impact of PSPS events. Pacific Power emergency management maintains a list of critical facilities within its service territory and, upon activation of the ECC, will work to establish and maintain direct contact with these facilities' emergency points of contact to provide projected PSPS timing and regular status updates until restoration efforts begin.

Customers

The Pacific Power PSPS webpage provides timely and detailed information for potential and actual PSPS events relevant to a specific location. Pacific Power's website has the bandwidth to manage site traffic under extreme demand; and has implemented bandwidth capacity to a level that will allow for increased customer access while maintaining site integrity. The webpage (available at www.pacificpower.net/psps) allows customers to determine the likelihood of a PSPS event based on address information. An additional online tool allows the customer to see the "Public safety power shutoff forecasting" for that area over the following seven days. The status indicates whether the area is operating as "Normal," whether there is a PSPS "Watch," or whether there is an actual PSPS "Event." The website is easily accessible by mobile device - additionally - the Pacific Power 'app' is available for mobile devices which allows customer access to real-time outage updates and information.

To ensure that outreach is provided in identified prevalent languages, Pacific Power delivers wildfire safety-specific communications including brochures, handouts, and bill messages translated into Spanish; a message in nine languages – which includes Chinese traditional, Chinese simplified, Tagalog, Vietnamese, Mixteco, Zapoteco, Hmong, German and Spanish – is included on bill messages, press releases, and on the company's wildfire safety website pages that states "A customer care agent can speak with you about wildfire safety and preparedness. Please call 888-221-7070."; and customers with specific language needs can contact the company's customer care number and request to speak with an agent that speaks their language. Pacific Power employs Spanish-speaking customer care professionals and contracts with a 24/7 translation service that translates communications in real-time over the phone in Chinese, Cantonese, Mandarin, Tagalog or Vietnamese and a variety of other languages and dialects; and the company's customer care agents have access to and training with wildfire safety and preparedness and PSPS-related communications and can facilitate a conversation between the customer and translation service to ensure the customer receives the wildfire safety and preparedness and PSPS-related information they need.

Public Safety Partners are an essential component to any communication plan during an event. They provide essential insight into the geographic and cultural demographics of the affected areas to advise on protocols to address limited broadband access, languages, medical needs and vision or hearing impairment. Pacific Power's communications plan includes procedures which ensure appropriate notifications (additional if time allows) to customers with serious medical conditions. Upon activation of the ECC, Pacific Power will attempt, time and circumstances allowing, to make personal outbound calls with known vulnerable customers who utilize life support equipment.

Pacific Power's communication plan allows for informational updates to customers using multiple methods of communication. Direct customer notifications are made by way of outbound calls, text messaging and email notifications. Customers will receive an outbound call - when possible - within 48 hours of a potential PSPS event, at the commencement of the event, at the beginning of the re-energization process and upon the event conclusion. Additional methods of

notification include use of social media sites including Facebook and Twitter. Upon activation of the ECC, and following appropriate customer notifications, the public information officer will distribute a press release to news outlets that serve the affected areas. Regular updates across all available channels are distributed as they are available, and the public information officer will manage press inquiries as appropriate.

Notification Timing

When there is a potential PSPS event forecast, customers and local government representatives will be provided with advanced notice; if feasible, notifications will begin 48 hours in advance of a potential de-energization event. If this is not possible due to rapidly changing weather conditions, or other emerging circumstances, the notification process will begin as soon as possible. Additional notice will be provided at appropriate times, as conditions are monitored and depending on the circumstances. There is some degree of balancing required. Customers generally want ample advance notice of any actual de-energization. At the same time, recognizing that weather forecasts are inherently speculative, it is possible to overburden customers with notices of “potential” PSPS events that never materialize, especially remembering that Pacific Power’s fundamental business objective is to keep the grid energized except under the most extreme conditions.

The table below illustrates Pacific Power’s planned PSPS notification timeline for notifications sent to customers, public safety partners and critical facilities. Timelines may be reduced if rapidly changing conditions do not allow for advance notification. In these cases, the company will notify customers as promptly as possible and will include a summary of the circumstances contrary to regulatory requirements in the final report.

Table 14: PPS Notification Timeline

72-48 Hours Prior	De-energization Warning
48-24 Hours Prior	De-energization Warning
1-4 Hours Prior	De-energization Imminent / Begins
Re-energization Begins	Re-energization Begins
Re-energization Completed	Re-energization Completed
Cancellation of Event	De-energization Event Canceled <i>(if needed)</i>
Status Updates	Every 24 hours during event <i>(if needed)</i>

8.7 Community Resource Centers

Pacific Power is aware of the potential impacts of PSPS events to customers, business, and communities and plans to provide community support through Community Resource Centers (CRCs). By leveraging established relationships with community and public safety partners, Pacific Power plans to activate a CRC in an impacted area, which allows community members and businesses to have access to items that may be affected by the interruption of electrical service. The services, which vary across CRCs, may include:

- Potable water
- Ice
- Shelter from hazardous environment
- Air Conditioning
- Seating and tables
- Restroom facilities
- Refrigeration for medicine and/or baby needs
- Interior and area lighting
- On-site security
- Communications including internet, Wi-Fi, cellular access, and satellite phone
- Television and radio
- On-site medical support (where available)
- Charging stations for cellular devices, radios and computers

CRCs also adhere to all existing local, county, state or federal public health orders and will have personal protective equipment available on site for customers.

9. Public Safety Partner Coordination Strategy

Pacific Power participates in public safety partner meetings and utility workshop sessions during the calendar year; meetings are attended throughout the service territory and include monthly, quarterly, and annual emergency management partner and pre- and post-fire season collaboration meetings with local, state, and federal fire officials. Pacific Power's 2022 emergency training plan includes one PSPS exercise to be held in Yakima County. The company will incorporate lessons learned from workshops attended to further compare and refine plans, streamline processes, and confirm capabilities with local public safety partners located in the designated FHCA.

Tabletop Exercises

Pacific Power, in coordination with public safety partners, conducts annual exercises throughout its service territory to support awareness, PSPS planning, and overall collaborative wildfire safety and PSPS preparedness within PSPS Zones. The exercises ensure public and private sector coordination during system events, validate communication protocols, and verify capability to support communities during extreme risk events through mitigation actions including the deployment of community resource centers. Identification of critical infrastructure at the county level is included as part of the exercise to better inform restoration planning and notifications.

Pacific Power solicits feedback from exercise sessions and real-world events involving wildfire safety and public safety power shutoffs. Areas found for improvement are added to a comprehensive improvement plan which is shared with the appropriate public safety partners. A webinar, prominently displayed on the wildfire safety section of the Pacific Power website, provides additional information on the company PSPS practices

10. Education and Awareness Strategy

Pacific Power provides wildfire safety and preparedness and Public Safety Power Shutoff (PSPS) public outreach and education through a variety of channels. Some communication efforts on these topics target the company's entire customer base, while specific communications target communities in FHCAs with some overlap into non-FHCA locations depending on media market and distribution channel. The following descriptions of engagement and outreach methods are not meant to be an exhaustive list but represent the baseline efforts that are planned for 2022. Pacific Power maintains an education and awareness strategy that is flexible and allows for a dynamic communications plan, informed by customer survey data, community stakeholder input and community needs. Overall, Pacific Power's plan includes information that can be heard, watched and read in a variety of ways with the goal of accessibility and understandability.

Media Campaign

For the past several years, the company has deployed some form of paid media campaign to raise awareness and action on wildfire safety. The company plans to expand this effort in 2022 as part of the broader community engagement strategy. The company will deploy radio, newspaper, digital, and social media ads, as a minimum, to promote wildfire safety and preparedness.

Prior to the 2022 paid media campaign launch, Pacific Power will engage Public Safety Partners, and Community-Based Organizations for messaging input and to ascertain if there are additional campaign element opportunities outside of traditional paid advertising channels. Based on customer survey data, Pacific Power anticipates that it will run social media and radio ads in Spanish. The paid media campaign will run during the wildfire season months. Following the campaign, the company will conduct a community survey and engagement review with Public Safety Partners to determine additional messaging and engagement opportunities ahead of the 2023 campaign.

Supporting Collateral and Media Outreach

Pacific Power has developed a number of print and digital collateral pieces that includes factsheets, flyers, brochures, infographics and safety checklists. These items are accessible through the company wildfire safety webpages and are utilized at public meetings and community events to describe PSPS (including its necessity, PSPS considerations and expectations before, during and after a PSPS) and to provide general information on emergency kits/plans and preparation checklists, among other topics. Brochures, flyers and factsheets are also printed and mailed to Community-Based Organizations and Public Safety Partners for additional distribution. The company is working to expand those efforts ahead of the 2022 wildfire season. Annually, the Pacific Power communications team updates these materials to ensure the information is relevant, accessible and actionable. Spanish versions of each piece of

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collateral are also available. Bill messages are an additional low cost means to reach customers. In 2022, Pacific Power plans to include messaging on bills similar to 2021.

Each year prior to fire season, Pacific Power distributes updated wildfire safety information and information on the company's wildfire mitigation plan to press outlets across its service area as an additional low-cost outreach method. Before and during previous wildfire seasons, Pacific Power Public Information Officers proactively engage with media on company wildfire mitigation efforts and wildfire safety information. For 2022, the company is working

to provide additional informational forums for news reporters on these topics, such as system hardening demonstrations or interview opportunities with company subject matter experts.

Customer Service Training

Customers with specific language needs can contact the company's customer care number and request to speak with an agent that speaks their preferred language. Pacific Power employs Spanish-speaking customer care professionals and contracts with a 24/7 translation service that translates communications in real-time over the phone in Chinese, Cantonese, Mandarin, Tagalog, Vietnamese and a variety of other languages and dialects.

Customer care agents have received training on wildfire safety and preparedness and PSPS-related communications to facilitate a conversation between the customer and translation service to ensure the customer receives the wildfire safety and preparedness or PSPS-related information they seek.

Webpage

The Pacific Power website provides robust and comprehensive information on company wildfire mitigation programs, general wildfire safety, PSPS information and more.

Various resources and tools for community preparedness can be found on the Pacific Power wildfire mitigation webpage (www.pacificpower.net/wildfiresafety). Prompts for customers to update contact information are displayed prominently on the page. Guides for the public to create an emergency plan for their family along with a Wildfire Safety Checklist are easily accessible. The Wildfire Safety webpages include a link to the Pacific Power Wildfire Protection Plan for reading, and links to webinars and videos describing key components of the plan for watching, providing site visitors a variety of ways to consume and engage with wildfire safety and preparedness information.



Figure 21: Overview of Ad Campaign Methodology

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The Pacific Power Public Safety Power Shutoff webpage (www.pacificpower.net/psps) provides educational material on PSPS. The webpage describes why a PSPS would happen, includes details of the wildfire risks monitored prior to executing a PSPS, and how customers can prepare for PSPS. Information on how customers will be notified, what to expect during and the service restoration process if a PSPS is deemed necessary is detailed on the webpage. Pacific Power seeks to serve the community by providing them with general situational awareness information, such as an interactive map of the PSPS areas and a seven-day forecasting table that provides insight into if the company is considering a PSPS for public safety and what areas might be affected.

To ensure that the website information is provided in identified prevalent languages, the PSPS webpage has a message in nine languages – which includes Chinese traditional, Chinese simplified, Tagalog, Vietnamese, Mixteco, Zapoteco, Hmong, German and Spanish that states “A customer care agent can speak with you about wildfire safety and preparedness. Please call 888-221-7070.” The company will continue to work with Public Safety Partners and Community-Based Organizations to determine if additional languages should be included.

Webinars

Once a year, Pacific Power develops a webinar to provide an overview of the company’s wildfire mitigation program and strategies. Amongst other items, key mitigation strategies addressed in the webinar include situational awareness capabilities, system hardening investments, and PSPS process review. The webinar also brings to focus how Pacific Power engages with local communities and Public Safety Partners on wildfire safety. The webinars continue to provide transparency and insight into the operational practices of Pacific Power’s Wildfire Protection Planning and typically leave room for questions and answers during the webinar’s initial live stream. The company intends to replicate this information format in a live setting during 2022 for its wildfire safety and preparedness forums.

Medical Baseline / Access and Functional Needs Population Engagement

Pacific Power allows customers to either self-identify as having access and functional needs (AFN) or apply for consideration as a medical baseline customer which, due to the pandemic, temporarily includes the ability to self-certify. A special designation is then added to these customer accounts in the company’s system or record which is used to manage notifications pertinent to potential or existing PSPS events, available programs, and overall wildfire safety.

While this system is robust, it does inherently rely on customer participation. Therefore, having key messages across all channels and materials asking AFN customers to self-identify with the company is a central component to the community engagement and customer outreach strategy. Pacific Power has engaged a vendor to survey AFN population to help inform the company’s communication outreach related to those customers, this includes assessing the need and type of communications for people with disabilities who may not be able to use standard forms of communication. Survey data has informed the overall strategy and the company has adjusted and expanded where key messages are disseminated to increase AFN self-identification.

One method used by the company to increase the likelihood AFN populations receive relevant information is by partnering with local and regional agencies that frequently interact with that segment. At the advice of these regional agencies where helpful, Pacific Power may produce and distribute brochures in multiple languages such as English or Spanish that include key messages and encourage customers to contact the company to self-identify as having medical needs dependent on electricity

11. Industry Collaboration

Industry collaboration is another component of Pacific Power’s Wildfire Protection Plan. Through active participation in workshops, international and national forums, consortiums, and advisory boards, Pacific Power maintains an understanding of existing best practices and collaborates with industry experts regarding new technologies and research.

For example, Pacific Power is an active member of the International Wildfire Risk Mitigation Consortium (IWRMC),¹⁵ an industry-sponsored collaborative designed to facilitate the sharing of wildfire risk mitigation insights and discovery of innovative and unique utility wildfire practices from across the globe. This consortium, with working groups focused in the areas of asset management, operations and protocols, risk management, and vegetation management, facilitates a system of working and networking channels between members of the global utility community to support the ongoing sharing of data, information, technology, and practices.

Additionally, Pacific Power plays leadership and support roles through other organizations such as the Edison Electric Institute (EEI), the Electric Sector Coordinating Council (ESCC), and the Institute of Electrical and Electronics Engineers (IEEE). Within the western United States, Pacific Power also engages with the Western Energy Institute (WEI) and the Rocky Mountain Electric League (RMEL) as well as the Western Protective Relaying Conference. Collaboration also occurs regarding research and applications of technologies through Pacific Power’s parent company (Berkshire Hathaway Energy, BHE) and its affiliated companies.

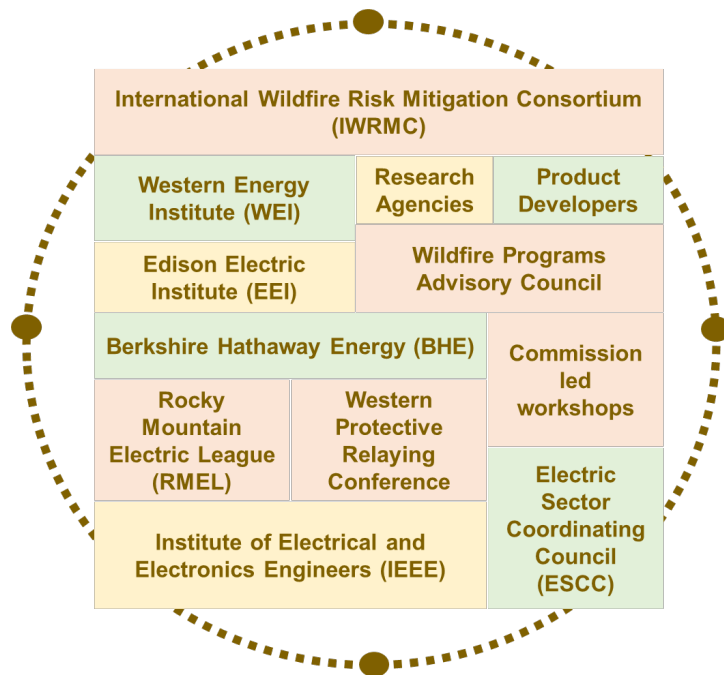


Figure 22: Key Industry Collaboration Channels

Furthermore, Pacific Power partners with certain research and response agencies to develop and test new technologies, such as existing efforts with the with the Oregon Department of Forestry to install wildfire cameras on utility infrastructure in key, high risk locations. Additionally, Pacific Power is currently working with Texas A&M university to pilot the use of Distributed Fault

¹⁵ See <https://www.umsgroup.com/what-we-do/learning-consortia/iwrmc/>

Anticipation (DFA) technology on its system. As part of a multi-year, collaborative effort, Pacific Power plans to install these unique, protection and control devices on its system and test the capability for advanced fault detection and as a potential wildfire mitigation tactic.

Through these various engagement channels, Pacific Power aims to maintain industry networks, understand the evolution of technologies, discover broader applications for such advancements, freely share data to enable scientists and academics, collaborate with developers to push the boundaries of existing capabilities, and expand its research network through support of advisory boards or grant funding.

12. Plan Monitoring and Evolution

Pacific Power's 2022 Washington Wildfire mitigation plan describes the additional investments and programs needed to construct, maintain and operate electrical lines and equipment in a manner that will minimize the risk of catastrophic wildfire. However, the strategies embodied in this plan are evolving and are subject to change. Pacific Power will regularly evaluate and monitor the effectiveness of this plan. As new analyses, technologies, practices, network changes, environmental influence or risks are identified, changes to address them may be incorporated into future iterations of the plan. Additionally, as new information or requirements are identified through formal rulemaking or collaboration with regulators and stakeholders, plan elements or scope may change.