CALIFORNIA WILDFIRE MITIGATION PLAN UPDATE

MARCH 5, 2021

CONTENTS

GLOSSARY OF DEFINED TERMS

Term	Definition
10-hour dead fuel moisture content	Moisture content of small dead vegetation (e.g. grass, leaves, which burn quickly but not intensely), which can respond to changes in atmospheric moisture content within 10 hours.
Access and functional needs populations	Per Government Code § 8593.3 and D.19-05-042, individuals who have developmental or intellectual disabilities, physical disabilities, chronic conditions, injuries, limited English proficiency or who are non-English speaking, older adults, children, people living in institutionalized settings, or those who are low income, homeless, or transportation disadvantaged, including, but not limited to, those who are dependent on public transit or those who are pregnant.
Authority Having Jurisdiction	AHJ, party with assigned responsibility, depending on location and circumstance.
Asset (utility)	Electric lines, equipment, or supporting hardware.
At-risk species	Species of vegetation that are particularly likely to contact power lines in the event of high winds and/or ignite if they catch a spark.
Baseline (ignition probability, maturity)	A measure, typically of the current state, to establish a starting point for comparison.
Carbon dioxide equivalent	Tons of greenhouse gases (GHG) emitted, multiplied by the global warming potential relative to carbon dioxide.
Circuit mile	The total length in miles of separate circuits regardless of the number of conductors used per circuit
Contractor	Any individual in the temporary and/or indirect employ of the utility whose limited hours and/or time-bound term of employment are not considered as “full-time” for tax and/or any other purposes.

Term	Definition
Critical facilities and infrastructure	For brevity, in the 2021 WMP "critical facilitates and infrastructure" may be shortened to "critical infrastructure" and/or "critical facilities" throughout the WMP. Critical facilities and infrastructure is defined in accordance with the definition adopted in Decision (D.) 19-05-042 and modified in D.20-05-051: those facilities and infrastructure that are essential to the public safety and that require additional assistance and advance planning to ensure resiliency during de energization events. Namely: ☐ Emergency Services Sector o Police Stations o Fire Station o Emergency Operations Centers o Public safety answering points ☐ Government Facilities Sector o Schools o Jails and prisons ☐ Healthcare and Public Health Sector o Public Health Departments o Medical facilities, including hospitals, skilled nursing facilities, nursing homes, blood banks, health care facilities, dialysis centers and hospice facilities (excluding doctor offices and other non-essential medical facilities) ☐ Energy Sector o Public and private utility facilities vital to maintaining or restoring normal service, including, but not limited to, interconnected publicly-owned utilities and electric cooperatives ☐ Water and Wastewater Systems Sector o Facilities associated with the provision of drinking water or processing of wastewater including facilities used to pump, divert, transport, store, treat and deliver water or wastewater ☐ Communications Sector o Communication carrier infrastructure including selective routers, central offices, head ends, cellular switches, remote terminals and cellular sites ☐ Chemical Sector o Facilities associated with the provision of manufacturing, maintaining, or distributing hazardous materials and chemicals (including Category N-Customers as defined in D.01-06-085) ☐ Transportation Sector o Facilities associated with automobile, rail, aviation, major public transportation, and maritime transportation for civilian and military
Customer hours	Total number of customers, multiplied by the average number of hours (e.g., of power outage).
Data cleaning	Calibrating raw data to remove errors, including typographical and numerical mistakes.
Dead fuel moisture content	Moisture content of dead vegetation which responds solely to current environmental conditions and is critical in determining fire potential.

Term	Definition
Detailed inspection	In accordance with General Order (GO) 165, an inspection where individual pieces of equipment and structures are carefully examined, visually and through use of routine diagnostic test, as appropriate, and (if practical and if useful information can be so gathered) opened, and the condition of each rated and recorded.
Enhanced inspection	Inspection whose frequency and thoroughness exceeds the requirements of the detailed inspection, particularly if driven by risk calculations.
Evacuation impact	Number of people evacuated, with the duration for which they are evacuated, from homes and businesses, due to wildfires.
Evacuation zone	Areas designated by the California Department of Forestry and Fire Protection (CALFIRE) and loCALFIRE agency evacuation orders, to include both "voluntary" and "mandatory" in addition to other orders such as "precautionary" and "immediate threat".
Fuel density	Mass of fuel (vegetation) per area which could combust in a wildfire.
Fuel management	Removing or thinning vegetation to reduce the potential rate of propagation or intensity of wildfires.
Fuel moisture content	Amount of moisture in a given mass of fuel (vegetation), measured as a percentage of its dry weight.
Full-time employee	Any individual in the ongoing and/or direct employ of the utility whose hours and/or term of employment are considered as "full-time" for tax and/or any other purposes.
GO 95 nonconformance	Condition of a utility asset that does not meet standards established by GO 95.
Greenhouse gas (GHG) emissions	Health and Safety Code 38505 identifies seven GHGs that Air Resource Board is responsible to monitor and regulate in order to reduce emissions: carbon dioxide (CO2), methane (CH4), nitrous oxide (N2O), sulfur hexafluoride (SF6), hydrofluorocarbons (HFCs), perfluorocarbons (PFCs), and nitrogen trifluoride (NF3).
Grid hardening	Actions (such as equipment upgrades, maintenance, and planning for more resilient infrastructure) taken in response to the risk of undesirable events (such as outages) or undesirable conditions of the electrical system in order to reduce or mitigate those events and conditions, informed by an assessment of the relevant risk drivers or factors.
Grid topology	General design of an electric grid, whether looped or radial, with consequences for reliability and ability to support de-energization (e.g., being able to deliver electricity from an additional source).
High Fire Threat District (HFTD)	Per D.17-01-009, areas of the State designated by the California Public Utilities Commission (CPUC or Commission) and CALFIRE to have elevated wildfire risk, indicating where utilities must take additional action (per GO 95, GO 165, and GO 166) to mitigate wildfire risk.
Highly rural region	In accordance with 38 CFR 17.701, "highly rural" shall be defined as those areas with a population of less than 7 persons per square mile.
High Wind Warning (HWW)	Level of wind risk from weather conditions, as declared by the National Weather Service (NWS). For historical NWS data, refer to the Iowa State University Iowa archive of NWS watch/warnings.[1]

Term	Definition
HWW overhead (OH) Circuit Mile Day	Sum of overhead circuit miles of utility grid subject to High Wind Warnings (HWW, as defined by the NWS) each day within a given time period, calculated as the number of overhead circuit miles that were under an HWW multiplied by the number of days those miles were under said HWW. For example, if 100 overhead circuit miles were under an HWW for 1 day, and 10 of those miles were under HWW for an additional day, then the total HWW OH circuit mile days would be 110.
Ignition probability	The relative possibility that an ignition will occur, probability is quantified as a number between 0% and 100% (where 0% indicates impossibility and 100% indicates certainty). The higher the probability of an event, the more certainty there is that the event will occur. (Often informally referred to as likelihood or chance).
Ignition-related deficiency	Any condition which may result in ignition or has previously resulted in ignition, even if not during the past five years.
Impact/consequence of ignitions	The effect or outcome of a wildfire ignition, affecting objectives, which may be expressed by terms including, although not limited to health, safety, reliability, economic and/or environmental damage.
Initiative	Measure or activity proposed or in process designed to reduce the consequences and/or probability of wildfire or Public Safety Power Shutoff (PSPS).
Inspection protocol	Documented procedures to be followed in order to validate that a piece of equipment is in good condition and expected to operate safely and effectively.
Invasive species	Non-native species whose proliferation increases the risk of wildfires.
Level 1 finding	In accordance with GO 95, an immediate safety and/or reliability risk with high probability for significant impact.
Level 2 finding	In accordance with GO 95, a variable (non-immediate high to low) safety and/or reliability risk.
Level 3 finding	In accordance with GO 95, an acceptable safety and/or reliability risk.
Life expectancy	Anticipated years that a piece of equipment can be expected to meet safety and performance requirements.
Limited English Proficiency (LEP)	Populations with limited English working proficiency based on the International Language Roundtable scale.
Live fuel moisture Content	Moisture content within living vegetation, which can retain water longer than dead fuel.
Lost energy	Energy that would have been delivered were it not for an outage. Typically called unserved energy.
Major roads	Interstate highways, U.S. highways, state and county routes.
Match drop simulation	Wildfire simulation method that takes an arbitrary ignition and forecasts propagation and consequence/impact.
Member of the public	Any individual not employed by the utility.

Term	Definition
Multi-attribute value function	Risk calculation methodology introduced during CPUC's Safety Model Assessment Proceeding (S-MAP) and Risk Assessment Mitigation Proceeding (RAMP) proceedings.
Near miss	An event with significant probability of ignition, including wires down, contacts with objects, line slap, events with evidence of significant heat generation, and other events that cause sparking or have the potential to cause ignition.
Near-miss simulation	Simulation of what the consequence would have been of an ignition had it occurred.
Need for PSPS	When utilities' criteria for utilizing PSPS are met.
Noncompliant clearance	Rights-of-way whose vegetation is not trimmed in accordance with the requirements of GO 95.
Outages of the type that could ignite a wildfire	Outages that, in the judgement of the utility, could have ignited a wildfire.
Outcome metrics	Measurements of the performance of the utility and its service territory in terms of both leading and lagging indicators of wildfire, PSPS, and other consequences of wildfire risk, including the potential unintended consequences of wildfire mitigation work, such as acreage burned by utility-ignited wildfire.
Overcapacity	When the energy transmitted by utility equipment exceeds that of its nameplate capacity.
Patrol inspection	In accordance with GO 165, a simple visual inspection of applicable utility equipment and structures that is designed to identify obvious structural problems and hazards. Patrol inspections may be carried out in the course of other company business.
Percentile conditions	Top X% of a particular set (e.g., wind speed), based on a historical data set with sufficient detail.
Planned outage	Electric outage announced ahead of time by the utility.
Preventive maintenance (PM)	The practice of maintaining equipment on a regular schedule, based on risk, elapsed time, run-time meter readings, or number of operations. The intent of PM is to “prevent” maintenance problems or failures before they take place by following routine and comprehensive maintenance procedures. The goal is to achieve fewer, shorter, and more predictable outages.
Priority essential services	Critical first responders, public safety partners, critical facilities and infrastructure, operators of telecommunications infrastructure, and water utilities/agencies.
Program targets	Quantifiable measurements of activity identified in WMPs and subsequent updates used to show progress towards reaching the objectives, such as number of trees trimmed or miles of power lines hardened.
Progress metrics	Measurements that track how much utility wildfire mitigation activity has changed the conditions of utility wildfire risk exposure or utility ability to manage wildfire risk exposure, in terms of leading indicators of ignition probability and wildfire consequences.
Property	Private and public property, buildings and structures, infrastructure, and other items of value that were destroyed by wildfire, including both third-party property and utility assets.

Term	Definition
PSPS event	Defined as the time period from the first public safety partner notified of a planned public safety de-energization to the final customer re-energized.
PSPS risk	The potential for the occurrence of a PSPS event expressed in terms of a combination of various outcomes of the event and their associated probabilities.
PSPS weather	Weather that exceeds a utility's risk threshold for initiating a PSPS.
Red Flag Warning (RFW)	RFW, level of wildfire risk from weather as declared by the National Weather Service.
RFW OH Circuit Mile Day	Sum of overhead circuit miles of utility grid subject to RFW each day within a given time period, calculated as the number of overhead circuit miles that were under an RFW multiplied by the number of days those miles were under said RFW. For example, if 100 overhead circuit miles were under an RFW for 1 day, and 10 of those miles were under RFW for an additional day, then the total RFW OH circuit mile days would be 110.
Risk event	An event with probability of ignition, including wires down, contacts with objects, line slap, events with evidence of heat generation, and other events that cause sparking or have the potential to cause ignition. The following risk events all qualify as risk event: ☐ Ignitions ☐ Outages not caused by vegetation ☐ Vegetation-caused outages ☐ Wire-down events ☐ Faults ☐ Other risk events with potential to cause ignitions
Risk event simulation	Simulation of what the consequence would have been of an ignition had it occurred.
Risk-spend efficiency (RSE)	An estimate of the cost-effectiveness of initiatives, calculated by dividing the mitigation risk reduction benefit by the mitigation cost estimate based on the full set of risk reduction benefits estimated from the incurred costs. For ongoing initiatives, the RSE can be calculated by determining the “marginal benefit” of additional spending in the ongoing initiative. For example, the RSE of an ongoing initiative could be calculated by dividing the mitigation risk reduction benefit from a 5% increase in spend by the cost associated with a 5% increase in spend.
Rule	Section of public utility code requiring a particular activity or establishing a particular threshold.
Run-to-failure	A maintenance approach that replaces equipment only when it fails.
Rural region	In accordance with GO 165, "rural" shall be defined as those areas with a population of less than 1,000 persons per square mile as determined by the United States Bureau of the Census. For the purposes of the Wildfire Mitigation Plan (WMP), “area” shall be defined as census tracts.
Safety Hazard	A condition that poses a significant threat to human life or property.
Simulated wildfire	Propagation and impact/consequence of a wildfire ignited at a particular point ('match drop'), as simulated by fire spread software.
Span	The space between adjacent supporting poles or structures on a circuit consisting of electric line and equipment. "Span level" refers to asset-scale granularity.

Term	Definition
System Average Interruption Duration Index (SAIDI)	System-wide total number of minutes per year of sustained outage per customer served.
Third-party contact	Contact between a piece of electrical equipment and another object, whether natural (tree branch) or human (vehicle).
Time to expected failure	Time remaining on the life expectancy of a piece of equipment.
Top 30% of proprietary fire potential index (FPI)	Top 30% of FPI or equivalent scale (e.g., "Extreme" on SCE's FPI; "extreme", 15 or greater, on SDG&E's FPI; and 4 or above on PG&E's FPI).
Trees with strike potential / hazard trees	Trees that are of sufficient height that if they were to fail could 'fall in' to the line / trees that are dead, dying, diseased, deformed, or unstable trees which have a high probability of falling and contacting a substation, distribution or transmission conductors, structure, guys or other Company electric facility.
Unplanned outage	Electric outage that occurs with no advance notice from the utility (e.g. blackout).
Urban region	In accordance with GO 165, "urban" shall be defined as those areas with a population of more than 1,000 persons per square mile as determined by the United States Bureau of the Census. For the purposes of the WMP, "area" shall be defined as census tracts.
Utility-ignited wildfire	Wildfires ignited by utility infrastructure or employees, including all wildfires determined by AHJ investigation to originate from ignition caused by utility infrastructure.
Vegetation management	Trimming and clearance of trees, branches, and other vegetation that poses the risk of contact with electric equipment.
Vegetation risk index	Risk index indicating the probability of vegetation-related outages along a particular circuit, based on the vegetation species, density, height, and growth rate.
Weather normalization	Adjusting metrics based on relative weather risk factors or indices.
Wildfire impact/ consequence	The effect or outcome of a wildfire affecting objectives, which may be expressed, by terms including, although not limited to health, safety, reliability, economic and/or environmental damage.
Wildfire risk	The potential for the occurrence of a wildfire event expressed in terms of a combination of various outcomes of the wildfire and their associated probabilities.
Wildfire-only WMP programs	Activities, practices, and strategies that are only necessitated by wildfire risk, unrelated to or beyond that required by minimum reliability and/or safety requirements. Such programs are not indicated or in common use in areas where wildfire risk is minimal (e.g., territory with no vegetation or fuel) or under conditions where wildfires are unlikely to ignite or spread (e.g., when rain is falling).
Wildland urban interface (WUI)	A geographical area identified by the state as a "Fire Hazard Severity Zone", or other areas designated by the enforcing agency to be a significant risk from wildfires, established pursuant to Title 24, Part 2, Chapter 7A.
Wire down	Instance where an electric transmission or distribution conductor is broken and falls from its intended position to rest on the ground or a foreign object.

EXECUTIVE SUMMARY

Despite years of focus on wildfire prevention, particularly in California, wildfires continue to impact communities at a more substantial rate than previously recorded. This has exacerbated the costs of wildfire damage in terms of both loss of human life and property damage. While electric utilities have always needed to mitigate against the potential of wildfire, the continuing growth of wildland urban interface, climate change and a host of other variables require even greater focus to prevent wildfires. For decades the California Public Utility Commission (CPUC or Commission) has worked to address the specific risks created by operation of an electric grid through regulations and programs, with even more substantial and targeted efforts over the past several years. PacifiCorp, which does business as Pacific Power in California, has been an active participant as these efforts have evolved.

The CPUC first initiated a decade-long fire safety rulemaking in 2008. The first phase of this rulemaking focused on immediate measures in the highest fire risk area, in the seven counties of southern California. Thereafter, rules (codified in General Orders (GO) 95, 165 and 166) having a longer timeline for implementation were developed in order to reduce the risk of fire ignition caused by overhead utility systems. These rules culminated at approximately the same time the state was experiencing widespread drought, and the company was directed to identify and implement actions, including these new rules, to address wildfire risk on its system. As a result, a Fire Prevention Plan and a Drought Mitigation Plan were prepared and implemented starting in 2014. In early 2018, as the multi-phase rulemaking concluded, the state of California experienced catastrophic wildfires in both northern and southern California, spurring greater efforts to augment the drought mitigation and fire prevention plan.

In response to Senate Bill (SB) 901, California took a comprehensive approach to mitigating wildfires while also working to create a more resilient electric grid. A key element of SB 901 is the requirement for all electric utilities to develop and implement Wildfire Mitigation Plans (WMPs or Plans). These WMPs were first filed and approved in 2019, while in 2020 the plans were bolstered with process changes developed by the nascent Wildfire Safety Division (WSD). Starting in 2020, WMPs are to be filed in a three-year cycle, with annual updates until the planning period terminates. The Plan builds on the company's previous filings, in addition to incorporating substantial changes based on stakeholder feedback and input gained through the WSD review process. The 2021 Update seeks to fulfill gaps identified in the 2020 WMP and address feedback on the company's Remedial Compliance Plan (RCP) filing and Quarterly Updates. Each of the improvements in this update represents another incremental step towards identification of wildfire risk, strategic identification of options available to mitigate the risk and prioritization and rationalization for each of these mitigation measures.

The first WMPs were developed and filed pursuant to SB 901 in the Commission's Rulemaking (R.) 18-10-007. Following approval of the 2019 WMPs and the filing and conditional approval of the 2020 WMP, RCP and Quarterly Report, the company has continued to engage with stakeholders, regulators including the Commission, WSD, public safety partners, fire science experts, and other utilities and utility experts, to improve and refine its mitigation and planning process. The end goal of these efforts is to improve wildfire resilience and safety for our customers and the broader public using the most appropriate, timely and cost-effective mitigation measures.

A component of the 2020 WMP process was an inaugural set of durable datasets for assessment of mitigation activities, intended to allow review by the WSD, the Commission and stakeholders of data related to each utility's mitigation activities. Modifications to this data collection foundation occurred as the WSD updated its data taxonomy, the result of which is generally cascaded through this Plan Update, while certain GIS-based updates are anticipated in the company's first quarterly 2021 filing, due in May 2021. While all major initiatives require a ramp-up period, PacifiCorp has made significant strides during these first years of its WMP implementation. Where possible, this update outlined successes and areas where improvements have been made, as well as areas still ripe for improvement. PacifiCorp has continued to improve upon current and legacy datasets with a goal to bolster the accessibility of the data provided, and as analytical methods and discoveries emerge, has rapidly incorporated them into the plan to yield better outcomes.

For context when reviewing multiple updates, PacifiCorp cautions that when reviewing its WMP Update, it must be noted that certain requirements related to risk analysis processes and quantification applicable to Pacific Gas & Electric (PG&E), Southern California Edison (SCE) and San Diego Gas & Electric (SDG&E) (collectively, the Large IOUs) do not apply to the three small multijurisdictional utilities (SMJUs), which includes PacifiCorp, Bear Valley Electric Service and Liberty Utilities. The regulations were developed for the Large IOUs in rulemaking R.13-11-006, which outlined Safety Model Assessment Proceeding (S-MAP) and Risk Assessment Mitigation Plan (RAMP) requirements. SMJUs were directed to introduce risk-based decision making into their general rate cases (GRCs), which PacifiCorp complied with starting in its 2018 GRC, leveraging information developed by the Large IOUs as well as other utilities, previous risk and health assessment methodologies and principles of the International Standardization Organization's "Risk Management – Principles and Guidelines"[1] to develop the company's first risk based decision-making framework. This methodology included an assessment of the company's top categorical equipment risks including, substation transformer failure, substation circuit breaker failure, overhead distribution conductor failure, and relay mis-operation. In a parallel activity, risks were evaluated against various maintenance and investment programs, including risks related to wildfire within its service territory, and benefits of these programs estimated. Nonetheless, due to the similar but differently constructed process, certain of the risk rubrics, including Risk Spend Efficiency, as portrayed within this report may not be appropriately compared to other utility plans and results. Where possible, the intended approach and underlying rationale for the incorporation into future decision-making will be outlined, furthering the company's development toward the longer-term RAMP/S-MAP structure which is anticipated to be addressed in proceeding R.20-07-013.

PacifiCorp remains fully committed to the continued development and improvement of the company's risk-based decision making framework, but many of the elements contemplated in the 2021 guidelines template may not be applicable to PacifiCorp, or may not be required in exactly the same manner as is required of the Large IOUs. To the extent that a program addresses a top categorical risk included in the company's last GRC, PacifiCorp was able to qualify relative risk ranking but may not be able to provide the discreet calculations as requested. In addition, in terms of Public Safety Power Shutoff (PSPS) events, the company experienced one activation and two watch events, so data is limited. PacifiCorp has monitored the PSPS events experienced by other utilities and incorporated lessons learned from

[1] International Standardization Organization's Risk Management-Principles and Guidelines are identified as ISO 3100 and is an internationally recognized standard for risk management. Adopting these principles and guidelines positions an organization to be able to achieve objectives, improve the identification of risks, and more effectively allocate resources for risk reduction.

those records, in addition to the limited record identified above, into its own procedures and plans (e.g., lessons learned regarding customer communications and coordination with public safety officials).

The company's WMP is primarily intended to guide PacifiCorp's efforts to minimize the risks of a fire igniting from company facilities. The WMP also addresses the response to an active wildfire (whether ignited by the company's facilities or otherwise) to minimize the potential for damage to PacifiCorp's facilities and its customers. The company has leveraged lessons learned from its experience and the experience of other utilities, guidance from the Commission's initiatives, and engineering and operational best practices to evolve its approach to managing wildfire risk. This experience includes its years of experience implementing safety and reliability risk mitigation programs. As a result, many of the initiatives and programs identified in this plan are an extension or augmentation of scope for its already existing programs (e.g., the company's vegetation maintenance inspection and correction programs). This experience was also leveraged together with historical data when new programs or activities were necessary (e.g., installation of covered conductor).

The company has incorporated a variety of available information sources including data gleaned from the California Department of Forestry and Fire Protection (CALFIRE) datasets (as well as United States Forest Service), weather and red flag warning data from the National Weather Service (NWS), in addition to the company's own outage records, circuit topology, as well as inspection and vegetation datasets. Notably, PacifiCorp's outage records include both planned and fault events, and specifically identify the frequency, duration, and cause of outages experienced on energized circuits. These outage records are analyzed to estimate ignition probability drivers, representing the most accurate depiction of how often potential ignition events may occur within the company's service territory. Through 2020, PacifiCorp was able to achieve substantial success despite significant startup activities required for such a substantial implementation plan.

The 2021 Plan Update builds on prior successes. In Chapter 5 of this plan update, the company sets forth its objectives for the next year and the following year, culminating the three-year Plan period. Key objectives for 2021 include:

- installation of 85 line miles of covered conductor
- installation and commissioning of 27 system automation programs
- proactive replacement of 128 in-service wooden poles with fiberglass for enhanced structural resilience.

In addition, PacifiCorp will continue evaluating various pilot project results and implementing enhanced inspection and correction programs. The company expects that the first three to five years of WMP implementation will be critical in terms of establishing data records to evaluate its progress. With the creation of the 2021 WMP Update and related data collection, the company has made significant progress in creating and providing a baseline of data to measure the incremental changes in its wildfire mitigation programs and initiatives.

1 PERSONS RESPONSIBLE FOR EXECUTING THE WMP

Provide an accounting of the responsibilities of the responsible person(s) executing the plan, including:

1. *Executive level with overall responsibility:*
2. *Program owners specific to each component of the plan*

Executive-level owner with overall responsibility

- Name and title: Allen Berreth, Vice President- Transmission and Distribution (T&D) Operations, Pacific Power
- Email: allen.berreth@pacificorp.com
- Phone number: 503-813-6205

Table 1-1: Program owners specific to each section of the plan

Program	Program Owner	Title	Contact Information	Contact Phone
Overall Oversight	Allen Berreth	Vice President, T&D Operations	allen.berreth@pacificorp.com	503.813.6205
Statutory Adherence	Tim Clark	Senior Attorney, PacifiCorp	tim.clark@pacificorp.com	801.220.4565
Risk Assessment and mapping	Heide Caswell	Director of Asset Performance and Wildfire Mitigation, T&D Operations	heide.caswell@pacificorp.com	503.813.6216
Situational Awareness and Forecasting	Steven Vanderburg	Manager, Meteorology, T&D System Operations	steven.vanderburg@pacificorp.com	503.251.5264
Grid Design and system hardening	Amy McCluskey	Director of Wildfire Mitigation PMO	amy.mccluskey@pacificorp.com	503.813.5493
Asset Management and inspections	Amy McCluskey	Director of Asset Management, T&D Operations	amy.mccluskey@pacificorp.com	503.813.5493
Vegetation management and inspections	Brian King	Director of Environmental & Vegetation Management, T&D Operations	brian.king@pacificorp.com	503.813.6031
Grid operations and protocols	Erik Brookhouse	Vice President of System Operations, T&D System Operations	erik.brookhouse@pacificorp.com	503.813.5153
Data Governance	Heide Caswell	Director of Asset Performance and Wildfire Mitigation, T&D Operations	heide.caswell@pacificorp.com	503.813.6216

Resource allocation methodology	Allen Berreth	Vice President of T&D Operations	allen.berreth@pacificorp.com	503.813.6205
Emergency planning and preparedness	Justin Bukartek	Director, Emergency Management, T&D System Operations	justin.bukartek@pacificorp.com	503.813.5000
Stakeholder cooperation and community engagement	Alan Meyer	Director of Commercial Accounts and Community Relations, External Affairs and Customer Solutions	alan.meyer@pacificorp.com	541.955.7946

1.1 VERIFICATION

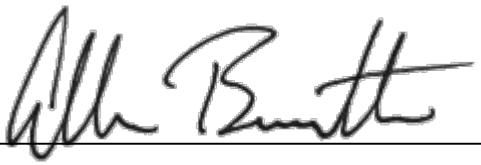
Complete the following verification for the WMP submission:

(See Rule 1.11)
(Where Applicant is a Corporation)

I am an officer of the applicant corporation herein, and am authorized to make this verification on its behalf. The statements in the foregoing document are true of my own knowledge, except as to matters which are therein stated on information or belief, and as to those matters I believe them to be true.

I declare under penalty of perjury that the foregoing is true and correct.

Executed on March 5, 2021 at Portland, Oregon



Allen Berreth, Vice President, T&D Operations, Pacific Power

2 ADHERENCE TO STATUTORY REQUIREMENTS

Section 2 comprises a "check list" of the CPUC Code Sec. 8386 (c) requirements and subparts. Each utility shall both affirm that the WMP addresses each requirement AND cite the Section or Page Number where it is more fully described (whether in Executive Summary or other section of the WMP).

Table 2-1: Adherence to Statutory Requirements

Requirement	Description	WMP Section
1	An accounting of the responsibilities of persons responsible for executing the plan	Section 1
2	The objectives of the plan	Section 5 .2
3	A description of the preventive strategies and programs to be adopted by the electrical corporation to minimize the risk of its electrical lines and equipment causing catastrophic wildfires, including consideration of dynamic climate change risks	Sections 4.2, 7.1, 7.3
4	A description of the metrics the electrical corporation plans to use to evaluate the plan's performance and the assumptions that underlie the use of those metrics	Chapter 6
5	A discussion of how the application of previously identified metrics to previous plan performances has informed the plan	Section 4.1
6	Protocols for disabling reclosers and deenergizing portions of the electrical distribution system that consider the associated impacts on public safety. As part of these protocols, each electrical corporation shall include protocols related to mitigating the public safety impacts of disabling reclosers and deenergizing portions of the electrical distribution system that consider the impacts on all of the aspects listed in PU Code 8386c	Sections 7.3.6.1, 8.2.
7	Appropriate and feasible procedures for notifying a customer who may be impacted by the deenergizing of electrical lines, including procedures for those customers receiving a medical baseline allowance as described in paragraph (6). The procedures shall direct notification to all public safety offices, critical first responders, health care facilities, and operators of telecommunications infrastructure with premises within the footprint of potential de-energization for a given event	Sections 8.2, 8.4
8	Plans for vegetation management	Section 7.3.5
9	Plans for inspections of the electrical corporation's electrical infrastructure	Section 7.3.4
10	Protocols for the de-energization of the electrical corporation's transmission infrastructure, for instances when the de-energization may impact customers who, or entities that, are dependent upon the infrastructure	Section 8.1
11	A list that identifies, describes, and prioritizes all wildfire risks, and drivers for those risks, throughout the electrical corporation's service territory, including all relevant wildfire risk and risk mitigation information that is part of the Safety Model Assessment Proceeding and the Risk Assessment Mitigation Phase filings	Section 4.3
12	A description of how the plan accounts for the wildfire risk identified in the electrical corporation's Risk Assessment Mitigation Phase filing	Chapter 4

Requirement	Description	WMP Section
13	A description of the actions the electrical corporation will take to ensure its system will achieve the highest level of safety, reliability, and resiliency, and to ensure that its system is prepared for a major event, including hardening and modernizing its infrastructure with improved engineering, system design, standards, equipment, and facilities, such as undergrounding, insulation of distribution wires, and pole replacement	Chapter 4
14	A description of where and how the electrical corporation considered undergrounding electrical distribution lines within those areas of its service territory identified to have the highest wildfire risk in a commission fire threat map	Section 7.3.3.16
15	A showing that the electrical corporation has an adequately sized and trained workforce to promptly restore service after a major event, taking into account employees of other utilities pursuant to mutual aid agreements and employees of entities that have entered into contracts with the electrical corporation	Sections 5.4, 7.3.8
16	Identification of any geographic area in the electrical corporation's service territory that is a higher wildfire threat than is currently identified in a commission fire threat map, and where the commission should consider expanding the high fire threat district based on new information or changes in the environment	Section 4.2.5
17	A methodology for identifying and presenting enterprise wide safety risk and wildfire-related risk that is consistent with the methodology used by other electrical corporations unless the commission determines otherwise	Section 4.5.1
18	A description of how the plan is consistent with the electrical corporation's disaster and emergency preparedness plan prepared pursuant to Section 768.6, including plans to restore service and community outreach	Section 7.3.9
19	A statement of how the electrical corporation will restore service after a wildfire	Section 7.3.9
20	Protocols for compliance with requirements adopted by the commission regarding activities to support customers during and after a wildfire, outage reporting, support for low-income customers, billing adjustments, deposit waivers, extended payment plans, suspension of disconnection and nonpayment fees, repair processing and timing, access to electrical corporation representatives, and emergency communications	Section 7.3.9
21	A description of the processes and procedures the electrical corporation will use to do the following: 1. Monitor and audit the implementation of the plan. 2. Identify any deficiencies in the plan or the plan's implementation and correct those deficiencies. 3. Monitor and audit the effectiveness of electrical line and equipment inspections, including inspections performed by contractors, carried out under the plan and other applicable statutes and commission rules.	Section 7.2
22	(Guidance-1, Class B) **Action PC-1:** In its 2021 WMP Update, PacifiCorp shall provide a high-level description of its risk-informed decision-making approach used to select the portfolio of mitigation initiatives presented in its 2020 WMP.	Section 4.5.1

Requirement	Description	WMP Section
23	(Guidance-1, Class B) **Action PC-2:** In its 2021 WMP Update, PacifiCorp shall provide quantitative values for ignition risk reduction for each initiative in its 2020 WMP.	Section 4.5.1
24	(Guidance-1, Class B) **Action PC-3:** In its 2021 WMP Update, PacifiCorp shall provide quantitative values for wildfire consequence risk reduction for each initiative in its 2020 WMP.	Section 4.5.1
25	(Guidance-1, Class B) **Action PC-4:** In its 2021 WMP Update, PacifiCorp shall: 1) outline its risk assessment models, 2) demonstrate the inclusion of existing ignition data into the development of its risk assessment models, and 3) provide a table describing its risk assessment techniques used for each initiative in the format used by Southern California Edison (SCE).[10] If subparts 1 and 2 cannot be completed, PacifiCorp shall provide an update on the development of its risk assessment models with a detailed timeline including progress metrics.	Section 4, Table 4.2-2
26	(Guidance-3, Class A) **Action PacifiCorp-1:** In its 2021 WMP update, PacifiCorp shall explain how the composite score will aide in targeting and selection of specific initiatives and mitigations.	Section 4.5.1
27	(Guidance-3, Class A) **Action PacifiCorp-2:** In its 2021 WMP update, PacifiCorp shall submit a table describing its risk assessment techniques used for each initiative in the format used by Southern California Edison (SCE).	Table 4.2-2
28	(Guidance-3, Class A) **Action PacifiCorp-3:** In its 2021 WMP update, PacifiCorp shall explain and provide the analysis used to determine the sufficiency of relying on HFTD for prioritization and modeling efforts.	Section 4.2.5
29	(Guidance-3, Class A) **Action PacifiCorp-4:** In its 2021 WMP update, PacifiCorp shall explain how it integrates cost analysis into its modeling and decision-making.	Section 4.5.1
30	(Guidance-3, Class A) **Action PacifiCorp-5:** In its 2021 WMP update, PacifiCorp shall: 1) explain how its modeling efforts are dynamic and detail the frequency of calculations for both model inputs and outputs, and 2) justify why annual refreshing of the model is sufficient.	Section 4.5.1
31	(Guidance-3, Class A) **Action PacifiCorp-6:** In its 2021 WMP update, PacifiCorp shall provide more information on its procedures to utilize the results of its modeling efforts for decision- making and prioritization of WMP initiatives.	Section 4.5.1
32	(Guidance-3, Class A) **Action PacifiCorp-7:** In its 2021 WMP update, PacifiCorp shall explain how it intends to update its modeling approach in the event that one of the components fails the "Testing Validation" outlined in Attachment A of PacifiCorp's QR filing.	Section 4.5.1
33	(Guidance-4, Class B) **Action PC-5**: In its 2021 WMP Update, PacifiCorp shall: 1) discuss the relationship between various grid hardening, vegetation management, and asset management initiatives and the corresponding impacts on thresholds for initiating PSPS events, and 2) specifically how each initiative in its WMP affects its threshold values for initiating PSPS events.	Section 4.5, Chapter 8
34	(Guidance-4, Class B) **Action PC-6:** In its 2021 WMP Update, PacifiCorp shall discuss how the various grid hardening, vegetation management, and asset management initiatives are expected to reduce the frequency (i.e., number of events over time) of PSPS events.	Chapter 8

Requirement	Description	WMP Section
35	(Guidance-4, Class B) **Action PC-7:** In its 2021 WMP Update, PacifiCorp shall discuss how the various grid hardening, vegetation management, and asset management initiatives are expected to reduce the scope (i.e. number of customers impacted) of PSPS events for its entire service area, not just Tier 3 areas.	Chapter 8
36	(Guidance-4, Class B) **Action PC-8:** In its 2021 WMP Update, PacifiCorp shall discuss how the various grid hardening, vegetation management, and asset management initiatives are expected to reduce the duration of individual PSPS events.	Chapter 8
37	(Guidance-4, Class B) **Action PC-9:** In its 2021 WMP Update, PacifiCorp shall discuss how the various grid hardening, vegetation management, and asset management initiatives supports its Planned Evolution and Timeframe Table, as outlined in Section 4.4.7 of its 2020 WMP.	Chapter 4-7
38	(Guidance-5, Class B) **Action PC-10:** In its 2021 WMP Update, PacifiCorp shall provide initiative-level details on the current and future approaches to its decision-making in selecting WMP initiatives, identifying where systematic and programmatic advancements are expected. These initiative-level details shall include: 1) an identification the specific risk being mitigated, or problem being addressed, 2) how the initiative or program was selected, 3) how prioritization or targeting is approached for each initiative or program, 4) future plans to improve risk modeling for the initiative or program, and 5) a timeline for the implementation and updating of risk modeling to support the decision-making for each initiative or program. At a minimum, these details shall be provided for every initiative associated with asset management, vegetation management, grid hardening, and PSPS identified in PacifiCorp's 2020 WMP.	Section 4.5.1
39	(Guidance-5, Class B) **Action PC-11:** In its 2021 WMP Update, PacifiCorp shall provide discussion for the repetition of identical and zero-dollar totals for each individual initiative.	Sections 4.5, 7.3.1
40	(Guidance-6, Class B) **Action PC-12:** In its 2021 WMP Update, PacifiCorp shall report the RSE analysis for all Standard Operations and Augmented Wildfire Operation upon completion of the work described in its response to Condition Guidance-1.	Section 4.5.1
41	(Guidance-7, Class B) **Action PC-13:** In its 2021 WMP Update, PacifiCorp shall clearly distinguish and report on benefits of IR and LiDAR "enhanced" inspections, as currently implemented, compared to established "routine" inspections that may exist across its programs.	Section 7.3.4.5
42	(Guidance-8, Class C) In its 2021 WMP update, each electrical corporation shall: (i) include objectives for each of its initiatives that are measurable, quantifiable, and verifiable by the WSD; (ii) provide targets and timelines for all strategies, plans, and approaches to wildfire mitigation that are measurable, quantifiable and verifiable by the WSD; and (iii) dispense with empty rhetoric and not use terms that are ambiguous, misleading, or otherwise have the result of diluting commitments. Continued use of equivocating language may result in denial of future WMPs.	Section 5.4.1
43	(Guidance-10, Class B) **Action PC-14:** In its 2021 WMP Update, PacifiCorp shall detail all actions it has taken and will take prior to its 2022 WMP submittal to bring its data submissions into full compliance with the WSD's GIS data reporting requirements.	Section 7.3.7

Requirement	Description	WMP Section
44	(Guidance-11, Class B) **Action PC-15:** In its 2021 WMP Update, PacifiCorp shall: 1) provide a table with the current number of employees and vacancies for apprenticeship, line, and vegetation management personnel, and 2) a description of its recruitment, training, and retention strategies.	Section 7.3.8.1
45	(Guidance-11, Class B) **Action PC-16:** In its 2021 WMP Update, PacifiCorp shall provide an overall description of its recruiting strategy.	Section 7.3.8.1
46	(Guidance-11, Class B) **Action PC-17**: In its 2021 WMP Update, PacifiCorp shall 1) provide percentage numbers of personnel employed from out of state, and 2) the percentage that were working for another California utility immediately prior to being hired.	Section 7.3.8.1
47	(Guidance-12, Class B) **Action PC-18**: In its 2021 WMP Update, PacifiCorp shall provide a more detailed and structured 10-year plan that is comprehensive and provides its long-term, directional vision. The updated 10-year plan, at a minimum, shall include: 1) either a) anticipated annual quantitative benchmarks that are reasonable and achievable for each goal, or b) explain how it intends to track progress of each goal if a quantitative benchmark is not provided, and 2) a list of activities with metrics to track progress toward annual benchmarks.	Section 4.5
48	(PacifiCorp-1, Class B) **Action PC-19:** In its 2021 WMP Update, PacifiCorp shall investigate and discuss how it may apply existing risk analysis models to consider future climate scenarios rather than the current state of climate-caused risk.	Section 4.5.1
49	(PacifiCorp-1, Class B) **Action PC-20:** In its 2021 WMP Update, as part of its indicated coordination with the Pyregence Initiative, PacifiCorp shall explain how it plans to integrate expertise and lessons learned into its analysis and planning to deploy wildfire initiatives.	Chapter 4
50	(PacifiCorp-2, Class B) **Action PC-21**: In its 2021 WMP Update, PacifiCorp shall provide a cost/benefit analysis of the impact of having a higher density of weather stations across its territory.	Section 7.3.2
51	(PacifiCorp-3, Class B) **Action PC-22:** In its 2021 WMP Update, PacifiCorp shall present and explain a methodology for tracking and measuring the effectiveness of its covered conductor installations at reducing the frequency and probability of: 1) outages for its top 10 outage causes based on best available historical data, and 2) ignitions for all CPUC reportable ignitions.	Section 4.5.1
52	(PacifiCorp-4, Class B) **Action PC-23:** In its 2021 WMP Update, PacifiCorp shall 1) detail its QA/QC measures for asset management and inspection initiatives and 2) provide planned spend for these initiatives.	Section 7.3.3
53	(PacifiCorp-5, Class C) In its 2021 annual update, PacifiCorp shall: (i) describe whether recloser setting adjustments and the detection and alleviation of faults reduce ignition risk along PacifiCorp's grid; and (ii) report on its assessments, including all supporting data and results.	Section 4.5.1
54	(PacifiCorp-6, Class B) **Action PC-24:** In its 2021 WMP Update, PacifiCorp shall describe its efforts to develop policies regarding (a) data collection and governance, (b) data transparency, and (c) information sharing, beyond supporting network operations, to demonstrate support of wildfire mitigation activities.	Section 7.3.7

Requirement	Description	WMP Section
55	(PacifiCorp-7, Class C) In its 2021 WMP update, PacifiCorp shall: (i) describe its plan for receiving input from customers, such as surveys and any formal method of incorporating such input into its procedures; (ii) provide updates relating to the WMP that derive from D.20-03-024, particularly relating to effectiveness of outreach and AFN coordination; (iii) outline in detail how PacifiCorp cooperates with suppression agencies, including how it cooperates on training, incidents, and other activities; and (iv) detail how it plans to coordinate cooperative efforts relevant to reducing wildfire risk with federal agencies.	Section 7.3.10, Chapter 8

3 Actual and Planned Spending for Mitigation Plan

3.1 Summary of WMP initiative expenditures

In the Table 3-1, summarize the projected costs (in thousands) per year over the three-year WMP cycle, including actual expenditures for years passed.

In Table 3-2 break out projected costs per category of mitigations, over the three-year WMP cycle. The financials represented in the summary tables below equal the aggregate spending listed in the mitigations financial tables reported quarterly. Nothing in this document shall be construed as a statement that costs listed are approved or deemed reasonable if the WMP is approved, denied, or otherwise acted upon.

The tables below show spending projections and actuals for the three-year WMP plan period (2020-2022).

Table 3-1: Summary of WMP Expenditures - Total

Spend in thousands $	
2020 WMP Planned	24,708
2020 Actual	18,202
Difference	6,506
2021 Planned	27,772
2022 Planned	24,015
2020-22 Planned	71,021

Table 3-2: Summary of WMP Expenditures by Category

WMP Category	2020 WMP Planned	2020 Actual	Difference	2021 Planned	2022 Planned	2020-22 Planned (w/ 2020 Actual)
Risk and Mapping	$25	$186	($161)	$186	$186	$558
Situational Awareness	$278	$1,209	($931)	$233	$296	$1,738
Grid Design and System Hardening	$15,403	$8,788	$6,615	$19,246	$15,303	$43,337
Asset Management and Inspections	$1,219	$803	$416	$760	$775	$2,338
Vegetation Management	$5,783	$6,999	($1,216)	$6855	$6,900	$20,754
Grid Operations	$2,000	$0	$2,000	$0	$0	$0
Data Governance	$25	$186	($161)	$186	$186	$558
Resource Allocation	$278	$1,209	($931)	$233	$296	$1,738
Emergency Planning	$0	$0	$0	$0	$0	$0
Stakeholder Cooperation and Community Engagement	$0	$36	$0	$73	$73	$0

WMP Category	2020 WMP Planned	2020 Actual	Difference	2021 Planned	2022 Planned	2020-22 Planned (w/ 2020 Actual)
Total	$25,011	$19,416	$5,631	$27,772	$24,015	$71,021

3.2 SUMMARY OF RATEPAYER IMPACT

PacifiCorp currently does not have any ratepayer impacts due to utility-ignited wildfires and wildfire mitigation activities to report for each of the years below. To-date, PacifiCorp has not requested Commission approval of or put into rates any costs related to wildfire mitigation initiatives which have been completed, are still under review, projected to be completed, or proposed in previous, current or future WMPs. Additionally, the company has not yet requested recovery for any utility-ignited wildfires for the years identified below. As such projected costs and ratepayer impacts become available, the company will provide this information.

Table 3-3: WMP Electricity cost increase to customers

Annual performance - Actual						
Outcome metric name	**2016**	**2017**	**2018**	**2019**	**2020**	**Unit(s)**
Increase in electric costs to ratepayer due to utility-ignited wildfires (total)	NA	NA	NA	NA	NA	*Dollar value of average monthly rate increase attributable to utility-ignited wildfires per year (e.g., $3/month on average across customers for utility-ignited wildfires occurring in 20XX)*
Increase in electric costs to ratepayer due to wildfire mitigation activities (total)	NA	NA	NA	NA	NA	Dollar value of average monthly rate increase attributable to WMPs per year

4 LESSONS LEARNED AND RISK TRENDS

4.1 LESSONS LEARNED: HOW TRACKING METRICS ON THE 2020 PLAN HAS INFORMED THE 2021 PLAN

Describe how the utility's plan has evolved since the 2020 WMP submission. Outline any major themes and lessons learned from the 2020 plan and subsequent implementation of the initiatives. In particular, focus on how utility performance against the metrics used has informed the utility's 2021 WMP.

Data and metrics developed through the 2020 WMP did not result in substantial changes to the specific selection of mitigation initiatives but were used to refine the company's approach in the prioritization and execution of its WMP. The area of largest change between 2020 and this update focused on the advancement of risk modeling techniques which was used to inform priorities for mitigation measures at specific locations. Fundamentally, historic data that had been previously used to target risk areas was weighed against current risk assessment, which informed longer-term strategies and priorities. In the case where priorities were found to be different, these are identified, but may not have been materially affected due to progress that had already been achieved on any given mitigation plan item, i.e. replacing a relay for a distribution circuit that had been designed and was ready for construction. Rather, this enhanced assessment process is more likely to pull projects forward in future years. In addition, the incorporation of risk assessment and fire risk mitigation in areas that were not identified as PSPS areas, but are within the HFTD, as well as those areas which weren't previously designated as HFTD suggests expansion of the company's fire mitigation efforts beyond that contained in its prior WMPs. Expanded PSPS and HFTD areas will be established once true risk spend efficiencies are calculated. The company anticipates this as part of its upcoming development activity.

4.2 UNDERSTANDING MAJOR TRENDS IMPACTING IGNITION PROBABILITY AND WILDFIRE CONSEQUENCE

Describe how the utility assesses wildfire risk in terms of ignition probability and estimated wildfire consequence, including use of Multi-Attribute Risk Score (MARS) and Multi-Attribute Value Function (MAVF) as in the Safety Model and Assessment Proceeding (S-MAP)2 and Risk Assessment Mitigation Phase (RAMP), highlighting changes since the 2020 WMP report. Include description of how the utility distinguishes between these risks and the risks to safety and reliability. List and describe each "known local condition" that the utility monitors per GO 95, Rule 31.1, including how the condition is monitored and evaluated.

In addition:

A. *Describe how the utility monitors and accounts for the contribution of weather to ignition probability and estimated wildfire consequence in its decision-making, including describing any utility-generated Fire Potential Index or other measure (including input variables, equations, the scale or rating system, an explanation of how uncertainties are accounted for, an explanation of how this index is used to inform operational decisions, and an explanation of how trends in index ratings impact medium-term decisions such as maintenance and longer-term decisions such as capital investments, etc.).*

[2] Updates to S-MAP are currently in deliberation under proceeding R. 20-07-013 – Order Instituting Rulemaking to Further Develop a Risk-based Decision-making Framework for Electric and Gas Utilities

a. PacifiCorp has built upon the analysis provided in its 2019 and 2020 WMPs to further recognize wildfire risks from utility equipment. It evaluated the impact weather plays in its wildfire risk and outlined its Fire/Not Fire Season analysis, which it explains further in Section 4.4.4. Also, to further develop this concept and support its situational awareness tactics, the company identified three weather influencers to which it needed to be mindful, which serve a similar function as a "fire potential index" and act as inputs to identify operational strategies, such as affecting non-reclosing, employee watches and PSPS. Additional weather influencers used by the company are described below.

B. *Describe how the utility monitors and accounts for the contribution of fuel conditions to ignition probability and estimated wildfire consequence in its decision-making, including describing any proprietary fuel condition index (or other measures tracked), the outputs of said index or other measures, and the methodology used for projecting future fuel conditions. Include discussion of measurements and units for live fuel moisture content, dead fuel moisture content, density of each fuel type, and any other variables tracked. Describe the measures and thresholds the utility uses to determine extreme fuel conditions, including what fuel moisture measurements and threshold values the utility considers "extreme" and its strategy for how fuel conditions inform operational decision-making.*

b. PacifiCorp further evaluated the variables for fuel indicators, including a measure of long-term drying, the Keetch Byram Drought Index (KBDI) and sustained wind, which can be correlated to fire size that could spread (not incorporating local terrain or fuel availability). The company further advanced this approach in 2020 with the use of vapor pressure deficit (VPD) to recognize the impact that alpine environments could have on the reliability of the KBDI, in addition to providing an estimate of short-term drying and its effect on fuel readiness. Finally, as PacifiCorp has built out its weather stations it has outfitted most of them with fuel moisture sensors to further augment its awareness of dryness that could result in wildfire risk. It also correlated Fosberg Fire Weather Index accumulated over a 6-hour period (FFWI6), in combination with wind gusts as a measure of weather driven forces that could cause utility damage. These elements are explained more fully in Section 8.2. The table below outlines the company thresholds used to determine elevated fire risk.

Table 4-1: Elevated Fire Risk Thresholds

PSPS Watch Level 1	PSPS Watch Level 2
☐ KBDI Mainly: KBDI >= 622 ☐ KBDI & VPD: KBDI >= 575 & Localized VPD > 94th ☐ VPD Mainly: Localized VPD >= 97th & KBDI >= 480 ☐ FFWI6 >= 30 and ☐ Wind gusts >=25 mph OR ☐ Sustained wind >=16	☐ KBDI & VPD: KBDI >= 650 & Localized VPD > 94th ☐ FFWI6 >= 30 and ☐ Wind gusts >= 31 mph

In addition, further situational awareness is applied using key metrics, such as:

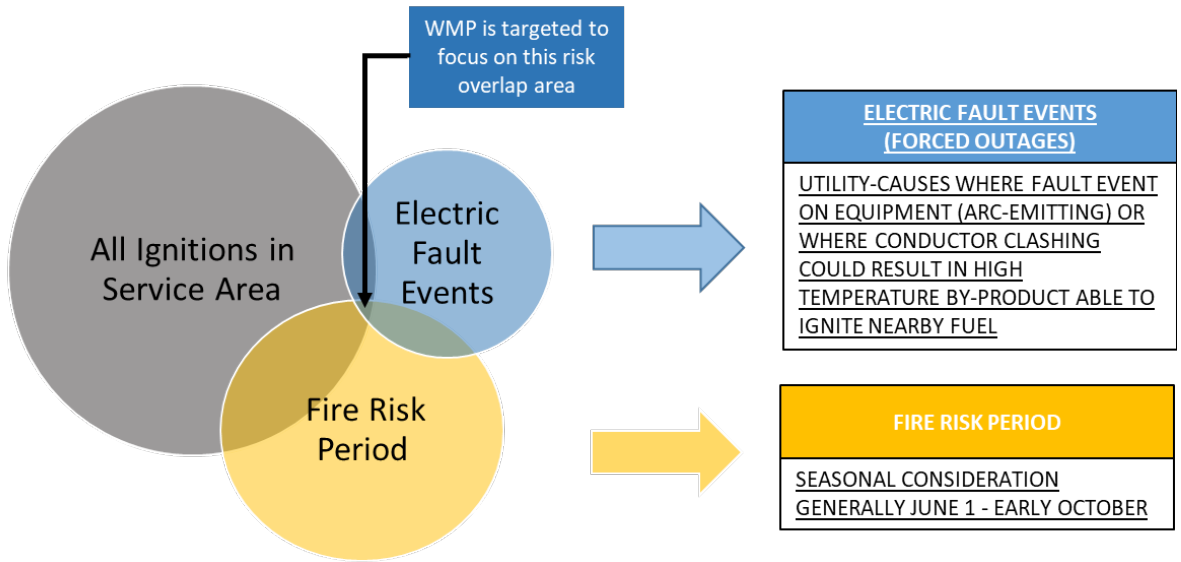
- Red flag warnings
- Availability of fire suppression resources
- Input received about need for electric supply to support key public safety partner locations

- Observer input regarding weather impacts to electrical equipment and positioned at key risk locations
- Input regarding any observed precipitation (or other meteorological input) that could indicate limits to fire spread risks.

In Section 4.5 the company outlines its risk modeling tool, however prior to location-specific analysis it looked broadly across the range of utility events which could lead to utility ignition. Thus, the company appraised what it considers the best proxy for ignition risk events, which it identified as forced outage events combined with actual ignitions. Thereafter it performed extensive analysis on this data to determine 1) what sort of trends in fault events occurred, 2) whether there was a substantial risk event driver, 3) how it would mitigate such drivers, 4) the coincidence of those drivers to weather that is conducive to wildfires and 5) how its proposed mitigation measures would influence future ignition probability risks. Next, it evaluated actual fire history and reviewed whether the event correlated to an ignition probability driver, as well as the weather conditions at the time of ignition.

PacifiCorp's fire risk model is founded upon the concept that fault events become a focal concern when they are experienced during fire risk time periods. The universe of fault events is represented by the blue circle in the Venn diagram below; such fault events might occur when trees, mylar balloons or animals contact phase conductors, or when equipment is damaged or reaches its end of life, causing the system's protection (like fuses, reclosers or breakers) to operate to clear the fault event, wherein an ignition risk could result. The yellow circle represents the environmental conditions that are conducive to fire risk periods, notably dry weather and generally elevated temperatures. When they overlap, they are a wildfire risk probability ignition driver. Those which remain only in the blue and do not overlap with the environmental conditions conducive to fire are however, and thus are still important for mitigation efforts but would not rise to the same level of importance as those which coincide with wildfire risk periods.

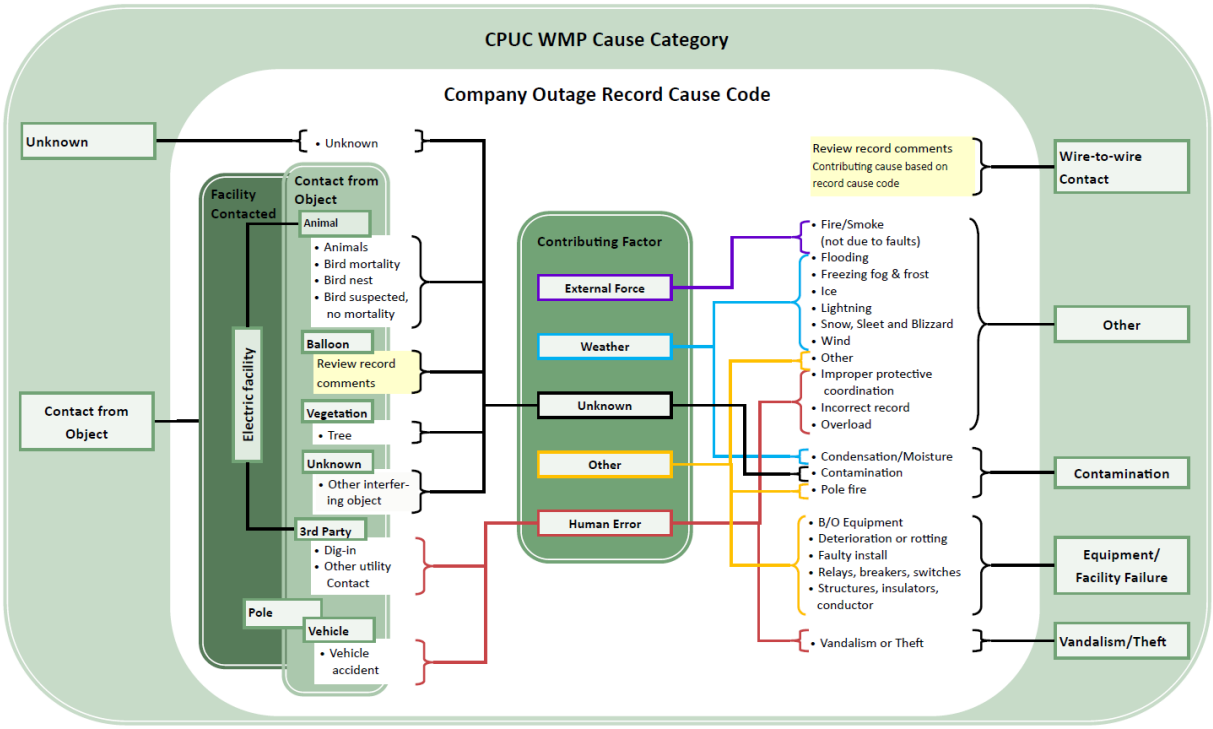
Figure 4.2-1: PacifiCorp's conceptual baseline ignition probability and wildfire risk exposure model



TRENDS IN RISK EVENTS

The graphic below shows the process undertaken to map outage causes to risk events. It is important to note that the company's outage data was developed to respond and subsequently analyze outage events, to benefit response and reliability improvement, using industry standards such as IEEE1366[3] and IEEE 1782[4], and is being re-purposed through this effort to support the evaluating ignition probabilities. As a result, certain assumptions relating to this mapping occurred. As this process matures and richer and better correlations between outages, aka risk events and ignition probabilities and actual ignitions are made, greater confidence in these relationships is likely to occur. In addition, as such data needs are recognized, they are becoming operationalized, such as modifying outage data collection systems to facilitate direct classification of wire down and wire-to-wire contact fault events (rather than relying on less precise classification methods). This results in slight variations in data when compared year over year.

Figure 4.2-2: PacifiCorp's process to map ignition drivers to outage causes

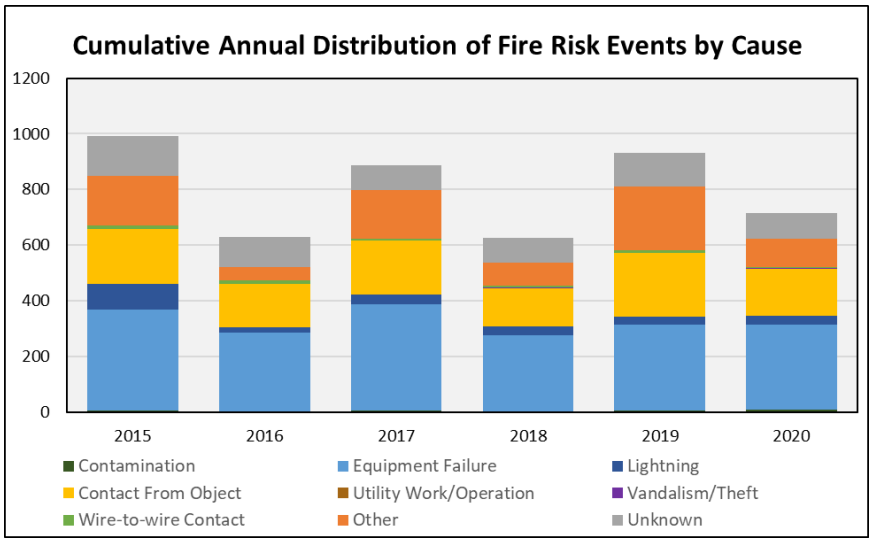


In the graphic below, annual outages, based upon their suspected initiating event are depicted. As can be seen performance in 2020 improved over performance in 2019, however this graphic doesn't support determining whether this is the beginning of a trend or part of the apparent cycle when compared year on year.

[3] IEEE 1366-2012 Guide for Electric Power Distribution Reliability Indices https://standards.ieee.org/standard/1366-2012.html

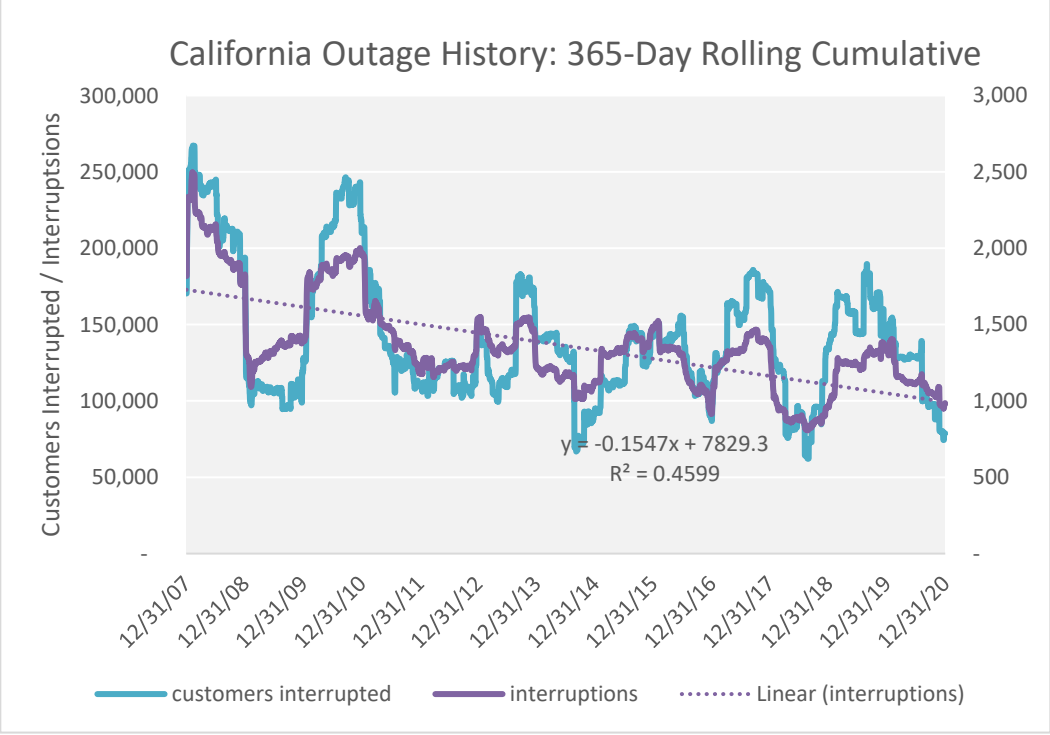
[4] IEEE 1782-2014 IEEE Guide for Collecting, Categorizing, and Utilizing Information Related to Electric Power Distribution Interruption Events https://standards.ieee.org/standard/1782-2014.html

Figure 4.2-3: Annual Distribution of risk event by cause category



In order to clearly establish evidence of a trend in performance, the analysis below was performed, in which each data point represents 365 days of performance (that day in addition to the prior 364 days) to see the long-term trend. With a correlation coefficient (R2) of 0.4599, there is correlation (reasonably so given the cycles which occur coincident to winter weather, which is most impactful for California outage performance. Thus, the trend is improving at approximately 56 interruptions per year. And while this trend relates to all outage causes, as PacifiCorp targets those which are more likely to be ignition probability driver causes, it expects to see a similar, but more dramatic improvement trend in risk reduction in the future.

Figure 4.2-4: 365 day rolling interruptions.



Climate impacts on wildfire risk from utility events (fire season/not fire season)

In Section 7.3.8 the company outlines how it modifies its operations of reclosing equipment through the application of a declared Fire Season. It provides history showing the dates during which the protocol was in place over the last seven years, as shown in Figure 4.2-5 below.

Figure 4.2-5: 2014-2020 company declared Fire Season

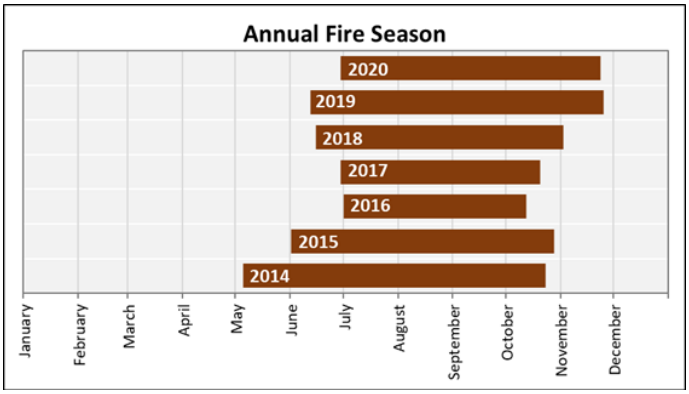
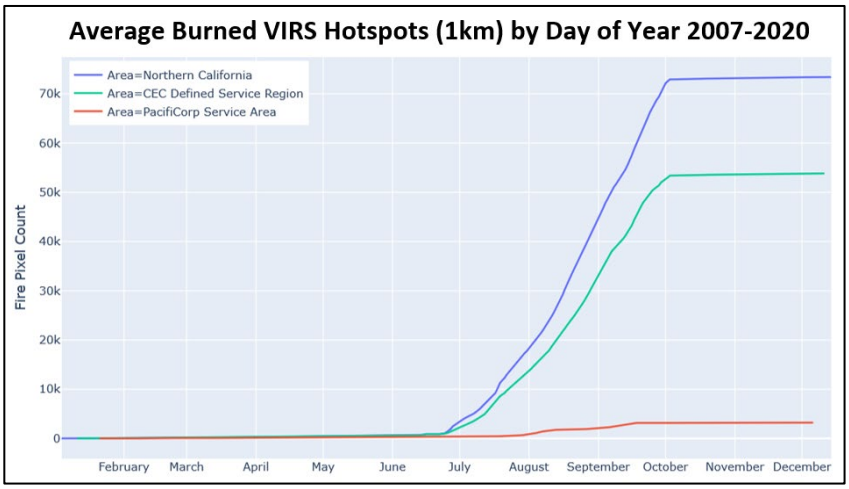


Figure 4.2-6: Average Burned VIRS Hotspots (1 km) by day of the year2007-2020



Further, the Company developed data evaluating area burned on a daily basis to re-evaluate the historic trend used to establish the beginning and end of fire. This provides a long-term history of fire growth for the day of the year, in northern California (from just north of Shasta Lake City, California), as well as PacifiCorp's designated service territory and in the specific area in which PacifiCorp's transmission and system service areas, independent of the ignition cause. This data set demonstrates bimodality in the fire environment and supports the need for pair-wise analysis of risk events. This concept was used to recognize the substantially different risks associated with fall/winter weather in the company's service territory; thus, the analysis that follows separately distinguishes Fire Season from Non-Fire Season. Notwithstanding this analysis, the company recognizes that climate changes, from year to year or over longer periods will cause this analysis to need to be refreshed, which it plans to incorporate into its annual wildfire risk assessment.

Figure 4.2-7: Annual Distribution of risk event by cause category by Fire Season

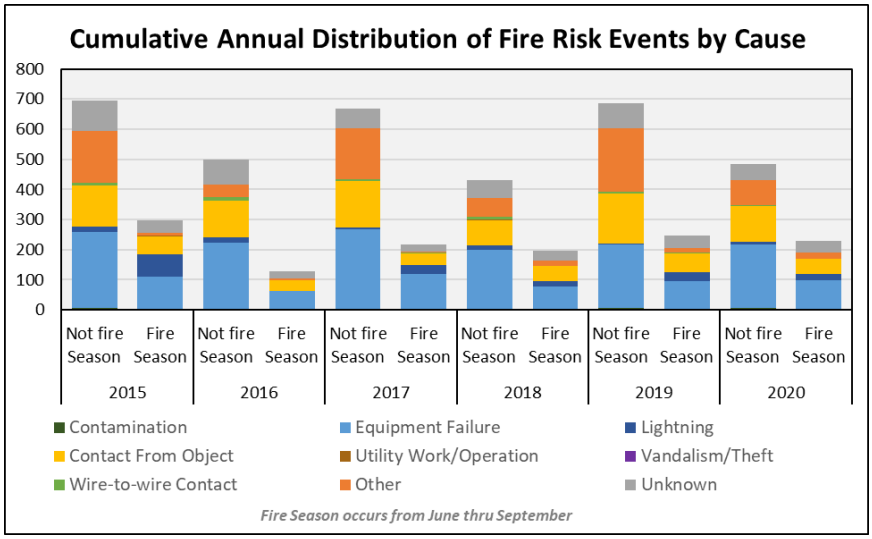


Figure 4.2-8: Annual Distribution of risk events as a result of contact from object by Fire Season

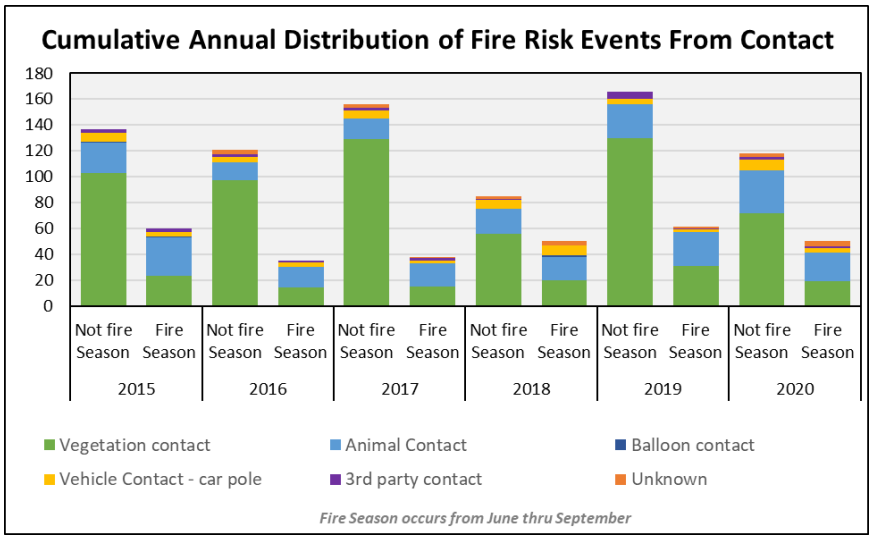
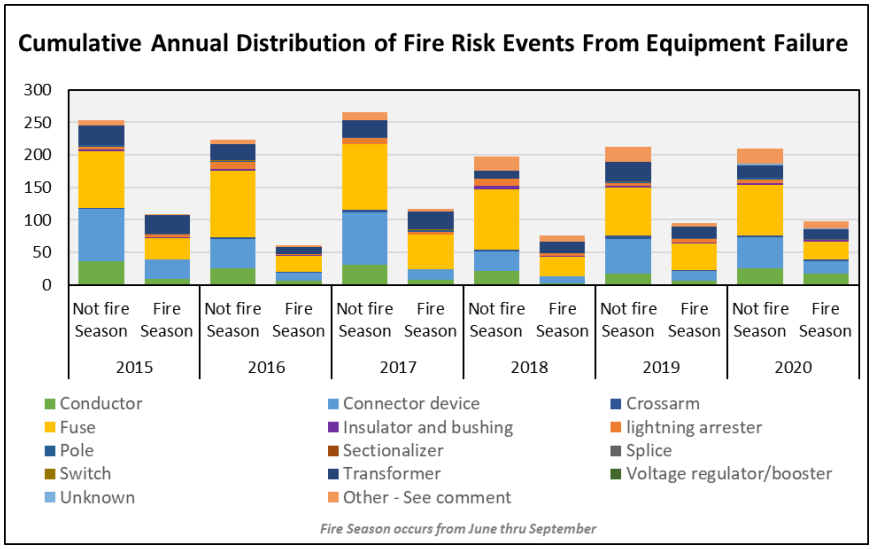
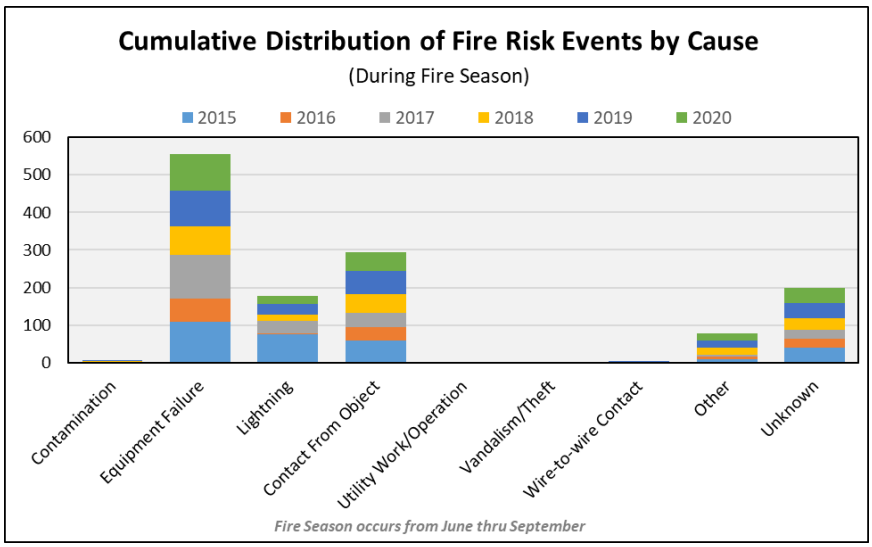


Figure 4.2-9: Annual Distribution of risk events as a result of equipment failure by Fire Season



Depicted below is PacifiCorp's evaluation of utility-related risk events from 2015-2020 during fire season with the potential to result in an ignition event, classified by potential suspected initiating event type, as defined in D.14-01-015, page C-8.

Figure 4.2-10: Historical cumulative risk event by cause category during fire season



In Figures 4.2-11 through 4.2-14, this data is further segmented focusing on contact and component elements. It is important to note that while this data set is helpful to identify potential fault scenarios that occur throughout PacifiCorp's service territory, the presence of an outage event with potential ignition risk does not explicitly infer that an ignition event has or will happen. This data was subsequently used to provide insight into PacifiCorp's ignition probability drivers.

Figure 4.2-11: Historical cumulative risk events as a result of contact from object during fire season

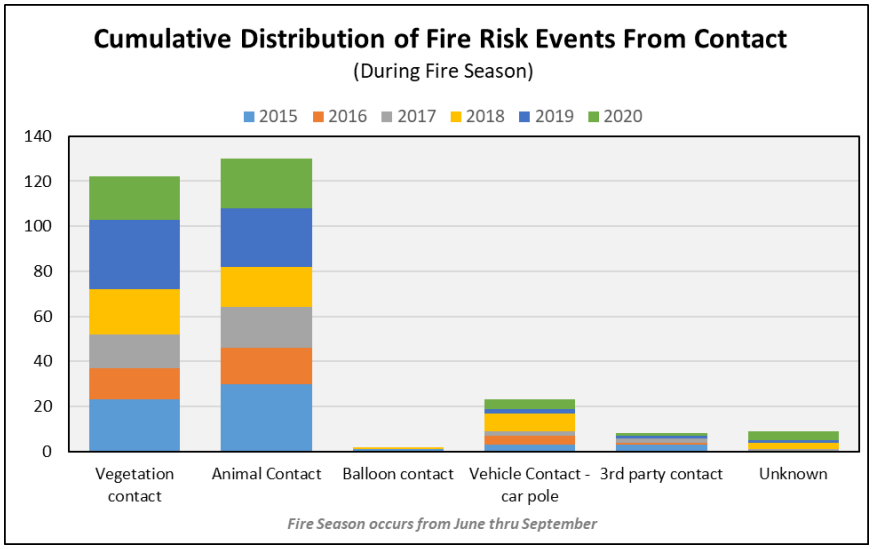


Figure 4.2-12: Annual distribution of fire risk as a result of contact from object during fire season

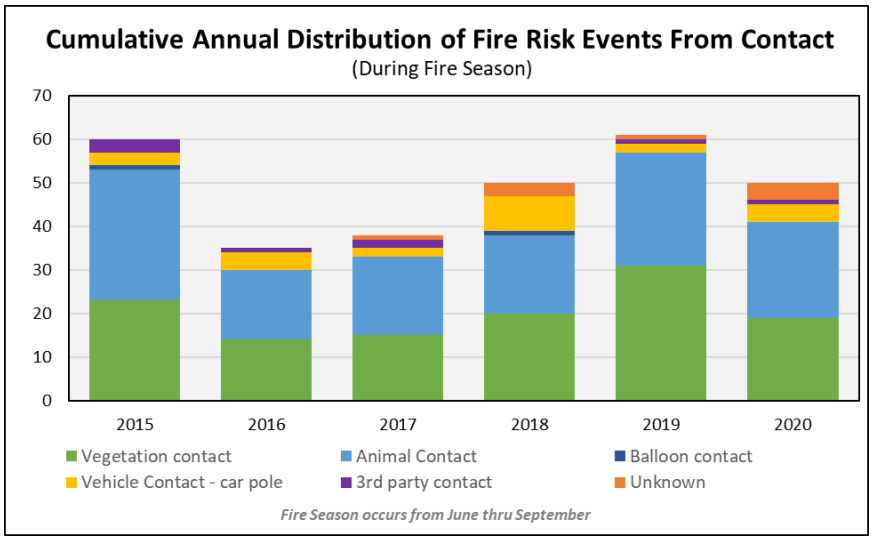


Figure 4.2-13: Historical cumulative risk events as a result of equipment failure during fire season

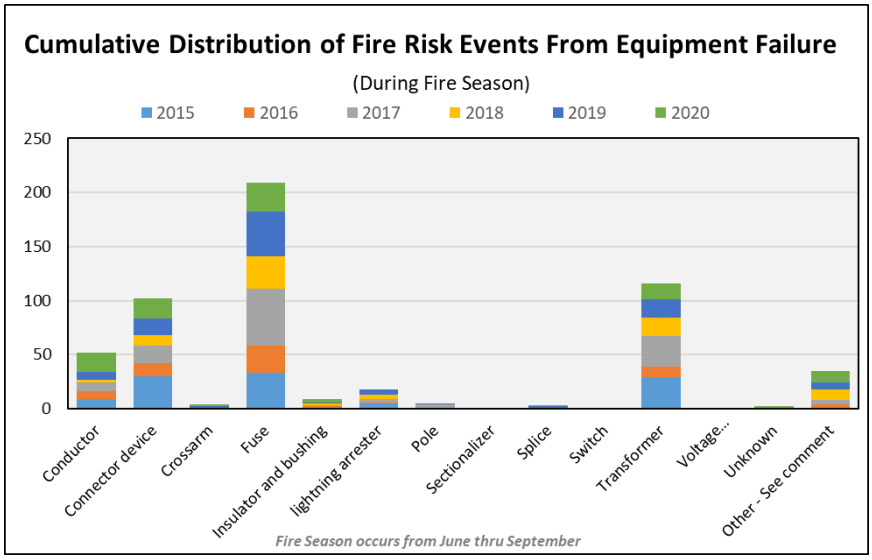
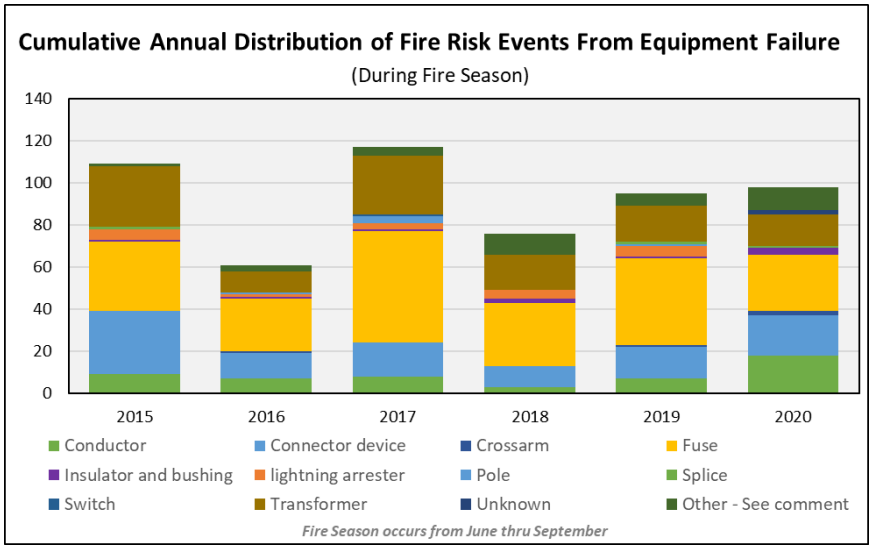


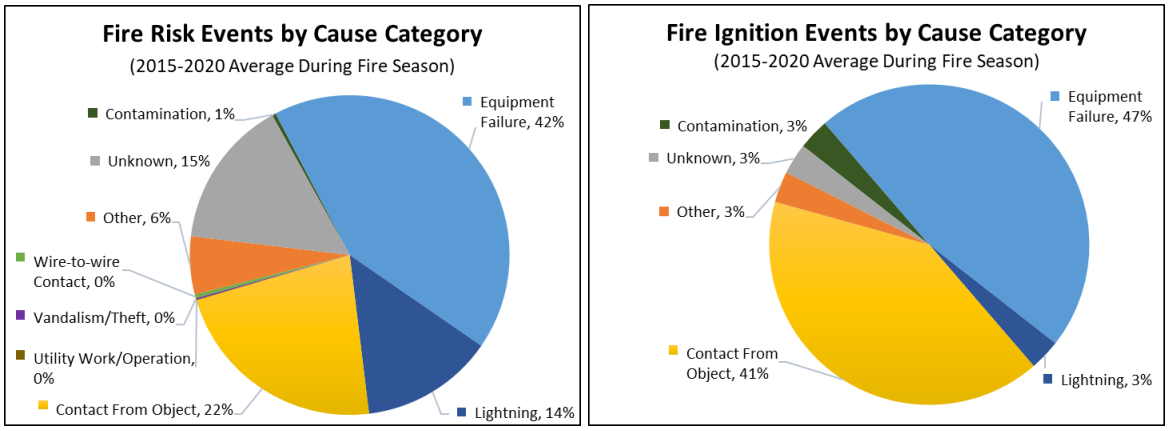
Figure 4.2-14: Annual distribution of fire risk as a result of equipment failure during fire season



Ignition probability drivers

The company further analyzed the data to determine during fire season those risk drivers with correlation to fire events. The following information found highlights that 64% of the risk events are due to equipment failure (damage) and contact from objects; the corollary view shows ignitions (based on the limited history the company has available) indicates that those two causes account for 88% of the recorded fires. Thus, mitigation measures biased toward equipment inspection & subsequent replacement and mitigations that minimize contacts from objects will result in substantial reduction in risk with an expected larger reduction in fire events.

Figure 4.2-15: 2015-2020 average risk and ignition events by cause category



Mitigation measures' influence on risk event and on ignition probability

In WSD's Evaluation of PacifiCorp's First Quarterly Report, WSD directed the company to utilize the convention adopted by SCE to organize each initiative into the category of interest described in the requested conditions based on how the initiative was classified in the WMP. The asset management section contains initiatives related to PacifiCorp's inspection programs (IN-n), the vegetation section contains vegetation management initiatives (VM-n), the asset hardening section contains system hardening initiatives (AH-n), and the PSPS section contains PSPS related initiatives (PS-n). The company was further directed to supply an analogous table that summarized the initiatives in this Plan Update and their related risk-informed decision-making basis. In Section 4.5 the company further outlines its intention to utilize the approach for estimating mitigation measure effectiveness to forecast changes in both risk events and ignition probabilities which will further support risk spend efficiency calculations.

Table 4-2: Initiative Mapping

PacifiCorp Wildfire Mitigation Initiative History						
Prior Initiative Name	In 2019 WMP	In 2020 WMP	2021 WMP Initiative ID	Initiative Name	Risk Event	Discussed In
		Pilot	**AH-12**	**Asset Hardening: Pole loading LiDAR Pilot**	Reduces Risk Event: Contact from Object, Equipment Failure, Improves Reliability	Section 4.4.1 Pilot 2
AH-2	**Yes**	Yes	**AH-2**	**Asset Hardening: Targeted Pole**	Reduces Risk Event: Contact from Object, Equipment Failure	Section 7.3.3.17
AH-4	**Yes**	Yes	**AH-4**	**Asset Hardening: Relay/Recloser**	Reduces Risk Event: Contact from Object, Equipment Failure, Improves Reliability	Section 7.3.3.33
AH-5	**Yes**	AH-5	**AH-5**	**Asset Hardening: Covered Conductor**	Reduces Risk Event: Contact from Object, Equipment Failure	Section 7.3.3.14
AH-6	**Yes**	AH-6	**AH-6**	**Asset Hardening: Small**	Reduces ignition probability	Section 7.3.3.35
		New	**IN-5**	**Inspection: LiDAR**	Reduces Risk Event: Equipment Failure	Section 7.3.4.5
AH-3	**Yes**	Yes	**RA-1**	**Technology: Risk Modeling**	Enabling tool supporting minimization of risk events	Section 4.5
SA-1	**Yes**	SA-1	**SA-1**	**Situational Awareness: Weather Information**	Enabling tool supporting minimization of risk events	Section 7.3.2
	No	New	**SA-3**	**Pilot: DFA**	Reduces ignition probability	Section 4.4.1 Pilot 1
VM-1	**Yes**	Yes	**VM-1**	**Vegetation Management:**	Ignition Risk: Contact from Object, Equipment Failure	Section 7.3.5.11
VM-3	**Yes**	Yes	**VM-15**	**Vegetation Management: Higher**	Reduces contact from object, ignition probability	Section 7.3.5.15
		New	**VM-5**	**Management: PSPS**	probability	Chapter 8

The company has identified many tools to mitigate against various risk events, including asset hardening, inspection and vegetation management programs, as well as protection coordination strategies. In review of its prior plans the company was criticized for appearing to adopt covered conductor as its lone strategy for limiting the probability of PSPS in the future. While the implementation of covered conductor is considered a key component in the reduction of PSPS probability, PacifiCorp has adopted many complementary elements to limit the probability or need for a PSPS event, evident by many components of the thorough rationale for assessing PSPS and fire risk described below. Components of the thorough rationale for mitigation of wildfire risk up to and including PSPS are outlined below. Additional practical examples are shown in Section 4.5.1 and tactics are explicitly detailed in Table 4-5.

1. Is there a fire risk such that PSPS would be a potential consideration (i.e. how frequently might this be considered)?
2. How substantial are the impacts of de-energizing?
    a. What number of customers, type and community impacts could be the result?
    b. How often would it be expected to occur, using long-term, short-term and forecast climate conditions?
    c. Is the area at risk as electrically-isolated and controllable as possible, such that the installation of additional switching points or devices, or alternate ties to sources result in fewer customer impacts, lower probability of occurrence or shorter duration of PSPS events?
3. Is the system's coordination of system protective devices as well-devised as possible?
4. Would the extension of a system neutral or other ground fault detection improve the probability that a fault would properly be detected?
5. Do system protective devices have advanced protection capability (i.e. fast tripping, ability for alternate settings, etc.)?
6. Can these settings be remotely reconfigured?
7. Is there fault history (in the form of outage events) that identify the risk events which occur, particularly those related to contact (i.e. animals, vegetation, etc.) or equipment performance or condition?
8. Can these risk events be expected to occur concurrent with fire weather conditions or are they coincident with non-fire conditions (winter weather with low KBDI and Fosberg indices)?
9. If there is limited outage history, is there environmental exposure or other leading indicators which suggest a future risk, despite past performance?
10. Are all maintenance and vegetation management activities up to date and acted upon?
11. Could additional patrols be advantageous as an alternate to de-energization?
12. Could enhanced inspections reveal latent situations that pose risk?
13. Are assets of a vintage or population that are prone to catastrophic end of life events?
14. Could the area benefit from targeted hardening activities against specific probability ignition drivers? And which hardening activities lend themselves to correcting any credible risks?
15. Finally, is the best long-term, targeted hardening activity reconductoring, whether overhead or underground?

In order to select mitigation measures considered for any given module of the electrical network the company has identified specific tactics which are valid measures for a given risk driver; in general these are identified by individuals assessing the situations, not developed programmatically based on model logic.

4.2.1 *Service Territory Fire-Threat Evaluation and Ignition Risk Trends*

Discuss fire-threat evaluation of the service territory to determine whether an expanded High Fire Threat District (HFTD) is warranted (i.e., beyond existing Tier 2 and Tier 3 areas). Include a discussion of any fire threat assessment of its service territory performed by the electrical corporation, highlighting any changes since the prior WMP report. In the event that the electrical corporation's assessment determines the fire threat rating for any part of its service territory is insufficient (i.e., the actual fire threat is greater than what is indicated in the CPUC Fire Threat Map and High Fire Threat District designations), the corporation shall identify those areas for consideration of HFTD modification, based on the new information or environmental changes. To the extent this identification relies upon a meteorological or climatological study, a thorough explanation and copy of the study shall be included.

- *List and describe any macro trends impacting ignition probability and estimated wildfire consequence within utility service territory, highlighting any changes since the 2020 WMP report:*
- *Change in ignition probability and estimated wildfire consequence due to climate change*
- *Change in ignition probability and estimated wildfire consequence due to relevant invasive species, such as bark beetles*
- *Change in ignition probability and estimated wildfire consequence due to other drivers of change in fuel density and moisture*
- *Population changes (including Access and Functional Needs population) that could be impacted by utility ignition*

The WSD directed the company to evaluate the efficacy of the existing HFTD designation, any trends influencing that designation and current or future considerations for expanding the designation.

4.2.2 *Service Territory Fire Threat Evaluation*

PacifiCorp used its Localized Risk Assessment Model (LRAM), described further in Section 4.5.1, to evaluate areas which were not considered to be an elevated fire threat, but its combined score, as measured by the LRAM combined scored exceeded a threshold value the company set. Those network sections with fire/climate scores that were found to be beyond 0.55 (from zero to one) that were not within the HFTD are shown in shades of blue in the graphics below. As a result of this comparison, the company has determined that two primary areas may be candidates for consideration within the HFTD, specifically Crescent City toward Klamath Glen and Montague.

Figure 4.2-16 - PacifiCorp HFTD versus Fire Risk Designation

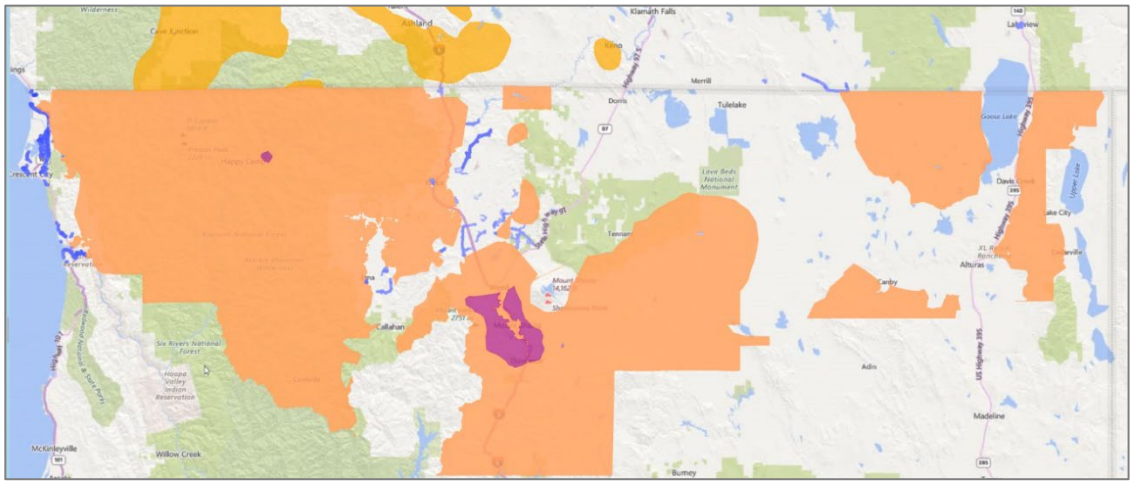


Figure 4.2-17 - Crescent City Close-up HFTD versus Fire Risk Designation

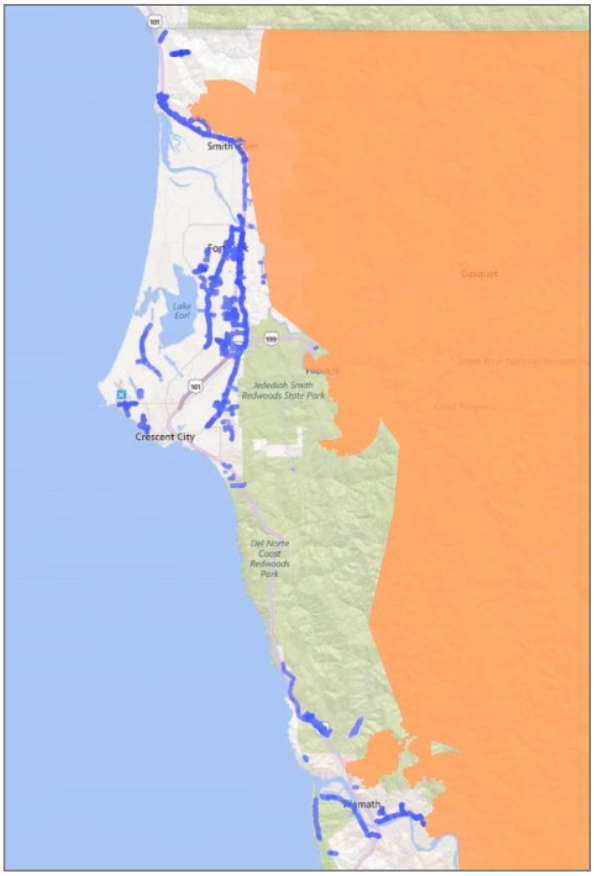
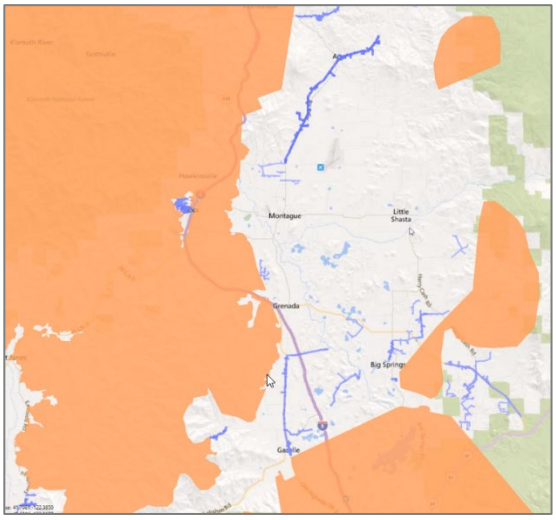


Figure 4.2-18 - Montague Close-up HFTD versus Fire Risk Designation



4.3 CHANGE IN IGNITION PROBABILITY DRIVERS

Based on the implementation of the above wildfire mitigation initiatives, explain how the utility sees its ignition probability drivers evolving over the 3-year term of the WMP, highlighting any changes since the 2020 WMP report. Focus on ignition probability and estimated wildfire consequence reduction by ignition probability driver, detailed risk driver, and include a description of how the utility expects to see incidents evolve over the same period, both in total number (of occurrence of a given incident type, whether resulting in an ignition or not) and in likelihood of causing an ignition by type. Outline methodology for determining ignition probability from events, including data used to determine likelihood of ignition probability, such as past ignition events, number of risk events, and description of events (including vegetation and equipment condition).

Since the 2020 WMP was filed, there have been limited changes to the macro trends within its service territory. However, the company is keeping a watchful eye on six key areas which could result in shifts to these trends in the future. These changing trends will be further incorporated into future iterations of WMPs.

Climate Change:

In response to feedback regarding the company's short-term planning gaps, including its lack of quantifiable consideration of climate change as it relates to wildfire risk in its service territory, the company has been in conversations with climate change experts (through the California Energy Commission's Pyregence Project climate science team), in addition to utilizing materials prepared by the 4th Climate Change Assessment[5] through CalAdapt to assess climate change and determined that fire-affecting climate change, particularly the effect of drying, is generally evenly impactful throughout the company's service territory (further discussion on these model results occurs in Section 4.5.1). Climate models suggest reductions in some of the fire weather inputs (i.e. wind gusts), which bear further analysis and reconciliation into models the company is preparing.

[5] Pierce, David W., et al. *Climate, Drought, and Sea Level Rise Scenarios for California's Fourth Climate Change Assessment: A Report for California's Fourth Climate Change Assessment*. California Energy Commission, 2018.

Invasive Species:

During the period of extreme drought in the company's northern California service territory, from 2014-2017, the company was experiencing substantial impacts from bark beetle invasion, damaging vegetation, for which it conducted hazard tree removal. At this time such invasive species do not appear to be on the rise, however, as noted above, to the extent that extreme drying becomes more normal, the tendency for invasive species such as bark beetle to damage vegetation increases. The company will be watchful of any erosion in tree health due to such affects and may consider inclusion of these patterns into its risk assessment model.

Population Changes:

The area in which the company serves is not a high growth area and no patterns suggesting greater AFN population percentages are anticipated by the company which could impact areas needing additional support during periods of elevated fire risks.

Population changes in the High Fire Threat Districts (HFTD):

The company serves a sparse area, much of which is federal, state or tribal lands, which were deemed part of the elevated fire threat areas. While these areas generally are not developed, any changes to their usage could result in expansion of the company's network into areas that are designated HFTD and potentially impact the ratio of elevated fire risk area the company serves. At this time 41% of its California assets are designated in the HFTD. Additional buildout in those areas would change the ratio and potentially require realignment of mitigation measures and resources. Shown below is quantitative analysis supporting these conclusions.

- Tract level ACS 5-year population estimates show a general decline in population within PacifiCorp's California service territory between the 2010 census and 2017. Population began increasing again in 2018 and 2019, but ACS estimates for 2019 are still 3.5% below 2010 population levels for the northernmost areas of California.
- Population changes in the HFTD follow the overall trends of the area. Population estimates for 2019 are roughly 3% below the 2010 population for the HFTD as a whole and roughly 2% below 2010 for the Tier-3 Areas.
- Based on these trends, it is unlikely that major population increases will occur inside the HFTD regions of PacifiCorp's service territory.

Population Changes in the High Fire Threat Districts

Data Source	Area	2010	2015	2017	2019
Census and ACS 5-year Tract Est.	Tracts Overlapping PC Territory	89,868	87,455	86,336	86,663
Census and FCC Block Est.	All HFTD	46,247	44,548	44,931	44,745
	Tier 3	4,735	4,499	4,685	4,631

Population Changes in WUI That Could Be Impacted by Utility Ignition:

The company's service area generally has limited growth and much of it is infill. Limited growth of projects that increase the WUI are expected, based on information the company has from local stakeholders.

ACS estimates are not available at the block level used to determine WUI classifications, but FCC population estimates at the block level also show population decrease in PacifiCorp territory's Wildland Intermix and Interface areas. Population levels estimates from 2019 are roughly 7% below 2010 levels in Wildland Intermix areas, and roughly 3% below 2010 levels in Wildland Interface areas. Populations in WUI areas also decreased between 2017 and 2019, despite modest gains in Northern California more generally. Further, there are zero Interface blocks with a population increase of more than 10. Only one Intermix block, located in Del Norte County, had a population increase of more than 10 between 2010 and 2019.

Based on these trends, it is unlikely that major population increases will occur inside the WUI regions of PacifiCorp's service territory.

Population Changes in WUI That Could Be Impacted by Utility Ignition

Data Source	Area	2010	2015	2017	2019
Census and ACS 5-year Tract Est.	Tracts Overlapping PC Territory	89,868	87,455	86,336	86,663
Census and FCC Block Est.	Wildland Urban Intermix	22,548	20,918	20,958	20,910
	Wildland Urban Interface	42,115	41,054	41,025	40,942

Risk events and ignition probability:

Substantial efforts in inspection, vegetation management and situational awareness have occurred and will continue to unfold over the next ten years. And while limited rollout of its covered conductor program has occurred to date, significant accomplishments with improvement in protective devices have occurred, all of which are expected to limit risk events that are leading indicators for ignition probability. Over the ten-year period the company expects its covered conductor projects to be completed, all of which will limit the need for PSPS as well as the potential for ignition from utility equipment.

4.4 Research Proposals and Findings

Report all utility-sponsored research proposals, findings from ongoing studies and findings from studies completed in 2020 relevant to wildfire and PSPS mitigation.

4.4.1 Research Proposals

Report proposals for future utility-sponsored studies relevant to wildfire and PSPS mitigation. Organize proposals under the following structure:

1. *Purpose of research – brief summary of context and goals of research*

2. *Relevant terms - Definitions of relevant terms (e.g., defining "enhanced vegetation management" for research on enhanced vegetation management)*
3. *Data elements - Details of data elements used for analysis, including scope and granularity of data in time and location (i.e., date range, reporting frequency and spatial granularity for each data element, see example table below)*
4. *Methodology - Methodology for analysis, including list of analyses to perform; section shall include statistical models, equations, etc. behind analyses*
5. *Timeline - Project timeline and reporting frequency to WSD*

Table 4-3: Example table reporting data elements

Data Element	Collection period	Collection frequency	Spatial granularity	Temporal granularity	Comments
Ignitions from contact with vegetation in non- enhanced vegetation areas	*2014 – 2020+ (ongoing)*	*Per ignition*	*Lat/lon per ignition*	*Date, hour of ignition (estimated)*	-
Ignitions from contact with vegetation in enhanced vegetation areas	*2019 – 2020+ (ongoing)*	*Per ignition*	*Lat/lon per ignition*	*Date, hour of ignition (estimated)*	-

PacifiCorp's Research Strategy and Approach

PacifiCorp's strategy regarding new technology and research supportive of utility operations and engineering is to maintain industry networks that provide a vehicle to understand the evolution of technologies and discover broader utilization and application for such advancements. As it becomes aware of areas of study or applications of technology, it engages with developers, adopters, manufacturers and others to evaluate relevance for that technology within the company's network. It freely shares information and application experiences it has gained through past pilots or realized implementation programs. Further, it also freely shares data to enable scientists and academics to gain an understanding of the real-world relevance of advancing specific technologies. And finally, it collaborates with developers to serve as a test bed for direct application of experimental efforts. For instance, PacifiCorp plays leadership and support roles through organizations such as the Edison Electric Institute (EEI), the Electric Sector Coordinating Council (ESCC), the Institute of Electrical and Electronics Engineers (IEEE). Within the western United States, it engages with Western Energy Institute (WEI) and Rocky Mountain Electric League (RMEL) as well as the Western Protective Relaying Conference. It further collaborates on research and applications of technologies through its parent company (Berkshire Hathaway Energy, BHE) through various platforms targeted to extending advancements. It acts as mentors for developing talent through guidance of engineering and other technical specialties, and guides Capstone projects for the advancement of practical utility tools and methodologies. Finally, it continues to expand its research network through support of efforts such as the "next generation utility wildfire tools" by participating as a technical advisory committee member for the Pyregence project and lends support to other potential grant or funding efforts. To the Pyregence project the company has dedicated in kind support, through providing utility, engineering and data science knowledge and participation as the project develops deliverables.

Pilot 1-Distributed Fault Anticipation and Waveform Analysis

1. ***Purpose of Research***
   PacifiCorp is pursuing the use of distribution fault anticipation (DFA) technology through piloting with Texas A&M. In addition, the company is investigating application of waveform analytics with

Oakridge National Lab (ORNL) through the Department of Energy's Grid Modernization Lab Consortium partnership. While PacifiCorp did not identify continuous monitoring sensors as an initiative in its WMP, both of these technologies can be considered "continuous monitoring sensors."

2. ***Data Elements***
   Data elements will be determined by contractors at Texas A&M and scientists at ORNL.
3. ***Methodology***
   Methodology will be determined by contractors at Texas A&M and ORNL.
4. ***Timeline***
   PacifiCorp has contracted with Texas A&M to facilitate the DFA pilot, and the first installation at Weed substation (on two circuits) is in final stages of implementation, with commissioning expected in Q2 2021. The collaboration with ORNL regarding wave form analytics is in early scoping stages.
5. ***Results and Discussion***
   No results have yet been produced. The first results are expected at Weed substation no sooner than second quarter 2021. Once the first relays are commissioned, their event history will be routinely assessed and subsequently reported in updates. Due to the small set of circuits available for monitoring, the first of these conclusions will be reported no sooner than third quarter 2021. If DFA delivers the expected early detection of wave form deviations, PacifiCorp anticipates this technology to be highly effective at reducing fault operations, which consequentially reduces ignition probability.
6. ***Follow-Up Planned***
   If successful, PacifiCorp will install DFA when replacing substation/circuit relays where communication networks exist. Depending on the result of the pilot, PacifiCorp may consider near-time replacements. For those portions of the network with limited communications options, alternative communications strategies will be considered.

Pilot 2-LiDAR Pole Loading Assessment

1. ***Purpose of Research***
   Pole loading to accommodate safety factors and necessary specifications are included in PacifiCorp's engineering and construction standards. LiDAR data collection allows for highly accurate 3-Dimensional (3D) depictions of pole assets. These results can be used to identify potential pole loading concerns. Upon validation in the field, corrective work can be scheduled.
2. ***Data Elements***

Data Element	Collection period	Collection frequency	Spatial granularity	Temporal granularity	Comments
LiDAR Point Cloud Data	2019	Once	10 cm	Single date	
Pole Locations	2019	Once	0.5 m	Single date	
Pole Lean	2019	Once	0.5 m	Single date	

3. **Methodology**
   Particular lines are identified based upon the fire risk, historic fault rates, inspection results that might indicate potential for insufficiently strong poles, in addition to joint user records. They are then flown with LiDAR, typically coincident to aerial inspections, and the data collected and processed for incorporation into strength modeling programs, typically PLSCadd. Various loading cases are reviewed to identify the performance of the poles and pole lines for each case and based

upon these results, replacement or strengthening (such as guying or use of phase raisers, etc.) would be considered.

4. ***Timeline***
   At this time, PacifiCorp has piloted the use of LiDAR to create structural models to calculate pole loading capacity. The pilot loading project was completed, and PacifiCorp observed positive results through improved identification of poles with pole loading concerns. The company is currently evaluating wider application of the technology and considering how to integrate this technology into other asset strategies (i.e. asset health index development).
5. ***Results and Discussion***
   The LiDAR Pole Loading Assessment Pilot produced usable and reliable structural information. While PacifiCorp has historically not experienced pole failures in its California service territory, resilient poles are an important element of a resilient electric system and reduce future ignition probability due to pole failure. Results from the pilot were incorporated into the company's pole replacement initiative.
6. ***Follow-Up Planned***
   PacifiCorp is evaluating use of LiDAR pole strength modeling in compiling an asset health index.

Pilot 3-LiDAR Vegetation Inspection Pilot Program

1. **Purpose of Research**
   LiDAR data collection allows for highly accurate 3D modeling of vegetation in proximity to utility assets. This data can be used to identify potential clearances encroachments and potential strike trees. The identification of these hazards can help prevent fault scenarios and reduce ignition risk. Therefore, PacifiCorp developed and implemented a pilot project assess using LiDAR data for vegetation management.
2. ***Data Elements***

Data Element	Collection period	Collection frequency	Spatial granularity	Temporal granularity	Comments
LiDAR Point Cloud Data	2019-2020	per demo ~2/yr	10 cm	date of flight	
Encroachment Locations	2019-2020	per demo ~2/yr	10 cm	date of flight	
Fall-In Potential Locations	2019-2020	per demo ~2/yr	10 cm	date of flight	

3. ***Methodology***
   LiDAR analysis was provided from vendors using various data processing techniques. These submitted results were then compared to field review for some locations. Clearance violations reported by several vendors were compared where data locations overlapped. Individual tree identifications were also compared to satellite or aerial photography and field review.
4. ***Timeline***
   PacifiCorp completed one vendor pilot in late 2019, another in the second quarter of 2020, and a third is currently being evaluated for follow-up in 2021.
5. ***Results and Discussion***
   Using LiDAR for vegetation inspection has not yet proved to be a viable mitigation initiative. PacifiCorp has conducted a pilot and demonstrations from three different vendors, but all of these have had mixed results. PacifiCorp observed a high degree of false positives compared to field review of clearance violations. When clearance violations from different vendors were

compared for the same locations, there were substantially different results. Attempts to use LiDAR data for individual tree identifications also produced many false positives.

6. ***Follow-Up Planned***

PacifiCorp plans to continue working with vendors to improve the accuracy of both clearance violations and tree segmentation and identifications using LiDAR data. Additional efforts in 2021 may use legacy LiDAR data to attempt improvements to analysis accuracy without additional high-cost data collection. These also will evaluate the effectiveness of satellite data processing to augment clearance identification or in support of inventory, as discussed in Pilot 4.
Further description of these results is included in section 7.2.5.7.

Pilot 4-Vegetation Management Data Analytics

1. ***Purpose of Research***

PacifiCorp is using publicly available vegetation data to estimate the amount of tree canopy near our equipment. The goal is to determine whether low-cost datasets can be used to identify areas with higher risk of vegetation contact and/or greater need for vegetation maintenance work.

2. ***Data Elements***

Data Element	Collection period	Collection frequency	Spatial granularity	Temporal granularity	Comments
NLCD Canopy Cover Raster	2016	3-5 years	30m	One year	
Tree Canopy Near Lines	2016	3-5 years	30m	One year	
Historic Vegetation Outages	2000-present	Daily	by isolation point, ~200m	outage timestamp, ~1 minute	
Historic Vegetation Maintenance	2000-present	Weekly	By circuit	weekly	

3. Methodology

A dataset of tree canopy area near PacifiCorp equipment was created by sampling the NLCD Canopy Cover raster data at the per pixel area, 30m resolution. The point layer was then clustered to avoid oversampling at circuit branch points and aggregated according to circuit and sub-circuit zones. Historic vegetation outages were compared to tree canopy area using a simple linear correlation, and vegetation trimming costs were compared to tree canopy area using a generalized linear model.

4. ***Timeline***

Construction of an initial data layer for estimated vegetation near distribution circuits was completed in the second quarter of 2020. Comparison of these results to historic vegetation maintenance records was completed in mid-2020, and comparison to historic vegetation outages was completed in late 2020. The next project phase using higher resolution vegetation cover data is anticipated in the third quarter of 2021.

5. ***Results and Discussion***

Comparison of vegetation area to outages and vegetation maintenance costs showed weak, but non-negligible, correlations. The dataset was predictive of vegetation trimming costs with large margins of error. The results highlight the limitations of the NLCD Canopy Cover layer but are also complicated by the lack of spatial granularity in historic vegetation maintenance and outage

records. As new vegetation maintenance records are established with high spatial accuracy, the dataset can be reassessed for its predictive power.
Attempts to use the NLCD Canopy Cover and LANDFIRE data layers for this purpose highlighted some of their inherent limitations: low update frequency, spatial resolution (30m) too high to capture smaller tree stands, and heavy use of masking in some locations. Together, these limitations result in a systematic bias towards underestimating tree coverage, with larger discrepancies occurring near roads or in developed areas.

6. ***Follow-Up Planned***
PacifiCorp is expanding these efforts through use of higher resolution vegetation canopy cover layers developed by a vendor from higher resolution satellite data. These products are not free, but they are substantially cheaper than obtaining LiDAR information for equivalent areas.

Pilot 5-Vegetation Management Database Pilot Program

1. ***Purpose of Research***
PacifiCorp's historic vegetation records often lack spatial granularity and are not centralized. The new vegetation management database allows vegetation management records to be centralized and incorporates GPS locations from field work.

2. ***Data Elements***

Data Element	Collection period	Collection frequency	Spatial granularity	Temporal granularity	Comments
Vegetation Work Records	2020-present	Daily	10m	Daily	

3. ***Methodology***
Record templates are created by vegetation management and new work records are entered by contractors and staff foresters in the field on provided tablets. The database storing these records is maintained by a vendor with access and download options provided to PacifiCorp personnel.

4. ***Timeline***
New records systems and equipment for recording GPS locations were distributed in early 2020 and are now in use throughout PacifiCorp's California territory. Additional refinement of this record system will occur throughout 2021.

5. ***Results and Discussion***
Data generated by this system has been used for reporting purposes. Additional incorporation of these records into various vegetation analyses is anticipated as the volume of records increases.

6. ***Follow-Up Planned***
Initial adoption of these systems by field crews resulted in some inconsistencies in formatting, which are being addressed. The system will be further refined over time to remove these early implementation problems.

Pilot 6- Radio Frequency (RF) / Infra-red (IR) for Line Patrolmen

1. ***Purpose of Research***
This pilot involves the use of new tools (IR and RF sensors) to supplement traditional visual inspections performed from the ground level and incorporate the capture and use of empirical data and measurements into condition identification. Traditionally, a human inspector has assessed assets visually; line patrolmen perform their inspection function on transmission circuits. PacifiCorp has experienced initial success from the use of IR in the company's enhanced inspection program discussion in Section 7.3.4.5. PacifiCorp expects that these tools, when used to

supplement visual inspections from the ground level, will similarly give the inspector additional "eyes" with the expectation to better identify a wider range of conditions.
Relevant Terms: Infrared, radio frequency, Do-FORM, splice

2. ***Data Elements***

Data Element	Collection period	Collection frequency	Spatial granularity	Temporal granularity	Comments
SAP Work Order	2020-present	per pilot	GPS	day of pilot	
Do-FORM Completed Record	2020-present	per pilot	GPS	day of pilot	
RF Measurements	2020-present	per pilot	GPS	day of pilot	
IR Measurements	2020-present	per pilot	GPS	day of pilot	
Splice location (GPS)	2020-present	per pilot	GPS	day of pilot	

3. ***Methodology***
Lines are selected based on records that suggest a high rate of splices, which may be attributed to past outages or additional construction activities on a line. Work orders are created and a Do-FORM collection process established for field results to be entered. The line patrolman performs the land-based inspection and stops for specific measurements at key points, which includes all poles and any splices within spans. The data is uploaded and available through the Do-FORMS application.

4. ***Timeline***
The pilot is in the early stages of implementation. PacifiCorp has obtained the equipment which will be used by line patrolmen and has completed the data collection forms for mobile application. The company conducted the first training sessions virtually on August 25, 2020. Line patrolmen will engage the new RF and IR tools on targeted local transmission lines over the next couple of months. After the first trials and as employees gain experience, the company will likely make modifications to sensitivity levels, equipment usage, data collection and analysis methods.

5. ***Results and Discussion***
Similar pilots for airborne applications have yielded results in detecting leakage current for pole fire mitigation. PacifiCorp expects that this pilot will yield results over the next quarter. Early detection of latent conditions will result in avoided fault operations that have a direct impact on ignition probability.

6. ***Follow-Up Planned***
If successful, the company intends to outfit all line patrol personnel with detection equipment. Depending on the pilot's results, PacifiCorp may engage in further studies regarding applications on the distribution network.

Pilot 7-Sophisticated Program Control Settings

1. ***Purpose of Research***
This pilot evaluates the optimal approaches in using sensitive and sophisticated device settings to reduce wildfire risk (and improve reliability). Devices, including relays, reclosers and fuses, all have methods by which they are programmed to operate in response to a fault condition. If there is limited coordination between devices, it can increase the probability of equipment damage, or delayed device operations which create and extend an ignition risk.

Relevant Terms: Setting group, relay, fault, relay event record, protective zone

2. ***Data Elements***

Data Element	Collection period	Collection frequency	Spatial granularity	Temporal granularity	Comments
Relay ID (SAP ID)	2010-present	on commissioning	by protective zone	based on date range of event records	
Relay Setting Group(s)	2020-present	on commissioning	by protective zone	based on date range of event records	
Relay Setting Element	since 2020	as needed	by protective zone	time during which setting was active (HH:MM)	
Relay Event Record	since 2020	as needed	by protective zone	quarter cycles	
Fault Analysis for Relay Event	TBD	as needed	by protective zone	quarter cycles	
Outage Record	2003-present	as occurs	by protective zone	microseconds	

3. ***Methodology***

As new relays and reclosers are set they are evaluated for their coincidence to elevated fire risk. In areas where this risk exists, remote (grid operations) device control and mirrored bits coordination are planned for installation. For all installations, independent of fire risk area, advanced settings, including high impedance fault relays will be deployed.

4. ***Timeline***

PacifiCorp developed advanced distribution line settings that were piloted in several areas the company serves (including Weed, CA and Lincoln City, OR). After experimenting and making some minor modifications, the company has adopted those settings as the company's standard. The settings profiles include normal (fast trip followed by reclosing attempts), elevated risk (fast trip followed by single reclose attempt after sufficient time to limit persistence of heat), extreme risk (no reclose attempt), and safety hold (for line worker usage during line operations where no reclosing occurs). Furthermore, the company is piloting the use of mirrored-bits (or radio communications) between substation relays and their associated first zone line reclosers. This pilot is aimed to reduce device-to-device coordination time, which reduces arc energy. Initial results indicate this approach is highly valuable in locations where coordination delays are needed for proper device coordination; such coordination delays increase the duration during which arc energy is being experienced and reducing the duration reduces the probability of ignition. The goal is to maintain a high level of reliability while still reducing potential arc ignition time or magnitude. The company has also piloted high impedance fault detection, which is currently configured to alarm upon detection. As the company gains more experience with alarming versus device operation, settings will be modified; also, during high fire risk periods the high impedance element is functioning in a tripping (not just alarm) mode.

5. ***Results and Discussion***

PacifiCorp has used the alternate settings developed through this pilot in recent elevated risk events. While no line operations occurred during that time, the settings were available to

perform the protective function. A handful of high impedance faults have been recorded (not in the high fire threat area) resulting in tuning of the algorithm.
Analysis of protective device settings is part of PacifiCorp's standard operating practices. Either field engineers, relay support personnel or protection and control team members evaluate the operations to ensure that protective devices function as expected. Those reviews determine whether there should be any subsequent changes to the network, which could include targeted inspections, device settings changes, training or further engineering analysis.

6. ***Follow-Up Planned***
PacifiCorp plans to expand its use of advanced settings in Tier 2 areas, depending on the results of localized risk assessment scores (as discussed in response to Guidance-3 and PacifiCorp's Remedial Compliance Plan). As equipment is replaced for any reason, PacifiCorp plans to further incorporate the advanced settings protocols.

Pilot 8-Fault Detection Line Monitoring

1. ***Purpose of Research***
This pilot explores the use of continuous monitoring sensors, including both line sensors and station relays, for fault identification and detection.
Relevant Terms: Relay, LineScope

2. ***Data Elements***

Data Element	Collection period	Collection frequency	Spatial granularity	Temporal granularity	Comments
Relay Setting Element	since 2020	as needed	by protective zone	time during which setting was active (HH:MM)	
Relay Event Record	since 2020	as needed	by protective zone	quarter cycles	
Fault Analysis for Relay Event	TBD	as needed	by protective zone	quarter cycles	
Outage Record	2003-present	as occurs	by protective zone	microseconds	

3. ***Methodology***
Lines and stations are selected based upon their coincidence to fire risk, length of line (percentage in fire risk tier), historic records of fault events with unknown locations and the impact to customer reliability when fault events occur. If communications technologies are not proximate to either line end, there are reduced technology opportunities.

4. ***Timeline***
The company has completed approximately 1/3 of its California transmission relays with fault detecting relays (and has outlined plans for the remainder to be completed); line sensor piloting (LineScope) has been completed and been found to be valuable in minimizing risk while maximizing reliability results; further installations are scheduled by Q2 2021. Single ended traveling wave is being piloted in four locations on three local transmission lines; the first installation was energized in late December 2020, and a first pair of temporary fault events were detected, and analysis conducted to correlate to impedance-based calculations. Additional field inspections were conducted, and no persistent fault evidence found. Additional pilots are to be installed in Q3 and Q4 2021.

5. ***Results and Discussion***

Substantial benefits have been experienced with the fault detection devices that have been placed, however no widespread metrics have yet been created due to the recent nature of the installations.

As addressed in Sophisticated Protection Control Settings, the device's event data is analyzed to guide response and correction actions.

6. ***Follow-Up Planned***

The company will continue to advance its multiyear installation plan. Further, the company will expand its use of fault detection equipment in areas where elevated risk scores are identified as it completes its element (zone of protection/module) analysis. As equipment is replaced due to its asset health indexing processes or when reactive reliability improvements are needed it will further incorporate viable fault detection equipment.

Pilot 9-Arc Energy Fault Modeling

1. ***Purpose of Research***

The pilot uses simulations of the distribution system model to arrive at arc energy values for studied locations. Higher arc energy from short circuit events is associated with an increased risk of ignition. Arc energy is calculated from the available fault current (amps) and the time required for a protective device to clear the fault event. Available fault current varies across the system due circuit topology, length and materials used. Line sections, and ultimately protective zones and circuits, were scored based on arc energy values and line length (exposure). The score is a gauge of relative ignition risk and can be used for the purpose of identifying locations where system improvements can be proposed to reduce said risk.

Relevant Terms

Arc flash analysis: Any of several engineering methods (IEEE 1584, NFPA-70E, CSA Z462, Lee Method, Wilkins Method) used to analyze electrical safety in power systems. The methods typically use heat transfer models, heat flux calculations and/or prescribed tables to assess risk level and help determine adequate safety procedures. A variety of parameters, including source impedance, equipment type, equipment location and clearing device are used to calculate total energy from an arc associated with a short circuit event.

Load current: The current (Amperes) normally flowing through an energized power system to deliver power.

Protective device details: The applicable TCC curves for a protective device, together with logic-based settings.

Short circuit event: An occasion when one or more components of an electrical system contact one or more circuit return paths. Commonly used for arc flash analysis: a phase conductor contacting earth or system neutral. The result is typically a current value higher than load current.

Time current characteristic (TCC): The specified relationship between applied current and operating time for a protective device such as a fuse, recloser or relay-controlled breaker. TCCs are often represented visually by curves for the purpose of studying device coordination, or for developing new settings. For example, a 100 Amp T-speed fuse will take more time to operate for a given current magnitude than will a 25 Amp T-speed fuse.

2. ***Data Elements***

Data Element	Collection period	Collection frequency	Spatial granularity	Temporal granularity	Comments
CYME v9.0 distribution system model	2020	Collected once in 2020, held constant throughout analysis	Lat/long for each node in the model	Not used	The system model includes source, line and protective device details.

3. ***Methodology***

The pilot simulation evaluated short circuit scenarios where 5 Ohms of impedance was assumed for all short circuit events, and applied voltage at the low end of ANIS A range (95% nominal). These values were chosen to represent an event whose arc energy was reasonably high. Simulating voltage higher than 95% nominal, or with fault impedance lower than 5 Ohms, generally results in faster clearing times and may result in lower total arc energy. A higher impedance value would generally result in slower clearing times and may result in higher total arc energy. The pilot results used relative, not absolute, arc energy value for final scores. For each protective device, downstream overhead lines in its zone of protection were evaluated for composite scoring by arc flash results and line length. That score was also aggregated to the circuit level. The result is a metric that helps the company focus on high-risk areas for remediation, and that can be used as a component within a more comprehensive score that accounts for risk from other categories.

Figure 4.4-1: Example CYME Arc Flash Analysis input

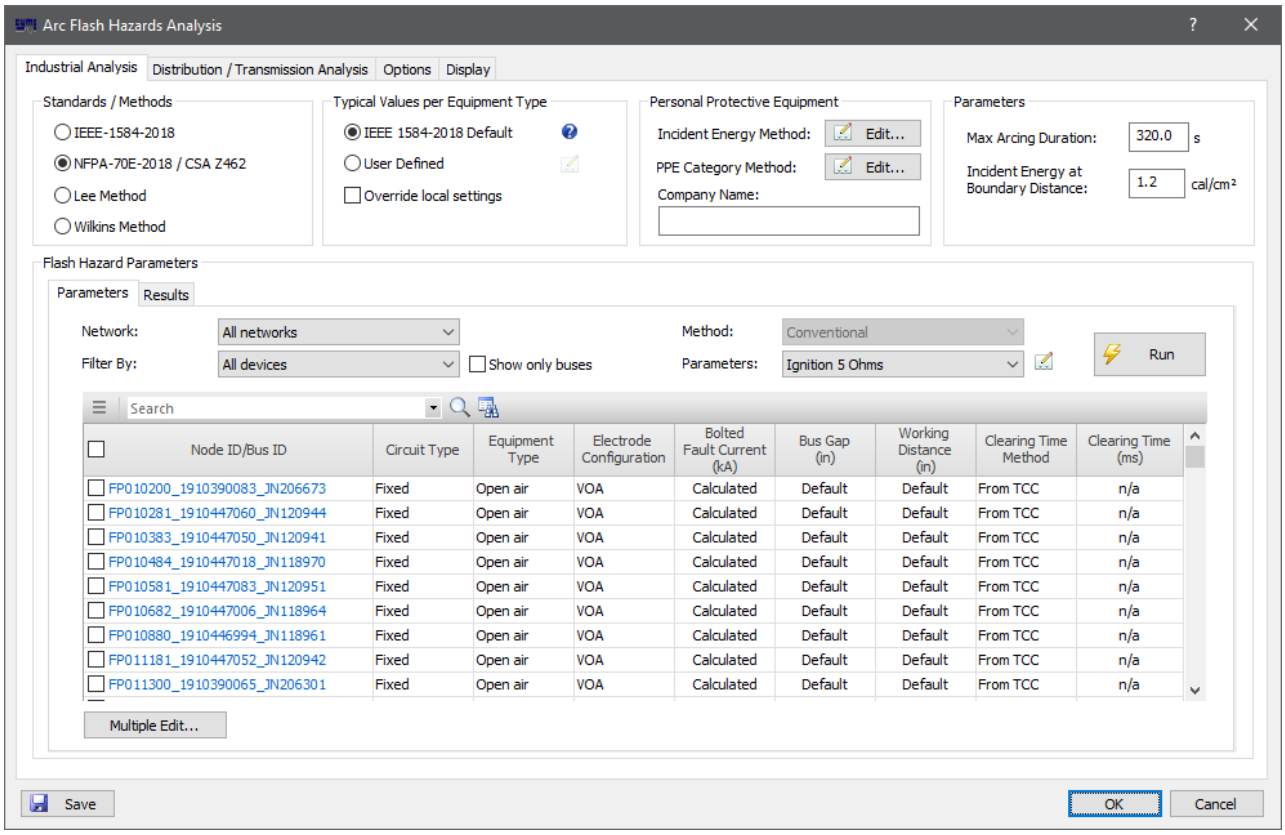
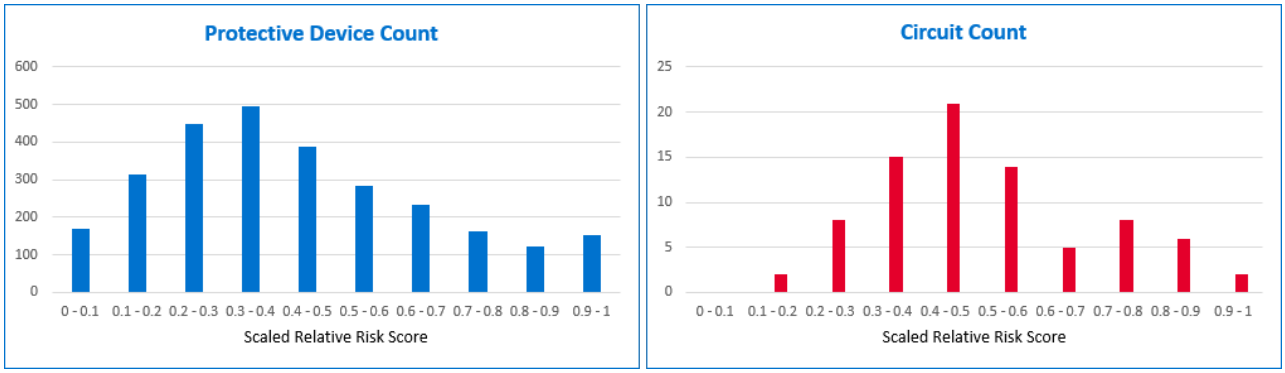


Figure 4.4-2: Summary of arc energy risk scores (scaled to the range 0..1)



4. ***Timeline***
   PacifiCorp completed the pilot in PSPS areas described in the WMP. Based on a review of the pilot results and system records, certain equipment has been either updated or identified for update. PacifiCorp expanded the pilot throughout its California service area during 2020, with long term adoption intended over the next five years, including incorporation as a standard aspect of cyclical study process.
5. ***Results and Discussion***
   The results of the pilot were used to identify locations where the potential fault (based on the similarity to modeled configurations) reflected a higher risk of damaged conductor or ignition. PacifiCorp used the modeling results to identify locations where there was a higher risk of ignition from a fault condition. Use of this information allows for system network changes to preempt such a risk condition.
6. ***Follow-Up Planned***
   PacifiCorp plans to focus pilot expansion on elevated risk areas. As the company develops risk assessment scores for ZOPs, it will use these results to prioritize areas for study and remediation of arc energy risks. Long term, the company anticipates incorporating the methodology into its cyclical study processes.

Pilot 10-Pyregence Ignition Modeling

1. ***Purpose of Research***
   As part of the California Energy Commission's Next Generation Utility Wildfire Toolset, named Pyregence, PacifiCorp has supported the grant development and participated in a technical advisory committee role to create practical tools for utility operations and engineering personnel to deploy as part of their wildfire mitigation and risk management activities. The Pyregence ignition modeling tool employs "match drop" simulation along specific corridors. This tool will allow a utility to strategically quantify the wildfire risk associated with particular assets over a forecast period (up to five days) in support of operational decisions, including PSPS segmentation designs.

2. ***Data Elements***

Data Element	Collection period	Collection frequency	Spatial granularity	Temporal granularity	Comments
Fire Consequence Forecasts	2020 - Ongoing	Published every 6 hours	500 ft	Hourly	Fire area, fire volume, and burned structures are provided
Gridded Weather Forecast	2016 – Ongoing	Published every 6 hours	3 km	Hourly	North American Model and High Resolution Rapid Refresh are provided

3. ***Methodology***

PacifiCorp piloted two products from Pyregence: their 5-day fire consequence maps and their 8-day gridded weather forecast of wind speed, gust, and the Fosberg Fire Weather Index obtained from the National Weather Service. The fire consequence maps are created by simulating millions of ignitions and calculating modeled burned area and volume for the forecast conditions after 6 hours (with no adjustment for suppression/intervention). The core of the methodology lies in overlaying our circuitry broken up by zones of protection over these data products in order to create forecasts localized at protection equipment. This information allows the company to better understand the timing of fire weather events and enables planning and prioritization of resources in a more informed manner. The Pyregence data layers have also been ported over into the company's propriety geospatial tool, GREATER, so that fire consequence and weather forecasts can be easily overlaid on the network. In the future these are expected to be more explicitly integrated into the PSPS decision making process. Conceptually, the company will combine these localized forecasts with downstream customer counts in order to get a picture of the associated risk at each zone of protection and how many customers would be affected if that zone was de-energized. Ideally, the company would target zones for de-energization that have the fewest customers but pose the greatest wildfire risk.

4. ***Timeline***

The pilot project is in trial use and expected to migrate to widespread application over 2021. The pilot product was first shared with Pyregence technical advisory committee (TAC) members in March 2020. Since that time, PacifiCorp has rendered the forecast products into its engineering and operations environment.

5. ***Results and Discussion***

A designated PacifiCorp platform has been created and network characteristics, including circuit zones of protection-level details has been provided to the Pyregence team, which is overlaying its calculation engine onto this base data.

The modeling process allows for short-term analysis of risk events within the electrical network. Such information will be used to elevate operational actions within the network in alignment with those areas which signal elevated risk.

6. ***Follow-Up Planned***

PacifiCorp's ignition modeling efforts have been advanced from pilot status. These programs have been expanded throughout our California service territory and fire risk areas in other states. They have been relied upon throughout the company's 2021 WMP update and are further described in section 4.5.1.

Pilot 11-Advanced Weather Station Modeling and Weather Stations

1. ***Purpose of Research***

   This pilot focuses on exploring of the benefits of RAWS (remote automatic weather system) stations versus micro weather stations. Additionally, this pilot sought out to create a methodology to systematically identify blind spots in our weather station network and in the National Interagency Fire Center's datasets. The company is installing multiple RAWS stations, to participate in the RAWS weather network and to calibrate RAWS stations with previously-deployed micro-stations. Participation in the RAWS weather network may enhance coordination with public safety partners and utility situational awareness. In particular, improved situational awareness may support modifications of system operations in response to risk periods that are weather dependent. Calibration between public and private weather systems may improve correlation between weather systems and their sensitivities to specific patterns, notably improving coordination between NIFC and USFS (United States Forest Service) and utility situational awareness.

   Relevant Terms: RAWS (remote automatic weather system), micro-station, National Interagency Fire Center (NIFC), USFS (United States Forest Service)

2. ***Data Elements***

Data Element	Collection period	Collection frequency	Spatial granularity	Temporal granularity	Comments
RAWS station	2021-present	15 minutes	Lat/long for weather station	15 minutes	
Micro-station	2021-present	10 minutes	Lat/long for weather station	10 minutes	

3. ***Methodology***

   PacifiCorp has leveraged the Localized Risk Assessment Model (LRAM) to site future weather stations in an objective and quantified manner. Using the LRAM we obtain the combined risk score for each zone of protection; this is a summary metric that reflects many aspects of wildfire risk including but not limited to fire weather history, fuel density, tree canopy cover, outage history, ignition history, and arc energy calculations. The second piece is to obtain the locations of all RAWS, NWS, and PacifiCorp weather stations throughout our service territory and join them to combined risk score dataset from the LRAM. For each zone of protection, we then identify the nearest weather station and calculate the distance and difference in elevations from which we obtain a situational awareness score. Finally, we synthesize the situational awareness score with the combined risk score to create a risk blindness score. We can then visualize the risk blindness scores on a map in GREATER to identify locations that have both low situational awareness and high combined risk score and consequently are optimal locations for future weather stations.

4. ***Timeline***

   PacifiCorp has received RAWS stations and micro-stations and plans to complete installations in Q2 2021 and access becomes viable in remote areas. Weather stations are being placed in Klamath Glen, Smith River, Cave Junction/Patricks Creek, Hornbrook, Fort Jones/Scott Valley, McCloud, Alturas, and Montague. (See response to PC-2 and Attachment D for graphic illustration.) PacifiCorp has installed two RAWS stations in its California service territory, at Klamath Glen and Smith River. (PacifiCorp is also installing additional RAWS stations in Oregon, including two just north of the state line in Grants Pass area).

5. ***Results and Discussion***
   Currently PacifiCorp has a strong initial base of micro-stations informing risk and enhancing operational response during elevated risk periods. Going forward the above-described methodology allows us to systematically identify the blind sports in our network and strategically place our weather stations to improve our situational awareness in our high-risk regions.
6. ***Follow-Up Planned***
   While the company has not yet identified an ideal weather station density it expects to continue to enhance its weather network, particularly as it evaluates the RAWS to micro-station correlations. We are currently utilizing the above-described methodology to place the new round of weather stations going out throughout 2021.

4.5 MODEL AND METRIC CALCULATION METHODOLOGIES

4.5.1 *ADDITIONAL MODELS FOR IGNITION PROBABILITY, WILDFIRE AND PSPS RISK*

Report details on methodology used to calculate or model ignition probability, potential impact of ignitions and / or PSPS, including list of all input used in impact simulation; data selection and treatment methodologies; assumptions, including Subject Matter Expert (SME) input; equation(s), functions, or other algorithms used to obtain output; output type(s), e.g., wind speed model; and comments.
For each model, organize details under the following headings:

1. ***Purpose of model*** *– Brief summary of context and goals of model*
2. ***Relevant terms*** *- Definitions of relevant terms (e.g., defining "enhanced vegetation management" for a model on vegetation-related ignitions)*
3. ***Data elements*** *- Details of data elements used for analysis, including scope and granularity of data in time and location (i.e., date range, reporting frequency and spatial granularity for each data element, see example table above)*
4. ***Methodology*** *- Methodology and assumptions for analysis, including Subject Matter Expert (SME) input; equation(s), functions, statistical models, or other algorithms used to obtain output*
5. ***Timeline*** *– Model initiation and development progress over time. If updated in last WMP, provide update to changes since prior report.*
6. ***Application and results*** *– Explain where the model has been applied, how it has informed decisions, and any metrics or information on model accuracy and effectiveness collected in the prior year.*

Purpose of the Model - Model and Metric Calculation:

In its Remedial Compliance Program filing[6] on July 27, 2020, the company outlined its roadmap for fire risk modeling which substantially evolved the deterministic method it had previously applied. The deterministic method was reliant on the High Fire Threat District, as developed and approved in D.17-012-024, in addition to risk analysis the company had developed with regard to climate risk drivers coincident to historic fires (independent of their cause) as well as analysis of outage events and their correlation to fires. While that groundwork set the stage for 1) identifying PSPS areas, 2) developing first phase mitigation plans and 3) outlining priorities, it was insufficient for the level of risk analysis contemplated by either the WSD or the company. As a result, the company leveraged its legacy reliability management

[6] https://www.cpuc.ca.gov/uploadedFiles/CPUCWebsite/Content/About_Us/Organization/Divisions/WSD/R.18-10-007%20PacifiCorp%20Remedial%20Compliance%20Plan%20(7-27-20).pdf

tools, and in combination with many previously untapped weather and land-based resources, began the development of its Localized Risk Assessment Model (LRAM).

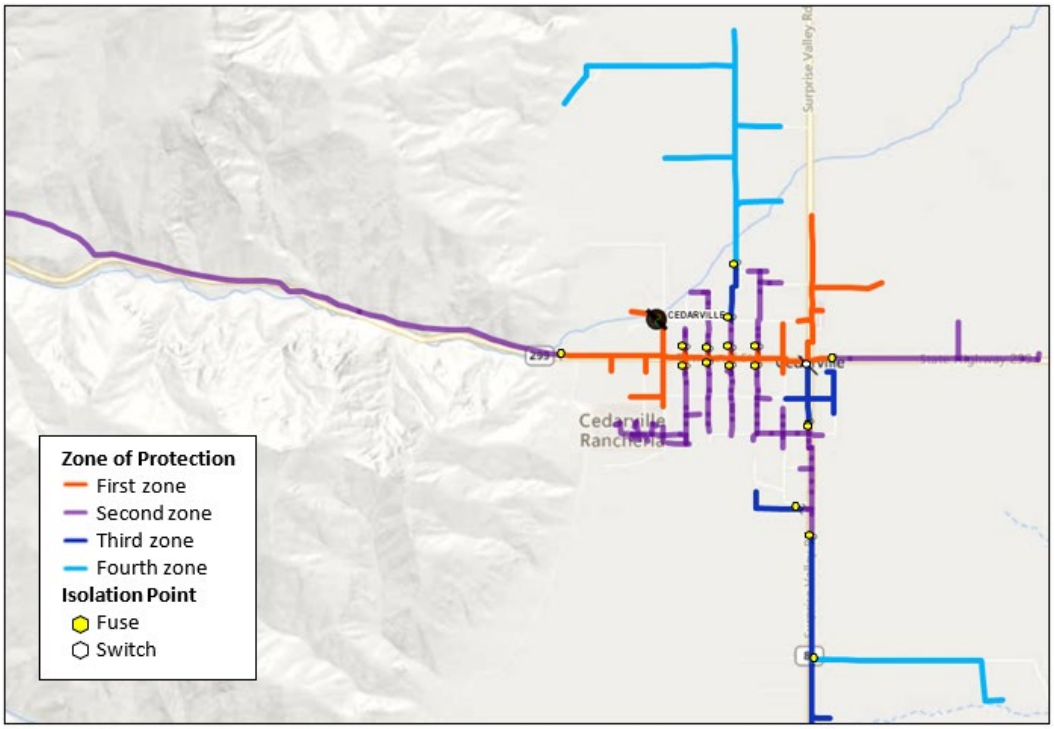
In its RCP filing it outlined the following. The first step in this process was to leverage prior risk modeling for application at the module level. The core logic in the existing risk modeling, as expressed by fire threat tier designation, remains sound. Modeling general ignition probability and historic fire weather fire spread probability, together and including population density to approximate impact, is the best and primary method to assess general wildfire risk, and this approach serves to establish risk to utility assets, irrelevant of the ignition cause. Accordingly, PacifiCorp used the Integrated Utility Threat Index (iUTI) to determine the relative risk score of each individual module.[7] Modules with varying iUTI scores are being assessed based on a weighted average proportionate to the portion of the module with any particular iUTI score.

Relevant Terms

- Zone of Protection (ZOP) A ZOP is a subsection of a circuit with control, either programmatically, automatically or manually. In Figure 4.5-1 below a graphic shows the ZOPs of a portion of a circuit beginning at the black dot, representing the substation's circuit breaker. All the orange color is the first ZOP, while the violet (downstream of a fuse, shown by the small hexagon) is the second ZOP, the dark blue the third ZOP and the cyan the fourth ZOP. Isolation devices are shown with a small hexagon.
  As such, the ZOP is the smaller granule against which any locational risk should be considered. Generally speaking, a ZOP goes from a protective device, like a circuit breaker, to the next protective device(s), such as line recloser or a fuse. Integration of all risks, combined mathematically, using rationalized weighting factors serve to provide rankings for each ZOP that are used to target mitigation tactics and prioritize efforts for wildfire mitigation actions.

[7] The Integrated Utility Threat Index (iUTI) is described in detail in the Independent Review Team Final Report on the Production of the California Public Utility Commission's Statewide Fire Map, dated November 21, 2017, at 12-14.

Figure 4.5-1: Graphical example of a Zone of Protection



Data Elements

As a next step, PacifiCorp identified and incorporated additional risk quantification layers to adjust each module's risk score based on the various risk assessment methods. Table 4.5-1 below outlines each of the data elements used in the LRAM.

As new risks are identified[8] they will be quantified and incorporated into the risk assessment and cascaded into the mitigation prioritization. Each layer is intended to assess an element of wildfire risk, localized to the module (or ZOP) level. The specific factors considered in each layer, together with the methodology for weighing those factors, is explained in detail in the following sections.

[8] As of the 2021 WMP Update the company has reviewed its LRAM with a limited audience to discuss methodology and subject it to the limited peer review. It anticipates expanding this review with other utility stakeholders as the opportunities for such discussions arise.

Table 4-4: LRAM data elements

	Model Element	Influencer Type	Level of Granularity	Assumptions in the Model	Validation Method	Future Improvements
A	**Circuit Topology**	Utility Base Case	Spatially, approximate 10' accuracy	Conductor types, spacing, etc. are accurate	Review by engineering team	Better locational precision; more hardware detail in GIS
B	**Historic Climate/ Probabilistic Fire Spread (iUTI)**	Fire Climate Risk	30 m pixels rendered on circuit topology	Locations where climate has favored fire spread will continue to favor fire spread	Review by stakeholders/fire professionals	Better integration of contemporary fuel situation; utility focus on ignitions rather than agnostic to source
C	**Contemporary Fire Weather Risk**	Fire Climate Risk	3 km gridding	Climatology can generally be inferred with limited measured assets, i.e. weather stations; models can be used to gauge local climate patterns	Calibration using company and external weather sources to gauge local terrain impacts	Machine learning application to fine tune locational precision when coincident to weather assets
D	**Tree Canopy Coverage**	Fire Spread Risk/ Utility Risk Event	30 m granularity	Position errors are random and can be removed through statistical sampling. Techniques used by the NLCD base layer are consistent and accurate. Higher tree canopy density correlates to more trees and more risk.	Comparison to historic vegetation outages and historic vegetation maintenance records.	Augmenting NLCD cover data with higher resolution datasets in developed areas.
F	**Vegetation Outage Rate**	Utility Risk Event	Reconciles outage events to autoisolation point/zones of protection; granularity in certain areas of model may not be particularly precise	Outages with reference to outages (whether by sustaining or contributory causes) may not be as accurate as ideal; weather-influenced outages may mistake vegetation impactions	Subject matter expertise	Reconciliation of tree canopy/vegetation performance would result in greater accuracy with causal relationship
G	**Utility Fault Rate Ignition Risk**	Utility Risk Event	Reconciles outage events to auto-isolation point/zones of protection; granularity in certain areas of model may not be particularly precise	Historic fault rates and locations have relationship to future risk events; circuit topology from year to year is relatively stable to enable translating past history forward onto zonal expectations	Quality checked by central engineering subject matter experts	Finer detail on locations of damaged equipment when risk events occur, i.e. which span was the location at which vegetation contact occurred?
H	**Available Probabilistic Arc Energy Risk**	Utility Risk Event	Sub-second time analysis overlaid on circuit topology	Requires accurate conductor registry in TCC/arc flash models	Quality checked by local engineering subject matter experts	Cyclic process to validate modeling and performance as part of annual readiness check
I	**Component Damage or Mechanical Failure**	Utility Risk Event	Device clearing time analysis overlaid on circuit topology	Requires accurate source and conductor representation in Protective Device Analysis models	Quality checked by local engineering	Cyclic process to validate modeling and performance as part of annual readiness check

	Model Element	Influencer Type	Level of Granularity	Assumptions in the Model	Validation Method	Future Improvements
	from Short Circuit Current				subject matter experts	
J	**Utility Fires**	Utility Ignition Event	GPS accuracy from field resource	Requires manual reporting processes instituted since 2019	Quality checked by risk, operations and engineering subject matter experts	Centralized database with information augmented by risk event investigation team

By combining all relevant risk influencers, PacifiCorp assigned each module a composite wildfire risk score, called "combined score", to reflect the total risk of a utility-related ignition occurring because of a fault on the ZOP.[9] In conjunction with reference to each layer discussed above, the composite risk score will also help PacifiCorp target mitigation programs to the highest risk portions of PacifiCorp's grid. Because of certain design goals, access limitations, and other factors not specifically calculated, a higher composite score does not necessarily mean that the module will always receive priority over a module with a lower risk score. For example, it would often not make sense to prioritize a module for certain types of mitigation in one year if the same module was scheduled for conversion to covered conductor in the following year.

Finally, each module is being separately considered for its relative PSPS impact, as measured by downstream customer counts (DCC). Factors in this risk assessment include:

- the total number of customers who would be impacted by de-energization of the module;
- the number and type of critical facilities which would be impacted by de-energization of the module, including an assessment of back-up generation capabilities;
- the number and type of access and functional needs customers who would be impacted by de-energization of the module, including an assessment of back-up generation capabilities;
- the economic impact to commercial customers if the module is de-energized. In each case, the number of customers is the sum of those customers directly served off the module as well as all downstream customers.

Unlike the layers discussed above, the PSPS impact layer is not intended to reflect the wildfire risk of ignition associated with the module, but rather its community impacts. Specifically, the PSPS impact layer helps PacifiCorp prioritize mitigation efforts. System hardening and other mitigation activities which reduce the wildfire risk associated with a module can justify strategies to minimize the PSPS impact of the module, by either eliminating the module from PSPS consideration or by reducing the probability that de-energization of the module would occur. Additional process as to how these calculations will influence mitigation measures is in the formative stages.

Consequently, PacifiCorp's strategy for fire risk modeling is intended to serve as a refreshable foundation establishing quantification methods for a variety of influencers that should be considered when estimating fire risk within any given zone of protection (ZOP) within its electrical network.

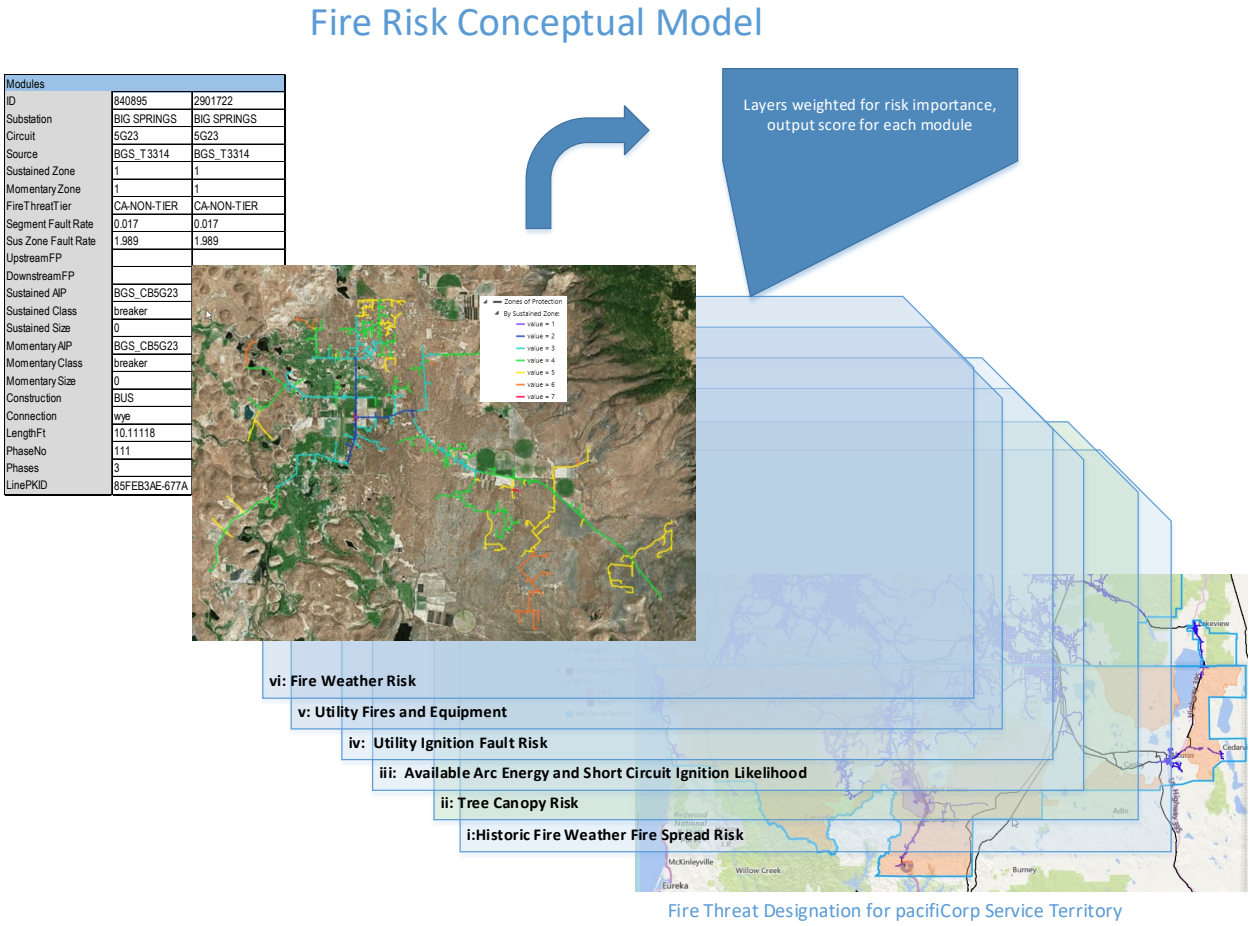
Methodology, including detailed construct of the Model Elements

The individual layers and model development parameters are outlined below. Within each of these ZOPs a variety of risks are consolidated to evaluate relative risk of that ZOP against all other California ZOPs. The construct of the model and the ancillary data layers are detailed below, as is the cycle for routine update and reassessment of model elements. Should any model elements fail their quality tests (each of which is separately identified), they would be appraised for alternate methods to incorporate the fundamental attributes they provide to the model output, and any substitution will be reported in future WMPs. Further, should additional data layers be identified and incorporated into wildfire risk assessment, the model elements for that layer will be outlined and model validation methods identified. It is important to note that the model explicitly includes locations and inputs from utility ignition history the company has developed as one of the layers considered, which it titled "Utility Fires and Equipment". At this time the history is used as a flag for the ZOP, however the company is evaluating how it can extend this limited

[9] After additional development and experimentation, PacifiCorp will decide whether the score will be a specific numerical value, a ranking, or a more generalized risk assessment category. As more quantification of these risks advances, it is expected that the composite score will be reflected by a numerical value.

dataset more broadly across its equipment, using the involved components to establish equipment ignition rate. Such modification to the model would be reported in future WMP updates.

Figure 4.5-2: Sample Fire Risk Conceptual Model highlighting various Data Elements for the LRAM



A. Circuit Topology

1. **Purpose of element** – Circuit topology is the company's base data in which containing the spatial locations and facility and equipment details such as Conductor types, spacing, and equipment.
2. **Relevant terms** – Standard GIS terminology
3. **Data elements** – GIS Point and line features
4. **Methodology** – PacifiCorp's base topology data is managed and mapped by the companies GIS department, and updates records based on field personnel work orders.
5. **Timeline** – Data is refreshed and maintained daily.
6. **Application and results** – the data is used to apply model area findings to specific facilities.

B. Historical Climate/ Probabilistic Fire Spread (iUTI)

1. **Purpose of element** – Using historic fire weather days simulate current fire spread for any of those days using random ignitions, modeling probability of spread with current vegetation and existing terrain.

2. **Relevant terms** – Anderson fuel model, Fosberg Fire Weather Index, ELMFIRE, ground truth, Point layer: raster data, gridded at 20 m
3. **Data elements** – LANDFIRE fuel data, Anderson fuel models, weather re-analysis data.
4. **Methodology** – Randomly ignited cells modeled fire spread based upon historic fire weather days (where FFWI >50), model run for six hours of fire weather days, with volume of acres burned from modeled ignitions accumulated for each 20 m grid. Data evaluated by SMEs and inference drawn re elevated areas, upon which iUTI was subsequently founded. This gridded raster dataset was overlaid on circuit ZOPs and length-weighted for the ZOP iUTI score.
5. **Timeline** – Data analysis will be refreshed based on updates to LANDFIRE dataset. In addition, major changes to PacifiCorp asset locations would require a refresh in analysis.
6. **Application and results** – Historic fire spread, as a proxy for long-term fire spread risk has been integrated into the model.

C. Contemporary Fire Weather Risk

1. ***Purpose of model*** – Create a normalized relative ranking for the fire weather risk at a zone of protection using recent historical gridded outputs. The main goal is to use the High Resolution Rapid Refresh (HRRR) model (3km resolution) to identify zones that have a high frequency of strong winds, high Fosberg, and frequent droughts (measured by KBDI). We then combine the weather component with the fuel density as quantified by the LANDFIRE 2020 remap to identify locations that have a coincidence of frequent fire weather and abundant fuel to sustain large wildfires.
2. ***Relevant terms*** – The High Resolution Rapid Refresh is a NOAA real time 3-km resolved weather forecasting model which is updated every hour.
3. ***Data elements*** - This layer is the combination of HRRR weather data going back to 2016 and the LANDFIRE 2020 Fuel Characteristic Classification System Fuelbeds (FCCS) dataset.
4. ***Methodology*** – First our circuitry is broken up into zones of protection defined as the lines downstream from a protective device (like a fuse or recloser) to the next protective device. The first goal is to obtain a localized and accurate weather history for each zone of protection. Historically we have relied on weather stations for this task, but for most locations across PacifiCorp the density of weather stations in our service territory is not high enough to enable sub-circuit analysis. To remediate this, we used the hourly HRRR 3km data which provides high quality historical weather throughout California and the United States. We then overlay the zones of protection over the HRRR data and extract the hourly wind speed, wind gust, precipitation, relative humidity, and temperature going back to 2016. From this we can extract most fire weather indices that are utilized in industry, and importantly the ones used at PacifiCorp: Fosberg & KBDI. We now have a detailed weather history for each zone of protection from which we just need to extract a ranking.
    a. There are many complicated ways to do this, but we went with a straightforward solution that is easily explainable – take the sum of the weather indices during the wildfire season at each location normalized by the number of years. This is essentially a measure of the exposure to each weather variable at each zone of protection and creates an easy way to rank them relatively. We then apply a min-max scaling to put all the exposure measures onto the same 0-1 scale. The final piece is the fuel density measure which we obtain by simply overlaying the zones of protection shapefile over the Total Available Fuel sublayer from the FCCS and mapping it to a 0-1 scale. Now for each zone of protection we have a measure of the wind gust, Fosberg, and KBDI intensity along with the fuel density.

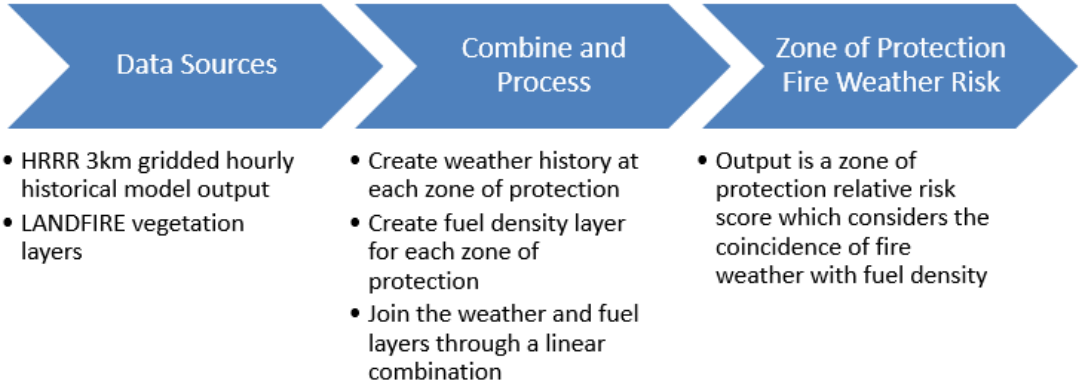
b. Now that we have all the pieces we must now combine the weather and fuel scores to get the final Fire Weather Risk Score. We chose to do a simple linear combination of each sub-score multiplied by its own respective coefficient shown as:

$$Fire\ Weather\ Risk\ Score = \sum_{i}^{Layers} x_i c_i$$

c. Where x_i is the relative ranking between 0-1 for each sublayer (Fosberg, KBDI, gust, and fuel) and c_i is the respective chosen coefficient to each variable. There is subjectivity in choosing the coefficients and after a few iterations we settled on the weather variables having a coefficient of 1 and the fuel component having a coefficient of 2, so essentially the weather variables carry 60% of the weight and the fuel carries 40%.

5. ***Timeline*** – We plan on updating the Fire Weather Risk layer after each wildfire season is concluded. The metrics are calculated on a per year basis and as a result we can identify trends across our service territory as they emerge.
6. ***Application and results*** – Using the Fire Weather Risk Score we can identify zones of protection that have a high frequency of fire weather coincident with dense fuel. We have been able to create a ranking of the zones of protection and circuits based on this risk score and are using it in conjunction with the other layers in the LRAM. The weather components of this risk score, namely wind gust, Fosberg, and KBDI, are exactly the variables we look at when decide the necessity of a PSPS event. Consequently, the Fire Weather Risk score can also be thought of as the relative frequency of weather conditions which necessitate a PSPS event. If we look at it through the PSPS lens, we can then combine this risk score with downstream customers from each zone of protection and essentially get the PSPS risk at a zone of protection (probability * consequence).

Figure 4.5-3: Flowchart outlining the process of creating the Fire Weather Risk layer.



D. Tree Canopy Coverage

1. **Purpose of element** – Find locations with highest demands for vegetation maintenance by determining the extent of tree coverage along circuits and circuit segments.
2. **Relevant terms** – Point layer: GIS layer consisting of individual points with location information and vegetation attributes.
3. **Data elements** – NLCD Tree Canopy coverage and internal distribution GIS data. NLCD data has $30m^2$ resolution and extracted data layers maintain that resolution.
4. **Methodology** - A point layer was created from distribution line GIS files with 30m spacing. The point layer was clustered to avoid oversampling at line intersections. Data was extracted from

the NLCD Tree Canopy Cover raster layer at each point, then aggregated per circuit or sub-circuit segment. This provided distribution functions and statistical values for the tree canopy cover along each segment.

5. **Timeline** – Data analysis will be refreshed based on updates to the NLCD Canopy Cover Layer, which is anticipated at 3 to 5-year intervals. In addition, major changes to PacifiCorp asset locations would require a refresh in analysis.
6. **Application and results** – The tree canopy coverage layer has been integrated into the fire risk model. The model results have also been incorporated into vegetation trimming cost forecasts. Layer validation efforts compared coverage to historic vegetation outages and historic vegetation maintenance records. These showed weak, but non-negligible, correlations. Limitations from the NLCD data resolution and techniques result in lower accuracies in developed areas.

E. Vegetation Outage Rate

1. **Purpose of element** – Find locations with highest historic vegetation outage rates corresponding to greatest risk of ignitions from vegetation.
2. **Relevant terms** – PROSPER, outage record database**.**
3. **Data elements** – Historic outage records and circuit information.
4. **Methodology** – Vegetation outages have a primary or secondary cause of 'vegetation' or any case where trees or vegetation are mentioned in the outage comments. The vegetation outage rate is determined by counting the outages per zone of protection and then normalizing by length and time. The general framework is very flexible so that an outage rate can be extracted for any outage type (car hit pole, animal contact, etc.) across all zones of protection.
5. **Timeline** – Historic vegetation outages have been incorporated into the risk model in late 2020 and will continue to be updated periodically.
6. **Application and results** – Vegetation outage frequencies normalized by line length have been incorporated into the risk model.

F. Utility Fault Rate Ignition Risk

1. **Purpose of model** – To review and assess the relationship between outages and ignitions, augmenting outage fault rates with specifics regarding types of components and outage causes. The resulting data provides areas of concern and hot spots when historical events occurred as broken down by cause category. This output is not only used to model high risk outage areas, but it is additionally used in the informing prioritization efforts.
2. **Relevant terms** – PROSPER, outage record database.
3. **Data elements** – The historical outage data is housed in PROSPER and joined with additional facility and asset data.
4. **Methodology** – All outage events records are reviewed based on the company's internal process for recording and categorizing outage events. After an initial review to determine if the event qualifies as an ignition risk event the data is correlated and analyzed consistent with methods developed in response to the CPUC's Wildfire Safety Division's Wildfire Mitigation Plan Template requirements, outlined in the table below. Outage causes are correctly captured to support segmentation. Certain unrecorded equipment type may be inferentially identified in a module and the assumptions for such associations are correct. Changes in circuit topology and environmental impacts can yield substantially different incident rates

from the suspecting initiating events. Sub-module changes can result in substantial variations in ignition risk over time and may not be easily back-cast for comparison purposes.

Figure 4.5-4: PacifiCorp's process to map ignition drivers to outage causes.

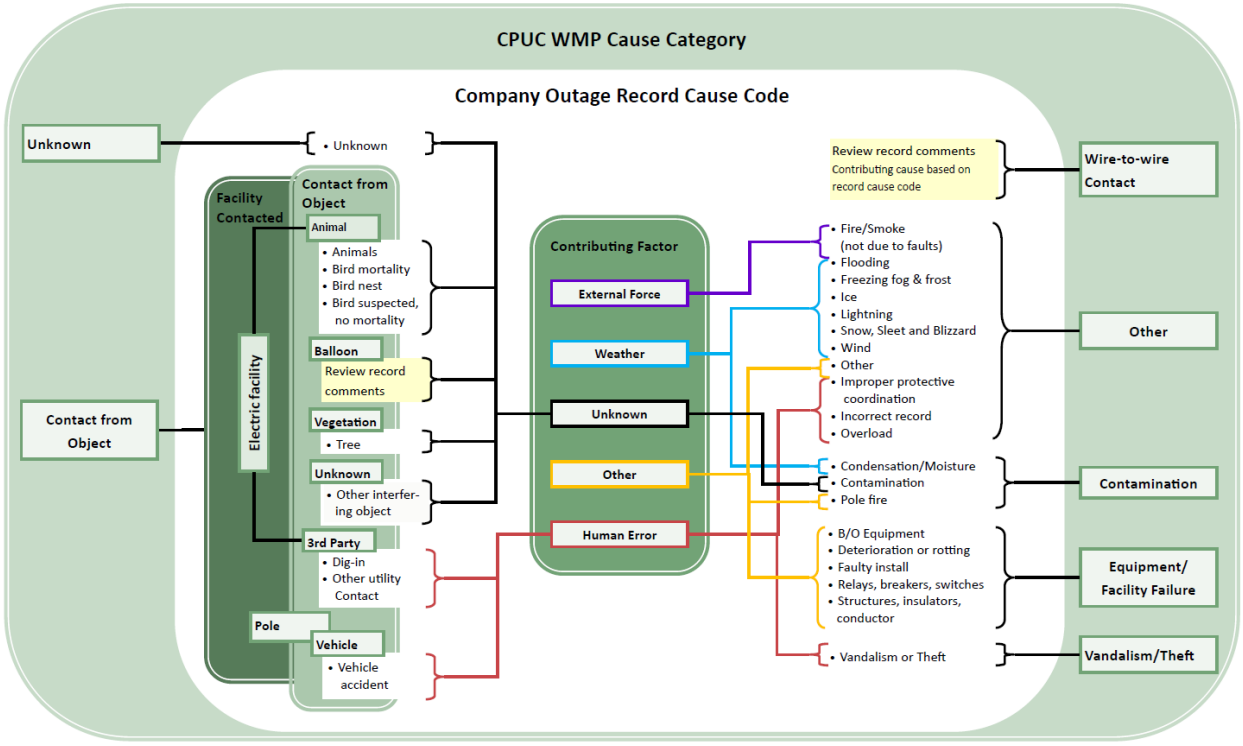
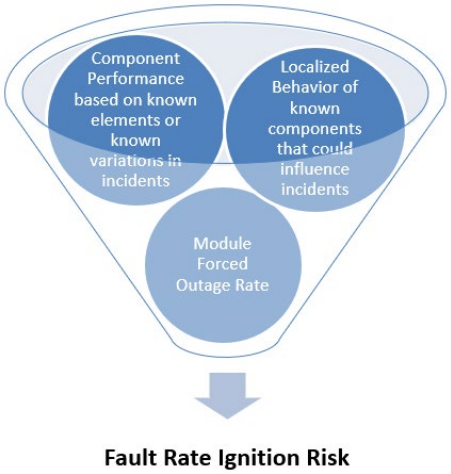


Figure 4.5-5: Fault Rate Ignition Risk process



5. **Timeline** – Annually.
6. **Application and results** – This dataset forms the basis for module fault rate/outage type/component factors. Implement wildfire mitigation strategy in areas where outage history, causes and equipment result in elevated outage ignition risks and shown in the below graphic.

G. Available Probabilistic Arc Energy Risk

1. **Purpose of model** – The pilot uses simulations of the distribution system model to arrive at arc energy values for studied locations. Higher arc energy from short circuit events is associated with an increased risk of ignition. Arc energy is calculated from the available fault current (amps) and the time required for a protective device to clear the fault event. Available fault current varies across the system due circuit topology, length, and materials used. Line sections, and ultimately protective zones and circuits, were scored based on arc energy values and line length (exposure). The score is a gauge of relative ignition risk and can be used for the purpose of identifying locations where system improvements can be proposed to reduce said ignition risk.
2. **Relevant terms** –
   - Arc flash analysis**:** Any of several engineering methods (IEEE 1584, NFPA-70E, CSA Z462, Lee Method, Wilkins Method) used to analyze electrical safety in power systems. The methods typically use heat transfer models, heat flux calculations and/or prescribed tables to assess risk level and help determine adequate safety procedures. A variety of parameters, including source impedance, equipment type, equipment location and clearing device are used to calculate total energy from an arc associated with a short circuit event.
   - CYME model: A software representation of a given power system, where simulations can be run to gain insight on system capability and behavior.
   - Load current: The current (Amperes) normally flowing through an energized power system to deliver power.
   - Protective device details: The applicable TCC curves for a protective device, together with logic-based settings.
   - Short circuit event: An occasion when one or more components of an electrical system contact one or more circuit return paths. Commonly used for arc flash analysis: a phase conductor contacting earth or system neutral. The result is typically a current value higher than load current.
   - Time current characteristic (TCC): The specified relationship between applied current and operating time for a protective device such as a fuse, recloser or relay-controlled breaker. TCCs are often represented visually by curves for the purpose of studying device coordination, or for developing new settings. For example, a 100 Amp T-speed fuse will take more time to operate for a given current magnitude than will a 25 Amp T-speed fuse.

3. **Data elements**

Data Element	Collection period	Collection frequency	Spatial granularity	Temporal granularity	Comments
CYME v9.0 distribution system model	2020	Collected once in 2020, held constant throughout analysis	Lat/lon for each node in the model	Not used	The system model includes source, line and protective device details (type, material, ratings, settings, etc.).

4. **Methodology** - The pilot simulation evaluated short circuit scenarios where 5 Ohms of impedance was assumed for all short circuit events, and applied voltage at the low end of ANSI A range (95% nominal). These values were chosen to represent an event whose arc energy was

reasonably high. Simulating voltage higher than 95% nominal, or with fault impedance lower than 5 Ohms, generally results in faster clearing times and may result in lower total arc energy. A higher impedance value would generally result in slower clearing times and may result in higher total arc energy. The pilot results used relative, not absolute, arc energy value for final scores.

For each protective device, downstream overhead lines in its zone of protection were evaluated for composite scoring by arc flash results and line length. That score was also aggregated to the circuit level. The result is a metric that helps the company focus on arc energy high-risk areas for remediation, and that can be used as a component within a more comprehensive score that accounts for risk from other categories.

Figure 4.5-6: Available Probabilistic Arc Energy Risk

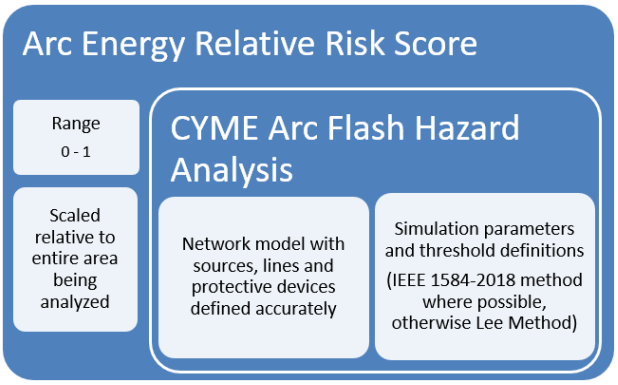


Figure 4.5-7: Example CYME Arc Flash Analysis input

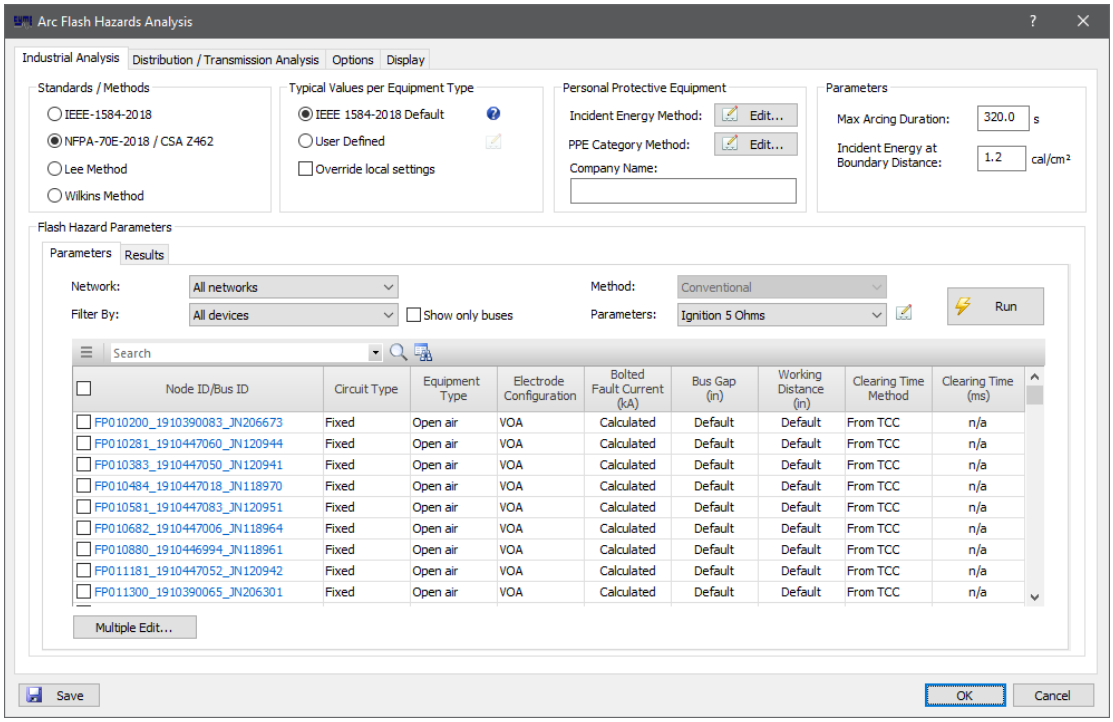
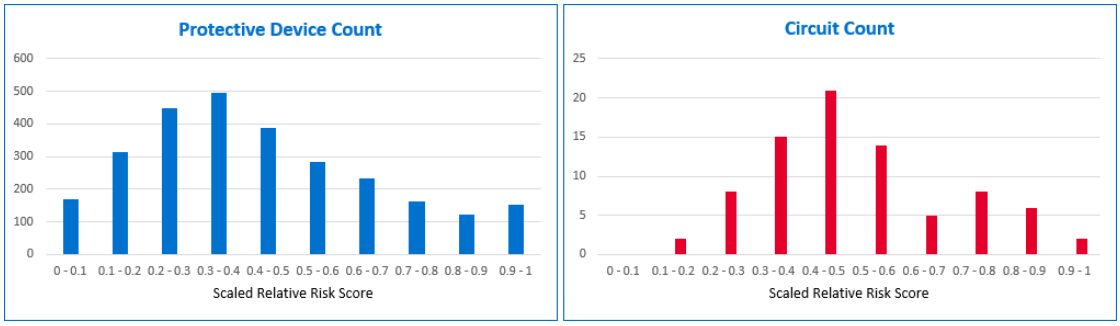


Figure 4.5-8: Summary of arc energy risk scores (scaled to the range 0..1)



5. **Timeline** – PacifiCorp completed the pilot in PSPS areas described in the WMP. Based on a review of the pilot results and system records, certain equipment has been updated. PacifiCorp expanded the pilot to other HFTD during 2020, with long term adoption intended over the next five years, including incorporation as a standard aspect of cyclical study processes.
6. **Application and results** – The results of the pilot were used to identify locations where the potential fault (based on the similarity to modeled configurations) reflected a higher risk of damaged conductor or ignition. PacifiCorp used the modeling results to identify locations where there was a higher risk of ignition from a fault condition. Use of this information allows for system network changes to preempt such a risk condition.

H. Component Damage or Mechanical Failure from Short Circuit Current

1. **Purpose of model** – Identify areas where system improvements (including but not limited to additional protective devices, neutral extensions, reconductors) are warranted in order to reduce ignition risk associated with component damage or mechanical failure from short circuit current. Available fault current varies across the system due circuit topology, length and materials used, and changes over time as system improvements and configuration changes are implemented. This metric may or may not be combined directly with other composite scoring methodologies.
2. **Relevant terms**

   Conductor damage: The material properties of overhead bare conductors include melting point, temperature coefficient, hardness and tensile strength. When performing engineering analysis on various sizes of conductors comprised of copper, aluminum and steel, these properties can be modeled in a two-dimensional damage curve, where the axes are current and time (TCC). This curve can be used to show the duration in time that a conductor can sustain a given current without degradation of its material properties (softening, etc.). Beyond this duration, the conductor is said to have incurred damage.

   Protective device details: The applicable TCC curves for a protective device, together with logic-based settings.

   Source details: A numerical representation, typically at the head of a circuit or substation, of the upstream configuration and equivalent impedance to all connected current contributors (e.g. generation). A low impedance suggests that generation is relatively close and available fault current is relatively high.

   Short circuit event: An occasion when one or more components of an electrical system contact one or more circuit return paths. Commonly used for arc flash analysis: a phase conductor contacting earth or system neutral. The result is typically a current value higher than load current.

Time current characteristic (TCC): the specified relationship between applied current and operating time for a protective device such as a fuse, recloser or relay-controlled breaker. TCCs are often represented visually by curves for the purpose of studying device coordination, or for developing new settings. For example, a 100 Amp T-speed fuse will take more time to operate for a given current magnitude than will a 25 Amp T-speed fuse.

3. **Data elements**

Data Element	Collection period	Collection frequency	Spatial granularity	Temporal granularity	Comments
CYME v9.0 distribution system model	2020	Collected once in 2020, held constant throughout analysis	Lat/long for each node in the model	Not used	The system model includes source, line and protective device details.

4. **Methodology** - Throughout the distribution system, identify components where high current flow and/or heat from a short circuit event is predicted to damage overhead components based on simulation results. Initially the focus will be on overhead conductor, but insulators and other devices may be included in the future. The metric will initially be associated with spans of overhead conductor and their protective devices. Simulations will be performed in CYME and possibly other tools yet to be determined.

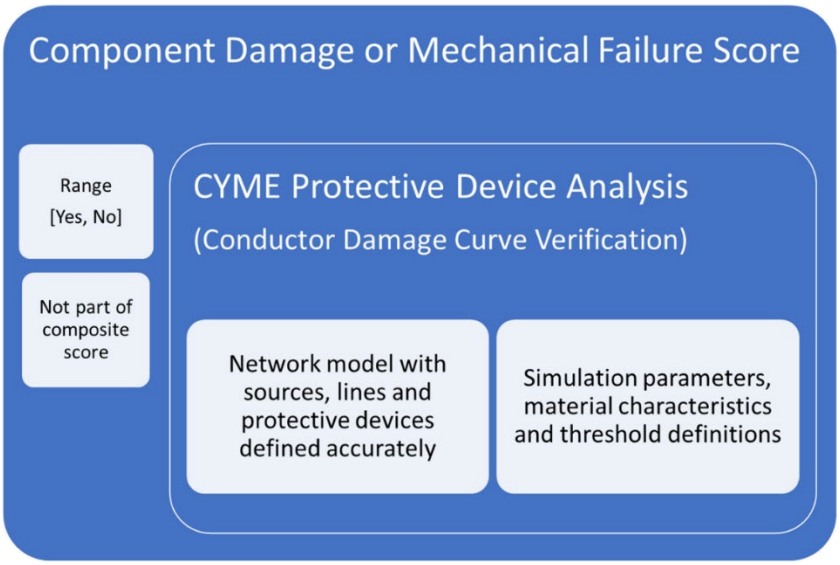
   Available short circuit current magnitude varies throughout the distribution system and can be estimated by the CYME model. The time for a clearing device (fuse, recloser, breaker, etc.) to clear a given fault can also be determined from the CYME model. Materials used for conductor, insulators and other devices have temperature withstand ratings, and when they sustain too high a temperature for sufficient time duration, mechanical damage and/or failure can result. Consequences can include a line down event, risking ignition.

   Small overhead conductors are expected to present the greatest risk for two reasons. First, their original material capacities (represented visually by a time-current-characteristic damage curve) are more susceptible to high current than are today's standard conductors. Second, by virtue of their vintage and service life, they are more likely to have sustained some annealing or loss of life from operational events. This further degrades their ability to sustain high current without damage. In the majority of locations, fast operating fuses provide adequate protection for small conductors, but the power system is constantly growing. System improvements can increase available fault current, and this metric will help to identify components whose protection is no longer adequate.

   The pilot simulation evaluated short circuit scenarios where 10 Ohms of impedance was assumed for all short circuit events, and applied voltage at the high end of ANIS A range (105% nominal). These parameters were found to better represent worst case damage than the 95% nominal voltage scenario.

   This metric will be measured as a simple yes or no – is the component likely to sustain damage from the fault events studied? Mitigation will be pursued for areas where the result is "yes."

Figure 4.5-9: Component damage or mechanical failure from short circuit current methodology

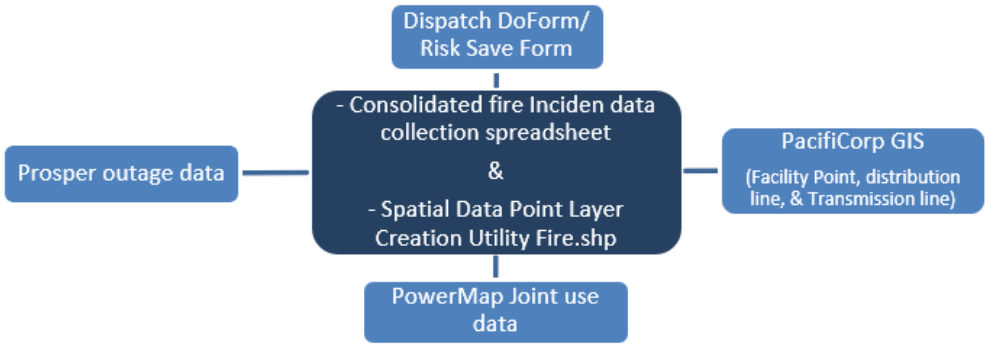


5. **Timeline** – PacifiCorp completed the pilot CYME analysis for bare overhead conductors in its California service territory in 2021. Other components were not simulated for damage risk, but they may be added in the future. The yes/no output is not expected to be combined directly with other measures for composite risk scoring, but it may be used to prioritize improvements related to the composite scores. Over the next five years the conductor analysis is intended to be incorporated as a standard aspect of cyclical study processes in California.
6. **Application and results** – The results of the pilot were used to identify locations where the potential fault (based on the similarity to modeled configurations) created a risk of damaged bare overhead conductor. Use of this information allows for system network changes to preempt such a risk condition.

I. Utility Fires

1. **Purpose of model** – To review and compare utility caused fire details and locations, to determine what causes and risks contribute to utility equipment ignition.
2. **Relevant terms** – PROSPER, Outage record database. PowerMap, internal company mapping system. Dispatch Do Form/Risk Save, internal form created at the onset of a fire risk event.
3. **Data elements** – Dispatch log, PROSPER outage records, risk save event forms, equipment location and asset details, in addition to event response personnel details and environmental drivers at the time of the event.
4. **Methodology** – All the above data elements are combined to create a recorded dataset of utility caused fires. In addition, a detailed review of the various data sources is preformed to consolidated the data into a single source. Data location based on GIS equipment location at the time of the incident.

Figure 4.5-10: Process graphic for consolidation of Fire Ignition events



5. **Timeline** – *data records are reviewed on a monthly basis. The model initiation and development progress over time.*
6. **Application and results** – Implement wildfire mitigation strategy in areas where at risk equipment exists. The information can be used to determine any trends which may occur when analyzed with additional fire risk influencers. This data will help to determine where addition system and equipment risk exist to drive facility locations upgrades and placements for protective equipment.

Timeline

As PacifiCorp continues to utilize the LRAM it expects to continuously improve and periodically update the model as the individual layers are updated or new layers are added. The company will additionally archive and evaluate the model yearly and update all the layers with the most up to date information at that time. The annual re-evaluation period will also establish a baseline going forward, and the company plans to compare future scores to those dating to the inception of the model. This approach will allow for a current versus future comparison, recognizing model and network improvements, and enable quantification of grid modernization efforts on utility risks for specific elements such as outage rates (risk events), arc energy calculations, and utility caused ignitions. The annual baseline will also allow for long term monitoring of the climate as measured through the weather components of the Fire Weather Risk Layer (KBDI, Fosberg, and wind gust). The company will then be able to combine these identified trends with California's 4th Climate Change Assessment to get an informed view of the macro trends of the climate within PacifiCorp's service territory, to support effective planning and prioritization.

Figure 4.5-11: LRAM annual refresh process summary.

Risk Modeling Refresh Process	
Annually	Evaluate the risk influencers to be quantified for the upcoming period
Annually	Develop the method for calculating the influencer for each risk influencer
Annually	Establish weighting for each influencer relative to some identified objective
Annually	Calculate module scoring for the combined influencers
Annually	Stress test the results against objective criteria
Annually	Modify calculation or weighting as necessary
Annually	Finalize the rating/ranking for each module
Annually	Compare against prioritization efforts for WMP, including PSPS operations
Annually	Modify prioritization where appropriate
Annually	Communicate the results of the risk scoring method
Annually	Archive results with appropriate version details
Ongoing	Review other risk influencers for inclusion in future assessment periods

LRAM Validation

Upon completion of the detailed framework the company conducted stress testing for the weightings of each of the models. It chose "boundary condition" locations, specifically circuits within three areas it served having various fuel, fire weather, equipment characteristics and outage rates and performed comparisons of the model results. It determined using subject matter experts evaluating model results that only the Probabilistic Arc Energy should be weighed at a lower value. This was rationalized that utility adjustments to arc energy are responses to relatively low frequency fault events, and according them equal weight with fire weather and fuel available to spread a fire improperly tips the scale. As a result, arc energy was accorded half weighting.

Evolution of the model toward S-MAP and RAMP products such as RSE. PacifiCorp intends to leverage the LRAM to deliver mitigation quantification to produce risk spend efficiencies. It will be applying methods developed by PG&E, SDG&E and SCE. These products are anticipated to be developed within the first half of 2021.

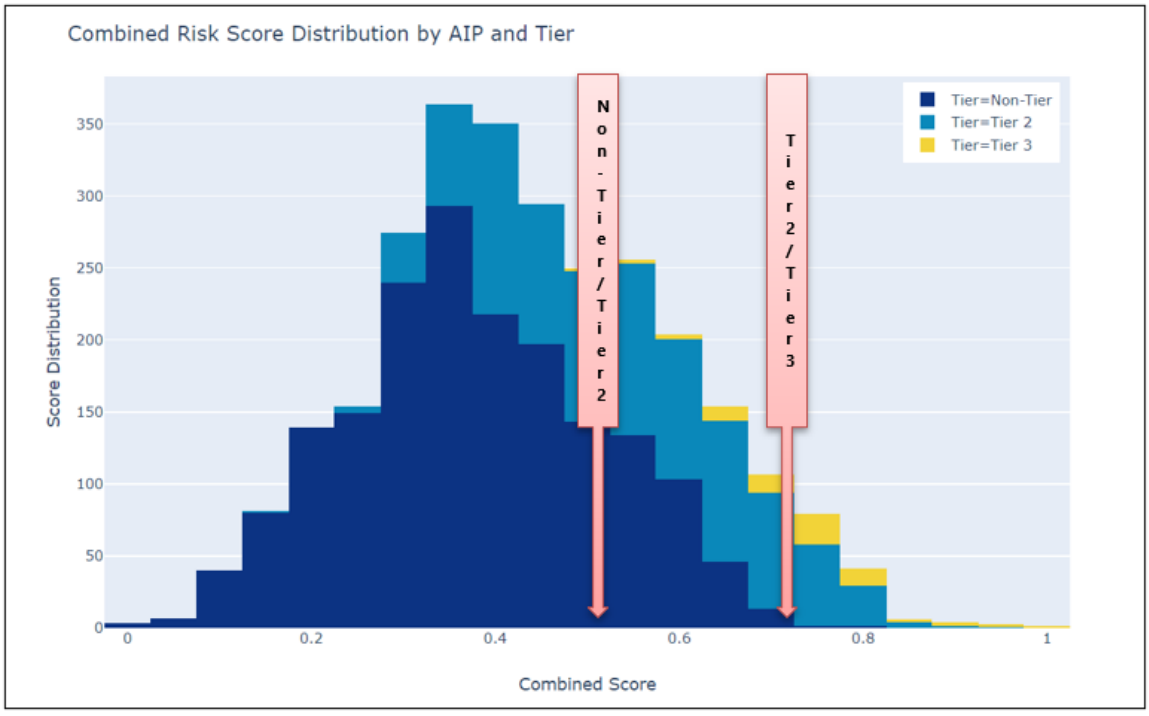
Now that the LRAM model is functional, PacifiCorp can use these products, notably ZOP (zone of protection) and circuit scores to strategically guide our wildfire mitigation activities going into the future. Using this methodology, we can get a deep understanding of the risk profile at the zone of protection level throughout our service territory. It also allows us to begin restarting our wildfire mitigation efforts in a more surgical manner. A large majority of ignition risk drivers have specific countermeasures that help remediate that risk. However, historically it has not been trivial to identify exactly where the mitigation efforts will be the most effective, and this is exactly where the LRAM model comes in and shows its utility. For example, as we look at resources and attempt to optimize the mitigations against the costs, the LRAM allows us to tackle this issue in an informed and methodical manner. As an approach, we can filter the zones of protection to the top 25% (or some other value) of fire weather scores, and from this subset we can then sort by a combination of tree outage frequency and tree canopy cover. These identified overhead line have a combination of frequent fire weather, outages, and dense tree canopy and consequently are prime candidates for vegetation management. This example illustrates the way which PacifiCorp intends to deliver on its commitment to calculate a risk spend efficiency, noted previously. Further it is expected the use cases will grow as the model is exercised and integrated it into the company's decision-making process.

As the company has responded to the deficiencies noted by the WSD, it outlined the need to demonstrate the application of its LRAM to 1) reconcile its network's fire risk against the currently designated HFTD, 2) to evaluate and amend priorities for mitigation efforts currently on its multiyear plan, 3) to ensure that mitigations were properly aligned for any fire risks the model might detect, 4) to select the logical extent to which mitigation is conducted throughout its network, 5) to quantify the potential impacts to customers served from portions of the network with elevated fire risk, 6) to evaluate credible impacts from climate change and 7) to estimate the changes in fire risk as its mitigations are completed. Certain of these areas are still under development (such as future ignition risks as mitigations are completed), however many are now complete and detailed below.

1) Reconciling HFTD Tier with Final Score

In Section 4.2.7 the company outlined its proposed modifications to the current HFTD. In the charts below the company displays material applying its LRAM results at the ZOP and aggregated to the circuit that served to broadly categorize the ranges of combined scores currently designated as Tier 3, Tier 2 and Non-Tier. Visually this is displayed through a histogram of the final combined risk score for each ZOP and colored by its HFTD tier designation. The distribution of scores contrasted to the tier designation enables identification of locations that should either be moved from Non-tier to Tier 2 or Tier 2 locations to Tier 3. Using the histogram, the company evaluated the combined score threshold and generally observed that combined scores of below 0.55 separates Non-Tier and above 0.70 separates Tier 3 from Tier 2. Previously, PacifiCorp used the Tier 3 designation as an indicator of population warranting development of a designated PSPS area, however these results afford the company the means to establish PSPS areas for other isolated areas of fire risk.

Figure 4.5-12: Distribution of the Combined Risk Score among the zones of protection in California. The two arrows demonstrate where we see choose risk boundaries between Non-Tier/Tier 1 and Tier 1/Tier 2.

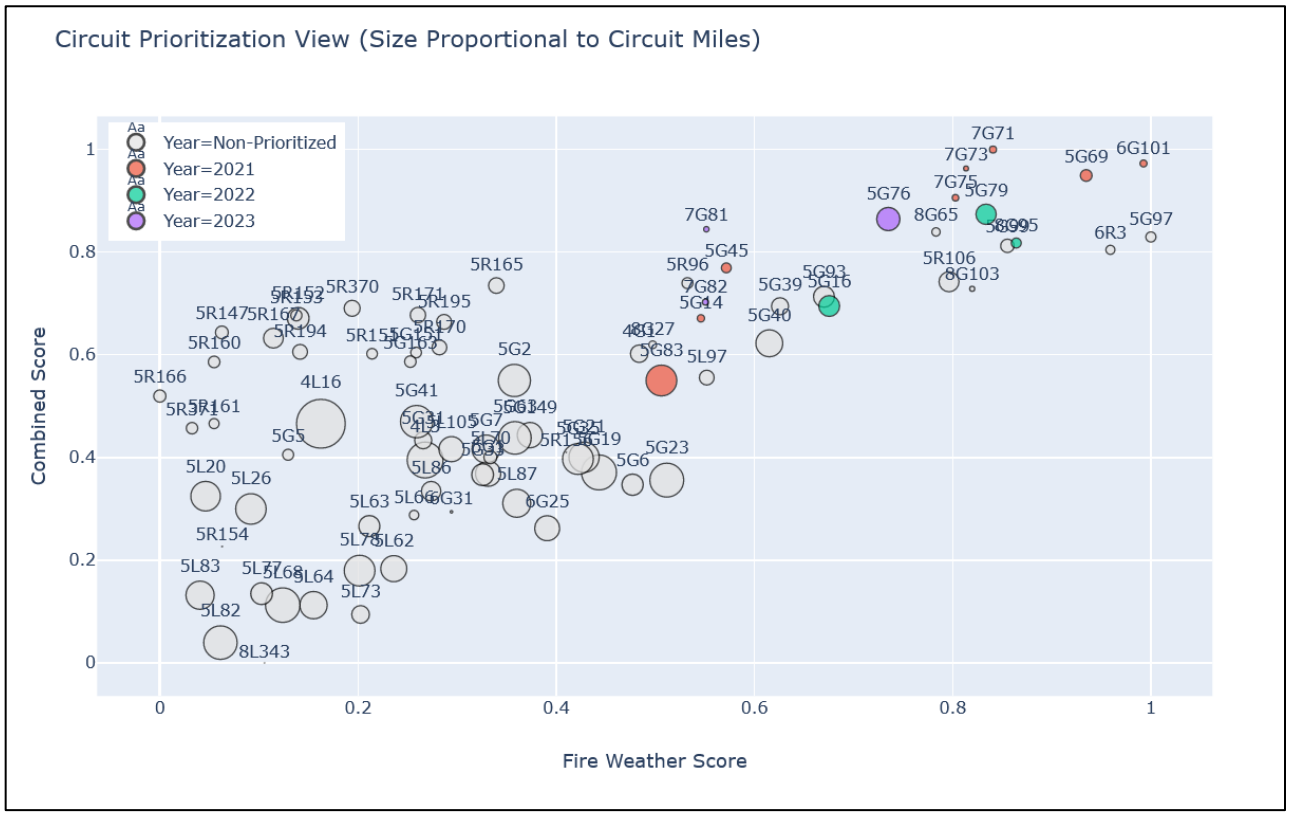


2) Comparing to Prioritization Efforts

The next order of model usage focuses on the assessment and modification, where appropriate, of circuit priorities. In its original prioritization the company used the HFTD Tier Designation and the customer impacts from PSPS as its criteria to establish priorities of mitigation. With the LRAM, PacifiCorp is now able to calibrate mitigation prioritizes at a finer level and with more risk elements consideration. In the chart below the pre-LRAM priority is shown by color using the projected year of construction, the climate risk is shown on the x-axis, the combined score (which integrates utility ignition risk with fire climate risk) is shown on the y-axis, and the size of the point corresponds to the length overhead conductor on that circuit. This product demonstrates several aspects to inform the company's WMP. First, it has combined risk in areas not previously designated as mitigation candidates for measures in addition to the plans for modification of protection control equipment (i.e. substation relays and recloser controls). Rather the company needs to evaluate the need for additional mitigation measures to limit the risk that PSPS would be a needed operational strategy. Second, it provides the company the ability to correct priorities of work currently in development.

Now that each zone of protection and circuit has a combined fire risk associated with it PacifiCorp can begin to systematically prioritize future grid upgrades relative to those high risk areas. One of the upgrades that has the largest impact on grid resilience is the installation of covered conductor. This comparison is underway and, as appropriate mitigations, including covered conductor installation schedule will be adjusted to areas that deliver improvements.

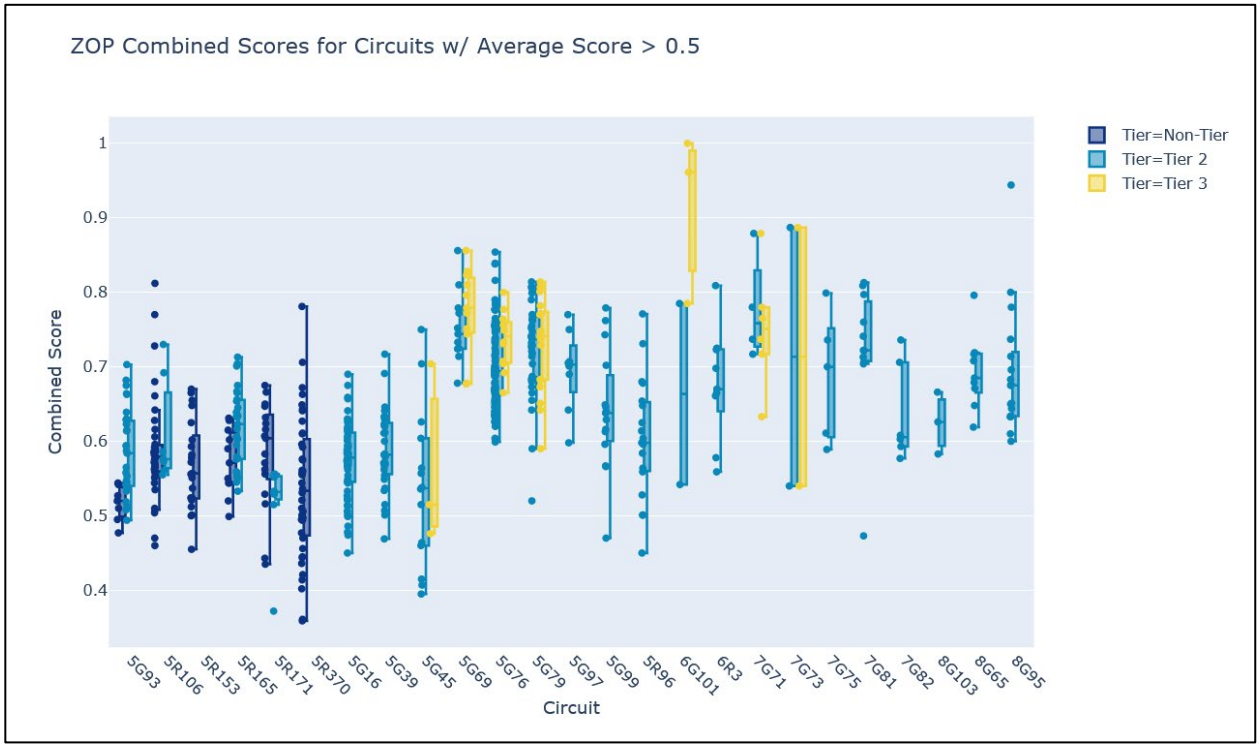
Figure 4.5-13: Pre-LRAM priority is shown by color using the projected year of construction, the climate risk is shown on the x-axis, the combined score (which integrates utility ignition risk with fire climate risk) is shown on the y-axis.



3) Circuit Wide vs. Targeted Efforts

This approach is further extensible to evaluate specific ZOPs within circuits, particularly those which may not be located within specific fire threat areas but are of substantial combined risk level to warrant targeted mitigation efforts. These specific zones of protection which warrant mitigation, regardless of HFTD classification are shown in the box plot view as seen below. The chart focuses on circuits having a combined weighted average score in excess of 0.5 for readability. Each circuit is represented by a data series on the x-axis and the combined score for each ZOP is on the y-axis with every point representing a specific ZOP (colored by tier). While often the combined score may be appraised at the circuit level as a single unit, the graphic below allows for each circuit's ZOPs to be evaluated for their range of combined risk. Circuits with wide variations are candidates for zonal corrections, while those circuits with generally high zones are best addressed as a combined unit for fire risk mitigation.

Figure 4.5-14: Box plot for the combined score of each circuit colored by HFTD designation, where each point is the score for a specific zone of protection.



Circuits with a relatively low combined risk score, with outlier zones of protection, tend to highlight the necessity for targeted alternative mitigation techniques. These techniques encompass a broad spectrum including protective device coordination, equipment inspection, vegetation inspection, etc. Many of these techniques are utilized by Pacific Power in its general reliability planning efforts to minimize impacts from faults.

Such alternative mitigation techniques focus on various ignition drivers, with specific methods aimed at mitigating the risk. These techniques are intrinsically linked, sharing the common goal of reducing ignition risks, but have varying degrees of mitigation effectiveness based on the driver. It's important to develop a comprehensive understanding of the conditions, fault history, and topology attributes (tree canopy exposure, arc energy, etc.) in selecting the appropriate mitigation.

The tables below identify the extensive methodologies, programs, and techniques Pacific Power utilizes to mitigate ignition risks. These mitigation efforts are conclusive to the logical steps identified earlier in Section 4.2, which may be grouped together to produce a strategy targeting the risk driver(s).

Table 4-5: Identified methodologies, programs, and techniques Pacific Power utilizes to mitigate ignition risks by fault response

Ignition Risk Driver		Fault Response							
		Coordinate protective equipment	Replace legacy protective equipment	Additional protective equipment	Current Limiting Fusing / Devices	Incipient Fault Detection	Fault Detection Enhancement	Fault Investigation	Proactive or Quickly Reactive Fault Response
Model or Legacy Risk Driver		**Arc Energy/Conductor Damage**							
Contact from object	**Animal contact**	x		x	x	x		x	
	Balloon contact	x		x	x	x		x	
	Other	x		x	x	x	x	x	
	Unknown	x		x			x		x
	Veg. contact	x	x	x	x	x		x	
	Vehicle contact	x		x			x		
Contamination		x	x		x	x	x	x	x
Equipment / Facility failure	**Conductor**	x	x		x			x	
	Crossarm					x	x	x	x
	Fuse	x	x		x	x		x	x
	Insulator					x		x	x
	Lightning arrestor					x		x	
	Other					x			
	Pole					x	x	x	x
	Sectionalizer	x	x		x	x		x	x
	Connectors					x		x	x
	Switch					x		x	
	Transformer								
	Voltage regulator					x		x	x
Normal Operation		x	x	x	x	x			
Other		x	x		x	x			
Unknown		x	x		x	x			
Vandalism/Theft									
Wire-to-wire contact		x		x				x	
Contact from 3rd party								x	

Table 4-6: Identified methodologies, programs, and techniques Pacific Power utilizes to mitigate ignition risks by inspection Maintenance and Vegetation Management

Ignition Risk Driver		Inspection/Maintenance					Vegetation Management				
		Reliability-Centered Inspection & Correction	Leakage Current Monitoring Pilot	RF/IR/ Resistance Detection of Connectors	Enhanced Inspection	Legacy Equipment Replacement	Vegetation Management	EVM	Radial Pole Clearing	Targeted Tree Removal	Veg Patrols
Model or Legacy Risk Driver		**Equipment Failure**					**Vegetation/Equipment Failure**				
Contact from object	**Animal contact**								x		
	Balloon contact								x		
	Other								x		
	Unknown	x		x	x	x			x		
	Veg. contact					x	x	x	x	x	x
	Vehicle contact								x		
Contamination		x	x	x	x	x			x		
Equipment / Facility failure	**Conductor**	x			x	x					
	Crossarm	x		x							
	Fuse	x	x		x	x			x		
	Insulator	x		x		x			x		
	Lightning arrestor		x			x					
	Other										
	Pole	x		x	x						
	Sectionalizer					x					
	Connectors	x			x	x			x		
	Switch	x				x					
	Transformer										
	Voltage regulator										
Normal Operation						x	x	x			
Other						x	x	x			
Unknown						x	x	x	x		
Vandalism/Theft											
Wire-to-wire contact						x					
Contact from 3rd party											

Table 4-7: Identified methodologies, programs, and techniques Pacific Power utilizes to mitigate ignition risks by asset hardening

Ignition Risk Driver		Asset Hardening														
		Covered Conductor	Underground Conversion	Enhance theft / vandalism resilience	Neutral Extension / Grounding System	Enhance Insulation (BIL)	Pole relocation	Visibility enhancement	Pole protection	Animal guarding	Spread construction	Create Animal Habitat/Bird Poles	Interset Structures	Midspan spacers	Contractor & Public Education	Damage Prevention Programs
Model or Legacy Risk Driver		**Gust/Fire Weather/General Outage**						**Vehicle Contact**		**Animal Contact**			**Wire to Wire Contact**		**Third Party Interference**	
Contact from object	**Animal contact**	x	x			x				x	x					
	Balloon contact	x	x								x					
	Other	x	x													
	Unknown	x	x			x										
	Veg. contact	x	x									x	x	x		
	Vehicle contact	x	x				x	x	x						x	x
Contamination		x				x					x					x
Equipment / Facility failure	**Conductor**	x	x									x	x	x		x
	Crossarm	x				x			x						x	x
	Fuse					x										x
	Insulator					x										x
	Lightning arrestor															x
	Other															x
	Pole	x				x			x						x	x
	Sectionalizer															x
	Connectors															x
	Switch															x
	Transformer															x
	Voltage regulator															x
Normal Operation		x	x		x			x								x
Other		x	x		x			x								
Unknown		x	x		x			x								
Vandalism/Theft		x	x	x											x	
Wire-to-wire contact		x	x			x	x				x	x	x	x	x	
Contact from 3rd party		x													x	x

While many circuits are included in our reconductoring mitigation efforts (most of which touch or border Tier 3 areas), several circuits may fit the profile for mitigation techniques, including alternatives up to and including reconductoring. Some examples we will discuss below are: 5L97, 8G27, and 5R370.

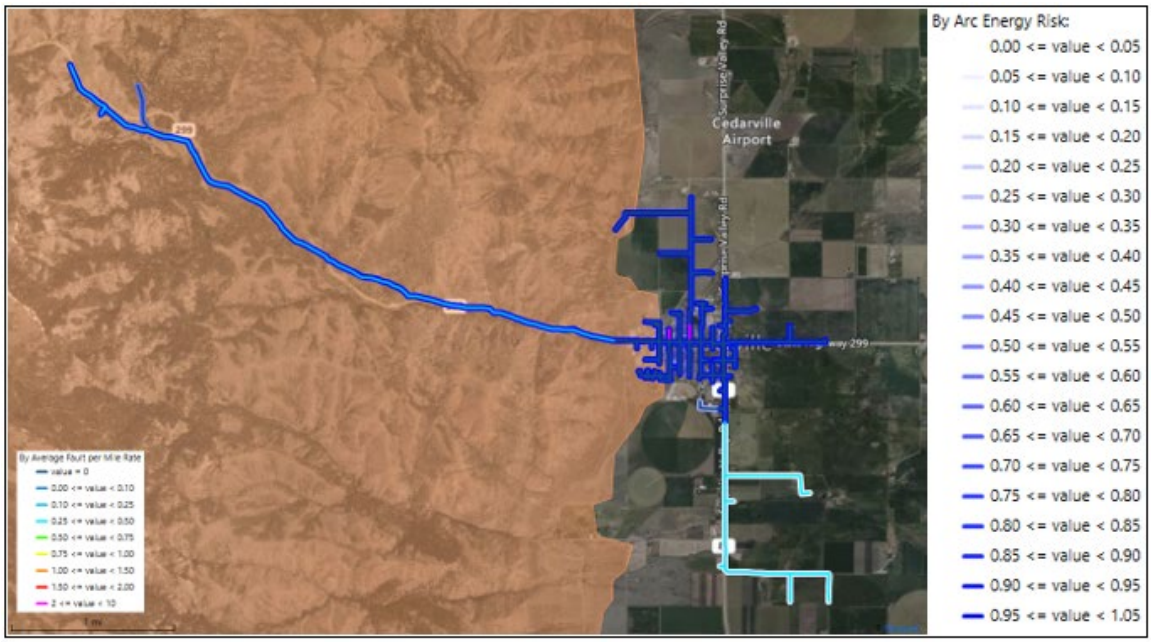
Circuit examples:
Each example's accompanying screen capture depicts the Arc Energy Risk score overlaid by the zonal Fault per Mile Rate (for previous four plus years). This depiction was chosen for the examples to highlight the correlation of faults and the relative energy involved during the fault, but many renditions could be used. The Arc Energy Risk score is depicted as a scaled step from zero to one ranging from white to dark blue. Zonal Fault per Mile Rates are depicted in steps from zero to two, with the final range being a catch all above two.

- **Circuit 5L97**
  5L97 is a 12.47kV-LL circuit having a large service footprint to the town of Cedarville, CA, but also possessing a westerly tap. The circuits zones of protection generally have a low combined risk score of about 0.5, but the tap extending west out of town has a noticeably higher score of 0.7. Of the scores which factor into the combined score, arc energy, Fosberg intensity, wind gusts, and tree canopy density stand out, all of which score close to 1.0. Additionally, the western portion of the circuit is surrounded by vegetation but serves few customers, most of whom appear to be winter seasonal loads.

  Outage history on this circuit indicate there are fewer outages during the dryer months. Most outages occur during wetter months when ignition probability is at its lowest. The history includes vegetation and equipment related outages.

  Mitigation efforts on 5L97 would involve a circuit-wide assessment but would further focusing on the west tap. Not only is the western tap encompassed by Tier 2, but it also has several outlier overall risk scores. The efforts may consist of:
    - Perform a full circuit coordination for protective devices
    - Replace any legacy protective equipment (relays, reclosers, etc.) to gain coordination capability
    - Installation of additional protective equipment capable of enhanced fault detection
    - Pole protection along roadways
    - Interim (fire season) vegetation patrols

Figure 4.5-15: 5L97 with zonal Faults per Mile Rate overlaid with zonal Arc Energy score



- **Circuit 8G27:**
  8G27 is a single phase 4.16kV-LL circuit served out of PacifiCorp's Hamburg substation. The rural circuit primarily extends west of the substation and is one such example with a median risk score of 0.56. While the circuit is encompassed within Tier 2, it doesn't have as high of a combined risk score comparative to its neighboring circuits or to circuits that fall into a covered conductor level of mitigation. Nor does it have a very high PSPS risk associated to it, as measured by customers impacted should a PSPS be considered. But while its risk is lower compared to other circuits, it still demonstrates combined risk. Of the scores which factor into the combined score, arc energy, tree canopy density, and Fosberg intensity stand out, all being above 0.7.

  Outage history on this circuit indicate there are few outages in general, with most outages occurring during wetter months when ignition probability is at its lowest. It's important to understand the fact this circuit is also underbuild on a 69kV transmission line along a substantial portion of the circuit.

  Mitigation efforts on 8G27 would involve a look at the entirety of the circuit, with special care to focus on the west tap from the substation. The efforts may consist of:
  - Perform a full circuit coordination to ensure protective devices are well coordinated
  - Replace any legacy protective equipment (relays, reclosers, etc.) incapable of sophisticated coordination
  - Installation of additional protective equipment capable of enhanced fault detection, particularly since native soil conditions may limit ability to detect fault conditions
  - Pole protection along roadways
  - Interim vegetation patrols
  - Analysis for covered conductor and/or spacer cable

Figure 4.5-16: 8G27 with zonal Faults per Mile Rate overlaid with zonal Arc Energy score

- **Circuit 5R370:**
  5R370 is a 12.47kV-LL circuit serving customers north of Crescent City, CA to the California-Oregon state border. Most of the circuit is in a non-tier designated area, however the risk score identifies outlier portions or the circuit. Of the scores which factor into the combined score, arc energy, tree canopy density, and ignition risk stand out.

  Outage history on this circuit indicate there are fewer outages during the dryer months, with most involving some form of equipment damage. Most outages occur during wetter months when ignition probability is at its lowest, i.e. Pacific coast storm related. This circuit is exposed to coastal conditions which are prone to adverse equipment contamination and deterioration.

  Mitigation efforts would involve a look at the entire circuit, while focusing on the main line and northern taps. Most of the circuit has a relatively low risk score associated to it. The efforts may consist of:
  - Perform a full circuit coordination to protective devices
  - Replace any legacy protective equipment (relays, reclosers, etc.)
  - Installation of additional protective equipment capable of enhanced fault detection
  - RF/IR/Resistance Detection of Connectors
  - Animal guarding
  - Pole protection along roadways
  - Interim vegetation patrols
  - Analysis for covered conductor and/or spacer cable

Figure 4.5-17: 5R370 with zonal Faults per Mile Rate overlaid with zonal Arc Energy score

4) Prioritization in the Context of PSPS

Using the fire weather risk score the company can also begin to gauge PSPS risk at any given zone of protection or circuit in the context of prioritization. The fire weather risk score incorporates the gust, FFWI and KBDI intensity at any given location and those are the exact variables we use when evaluating the need for a PSPS event. Consequently, the fire weather risk score can be thought of as a frequency (or probability) of weather which necessitates a PSPS event. The second component of the PSPS risk is the number of customers that would be affected by a PSPS event (customer count is calculated programmatically, however AFN and medically vulnerable or critical services are evaluated after the count of customers impacted). Together these two components make up the probability of a PSPS event occurring and the consequence (fire weather score X customers affected) which we denote PSPS risk. Below are two figures which create a circuit prioritization view in the context of PSPS. The x axis on the figures is either the Fire Weather Score or the PSPS risk, the y axis represents the number of customers on the circuit, the size of the point corresponds to the overhead circuit miles, and the color corresponds to the year work covered conductor work is scheduled. Using this view, we can logically identify the circuits that need to be prioritized for reconductoring. Ideally, the company will target circuits that have both a high fire weather score and have many downstream customers connected (top right corner of the figure). We can also identify circuits that either have a low priority (like 5G76 – purple dot top right) that might need to have their priority increased or circuits with a high priority (like 5G69 – red dot bottom right) that might need to have their priority lowered. Leveraging the LRAM model in this manner will allow our subject matter experts to prioritize future covered conductor (and other improvements) a data-driven manner.

Figure 4.5-16: Circuit prioritization view where the Fire Weather Score is on the x-axis, and the Combined Risk Score is on the y-axis, the color corresponds to the prioritization year, and the size to the overhead line miles.

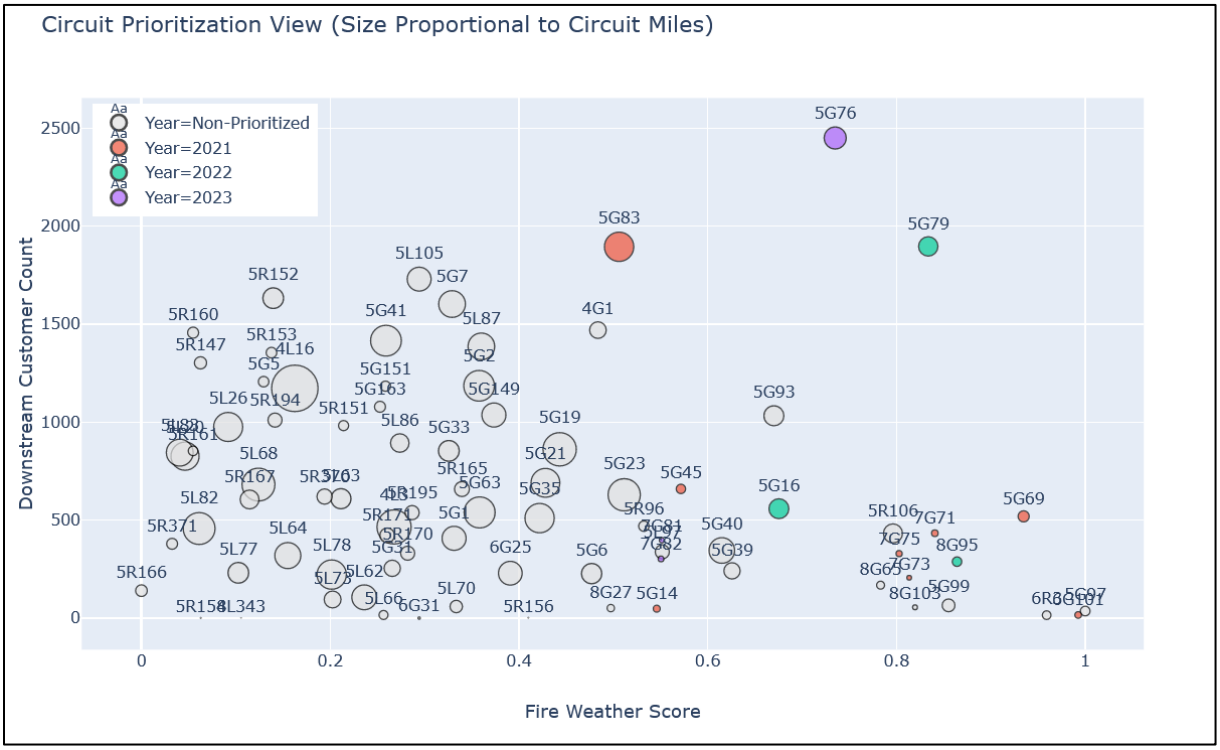
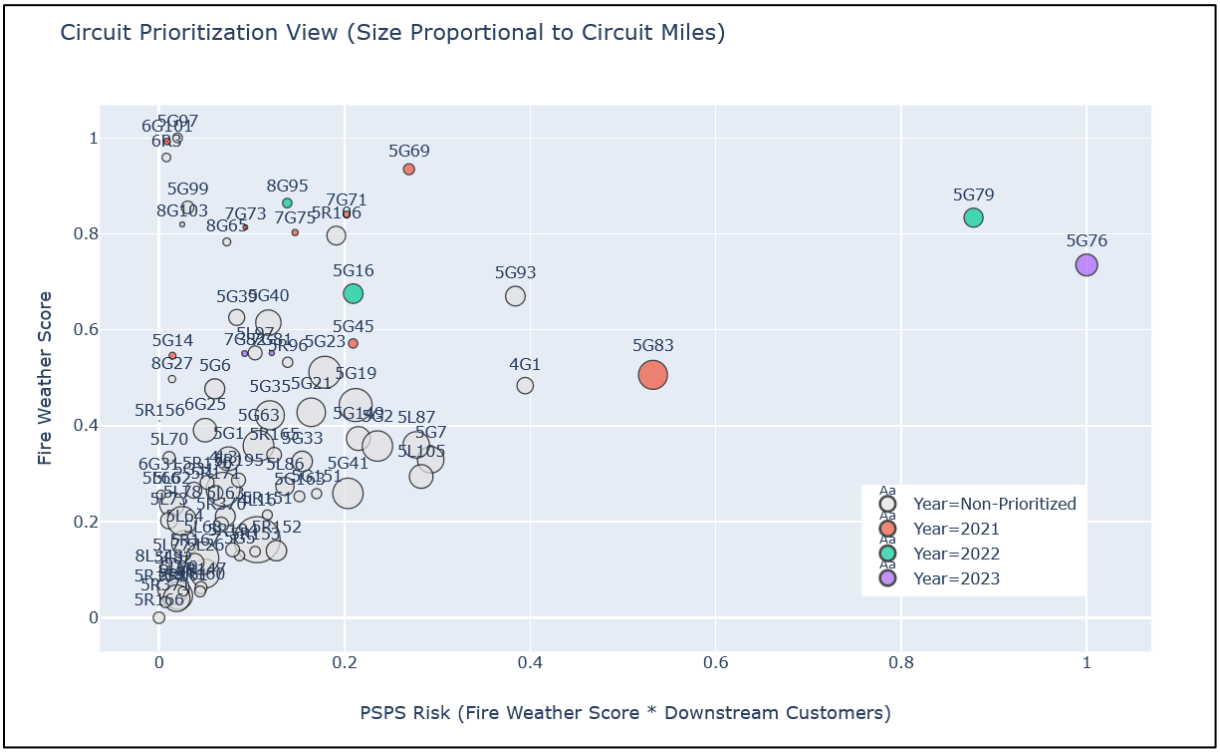


Figure 4.5-19: Circuit prioritization view where the PSPS risk is on the x-axis, and Fire Weather Risk Score is on the y-axis, the color corresponds to the prioritization year, and the size to the overhead line miles.



5) Climate Change and the LRAM Model

PacifiCorp has utilized materials prepared by California's 4th Climate Change Assessment through CalAdapt to assess the impacts of climate change throughout the service territory. A general summary of the climate impacts, historical trends, and future projections are summarized in the table below. The primary metric that is used at PacifiCorp to gauge wildfire risk and the necessity of a PSPS event is KBDI, and it increases based on the lack of rainfall and the increase is more rapid during higher temperatures. If we reference the table, we can see that the temperature is projected to increase with a very high confidence and the drought frequency is also projected to increase with a medium-high confidence. Based on these two macro trends we can confidently say that we expect the KBDI intensity to increase over the long term throughout our service territory. Consequently, if wind intensity stays the same or increases, the risk of utility caused catastrophic wildfires would increase which would lead to more frequent PSPS events.

Now that these macro trends have been considered it is important to dive into the data and analyze these climate trends at a more refined scale. This is accomplished by overlaying circuitry (broken up by zone of protection) over the downscaled projected climate forecasts provided through the CapAdapt website. Now each zone of protection has a climate projection of temperature, precipitation, wind, and rainfall from which we can extract the fire weather indices that we rely on - namely Fosberg and KBDI. This was done for both climate scenarios, RCPs 4.5 and 8.5, and used the HadGEM2-ES, CANESM2, CRNM-CM5, and MIROC5 models which address the largest possible variability in the future climate.

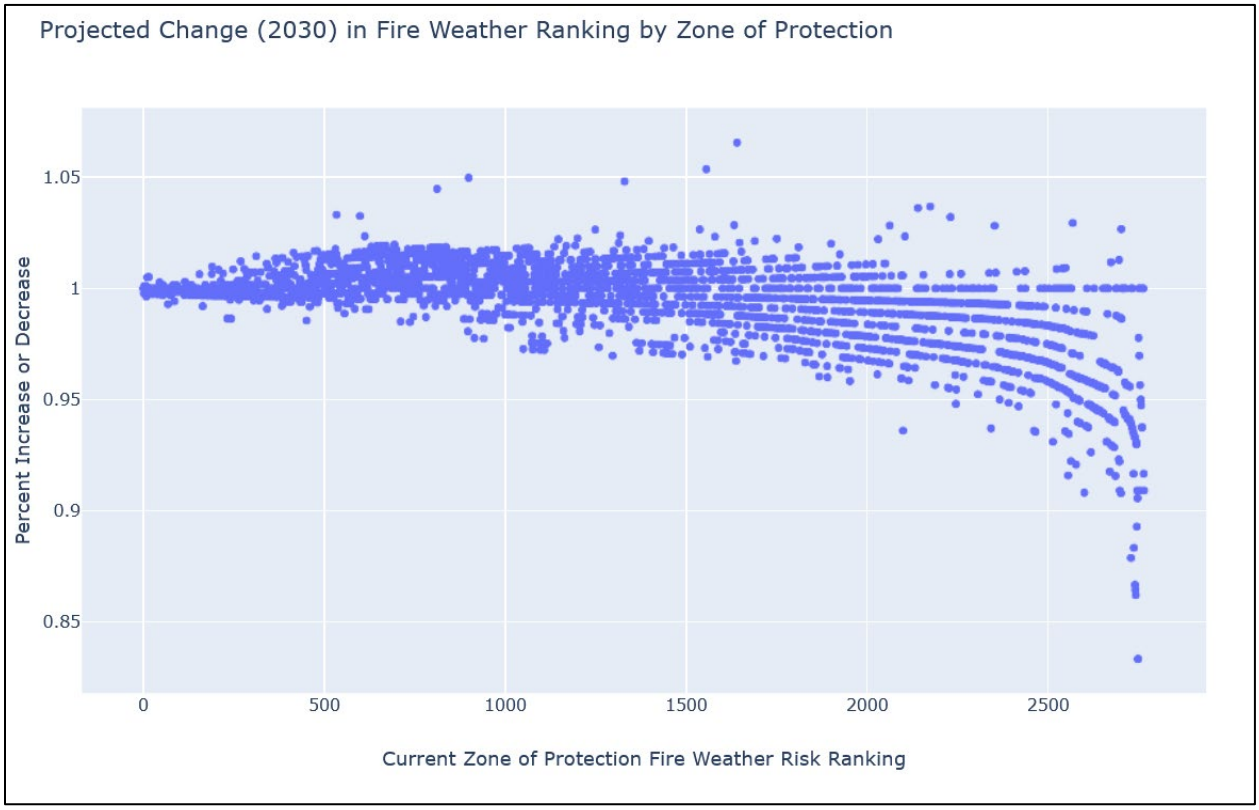
Table 4-8: A qualitative summary of historical and expected future climate trends

CLIMATE IMPACT	HISTORICAL TRENDS	FUTURE DIRECTION OF CHANGE	CONFIDENCE FOR FUTURE CHANGE
Temperature	Warming (last 100+ years)	Warming	Very High
Sea Levels	Rising (last 100+ years)	Rising	Very High
Snowpack	Declining (last 60+ years)	Declining	Very High
Annual Precipitation	No significant trends (last 100+ years)	Unknown	Low
Intensity of heavy precipitation events	No significant trends (last 100 years)	Increasing	Medium-High
Frequency of Drought	No significant trends (last 100+ years)	Increasing	Medium-High
Frequency and intensity of Santa Ana Winds	No significant trends (last 60+ years)	Unknown	Low
Marine Layer Clouds	Some downward trends; mostly not significant (last 60+ years)	Unknown	Low
Acres Burned by Wildfire	Increasing (last 30+ years)	Increasing	Medium-High

For each zone of protection and climate scenario PacifiCorp then took the average of the four models and created an average forecasted KBDI and Fosberg forecast to 2030. Thereafter PacifiCorp performed a linear regression fit to these average fire weather indices between May and October. From the linear regression fit we obtain the slope, grab the fitted intensity in 2020 and 2030, and calculate a percent increase or decrease by 2030 at each zone of protection. At this time the company propagated the percent change of KBDI/Fosberg though the LRAM model to identify how the Fire Weather Risk Score and the Combined Risk Score will be impacted by 2030. Using these forecasted risk scores we can identify zones of protection that are forecasted to cross the identified thresholds from non-tier to Tier 2, or Tier 2 to Tier 3 which in in turn will help inform the company's long term prioritization strategy.

A figure summarizing the projected change to the Fire Weather Risk Score at the zone of protection can be seen summarized below. On the y-axis is the percent change to the Fire Weather Risk Score by 2030 and on the x-axis is the current Fire Weather Risk Score ranking. From this figure one can see that the zones of protection with the lowest Fire Risk Score (right side of figure) are projected to continue decreasing in fire weather. We can also see that the higher risk zones have more variability where some increase and some decrease, and there are actually some zones that increase by as much as 5%. This is PacifiCorp's first pilot into incorporating the CapAdapt climate data, and we expect to integrate it into our long-term wildfire mitigation strategies. This aspect is particularly noteworthy as the company continues the future of mitigation efforts beyond those that were targeted toward Tier 3 and PSPS reduction.

Figure 4.5-20: Current Fire Weather Risk Score ranking for the zone of protection is on the x-axis and the y-axis has the projected change in the Fire Weather Risk Score by 2030.



Assessment of the Effectiveness of Covered Conductor

PacifiCorp was directed to provide an assessment of the effectiveness of covered conductor. It is notable that PacifiCorp has adopted the application of spacer cable which combines covered conductor with structural members retaining the phase conductors. This convention was adopted due to the experience with large limb/tree contacts to which the company's equipment is exposed. The content below explains the company's response explaining its experience with covered conductor, specifically spacer cable, effectiveness.

This effectiveness methodology was developed with the expectation it will be replicated for the primary mitigation measures the company has outlined, including but not limited to advanced protection, small diameter reconductoring, strategic equipment replacement and contact events, including animals, vegetation and vehicular. First, the company identified areas in which spacer cable had been installed. It identified the pre-installation period and compared to post-installation, evaluating the number of outages recorded. This information was factored based upon the percentage of the zone of protection that had been reconductored to gauge the zonal impact for reduced outages. The data was plotted and is shown below.

Figure 4.5-21: Percent improvement in Faults per Mile versus the percentage of covered conductor in a Zone of Protection.

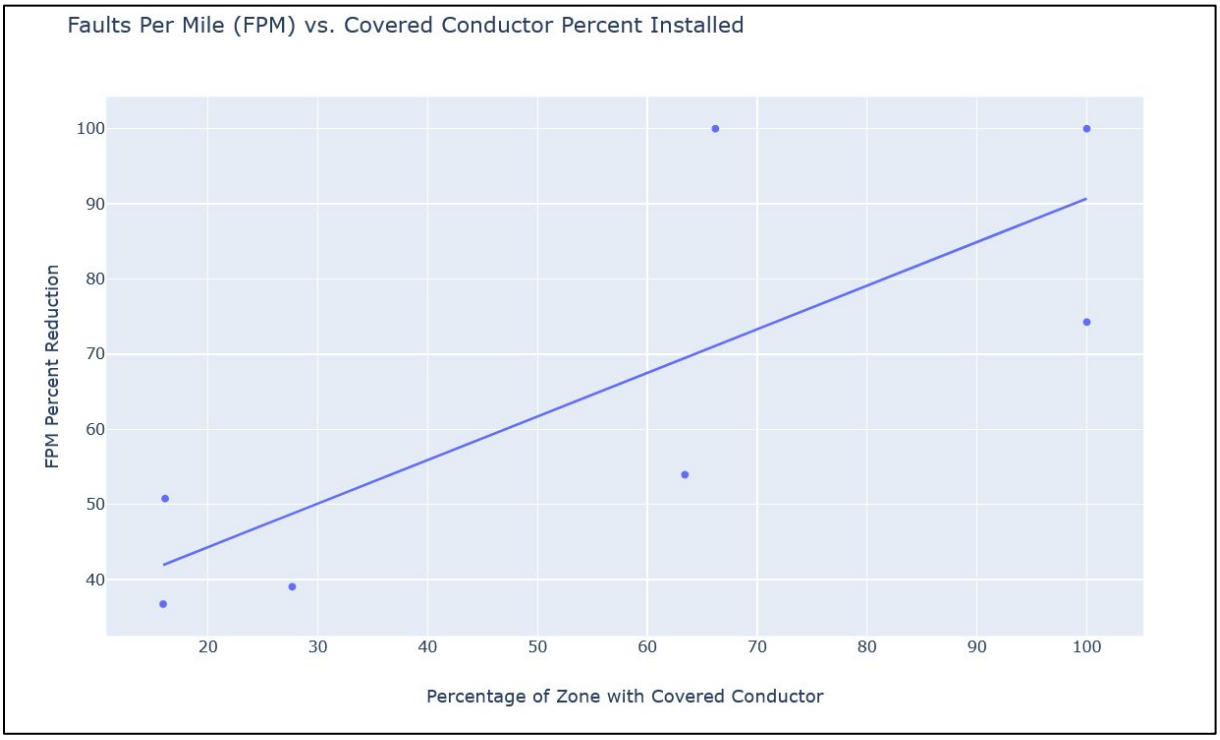
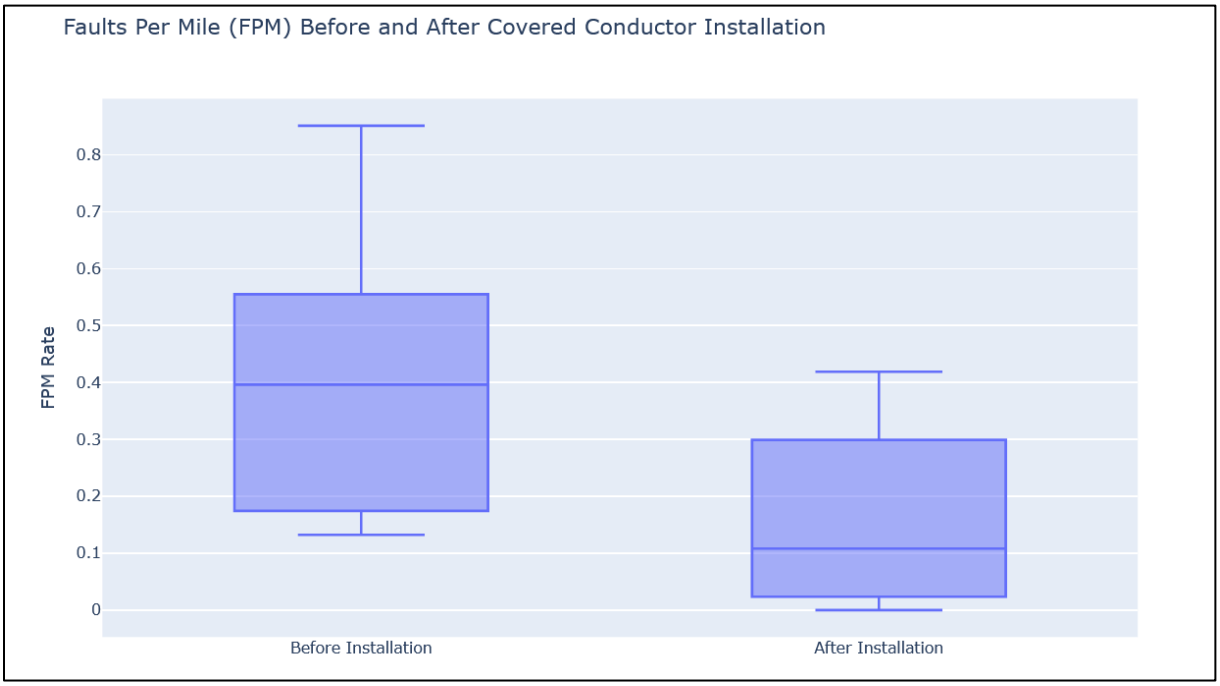


Figure 4.5-22: The reduction in Faults per Mile Rates before and after covered conductor is installed.



One key difference between the legacy projects discussed and these wildfire mitigation projects is the extent to which re-conductoring was performed. Generally, these projects have been more targeted and often haven't involved entire zones of protection.

Thus, we lack the history that is ideal for increased confidence in post-installation outage experience to fully demonstrate how effective our wildfire mitigation covered conductor installations are expected to be. While these results strongly suggest 90% reduction in outages, or risk events, there simply has not been enough time to declare without a doubt the efficacy of the strategy. However, there are two positive signs in the analysis of our reliability focused samples, as well as additional reliability focused projects not included in the sample.

As the company can add more projects, time, and operating experience it expects to improve these estimates, however, in conclusion, the company's analysis gauges the effectiveness of covered conductor/spacer cable to yield approximately 90% reduction in faults. This is a striking improvement and highly beneficial to fire risk avoidance, since outages are risk events with ignition probability. As time progresses and confidence in our outage history grows, we will be able to more confidently narrow and highlight the range of effectiveness. Additionally, as time progresses, we will gain a better understanding of the effectiveness of how covered conductor/spacer cable effectiveness coalesces with or is otherwise complementary to other mitigation measures, for example the use of enhanced fault detection devices or continuous monitoring technologies.

Identification of future elements for inclusion and development of the model
Noted previously, the company intends to extend the LRAM to calculate risk spend efficiencies. Using the methodology for assessment of risk event reduction, noted above, and with developed ignition probabilities, the company will be position to calculate the effectiveness of its mitigation measures, while it continues to refine costs of mitigation measures, which serve as a direct input also to the calculations.

Further, as it becomes clear the requirements of the SMJUs, the company anticipates integrating categorical risks from assets, as was provided in its 2018 GRC.

4.5.2 *CALCULATION OF KEY METRICS*

Report details on the calculation of the metrics below. For each metric, a standard definition is provided with statute cited where relevant. The utility must follow the definition provided and detail the procedure they used to calculate the metric values aligned with these definitions. Utilities must cite all data sources used in calculating the metrics below.

1. ***Red Flag Warning overhead circuit mile days*** *– Detail the steps to calculate the annual number of red flag warning (RFW) overhead (OH) circuit mile days. Calculated as the number of circuit miles that were under an RFW multiplied by the number of days those miles were under said RFW. Refer to Red Flag Warnings as issued by the National Weather Service (NWS). For historical NWS data, refer to the Iowa State University Iowa archive of NWS watch / warnings[10]. Detail the steps used to determine if an overhead circuit mile was under a Red Flag Warning, providing an example of how the RFW OH circuit mile days were calculated for a Red Flag Warning that occurred within utility territory over the last five years.*

   First the shapefiles for the Red Flag Warnings (RFW) are obtained from the Iowa State University of Iowa archive of NWS watches and warnings. Next the distribution and transmission assets in California were intersected against Tier 2, Tier 3, Zone 1, and non-High Fire Threat District boundaries. Then, for each RFW and HFTD combination and designation the sum of the line

[10] https://mesonet.agron.iastate.edu/request/gis/watchwarn.phtml

lengths within the affected area were calculated for each warning's duration. Finally, the duration and the length of lines within each warning are multiplied to calculate the mile-days metric. These results were summarized.

2. **High Wind Warning overhead circuit mile days**[11]– *Detail the steps used to calculate the annual number of High Wind Warning (HWW) overhead circuit mile days. Calculated as the number of overhead circuit miles that were under an HWW multiplied by the number of days those miles were under said HWW. Refer to High Wind Warnings as issued by the National Weather Service (NWS). For historical NWS data, refer to the Iowa State University Iowa archive of NWS watch / warnings. Detail the steps used to determine if an overhead circuit mile was under a High Wind Warning, providing an example of how the OH HWW circuit mile days were calculated for a High Wind Warning that occurred within utility territory over the last five years.*

   First the shapefiles for the High Wind Warnings (HWW) are obtained from the Iowa State University of Iowa archive of NWS watches and warnings. Next the distribution and transmission assets in California were intersected against Tier 2, Tier 3, Zone 1, and non- High Fire Threat District boundaries. Then, for each HWW and HFTD combination and designation the sum of the line lengths within the affected area were calculated for each warning's duration. Finally, the duration and the length of lines within each warning are multiplied to calculate the mile-days metric. These results were summarized.

3. ***Access and Functional Needs population*** *– Detail the steps to calculate the annual number of customers that are considered part of the Access and Functional Needs (AFN) population. Defined in Government Code § 8593.3 and D.19-05-042 as individuals who have developmental or intellectual disabilities, physical disabilities, chronic conditions, injuries, limited English proficiency or who are non-English speaking,*[12] *older adults, children, people living in institutionalized settings, or those who are low income, homeless, or transportation disadvantaged, including, but not limited to, those who are dependent on public transit or those who are pregnant.*

   PacifiCorp uses two primary methods to establish AFN populations. First, the direct assignment of a customer as a medical baseline customer. In addition, the company identifies customers as medical needs customers who may not qualify for MBL rate status (due to the requirements for specific equipment) but have self-identified. As the company continues to reach out to customers to understand methods to properly support them in the event of a wildfire or PSPS risk, it records the customer as medically-vulnerable in its CSS.

4. ***Wildlife Urban Interface*** *– Detail the steps to calculate the annual number of circuit miles and customers in Wildlife Urban Interface (WUI) territory. WUI is defined as the area where houses exist at more than 1 housing unit per 40 acres and (1) wildland vegetation covers more than 50% of the land area (intermix WUI) or (2) wildland vegetation covers less than 50% of the land area, but a large area (over 1,235 acres) covered with more than 75% wildland vegetation is within 1.5 mi (interface WUI) (Radeloff et al, 2005)*[13]*.*

[11] https://mesonet.agron.iastate.edu/request/gis/watchwarn.phtml

[12] Guidance on calculating number of households with limited or no English proficiency can be found in D.20-04-003

[13] Paper can be found here - https://www.fs.fed.us/pnw/pubs/journals/pnw_2005_radeloff001.pdf with the latest WUI map (from 2010) found here - http://silvis.forest.wisc.edu/data/wui-change/

The annual number of circuit miles in the WUI is calculated by intersecting geospatial overlays of OH distribution and transmission circuits against WUI polygons and calculation of total overhead circuit lengths in miles within the WUI. The sources of data used in the calculation of this information include CalFIRE's WUI GIS data layer and PacifiCorp's GIS circuit data.

5. ***Urban, rural and highly rural*** *– Detail the steps for calculating the number of customers and circuit miles in utility territory that are in highly rural, rural, and urban regions for each year. Use the following definitions for classifying an area highly rural/rural/urban (also referenced in glossary):*
    - *Highly rural – In accordance with 38 CFR 17.701, "highly rural" shall be defined as those areas with a population of less than 7 persons per square mile as determined by the United States Bureau of the Census. For the purposes of the WMP, "area" shall be defined as census tracts.*
    - *Rural – In accordance with GO 165, "rural" shall be defined as those areas with a population of less than 1,000 persons per square mile as determined by the United States Bureau of the Census. For the purposes of the WMP, "area" shall be defined as census tracts.*
    - *Urban – In accordance with GO 165, "urban" shall be defined as those areas with a population of more than 1,000 persons per square mile as determined by the United States Bureau of the Census. For the purposes of the WMP, "area" shall be defined as census tracts.*

    Population densities were calculated at the census tract level based on ACS 5-year estimates. (The ACS 1-year estimate data is only created for regions with a population of 65,000 or more, well above the populations in PacifiCorp's territory. 5-year estimates are released every year for each census tract and are so named because they are based upon more than one year's survey data.) The census tracts overlapping PacifiCorp territory were then assigned a population density category based upon the provided thresholds of 7 or 1000 persons per square mile. These tract level population calculations were then combined with census tract shapefiles for additional calculations.

4.6 PROGRESS REPORTING ON PAST DEFICIENCIES

Report progress on all deficiencies provided in the 2020 WMP relevant to the utility. This includes deficiencies in Resolution WSD-002.

Response: *Summarize how the utility has responded and addressed the conditions in the table below. Reference documents that serve as part of the utility's response (e.g. submitted in the utility's Remedial Compliance Plan, location in 2021 WMP update, etc.). Note action taken by the WSD for Class A and B deficiencies (e.g. response found sufficient, response found insufficient and further action required, etc.).*

Abbreviations are used for referenced documents as follows:

- PacifiCorp's 2020 Wildfire Mitigation Plan Remedial Compliance Plan, dated July 27, 2020 ("**RCP**")
- PacifiCorp's Quarterly Report on 2020 Wildfire Mitigation Plan for June 12, 2020 through September 9, 2020, dated September 9, 2020 ("**First QR**")
- Wildfire Safety Division Draft Evaluation of PacifiCorp's Remedial Compliance Plan, December 30, 2020 ("**RCP Action Statement**")
- Wildfire Safety Division Draft Evaluation of PacifiCorp's First Quarterly Report, dated January 21, 2021 ("**QR Action Statement**")

Table 4-9: List of utility deficiencies and summary of response, 2020

Deficiency number	Deficiency title	Utility response (brief summary)	Referenced documents	WSD Action
Guidance-1	Lack of risk spend efficiency (RSE) information	PacifiCorp has completed LRAM which affords before-mitigation fire risk and combined risk values; with model now functional the company is in a position to begin to objectively quantify the benefits of specific mitigations at specific locations with estimated improvements in performance, as discussed in 4.5.1.	First QR QR Action Statement	Deemed Insufficient
Guidance-2	Lack of alternative analysis for chosen initiatives	PacifiCorp, in its First QR outlined alternatives analysis. In Section 4.5.1 it further builds upon this alternative approach for mitigation options available at specific locations that will be able to be modeled within the LRAM and thus support ability for location specific mitigations to be modeled.	First QR QR Action Statement	Deemed Sufficient
Guidance-3	Lack of risk modeling to inform decision-making	In Section 4.5 substantial risk analysis is undertaken which is built upon through Section 4.5.1 with details of the company's recently-developed LRAM.	RCP RCP Action Statement	Deemed Insufficient
Guidance-4	Lack of discussion on PSPS impacts	In Section 4.5.1 PacifiCorp demonstrates how it evaluates PSPS to prioritize mitigation efforts; in Section 8 it outlines how the company developed PSPS plans and the countermeasures it employs to notify and minimize customer impacts.	First QR QR Action Statement	Deemed Insufficient
Guidance-5	Aggregation of initiatives into programs	PacifiCorp disaggregated all programs into individual initiatives and included these details in the company's First QR.	First QR QR Action Statement	Deemed Sufficient
Guidance-6	Failure to disaggregate WMP initiatives from standard operations	PacifiCorp provided initiative level detail in the First QR, including the designation of "standard" vs "augmented" for each initiative. The designation "standard" was used to reflect programs with costs already included in a prior rate case that adhere to existing regulation, and "augmented" was used for new programs that exceed regulatory requirements and require supplemental funding.	First QR QR Action Statement	Deemed Sufficient
Guidance-7	Lack of detail on effectiveness of "enhanced" inspection programs	PacifiCorp agreed that "enhanced" inspections are separate from other standard or "routine" inspections contemplated in GO 165 and adopted the term "enhanced" inspection moving forward to reflect the company's IR Transmission Inspection Program. PacifiCorp provided detail regarding these IR inspections and will continue to update in the WMP.	First QR QR Action Statement	Deemed Sufficient

Deficiency number	Deficiency title	Utility response (brief summary)	Referenced documents	WSD Action
Guidance-8	Prevalence of Equivocating Language – failure of commitment	PacifiCorp has avoided using equivocating language in this 2021 WMP Update.	[Class C]	[Class C]
Guidance-9	Insufficient discussion of pilot programs	PacifiCorp provided pilot program detail in the First QR, outlining the progress achieved to date, in addition to anticipated implementation and timing as they become mature.	First QR QR Action Statement	Deemed Sufficient
Guidance-10	Data issues - general	As the reporting of GIS data is expected to be on-going, initial efforts were focused on the development of an architecture and framework to ensure consistent and sustainable delivery of the data. Since the First QR, PacifiCorp made significant progress on the development of a data extraction and translation process to deliver data consistent with the WSD GIS Data Schema Requirements on a quarterly basis and provided 45% of the asset data requested in the company's December 2020 quarterly report. In addition, a significant portion of the requested PSPS Event and Risk Event data was further incorporated in to 2021 WMP. PacifiCorp is adapting the newly created processes to meet the forthcoming structure changes to the GIS Data Schema requirements.	First QR QR Action Statement	Deemed Insufficient
Guidance-11	Lack of detail on plans to address personnel shortages	PacifiCorp does not have a personnel shortage that would frustrate completion of the planned wildfire mitigation activities in its California service territory. (Nor is it forecasting any personnel shortage.) The company is confident that it has adequate current personnel to accomplish the planned mitigation initiative objectives in the WMP, and it will update appropriately if that assessment changes.	First QR QR Action Statement	Deemed Insufficient
Guidance-12	Lack of detail on long-term planning	PacifiCorp outlines its development of a modeling basis upon which it is able to conduct long term fire risk planning, including the integration of a variety of external factors that will enable better long-term planning.	First QR QR Action Statement	Deemed Insufficient
PC-1	PacifiCorp's WMP does not report adequate planning for climate change	PacifiCorp has leveraged work developed through CalAdapt and its newly developed LRAM modeling platform to evaluate climate change within its service territory.	First QR QR Action Statement	Deemed Insufficient
PC-2	PacifiCorp has not demonstrated effective weather	PacifiCorp provided methodology, criteria and coverage of weather stations, which may further inform how weather systems are	First QR QR Action Statement	Deemed Sufficient

Deficiency number	Deficiency title	Utility response (brief summary)	Referenced documents	WSD Action
	station utilization	moving across its service territory. Consistent with Action PC-21, PacifiCorp is supplying additional cost/benefit analysis.		
PC-3	PacifiCorp did not explain how it would track effectiveness of its covered conductor initiative	PacifiCorp explains the method for quantifying current experiences in effectiveness with covered conductor in section 4.5.1.6 which it expects to update as further reconductor projects are completed. The findings show there is a strong positive correlation to the percent of the overhead mileage being converted to covered conductor and the improvement in fault rate per mile of exposure. This positive correlation is illustrated earlier in this document in charts 4.5-23 and 4.5-24 in section 4.5.1.6.	First QR QR Action Statement	Deemed Insufficient
PC-4	PacifiCorp's WMP lacks a QA/QC program for inspections	PacifiCorp does not have a separate wildfire mitigation QA/QC program but does incorporate elements of wildfire mitigation into existing QA/QC programs which include on-site auditing of inspections to ensure all fire risk conditions are identified and classified properly to reflect risk and requirements for correction. As requested, PacifiCorp will begin reporting on the specifics of the company's program, including spend.	First QR QR Action Statement	Deemed Insufficient
PC-5	PacifiCorp's WMP does not report sufficient information on the risk reduction outcomes of its automatic recloser program	PacifiCorp has not yet created a metric to quantify the benefits of automatic recloser replacement program that afford more sophisticated device operation, particularly during periods of elevated fire risk. It intends to emulate its covered conductor effectiveness analysis (in Section 4.5.1) and provide such effectiveness measures for this program and other mitigations in future updates.	[Class C]	[Class C]
PC-6	PacifiCorp does not have a specific data governance wildfire mitigation program	Considerable data is stored in regularly maintained systems, which are used for a variety of functions. It may be technically feasible to translate and extract all data relevant to wildfire mitigation initiatives from these systems into a centralized repository to support WMP efforts; however, a narrowly and precisely defined data structure will reduce flexibility in evaluating alternative correlations within data sets going forward. PacifiCorp's approach is to provide a data governance across existing internal databases that can be queried to provide the desired	First QR QR Action Statement	Deemed Insufficient

Deficiency number	Deficiency title	Utility response (brief summary)	Referenced documents	WSD Action
		data structure as an output without modifying the underlying data storage.		
PC-7	PacifiCorp's stakeholder cooperation and community engagement needs further detail	The company has added to its community outreach as outlined in 7.3.9 and 8.4, including incorporating outreach through its newly created Wildfire Advisory Board, leveraging CBOs, collaborating with SMJUs in assessing community awareness of wildfire mitigations, including PSPS and evaluating additional support for communities and vulnerable populations.	[Class C]	[Class C]

With respect to ongoing deficiencies, where WSD has determined that prior responses were deemed "Insufficient," there are specific "Action" items, as identified in the RCP Action Statement and the QR Action Statement (e.g. "Action PC-1" and so on). The brief summary above summarizes PacifiCorp's response to the referenced deficiency and does not attempt to specifically address each individual action item. Detailed responses to the action items are made throughout this WMP Update, and cross-references to specific section action numbers are provided in Section 2 above.

5 INPUTS TO THE PLAN AND DIRECTIONAL VISION FOR WMP

5.1 GOAL OF THE WILDFIRE MITIGATION PLAN

The goal of the Wildfire Mitigation Plan is shared across WSD and all utilities: Documented reductions in the number of ignitions caused by utility actions or equipment and minimization of the societal consequences (with specific consideration to the impact on Access and Functional Needs populations and marginalized communities) of both wildfires and the mitigations employed to reduce them, including PSPS.

In the following sub-sections report utility-specific objectives and program targets towards the WMP goal. No utility response required for section 5.1.

5.2 THE OBJECTIVES OF THE PLAN

Objectives are unique to each utility and reflect the 1, 3, and 10-Year projections of progress towards the WMP goal. Objectives are determined by the portfolio of mitigation strategies proposed in the WMP. The objectives of the plan shall, at a minimum, be consistent with the requirements of California Public Utilities Code §8386(a) –

Each electrical corporation shall construct, maintain, and operate its electrical lines and equipment in a manner that will minimize the risk of catastrophic wildfire posed by those electrical lines and equipment.

Describe utility WMP objectives, categorized by each of the following timeframes, highlighting changes since the prior WMP report:

1. *Before the next Annual WMP Update*
2. *Within the next 3 years*
3. *Within the next 10 years – long-term planning beyond the 3-year cycle*

PacifiCorp's 2021 WMP Update builds upon the work performed in 2019 and 2020 to extend the logical approach to mitigating wildfire risk within its service territory. At the heart of this plan is the recognition that a broad range of solutions, in the form of situational awareness, inspection and correction, focused and timely vegetation management, operational acuity and strategic system hardening are required to deliver the best risk managed program to its customers at the best cost. While PacifiCorp began its risk modeling framework behind the large three IOUs in the state it has listened to their pioneering efforts and attempted to cascade these learnings into the model it outlined in Section 4.5. Further, it stands ready to leverage these learnings further throughout its system and the industry, in order to advance broadly this awareness and develop these tools. In the sections below the company outlines its short-term and longer-term vision. Section 7.1 also provides a specific breakdown of WMP initiatives in the requested timeframes of before the next Annual WMP update, within the next 3 years, and within the next 10 years.

5.3 PLAN PROGRAM TARGETS

Program targets are quantifiable measurements of activity identified in WMPs and subsequent updates used to show progress towards reaching the objectives, such as number of trees trimmed, or miles of power lines hardened.

List and describe all program targets the electrical corporation uses to track utility WMP implementation and utility performance over the last five years. For all program targets, list the 2019 and 2020 performance, a numeric target value that is the projected target for end of year 2021 and 2022, units on the metrics reported, the assumptions that underlie the use of those metrics, update frequency, and how the performance reported could be validated by third parties outside the utility, such as analysts or academic researchers. Identified metrics must be of enough detail and scope to effectively inform the performance

(i.e., reduction in ignition probability or wildfire consequence) of each targeted preventive strategy and program.

In PacifiCorp's 2021 WMP Update it pivots from the prior work done in 2019 and 2020 and incorporates many new aspects as directed by the WSD and other stakeholders. While previously the company was not yet positioned to implement aspects that had been required of the Large IOUs, the company's efforts aligned with the intent behind those requirements, rather than specifically creating the capacity to fully fulfill them. In the 2021 WMP update this approach has shifted and demonstrates its commitment to the substantial efforts articulated by WSD in its Action Statements.

Table 5.43-5-1: List and description of program targets, last 5 years

Program target	2019 performance	2020 performance	Projected target by end of 2021	Projected target by end of 2022	Units	Underlying assumptions	Update frequency	Third-party validation
Weather Station Installations	11	2	22	14	Stations	Targeting high risk/PSPS locations; Potential to expand	Annual	Physical Site Visit
Enhanced Inspections (Transmission IR Inspections)	1,474	866	700	700	Line Miles	Continue annual inspection of all OH transmission lines in the HFTD	Annual	Review of Records
Standard Inspections	3,444	3,542	3,400	3,400	Line Miles	Continue standard inspection programs consistent with regulatory required cycles normalized consistent with Table 1 and 2 metrics	Annual	Review of Records
Installation of Covered Conductor	0	1.4	85.2	52.4	Line Miles	Focus hardening on PSPS locations to reduce risk and the likelihood/ frequency of PSPS events	Annual	Physical Site Visit
Replacement of Cu Conductor	0	0	0	17.3	Line Miles	Replaced as part of the covered conductor program where coincident but tracked separately. Stand-alone projects begin in 2022.	Annual	Review of Records
Installation of System Automation Equipment	10	28	27	3	Projects	Number of projects which may include multiple component and vary in scope	Annual	Physical Site Visit
Proactive Wood Pole Replacement	0	29	128	272	Poles	Pole replacements in 2020-2022 coincide with other hardening work such as installation of covered conductor but are tracked and measured separately.	Annual	Review of Records
Patrol inspections on distribution and transmission (Vegetation	1,170	1,107	1,717	1,717	Line-Miles	Incremental to cycle program work Increased assumption in 2021 to cover fluctuations in underlying cycle program work which changes the volume requiring an incremental inspection.	Annual	Physical Site Visit
Radial Pole Clearing (Component of Fuel Management)	626	2,164	3,047	3,047	Poles	Incremental to regulatory mandated pole clearing (SRA). Full annual cycle assumed starting in 2021.	Annual	Physical Site Visit

5.4 PLANNING FOR WORKFORCE AND OTHER LIMITED RESOURCES

Report on worker qualifications and training practices regarding wildfire and PSPS mitigation for workers in the following target roles:

1. *Vegetation inspections*
2. *Vegetation management projects*
3. *Asset inspections*
4. *Grid hardening*
5. *Risk event inspection*

For each of the target roles listed above:

1. *List all worker titles relevant to target role (target roles listed above)*
2. *For each worker title, list and explain minimum qualifications with an emphasis on qualifications relevant to wildfire and PSPS mitigation. Note if the job requirements include the following:*
    a. *Going beyond a basic knowledge of General Order 95 requirements to perform relevant types of inspections or activities in the target role*
    b. *Being a "Qualified Electrical Worker" (QEW) and define what certifications, qualifications, experience, etc. is required to be a QEW for the target role for the utility.*
    c. *Include special certification requirements such as being an International Society of Arboriculture (ISA) Certified Arborist with specialty certification as a Utility Specialist*
3. *Report percentage of Full Time Employees (FTEs) in target role with specific job title*
4. *Provide a summarized report detailing the overall percentage of FTEs with qualifications listed in (2) for each of the target roles.*
5. *Report plans to improve qualifications of workers relevant to wildfire and PSPS mitigation. Utilities will explain how they are developing more robust outreach and onboarding training programs for new electric workers to identify hazards that could ignite wildfires.*

5.4.1 *TARGET ROLE: VEGETATION INSPECTIONS*

PacifiCorp conducts various types of inspections and/or patrols to identify vegetation maintenance actions to be performed in accordance with the company's Transmission and Distribution Vegetation Management Program Standard Operating Procedures (Vegetation SOP).

Table 5.4-1 presents PacifiCorp worker titles and associated minimum qualifications target roles who conduct work in PacifiCorp's service territory in California.

Table 5.54-2-1: PacifiCorp Conducted Vegetation Inspections – Target Roles and Qualifications

Worker Titles	Minimum Qualifications relevant to wildfire and PSPS mitigation	FTE Percent by Target Role	FTE Percent by High-Interest Qualification
Senior Utility Forester	ISA Arborists; See below	50%	100%
Utility Forester	ISA Arborists; See below	50%	100%

Senior Utility Forester and Utility Forester positions are required to be International Society of Arboriculture (ISA) Certified Arborists with specialty certification as Utility Specialists. Both Senior Utility and Utility foresters are required to perform post-work audits against PacifiCorp's program standards (e.g. conductor to line clearance specifications) for work conducted along distribution

rights-of-way, investigate vegetation-related outages, and identify work required and review work conducted along transmission rights-of-way.

Table 5.4-2 presents contractor worker titles and associated minimum qualifications target roles who conduct work in PacifiCorp's service territory in California.

Table 5.54-2-2: Contractor Conducted Vegetation Inspections – Target Roles and Qualifications

Worker Titles	Minimum Qualifications relevant to wildfire and PSPS mitigation	FTE Percent by Target Role	FTE Percent by High-Interest Qualification
Pre-Listers	See below	44%	25%
General Foreperson	See below	56%	60%

PacifiCorp employs contractors to assist with implementing the vegetation management program, including pre-listers and general forepersons.

Pre-listers conduct patrols and/or inspections to identify vegetation work needed in accordance with PacifiCorp's program standards and conduct post-audit inspections. Minimum qualification is to have a current ISA Arborist certification or the ability to obtain within 6 months of hire date.

General Forepersons are considered front line mangers of the independent contractors retained by PacifiCorp and are required at a minimum to be ISA Certified Arborists with specialty certification as Utility Specialists.

Plans to improve qualifications of workers relevant to wildfire and PSPS mitigation

PacifiCorp strives for continuous improvement. Senior Utility Foresters and Utility Foresters are encouraged to obtain ISA Board Certified Master Arborist credentials, tree risk assessment certifications, participate in arboriculture-related seminars/conferences and complete other related certifications from accredited education institutions. PacifiCorp Senior Utility Foresters and Utility Foresters provide training, hold regular performance-related discussions with pre-listers and other contractor-filled positions to review expectations and job requirements to identify areas for improvement and ensure consistency in execution of duties, and review post-audit findings. PacifiCorp works with contract positions that do not currently have ISA certifications, to obtain these certifications and will continue to require these certifications.

PacifiCorp also provides environmental awareness training to both company employees and contractor positions to minimize potential for negative impacts to sensitive environments and increase general understanding of environmental considerations.

5.4.2 *TARGET ROLE: VEGETATION MANAGEMENT PROJECTS*[14]

PacifiCorp seeks to collaborate with communities and agencies to partner in the implementation of projects with defined scopes to promote wildfire resiliency, such as projects that reduce fuels or establish fire breaks in and around power line rights-of way.

The same worker titles, qualifications and additional information provided in section 5.4.1 is applicable.

5.4.3 *TARGET ROLE: ASSET INSPECTIONS*

Worker Titles	Minimum Qualifications relevant to wildfire and PSPS mitigation	FTE Percent by Target Role	FTE Percent by High-Interest Qualification
Field Inspection Specialist	See Below	50%	n/a
Field Inspector	See Below	50%	n/a

Field Inspection Specialist within the Field Inspection Support group inspect, evaluate and document inspection data and information on overhead (distribution, transmission, communications, municipality and private-ownership) and underground facilities. Inspection activities include, but are not limited to pole attachment inspections, bird damage assessments, condition verification, pole plating, pole stub removal assessments, pole attachment transfer requests, ground-line pole testing, visual/safety inspections. An individual in this position is familiar with the National Electric Safety Code and PacifiCorp Construction Standards and apply this knowledge to recommend appropriate corrective actions. Collection of data will require the use of measuring sticks and wheels, binoculars, and handheld electronic devices. An Inspection Specialist is proficient in the use of maps, data sheets, work requests and engineered drawings.

Field Inspector: In addition to the Field Inspection Specialist position, Pacific Power contracts inspectors to perform either Visual Assurance or full Detailed inspections including pole testing as determined by cycle requirements. These inspectors are trained to identify all code compliance conditions (NESC and GO95). The condition inspection process is comprehensive without regard to the type of risk (public safety, worker safety, reliability, fire threat, etc.).

Plans to improve qualifications of workers relevant to wildfire and PSPS mitigation

As part of the annual training for the Field Inspection Support group any changes or focus areas related to the wildfire mitigation plan efforts will be documented and incorporated into the ongoing training to ensure all inspectors are aware of possible new equipment and the related construction standards. Additional elements of this annual training, which include a focus on wildfire mitigation and continuous improvement, are included in 7.3.4.14

[14] PacifiCorp interprets Vegetation Management Projects as referring to components of program vegetation maintenance activities or projects with a specific scope and duration.

5.4.4 *TARGET ROLE: GRID HARDENING*

PacifiCorp's grid hardening initiatives generally involve the retrofitting of existing overhead lines and substation components with more fire resilient materials, including covered conductor, fiberglass poles, relays/reclosers, and advanced communication devices. Once installed, PacifiCorp employees and contractors are required to work on and around these new devices as either part of planned maintenance and inspections or emergency response efforts. The details below reflect information regarding front line workers that will maintain or repair equipment associated with the Grid Hardening program target.

Worker Titles	Minimum Qualifications relevant to wildfire and PSPS mitigation	FTE Percent by Target Role	FTE Percent by High-Interest Qualification
Journeyman/Lineman	Qualified Electrical Worker (See Below)	88%	100%
Highline Patrolman	Qualified Electrical Worker (See Below)	4%	100%
Technician	Qualified Electrical Worker (See Below)	8%	100%

Journeyman/Lineman perform routine maintenance of poles and wires and respond to emergency outages or PSPS events. Responsible for performing construction and maintenance work on overhead and underground facilities. Pacific Power Journeyman linemen are qualified electrical workers and must have: (1) working experience as a lineman or (2) and graduated from a sanctioned apprenticeship program and must also have successfully passed a pre-hire physical assessment. Skills and abilities required by this job are of a level normally acquired by completion of job-related high school courses and the apprenticeship program for Lineman.

Highline Transmission Patrolman are journeyman lineman that are responsible for patrolling, inspecting and ensuring assigned transmission lines are properly maintained. Pacific Power highline patrolmen have knowledge of: (1) equipment, tools, techniques, and methods employed in the construction, installation, maintenance and repair of overhead line facilities, roads, trails and rights of way; (2) stresses, strains, and rigging; safety regulations (3) capabilities and limitations of insulator washing equipment; (4) transmission overhead circuitry and switching. The knowledge, skills, and abilities required for this job are of a level comparable with those normally acquired through a high school education, supplemented by technical study and extensive training and experience as a journeyman, patrolman or lineman. Additionally, highline patrolman have been provided and trained in the use of detection equipment that locates static or voltage leakage used during visual inspection patrols of assigned transmission lines.

Meter Relay Technicians perform routine maintenance of protection and control devices and advise on operation during emergency response. Meter relay techs have a working knowledge of Company substation protection and control schemes. As assigned, installs, maintains, adjusts, tests, troubleshoots and repairs substation protection and control equipment which includes but is not limited to apparatus, meters, relays, controls and remote control equipment.

<u>Plans to improve qualifications of workers relevant to wildfire and PSPS mitigation</u>

Beginning in 2019, PacifiCorp's training program included, as a component, annual training to review operating practices that reduce wildfire risk while performing routine work and confirming the availability

of fire mitigation / suppression tools before fire season. This refresher training has continued into 2020 and 2021 and has been successful to raise awareness of PSPS events, wildfire risk, and how procedures must change to adapt to that risk.

While effective, this training has been procedural and the full incorporation of Grid Hardening into the company's formal training program is an area planned for improvement. Specifically, this improvement will aim to enhance existing programs to ensure workers are properly trained to work around materials such as covered conductor, fiberglass poles, and advanced protection and control devices. PacifiCorp is also constructing a training yard in Bend, Oregon (to be completed in 2021) where consistent standard training is provided to employees to aid in the onboarding training programs for new employees; including training specific to the identification of hazards that could ignite wildfires.

5.4.5 *TARGET ROLE: RISK EVENT INSPECTIONS*

At this time PacifiCorp hasn't developed a specific work force dedicated to risk event inspections. Rather, this role has been fulfilled by a combination of field inspectors, field engineers, foresters and journeymen linemen who pass the baton through the risk event inspection process. PacifiCorp has developed a series of operational triggers which serve as "watchlist" items for which operational team members are notified of the need for a specific follow-up action. This tool, titled FIRE (frequent interrupters requiring evaluation) notifies employees on the following business day that an investigation needs to be completed. These thresholds can be modified based on a variety of parameters for which the company can modulate the triggers, i.e. vegetation outages are notified to foresters the day after a tree caused outage is completed. The company is evaluating whether additional investigative processes should be implemented to ensure that all relevant investigations are completed.

6 PERFORMANCE METRICS AND UNDERLYING DATA

Instructions: Section to be populated from Quarterly Reports. Tables to be populated are listed below for reference.

Note: Report updates to projected metrics that are now actuals (e.g., projected 2020 spend will be replaced with actual unless otherwise noted). If an actual is substantially different from the projected (>10% difference), highlight the corresponding metric in light green.

6.1 RECENT PERFORMANCE ON THE PROGRESS METRICS, LAST 5 YEARS[15]

Table 1: Recent performance on progress metrics last 5 years – reference only, fill out attached spreadsheet to correct prior reports

Instructions for Table 1: *In the attached spreadsheet document, report performance on the following metrics within the utility's service territory over the past five years as needed to correct previously-reported data. Where the utility does not collect its own data on a given metric, the utility shall work with the relevant state agencies to collect the relevant information for its service territory, and clearly identify the owner and dataset used to provide the response in the "Comments" column.*

Table 1 includes PacifiCorp's recent performance on progress metrics over the last 5 years. PacifiCorp implemented its HFTD mapping as well as fire threat condition programs in 2019. Therefore, grid condition findings per HFTD were available in 2019 and 2020. PacifiCorp has included the number of grid condition findings for 2015-2018 assuming that the HFTD zones are equivalent to those in 2019/2020. Additionally, PacifiCorp plans, tracks, and reports inspections and corrections per facility point[16] as opposed to per line mile. However, equivalent inspection miles were extrapolated in years 2015-2020 assuming little to no changes in grid topology. While these values reflect best estimates or equivalent line-miles, slight difference may exist when comparing to other data sets.

When an inspector completes an inspection of a facility, the inspection includes all assets at that facility location, as well as any applicable and adjacent line miles. This method allows PacifiCorp to level load resources and distribute work as evenly as practical across each year where appropriate. While a strong correlation can be made between number of facilities and line-miles when discussing inspections, it is expected that the number of equivalent line-miles inspected in any given year will vary, often significantly, as the number of facilities to be inspected vary each year and not all spans are the same length across the entire system. To meet the needs for Table 1, equivalent line miles were extrapolated from PacifiCorp's inspection records and should be viewed as generally reflective of the scope of work completed.

Additionally, as is expected with multi-year inspection programs, the actual topology and system inspected will significantly change from year to year, to include variations in voltage, type of installation, span length, geographic location, and environmental conditions. Therefore, PacifiCorp cautions against drawing conclusions regarding annual trends when reviewing inspection and correction metrics as

[15] Table references are to 2021 WMP Update Attachment 1 (Tables 1-12) - 2021 Performance Metrics Data Templates (Excel).

[16] "Facilities" refers to a location where PacifiCorp has one or more assets installed. Usually, this would mean a pole or structure but could also be pad-mounted switchgear, a substation, or a switching station. These facilities were included in the GIS data requested in Section 6.8.

included in the document. Instead, PacifiCorp recommends using the full data set provided to calculate qualitative multi-year averages, identify the relative range of values that can be expected, and understand qualitative relative order of magnitude for comparison to other utilities.

Furthermore, the evolution of PacifiCorp's electronic database requires extrapolation when determining condition findings per inspection type. However, PacifiCorp's programmatic inspection results were generally extrapolated and categorized as either "Detailed" or "Safety" inspection results. "Other" inspection types might include the results of internal audits or administrative changes.

Table 1 also presents PacifiCorp's 2020 performance metrics regarding vegetation clearance findings. PacifiCorp currently does not track number of spans with non-compliant conditions, but rather identifies areas where vegetation management actions are needed in order to maintain clearances as identified in PacifiCorp's Vegetation Management Transmission and Distribution Standard Operating Procedures. As such, the number of trees pruned per mile is presented, indicating number of trees identified to be prune per mile in order to maintain clearances as indicated in PacifiCorp's standards/specifications. Totals presented in Table 1 for metric 2.a are for distribution lines and include prunes conducted on cycle, interim, and patrols prior to height of fire season. Totals for metric 2.b are also for distribution lines and include prunes conducted on distribution lines within HFTD as a result of patrols prior to the height of the fire season.

6.2 Recent Performance on Outcome Metrics, Annual and Normalized for Weather, Last 5 Years

Table 2: Recent performance on outcome metrics, last 5 years – reference only, fill out attached spreadsheet to correct prior reports

In the attached spreadsheet document, report performance on the following metrics within the utility's service territory over the past five years as needed to correct previously-reported data. Where the utility does not collect its own data on a given metric, the utility shall work with the relevant state agencies to collect the relevant information for its service territory, and clearly identify the owner and dataset used to provide the response in "Comments" column.

Provide a list of all types of findings and number of findings per type, in total and in number of findings per circuit mile.

Table 2 includes PacifiCorp's recent performance on outcome metrics over the last 5 years.[17] As PacifiCorp's WMP and associated programs were developed in 2019, all data reported before 2019 represents the company's interpretation of historic data in light of current programs, risk mapping, and circuit topography.

As included in the following tables, PacifiCorp interprets a fire threat (risk) condition (table 2; metric 1.a) to be a discovered finding that could be interpreted to reflect an increased probability of ignitions; in

[17] The cause and origin of the Slater Fire remains under investigation. Accordingly, statistics related to the Slater Fire, which may or may not involve PacifiCorp electrical facilities, are not currently included in Table 2. If the Slater Fire is eventually determined to be a utility-ignited wildfire, PacifiCorp will update the 2020 figures in Table 2 in future data submissions.

company standards this attribute is designated as a Fire Risk Condition and is one which based on the inspection guidelines could be expected to pose a future fire risk if not corrected in a timely fashion.

As included in PacifiCorp's 2019 WMP[18] and further contemplated in the company's Data Collection for WMPs Report[19], PacifiCorp concluded that a circumstance where the potential exists for a fault creating a spark, which could result in the ignition of a fire if it lands in an adequate fuel bed, is considered a potential electric utility ignition event based on both the company's review of primary causes of fires in California and available CALFIRE data sets. PacifiCorp's outage records, which document the frequency, duration, and cause of outages experienced on energized circuits, represent the most accurate depiction of how often these potential ignitions may have occurred within the company's service territory. These records were applied using the methodology outlined in Figure 4.2-2: PacifiCorp's process to map ignition drivers to outage causes.

Since the approval of PacifiCorp's 2019 WMP, the company has developed additional data collection processes consistent with conditions of the approval, including the establishment of a Fire Incident Data Reporting process and wires down events, PacifiCorp has improved its data collection methods. These efforts have likely resulted in identifying more events that could be categorized as "fires potentially involving utility equipment" or "wires down," causing an increase event counts prior to its development in 2019. Prior years' data was reliant on interpretation of comments contained generally in outage records and was likely not a comprehensive listing of the more minor occurrences; noteworthy occurrences were captured through other company processes, such as claims management procedures.

As discussed above, when reviewing this data, as well as any other data included in this plan, it is critical to understand that PacifiCorp identifies, tracks, and reports inspection based on facilities[20] as opposed to line miles. Additionally, as discussed in Section 6.1, PacifiCorp cautions against drawing conclusions regarding annual trends when reviewing inspection and correction metrics as included in the document. Instead, PacifiCorp recommends using the full data set provided to calculate qualitative multi-year averages, identify the relative range of values that can be expected, and understand qualitative relative order of magnitude for comparison to other utilities.

6.3 DESCRIPTION OF ADDITIONAL METRICS

Table 3: List and description of additional metrics, last 5 years – reference only, fill out attached spreadsheet to correct prior reports

Instructions for Table 3: *In addition to the metrics specified above, list and describe all other metrics the utility uses to evaluate wildfire mitigation performance, the utility's performance on those metrics over the last five years, the units reported, the assumptions that underlie the use of those metrics, and how the performance reported could be validated by third parties outside the utility, such as analysts or academic researchers. Identified metrics must be of enough detail and scope to effectively inform the performance (i.e., reduction in ignition probability or wildfire consequence) of each preventive strategy and program*

[18] See Section III.D.2 at page 24 of the Initial 2019 WMP of PacifiCorp filed 2/6/2019 pursuant to Senate Bill 901, Rulemaking (R.)18-10-007.

[19] See PacifiCorp (U 901 E) Data Collection for Wildfire Mitigation Plans Report filed 7/30/19 pursuant to Senate Bill 901, and the California Public Utilities Commission Rulemaking (R.)18-10-007, Decision (D.)19-05-036.

[20] "Facilities" refers to a location where PacifiCorp has one or more assets installed. Usually, this would mean a pole or structure but could also be pad-mounted switchgear, a substation, or a switching station. These facilities are included in the GIS data requested in Section 2.7.

Provide a list of all types of findings and number of findings per type, in total and in number of findings per circuit mile.

In 2019, PacifiCorp proposed the addition of a series of metrics that were aligned to performance such that, as time passed, the metric results could be reasonably correlated to actions taken by the company in the execution of its WMP. Some of these additional metrics were included as part of the Standard Data Request, while others are more significantly different, but are reasonably correlated to better wildfire resilience of the utility equipment.

As noted in previous filings, PacifiCorp will make data available upon request to pertinent entities or individuals, such as universities or researchers including for validation purposes. PacifiCorp also includes progress reports regarding any WMP programs or initiatives on the company's public website. PacifiCorp viewed participation in regulatory proceedings, discovery requests, and workshops as opportunity to present data, engage third parties, solicit feedback, and, where appropriate, seek validation or make necessary changes to any program or initiative. This general approach has been applied to all metrics or data sets.

6.4 Detailed Information Supporting Outcome Metrics

Table 4: Fatalities due to utility wildfire mitigation initiatives, last 5 years – reference only, fill out attached spreadsheet to correct prior reports

Instructions for Table 4: *In the attached spreadsheet document, report numbers of fatalities attributed to any utility wildfire mitigation initiatives, as listed in the utility's previous or current WMP filings or otherwise, according to the type of activity in column one, and by the victim's relationship to the utility (i.e., full-time employee, contractor, of member of the general public), for each of the last five years as needed to correct previously-reported data. For fatalities caused by initiatives beyond these categories, add rows to specify accordingly. The relationship to the utility statuses of full-time employee, contractor, and member of public are mutually exclusive, such that no individual can be counted in more than one category, nor can any individual fatality be attributed to more than one initiative.*

There are no fatalities associated with utility wildfire mitigation initiatives over the prior five years, as shown in Table 4.

Table 5: OSHA-reportable injuries due to utility wildfire mitigation initiatives, last 5 years – reference only, fill out attached spreadsheet to correct prior reports

Instructions for Table 5: *In the attached spreadsheet document, report numbers of OSHA-reportable injuries attributed to any utility wildfire mitigation initiatives, as listed in the utility's previous or current WMP filings or otherwise, according to the type of activity in column one, and by the victim's relationship to the utility (i.e., full-time employee, contractor, of member of the general public), for each of the last five years as needed to correct previously-reported data. For members of the public, all injuries that meet OSHA-reportable standards of severity (i.e., injury or illness resulting in loss of consciousness or requiring medical treatment beyond first aid) shall be included, even if those incidents are not reported to OSHA due to the identity of the victims.*

For OSHA-reportable injuries caused by initiatives beyond these categories, add rows to specify accordingly. The victim identities listed are mutually exclusive, such that no individual victim can be

counted as more than one identity, nor can any individual OSHA-reportable injury be attributed to more than one activity.

PacifiCorp tracks all safety statistics including, but not limited to, accidental deaths, OSHA-reportable, or near misses. While the use of the term reportable OSHA events slightly mischaracterizes the information the company may have available to report upon such metrics the company has attempted to comply with the intent behind the data requested and provided it consistent with its understanding of such a classification. (Because PacifiCorp is early in its WMP implementation, certain historic safety statistics should not be misconstrued; specifically, wildfire mitigation initiatives, as currently defined, were not in place prior to 2019, and so OSHA reporting data from such period could appear understated.).

6.5 Mapping Recent, Modelled, and Baseline Conditions

Underlying data for recent conditions (over the last five years) of the utility service territory in a downloadable shapefile GIS format, following the schema provided in the spatial reporting schema attachment. All data is reported quarterly, this is a placeholder for quarterly spatial data.

Both confidential and non-confidential geodatabases are being submitted through the CPUC's Kiteworks system.

Further, PacifiCorp appreciates the willingness of the WSD to consider some of the logistical challenges it has worked through to provide GIS data. Since the company's last quarterly report filed on December 10, 2020, PacifiCorp has been working to make progress in its delivery of data consistent with the WSD GIS Data Schema requirements published by the WSD on February 4, 2021. Submission of PacifiCorp's data consistent with these specific requirements is expected to be on-going and requires a substantial amount of data extraction and translation to achieve. Therefore, much of PacifiCorp's initial efforts prior to the September 2020 update centered around the development of an architecture and framework to ensure consistent and sustainable delivery of the data as part of these on-going requirements. During the fourth quarter of 2020, PacifiCorp then focused on extracting and translating data currently available in GIS format to the new WMP data schema using this architecture and framework and, as a result, was able to deliver approximately 45% of the asset data in the requested format in the company's' December 2020 update consistent with other utilities who also delivered data in 2020. As indicated in the December 2020 update, PacifiCorp planned to move toward more complex datasets not currently in GIS format and, while the company anticipated making progress, cautioned that this progress could be slow and iterative.

PacifiCorp was able to meet some of these growth targets, namely in the areas of PSPS Event and Risk Event data sets by providing approximately 50% of the requested data in these respective focus areas. However, with the release of the updated GIS Data Schema requirements on February 2, 2021, PacifiCorp redirected some efforts to restructure existing processes to accommodate these new requirements and deferred the total planned growth of the data set until the May 2021 quarterly report. At the advice of the WSD, PacifiCorp's March 2020 quarterly update includes the GIS data previously submitted in December of 2020 augmented with the additional PSPS and Risk Event data consistent with the 2020 GIS Data Schema Requirements. Additionally, consistent with the Wildfire Safety Division (WSD) Geographic Information System (GIS) Data Reporting Requirements and Schema for California Electrical Corporations, PacifiCorp has prepared its WSD GIS Data Schema Report, which is provided as Attachment 2-2021 Utility GIS Data: WSD GIS Data Schema Status Report – March 2021.

PacifiCorp now plans to move toward more complex datasets, such as further evaluation of risk event, PSPS event data as well as initiative data such as inspections not currently in GIS format and, while the company anticipates making progress, cautions that this progress could be slow and iterative. Where significant effort and dedicated resources are required to develop and implement further data extraction and translation, PacifiCorp anticipates additional dialogue with the WSD regarding how compliance can be accomplished in the most efficient manner. Along the same lines, efforts focused to inventory assets or compile additional data will follow.

6.6 Recent Weather Patterns, Last 5 Years

Table 6: Weather patterns, last 5 years – reference only, fill out attached spreadsheet to correct prior reports

Instructions for Table 6: *In the attached spreadsheet document, report weather measurements based upon the duration and scope of NWS Red Flag Warnings, High wind warnings and upon proprietary Fire Potential Index (or other similar fire risk potential measure if used) for each year. Calculate and report 5-year historical average as needed to correct previously-reported data.*

Table 6 provides a five-year history, where applicable, of weather patterns as defined by the Guidelines. The shapefiles for the Red Flag Warnings (RFW) and High Wind Warnings (HWW) are obtained from the Iowa State University archive of NWS watches and warnings. The RFW circuit-mile days are based on all overhead distribution and transmission circuits that traverse through the NWS FWZ between 2015 and 2020. The overhead lengths of distribution and transmission circuits are calculated within each FWZ polygon (area divided geospatially into over approximately 1,000 space areas). All circuit lengths within that FWZ polygon are then multiplied by the number of days (or fraction of days) that a particular polygon had an RFW in effect.

The Guidelines require that PacifiCorp use RFW circuit mile days to normalize data required in other tables. PacifiCorp recommends the WSD consider using alternate methods to normalize. The company believes the year-to-year comparison with RFW circuit mile days as the normalizing method demonstrates the concern for this metric as a normalizing method. Several other utilities have suggested the use of the NFDRS, which all fire agencies use to determine daily fire danger risk, instead of RFW data. NFDRS is a system that allows fire managers to estimate today's or tomorrow's fire danger for a given area, and the fire danger ratings describe conditions that reflect the potential, over a large area, for a fire to ignite, spread, and require suppression action. PacifiCorp recommends that an assessment of state-wide normalizing methods be conducted in an objective and results-oriented manner to ensure accurate calibration for the expression of the risks over time. It would actively participate and stress test any potential normalizing metric to ensure its climatic risks comport with results in other parts of the state.

6.7 Recent and Projected Drivers of Ignition Probability

Table 7.1: Key recent and projected drivers of ignition probability, last 5 years and projections – reference only, fill out attached spreadsheet to correct prior reports

In the attached spreadsheet document, report recent drivers of ignition probability according to whether or not risk events of that type are tracked, the number of incidents per year (e.g., all instances of animal contact regardless of whether they caused an outage, an ignition, or neither), the rate at which those incidents (e.g., object contact, equipment failure, etc.) cause an ignition in the column, and the number of

ignitions that those incidents caused by category, for each of last five years as needed to correct previously-reported data.

Calculate and include 5-year historical averages. This requirement applies to all utilities, not only those required to submit annual ignition data. Any utility that does not have complete 2020 ignition data compiled by the WMP deadline shall indicate in the 2020 columns that said information is incomplete.

Table 7.1 provides a five-year history of risk events as defined by the Guidelines, using the cause category. PacifiCorp's outage records, which document the frequency, duration, and cause of outages experienced on energized circuits, represent the most accurate depiction of how often these potential ignitions may have occurred within the company's service territory. These records were applied using the methodology outlined in Figure 4.2-2: PacifiCorp's process to map ignition drivers to outage causes.

Since the approval of PacifiCorp's 2019 WMP, the company has developed additional data collection processes consistent with conditions of the approval, including the establishment of a Fire Incident Data Reporting process and wires down events, PacifiCorp has improved its data collection methods. These efforts have likely resulted in identifying more events that could be categorized as "fires potentially involving utility equipment" or "wires down", causing an increase event counts prior to its development in 2019. Prior years' data was reliant on interpretation of comments contained generally in outage records and was likely not a comprehensive listing of the more minor occurrences; noteworthy occurrences were captured through other company processes, such as claims management procedures.

In addition, the company differentiated this history via its designation of fire season and not fire season in supplemental Tables 7.1-fire season and 7.1 not fire season. It extrapolated future risk events based upon the trends it calculated, recognizing that until 2022 is compete, limited asset hardening will have taken place. The outage rates were forecasted out to 2022 using the historical average outage rates grouped by cause category and fiscal quarter over the previous five years. This is a rather conservative estimate which assumes a persistence of trends from historic outage rates. As we continue to complete and leverage our wildfire mitigation improvements, programs, and technologies, we contend the outage frequency will continue its downward trend. In certain areas the improving trends could be accelerated based on the findings on effectiveness of covered conductor in subsection 4.5.3.

Table 7.2: Key recent and projected drivers of ignition probability by HFTD status, last 5 years and projections – reference only, fill out attached spreadsheet to correct prior reports

Table 7.2 provides a five-year history of ignition events as defined by the Guidelines and company methodology described for table 7.1. The ignition history dataset is sparse, with over 70% of the data coming from years 2019 and 2020. This limited data set inhibits our forecasting of future ignition rates, and will take time to build confidence in our forecast. As a result, the projections for the future ignitions are left at zero as at this moment we are unable to asses any statistically defendable ignition frequency. Going forward we plan on performing correlation studies between gridded climate reanalysis data with ignition events, so that we may begin investigating the relationship between the two.

6.8 Baseline State of Equipment and Wildfire and PSPS Event Risk Reduction Rlans

6.8.1 Current Baseline State of Service Territory and Utility Equipment

Table 8: State of service territory and utility equipment – reference only, fill out attached spreadsheet to correct prior reports

Instructions for Table 8*: In the attached spreadsheet document, provide summary data for the current baseline state of HFTD and non-HFTD service territory in terms of circuit miles; overhead transmission lines, overhead distribution lines, substations, weather stations, and critical facilities located within the territory; and customers by type, located in urban versus rural versus highly rural areas and including the subset within the Wildland-Urban Interface (WUI) as needed to correct previously- reported data.*

The totals of the cells for each category of information (e.g., "circuit miles (including WUI and non-WUI)") would be equal to the overall service territory total (e.g., total circuit miles). For example, the total of number of customers in urban, rural, and highly rural areas of HFTD plus those in urban, rural, and highly rural areas of non-HFTD would equal the total number of customers of the entire service territory.

The baseline status of service territory and utility equipment was included in Table 8. The 2019 data provided in Table 8 mirrors Table 13 of the company's 2020 WMP. The 2020 data reflects a refresh to the 2019 data submitted in the 2020 WMP. Pre-2019 data was not able to be populated as this data pre-dates the requirement. However, for the purposes of this filing, 2019 values assumed to reflect the pre-2019 years. No substantial changes to the company's overall topology occurred during that time period. To ensure a complete data set could be provided, the 2019 values were submitted for all years 2015-2018

6.8.2 Additions, Removal, and Upgrade of Utility Equipment By End of 3-Year Plan Term

Table 9: Location of actual and planned utility equipment additions or removal year over year – reference only, fill out attached spreadsheet to correct prior reports

Instructions for Table 9: *In the attached spreadsheet document, input summary information of plans and actuals for additions or removals of utility equipment as needed to correct previously-reported data. Report net additions using positive numbers and net removals and undergrounding using negative numbers for circuit miles and numbers of substations. Report changes planned or actualized for that year – for example, if 10 net overhead circuit miles were added in 2020, then report "10" for 2020. If 20 net overhead circuit miles are planned for addition by 2022, with 15 being added by 2021 and 5 more added by 2022, then report "15" for 2022 and "5" for 2021. Do not report cumulative change across years. In this case, do not report "20" for 2022, but instead the number planned to be added for just that year, which is "5".*

Planned projects at the distribution level (4 kV to 34.5 kV) are derived from the regional distribution studies conducted approximately every five years as well as a complementary reliability analysis. These distribution studies include a review of historical system loading, an evaluation of projected systematic growth over a five year period, and a determination of the required system improvements to accommodate the projected load. Specific distribution system improvements may also be identified as required in customer requested system impact studies of large new load and large new generation facilities. There is one new substation being constructed in the HFTD (Tier 2) in 2022 that will utilize the

latest wildfire mitigation construction standards where applicable.

Local transmission follows a similar approach to that of distribution. Planned projects at the sub-transmission level (69 to 115 kV) are derived from the regional transmission studies conducted every three to five years, which project five years of systemic load growth and describe the consequentially required transmission system improvements in detail as well as discuss the general direction proposed for longer term transmission improvement plans. Similar to distribution projects, specific transmission system improvements may also be identified as required in customer requested system impact studies of large new load and large new generation facilities.

At the main grid transmission level (115 kV and above) planned projects are primarily derived from the transmission planning assessments performed every year in accordance with the North American Electric Reliability Corporation (NERC) Standard TPL-001-4 and Western Electricity Coordinating Council (WECC) Criterion TPL-001-WECC-CRT-3.1. This assessment is comprised of the steady-state, transient stability and short circuit studies that evaluate the performance of the Bulk Electric System over a wide range of system conditions throughout the 10-year planning horizon. When the analysis identifies an inability of the system to meet the required level of performance, a corrective action plan is developed to identify transmission system improvements necessary to resolve the identified system deficiencies and ensure compliance with NERC and WECC reliability standards.

As a result of these studies, one new transmission substation with corresponding overhead interconnection is planned for 2022 located within Tier II, non-WUI, rural area. The approximately 0.9 mile overhead interconnection is also located within a rural Tier II area but is split between the WUI and non-WUI areas. This project and corresponding breakdown were included in Table 9.

Table 10: Location of actual and planned utility infrastructure upgrades year over year – reference only, fill out attached spreadsheet to correct prior reports

Instructions for Table 10: *Referring to the program targets discussed above, report plans and actuals for hardening upgrades in detail in the attached spreadsheet document. Report in terms of number of circuit miles or stations to be upgraded for each year, assuming complete implementation of wildfire mitigation activities, for HFTD and non- HFTD service territory for circuit miles of overhead transmission lines, circuit miles of overhead distribution lines, circuit miles of overhead transmission lines located in Wildland-Urban Interface (WUI), circuit miles of overhead distribution lines in WUI, number of substations, number of substations in WUI, number of weather stations and number of weather stations in WUI as needed to correct previously-reported data.*

If updating previously-reported data, separately include a list of the hardening initiatives included in the calculations for the table.

Transmission lines refer to all lines at or above 65kV, and distribution lines refer to all lines below 65kV.

Table 10 includes the locations of planned utility infrastructure upgrades consistent with the grid hardening initiatives included in Section 7.3.3 and the table requirements. In the company's 2020 WMP, specific details were not available beyond the 2020 as the full scope of the three-year WMP had yet to be completed. However, detailed and location specific plans have now been included for years 2020-2022 where 2020 reflects actuals and 2021-2022 reflect planned upgrades. This data maps back to grid design and system hardening programs such as the installation of covered conductor, replacement of small

diameter copper conductor, installation of weather stations, and installation of system automation to facilitate advanced protection and control schemes.

As evident in the data, a significant portion of the company's hardening efforts focus on locations that fall within Tier II, Tier III, and the WUI consistent with the company's risk assessment and prioritization. As the company's risk model evolves, PacifiCorp anticipates slight changes and prioritization to grid hardening efforts could impact location specific activity planned in late 2021 and throughout 2022. However, the company does not anticipate significant changes to the overall scope through this period. The company notes, however, that its mitigation efforts may be more extensive than originally proposed, because updated risk modeling indicates that expansion of geographic areas with the potential for PSPS is justified. Consequently, additional grid design and system hardening mitigation efforts are also justified to help reduce risk in those areas and reduce the potential of PSPS in such areas.

7 MITIGATION INITIATIVES

7.1 WILDFIRE MITIGATION STRATEGY

Describe organization-wide wildfire mitigation strategy and goals for each of the following time periods, highlighting changes since the prior WMP report:

1. *By June 1 of current year*
2. *By Sept 1 of current year*
3. *Before the next Annual WMP Update*
4. *Within the next 3 years*
5. *Within the next 10 years*

The description of utility wildfire mitigation strategy shall:

a) *Discuss the utility's approach to determining how to manage wildfire risk (in terms of ignition probability and estimated wildfire consequence) as distinct from managing risks to safety and/or reliability. Describehow this determination is made both for (1) the types of activities needed and (2) the extent of those activities needed to mitigate these two different groups of risks. Describe to what degree the activities needed to manage wildfire risk may be incremental to those needed to address safety and/or reliability risks.*

b) *Include a summary of what major investments and implementation of wildfire mitigation initiatives achieved over the past year, any lessons learned, any changed circumstances for the 2020 WMP term (i.e.,2020-2022), and any corresponding adjustment in priorities for the upcoming plan term. Organize summaries of initiatives by the wildfire mitigation categories listed in Section 7.3.*

c) *List and describe all challenges associated with limited resources and how these challenges are expectedto evolve over the next 3 years.*

d) *Outline how the utility expects new technologies and innovations to impact the utility's strategy and implementation approach over the next 3 years, including the utility's program for integrating new technologies into the utility's grid. Include utility research listed above in Section 4.4.*

The following subsections include PacifiCorp's organization-wide wildfire mitigation strategy and goals for each of the following time periods.

7.1.1 BY JUNE 1 OF CURRENT YEAR

Situational Awareness and forecasting

- Ensure PacifiCorp's full weather station fleet is fully functional and integrated to promote the best situational awareness for the upcoming fire season
    - Complete calibration and integration of existing 12 weather stations;
    - Complete installation with calibration of an additional 9 new weather stations (2 RAWS and 7 microstations);
- Perform verification and validation of forecast vs actual fire weather data from 2020 to improve forwarding looking forecast;

Grid Design and system hardening

- Re-prioritize programs needed before the next fire season and annual update based on the evolution of risk modelling to ensure inclusion in the CY2022-2023 execution plan;

- Continued deployment of an RF network where appropriate to facilitate remote implementation of fire season settings on newly installed field reclosers;
- Complete the installation and commissioning of 16 system automation devices with advanced protection and control capabilities;
- Complete the installation and commissioning of advanced protection pilot at Weed substation (circuits 5G45 and 5G83) with mirrored bits (transfer/trip) protective coordination;

Asset management and inspections:

- Complete the CY2021 planned inspections within the HFTD;
- Complete transmission line IR inspections scheduled in Q2 targeting peak loading or near peak leading conditions;

Vegetation management and inspections:

- Complete incremental Tier III visual vegetation inspections within the HFTD;
- Continue piloting new electronic planning, mapping, and record keeping system regarding vegetation management within the HFTD;

Grid operations and protocols:

- Review existing operating protocols and ensure preparedness for 2021 fire season;
- Develop a plan to evaluate the impacts of newly installed alarm based high impedance fault detection during an entire fire season, with the intent leverage new data analytics and inform operating procedures and protocols;

Stakeholder cooperation and community engagement

- Improve internal and external customer and community facing forecast of PSPS status (website);
- Continue partnering with public safety partners in communities throughout California regarding wildfire and PSPS preparedness;

7.1.2 By September 1 of Current Year

PacifiCorp's wildfire mitigation strategy and goals to be accomplished before September 1 of the current year include:

Situational Awareness and forecasting:

- Collaborate with USFS and NFIS regarding value of additional RAWS stations to complement utility and fire professionals' situational awareness;
- Complete installation of additional 11 weather stations to meet the combined program target of 20 installations in 2021;
- Substantially advance the company's capabilities with regard to risk modelling and inform prioritization of work in 2022-2023;

Grid Design and system hardening:

- Plan corrective work identified through the pole loading infrastructure hardening program;

- Construct and commission 11 additional transmission and distribution system automation devices to meet the program target of 27 in 2021;
- Complete initial construction of an additional 8 transmission and distribution system automation devices for commissioning in early 2022;
- Nearing completion of approximately 81 miles of covered conductor installation;

Asset management and inspections:

- Plan corrective work identified through the pole loading infrastructure hardening program;
- Construct and commission 11 additional transmission and distribution system automation devices to meet the program target of 27 in 2021;
- Complete initial construction of an additional 8 transmission and distribution system automation devices for commissioning in early 2022;
- Nearing completion of approximately 81 miles of covered conductor installation;

Vegetation management and inspections

- Review 2021 fire season operating protocols and evaluate areas for improvement in 2022;
- Leverage data analytics to evaluate the impact of alarm based high impedance fault detection observed through the 2021 fire season

Grid operations and protocols:

- Review 2021 fire season operating protocols and evaluate areas for improvement in 2022;
- Leverage data analytics to evaluate the impact of alarm based high impedance fault detection observed through the 2021 fire season

Stakeholder cooperation and community engagement

- Continue improvements to internal and external customer and community facing forecast of PSPS status (website);
- Continue partnering with public safety partners in communities throughout California regarding wildfire and PSPS preparedness;

7.1.3 Before the Next Annual WMP Update

PacifiCorp's wildfire mitigation strategy and goals to be accomplished before the next annual update include:

Situational awareness and monitoring

- Complete installation of and integration of the aggregate 20 additional weather stations included in the 2021 plan and be on track to install 14 additional stations in 2022;

Grid Design and system hardening

- Complete the 2021 scope of work planned;
- Complete full detailed scope for specific programs in years CY2022 and CY2023 (if not yet completed);
- Be on track to deliver the CY2022 plan;

Asset management and inspections

- Complete the CY2021 planned inspections within California;
- Complete the CY2021 planned IR inspections and evaluate effectiveness;
- Review research project results and incorporate new techniques if appropriate;

Vegetation management and inspections

- Evaluate and, if applicable, be prepared to implement a new tree density inventory system targeted initially within the HFTD to inform risk assessment and prioritization of efforts;
- Evaluate for continued use the newly piloted electronic planning, mapping, and record keeping system regarding vegetation management within the HFTD;
- Establish longer term strategy/efficacy regarding the use of LiDAR as it pertains to vegetation management and inspections applications;

Grid operations and protocols

- Review existing operating protocols and ensure preparedness for 2022 fire season;
- Leverage RF network where available to facilitate remote implementation of fire season settings on newly installed field reclosers;
- Implement the final plan to leverage new high impedance fault detection capabilities and data analytics to inform operating procedures and protocols;

Stakeholder cooperation and community engagement:

- Continue applicable improvements to internal and external customer and community facing forecast of PSPS status (website);
- Continued alignment with regulatory requirements regarding customer identification, outreach and communication;
- Continue partnering with public safety partners in communities throughout California regarding wildfire and PSPS preparedness;

7.1.4 WITHIN THE NEXT 3 YEARS

PacifiCorp's wildfire mitigation strategy and goals to be accomplished within the next 3 years include:

Situational awareness and monitoring:

- Complete installation of all program weather stations and continue improvement of real time weather monitoring capability;
- Evaluate benefits and costs of distribution fault anticipation (DFA) technology in normal system operations;
- Full integration of the company's newly evolved risk model including elements to address climate change;

Grid Design and system hardening:

- Complete CY2020 – CY2022 system hardening program scope per Table 12 and additional work or scope developed in CY2023

- Evaluate the use of additional new technologies as it relates to grid design and system hardening programs;

Asset management and inspections:

- Complete annual scope of planned inspections in CY2021-CY2023 within California;
- Evaluate potential incorporation of risk assessment software solutions to inform asset management and inspections programs and augment existing risk based decision making framework;
- Memorialize findings regarding evaluation of potential line equipment maintenance programs as a result of research projects and, where appropriate, new programs into the long term asset management strategy;

Vegetation management and inspections:

- Evaluate overall workforce management strategies and structures to augment existing programs;
- If implemented, incorporate lessons learned though tree inventory system analytics to inform risk assessment and prioritization of efforts;
- Incorporate lessons learned from pilot project and fully implement new electronic planning, mapping, and record keeping system regarding vegetation management within the HFTD;

Grid operations and protocols:

- Review existing operating protocols and ensure preparedness for 2024 fire season;
- Expand capability of RF network to facilitate remote implementation of fire season settings on newly installed field reclosers;
- Validate effectiveness of high impedance fault detection in both day to day and extreme weather condition operations;

Stakeholder cooperation and community engagement:

- Continue applicable improvements to internal and external customer and community facing forecast of PSPS status (website);
- Continued alignment with regulatory requirements regarding customer identification, outreach and communication;
- Incorporate three years of data, enhanced real time weather monitoring capability, and system hardening progress to, where appropriate, evaluate PSPS methodology and protocols and potential reduce the potential scope or impact of PSPS events;
- Continue partnering with public safety partners in communities throughout California regarding wildfire and PSPS preparedness;

7.1.5 Continue Partnering with Public Safety Partners in Communities Throughout California Regarding Within the Next 10 Years

PacifiCorp's general goal within the next 10 years is to complete the work included in this plan to mitigate wildfire risk and continue the vigilance of discovery, technology, shared information and program improvements and further grow the programs in areas identified from data collection and analysis. At this time, it is challenging to set additional specific goals on a 10-year planning horizon, except to the

extent that certain programs can be delivered within the WMP term. However, as PacifiCorp progresses with program implementation and lessons learned are incorporated, the company anticipates firming up these longer-term goals in future updates to the plan. Specific target areas to improve capability include risk modelling coupled with situational awareness to inform both short term decision making and long-term planning, continued evaluation and incorporation of new technology to improve resilience, and overall reduction in PSPS impacts.

7.2 Wildfire Mitigation Plan implementation

Describe the processes and procedures the electrical corporation will use to do all the following:

A. *Monitor and audit the implementation of the plan. Include what is being audited, who conducts the audits, what type of data is being collected, and how the data undergoes quality assurance and quality control.*

PacifiCorp's WMP reflects a broad and thorough approach to wildfire mitigation proportional to the heightened risk and growing impact to communities in the company's California service territory. As a result, the plan contains many elements and touches nearly every department in the company, and, while the utilities have always needed to mitigate the potential for a wildfire sparked by an electric facility, this exhaustive approach reflects a new way for PacifiCorp to tackle this elevated risk.

As is true with any plan or program, monitoring and auditing the implementation of the plan is just as critical as the plan elements itself. PacifiCorp's WMP is not different. PacifiCorp uses a combination of company processes, tools, and physical site work to monitor program activities and individual departments have oversight and responsibility to deliver applicable portions of the plan. A few of these key areas include local operations management, emergency management, construction activity management, and non-construction program management such as inspections and maintenance.

The Emergency Management department is responsible for ensuring annual review of preparedness of on-going tasks and processes such as; Wildfire Prevention Practices for operational employees and PSPS processes. Part of this review includes the use of desktop exercises and after event reports for lessons learned that can inform and improve future plans as included and further described in Section 7.3.9.

To facilitate the implementation of PacifiCorp's WMP construction projects (generally reflected in the system hardening programs) a focused wildfire mitigation project management office has been established. It is the responsibility of this department to monitor all aspects of construction (engineering, permitting, standards, estimating, materials, and post audit quality assurance) to ensure the plan deliverables are achieved. PacifiCorp uses a combination of company processes, tools, and physical site work to monitor these activities. For example, coordination meetings are held weekly and costs and progress are tracked and monitored monthly to ensure adherence to plan. Additionally, internal engineering reviews all contracted design work as a type of audit and verification to ensure projects are being designed to deliver necessary scope and meet company and industry standards.

The non-construction aspects of the WMP are overseen by existing program offices such as Vegetation Management, Asset Management, and Customer Advocacy, etc. that will have the responsibility of collecting all pertinent information (inspection records, etc.) to ensure compliance. All collected data is maintained in the company's corporate enterprise systems. Details regarding program oversight and management are included in the detailed program elements.

While individual departments have auditing and monitoring capabilities for individual elements of the company's WMP, PacifiCorp has identified a gap that exists as the WMP lacks a clear plan and process to audit and monitor implementation as a collective plan. This gap has become more evident during plan implementation in 2020 due to both the increase in reporting requirements and frequency as well a heightened need for coordination between departments to ensure programs reflect the WMP's overall strategy and vision.

In 2021, PacifiCorp is evaluating methods it can employ to ensure greater structure within the PMO to ensure that proper delivery, monitoring and auditing practices are put in place.

B. Identify any deficiencies in the plan or the plan's implementation and correct those deficiencies.

Deficiencies in the plan are generally identified as a result of self-audits, after action reviews, and progress updates. As described above, each department generally has the capability to monitor and audit progress and identify deficiencies. For example, the Emergency Management department is responsible for conducting after action reviews which include, as a component, action items to close gaps encountered. Audits conducted following asset inspections include detailed reports on findings which are then incorporated into annual training for inspectors.

One area currently identified for improvement at PacifiCorp and identified by the WSD is data governance. PacifiCorp has been working diligently to make progress in its delivery of data consistent with the WSD GIS Data Schema requirements published by the WSD. To date, the company has been able to deliver a substantial portion of the asset data, PSPS event data, and risk event data in the format requested. PacifiCorp intends to reconfigure this data consistent with the newly established requirements and expand further to include initiative data such as inspections in the company's next quarterly filing, scheduled for May 9, 2021.

However, this effort requires the extraction and translation of non-spatial data into GIS format. Similar to monitoring and auditing the WMP, the evolution of the company's GIS data capabilities touches many departments throughout the company and requires an intense amount of input and coordination. While individual departments may have policies, processes, and procedures that determine how to manage key data for operations, PacifiCorp does not have a single, overarching data governance plan. However, the company recognized the need to develop a plan to close this gap, which will continue to be reported in quarterly updates.

C. Monitor and audit the effectiveness of inspections, including inspections performed by contractors, carried out under the plan and other applicable statutes and commission rules.

Therefore, the effectiveness of these programs at reducing operating risk as planned, which includes wildfire risk, relies upon the quality of the inspection itself as well as the proper characterization of any findings. PacifiCorp monitors and audits the effectiveness of inspections through its quality assurance and quality control program. This program generally includes desktop audits and field audits catered to identify gaps in the inspection programs, inspector capability, and corrective actions, thereby increasing inspection result accuracy and reliability. This accuracy and reliability are critical to ensure effectiveness and enable the planned risk reduction associated with the company's planned inspections.

To perform QA/QC of inspections, PacifiCorp utilizes a combination of process controls, software tools, company policy, and physical record checking to quickly identify inaccuracies for corrective action, evaluation, root cause analysis and system improvements. Engaging in these activities is a cost-effective

means to minimize the risk that inspection results are inaccurate or unreliable. Inspection results are reviewed continuously to confirm that inspections in the HFTD are meeting acceptable standards of performance.

The main components of this program, including enhancements to mitigate wildfire risk, are:

- Physical audits of at least 5% of planned inspections of facilities with a focus fire threats and Tier II and Tier III prioritization (885 physical field audits performed in 2020)
- Software controls which prohibit freeform condition assignment, allowing for result controls, minimizing the amount of human error possible
- A quarterly review of already audited results as a secondary check
- Annual training with inspectors to address audit findings and improve inspection reliability and accuracy

Additional details regarding these components, program management, spend, evolution, and new enhancements to reduce wildfire risk in recognition of PC-4 are included in Section 7.3.4.

D. Ensure that across audits, initiatives, monitoring, and identifying deficiencies, the utility will report in a format that matches across WMPs, Quarterly Reports, Quarterly Advice Letters, and annual compliance assessment.

PacifiCorp has taken the guidance provided by the WSD and attempted to reconcile its programs to legacy identifiers, as requested in prior updates. Where realignment of programs has occurred, the company has referred to the legacy identifier as well as the current identifier. This genealogy is still in the formative stages, but as the company and stakeholders evaluate its plan and become familiar with the programs, it is hoped that it becomes clearer how the programs are evolving and aligning with directions provided by stakeholders.

7.3 DETAILED WILDFIRE MITIGATION PROGRAMS

In this section, describe how the utility's specific programs and initiatives plan to execute the strategy set out in Section 7.1. The specific programs and initiatives are divided into 10 categories, with each providing a space for a narrative description of the utility's initiatives and a summary table for numeric input in the subsequent tables in this section. The initiatives are organized by the following categories provided in this section:

1. *Risk assessment and mapping*
2. *Situational awareness and forecasting*
3. *Grid design and system hardening*
4. *Asset management and inspections*
5. *Vegetation management and inspections*
6. *Grid operations and protocols*
7. *Data governance*
8. *Resource allocation methodology*
9. *Emergency planning and preparedness*
10. *Stakeholder cooperation and community engagement*

7.3.a Financial data on mitigation initiatives, by category

In the following section is a list of potential wildfire and PSPS mitigation activities which fit under the 10 categories listed above. While it is not necessary to have initiatives within all activities, all mitigation initiatives will fit into one or more of the activities listed below. Financial information—including actual / projected spend, spend per line-miles treated, and risk-spend-efficiency for activity by HFTD tier (all regions, non-HFTD, HFTD tier 2, HFTD tier 3) for all HFTD tiers which the activity has been or plans to be applied—is reported in the attached file quarterly. Report any updates to the financial data in the spreadsheet attached in Table 12.

7.3.b Detailed information on mitigation initiatives by category and activity

Report detailed information for each initiative activity in which spending was above $0 over the course of the current WMP cycle (2020-2022).

For each activity, organize details under the following headings:

1. ***Risk to be mitigated / problem to be addressed***
2. ***Initiative selection ("why" engage in activity)*** *– include reference to a risk informed analysis on empirical (or projected) impact of initiative in comparison to alternatives*
3. ***Region prioritization ("where" to engage activity)*** *– include reference to a risk informed analysis in allocation of initiative (e.g., veg clearance is done for trees tagged as "high-risk")*
4. ***Progress on initiative*** *(amount spent, regions covered) and plans for next year*
5. ***Future improvements to initiative***

List of initiative activities by category - Detailed definitions for each mitigation activity are provided in the appendix

7.3.1 Risk Assessment and Mapping

1. *Risk to be mitigated*

In Section 4.3 PacifiCorp explained its evolution toward a comprehensive risk modeling approach in which various inputs afford it the opportunity to evaluate a variety of fire risks in the context of its network overlaid on the appropriate land features; it also creates an extensible model for estimating the impacts of various mitigation measures on future fire risks. When it estimated the costs to develop such modeling it assumed proportionate cost estimates for each subcomponent of the modeling function, which led to repetition of the same cost estimate (a percentage of the labor costs for the data scientists and engineers developing these tools). As it unfolded that approach, it created a single modeling tool through its LRAM which addresses utility ignition, climate risks (historic, current and forecast), the impacts of fire spread and the consequences of PSPS. As result, it has consolidated all aspects of the risk assessment mapping into a new initiative ID, RA-1. RA-1 (which was previously identified as Initiative AH-3.1-3.4) serves as an enabling technology and foundational element upon which to rationalize the risks, costs and benefits for a variety of mitigation approaches designed to result in improvements in utility fire risk.

2. *Initiative selection*

In its review of PacifiCorp's application of established HFTD, WSD and other stakeholders criticized the lack of risk-spend efficiency methods underlying the identification and prioritization of mitigation

activities. The company heeded this feedback and took prompt action to begin building out its capability to model a variety of inputs to inform its risk identification on both a short-term and long-term basis. The company has previously reminded that its obligations through S-MAP and RAMP are not yet articulated (they are still under development in R.18-10-007, but in order to achieve the needed outcome with regard to moving its WMP forward it leapfrogged forward its risk modeling activities and will later integrate non-fire risk elements into the LRAM as necessary for alignment with the outcomes of this rulemaking.

3. *Region prioritization*

PacifiCorp designed the LRAM, in its enabling function, to be broadly extended throughout its electrical network. With regard to prioritization and validation of its model, it utilized a Tier 3 area, Tier 2 are subject to PSPS due to local climatology and a Non-Tier area.

4. Progress on initiative

The company has materially delivered Phase 1 of its LRAM.

5. *Future improvements to initiative*

The company outlined several areas in which it plans further development, including the incorporation of equipment/components and their ignition probability. It further intends to integrate various aspects of asset health and the inclusion of the 10 RAMP Elements that were part of the 2018 GRC from the company's risk-based decision-making framework. It further anticipates more direct and transparent cost quantification to support extensible RSE metrics.

7.3.2 Situational Awareness and Forecasting

7.3.2.1 Advanced weather monitoring and weather stations

1. Risk to be mitigated

A key component of fire risk mitigation revolves around knowing when, where, how and why to take abnormal action. With proper awareness, operational strategies can be employed that can reduce the probability that fault operations will result in utility ignitions; for instance, resetting reclosers to minimize test energizing after a fault is detected by the equipment. The first line of defense then, involves creating an understanding of the metrics that are key to recognizing the need to be on a higher level of awareness. Thus, mitigating the risk involves creating an understanding of when weather creates increased risk of wildfire. As outlined in Section 4.2 in the company's risk assessment, this is particularly important due to the bimodality of the fire risk environment in which the company's system exists. During late fall, early spring and winter periods (when there is heavy moisture, higher relative humidity, lowered temperatures and dried out fuels) the wildfire risk is reduced. However, during periods of elevated temperature accompanied with dryness, such risks increase. Thus, the company investigated the climate history of its service territory, established fire weather indicators appropriate for its territory and has begun the development of its weather network. PacifiCorp has not established a target density for weather stations but has identified areas where it has "blind spots" to weather phenomenon and as it uncovers these locations continues to infill within its territory. 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.

2. Initiative selection

PacifiCorp outlined in its September 9, 2020 Quarterly Reporting filing the process it had engaged to begin building out its weather network. Because of the importance of localized, real-time weather data to any PSPS program, PacifiCorp's main priority in 2019 was locating weather stations in and around defined proactive de-energization zones. PacifiCorp's service territory, especially its territory in the HFTD, is sparsely populated, and much of the area is state, federal and tribal lands. There is limited amount of developed infrastructure, including weather stations. Prior to the siting of PacifiCorp's 2019 station installations, only a handful of National Weather Station and National Interagency Fire Stations existed, and they weren't generally located proximate to the populations which would have been impacted by PSPS. As result, peppering those stations in the vicinity to support situational awareness for PSPS was deemed highest priority.

The company engaged REAX to provide input regarding the best placement of stations, considering topography and climate trends. After the target locations were established, PacifiCorp reviewed those locations with the National Weather Service office in Medford, Oregon (which supports Siskiyou County, California for much of its weather forecasting). All data collected by these stations is communicated into MesoWest (operated by the University of Utah), which aggregates all climate data and makes it publicly available, on a 10-minute refresh.

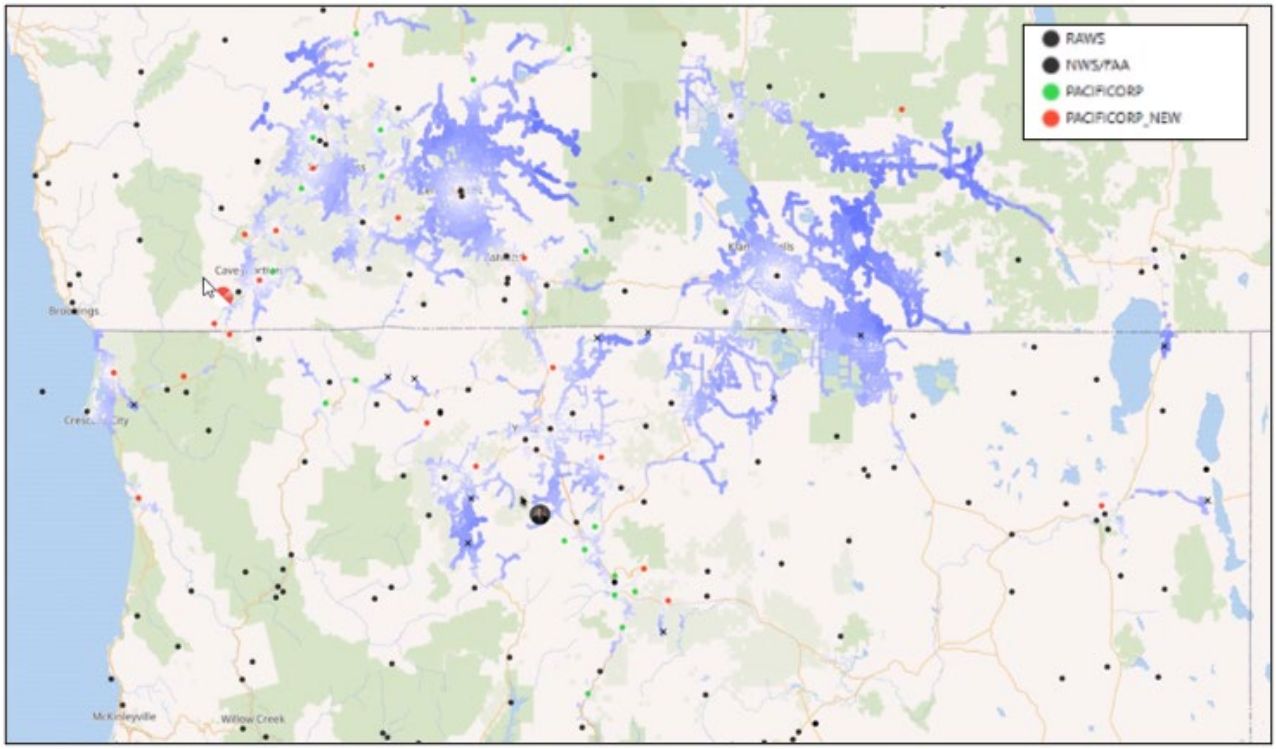
Going into 2020, PacifiCorp's perspective was very similar to comments expressed in PC-2, and PacifiCorp has focused on better coverage across its whole service territory and near populated communities bordering Tier 2 areas. PacifiCorp is expanding the system to establish a more macro understanding across its service territory, including outside the PSPS areas. PacifiCorp has continued to work with REAX to determine the most efficient locations. The analysis uses distance and elevation change from a particular circuit zone of protection to the closest weather stations in the area to determine locations reflecting data gaps. Thereafter, the company engaged weather experts, including those at the National Weather Service and participants of the Pyregence project, and fire response professionals, including at the Bureau of Land Management (BLM) and the National Interagency Fire Center, to consider the proposed locations. The company is also integrating the use of BLM's RAWS network (by installing 10 stations throughout California, Oregon and Washington) to provide information within its operational awareness rubric, in addition to informing the National Interagency Fire Council's understanding of weather inputs.

At the end of 2020, with substantial fires being experienced, the pace of weather station installations was slowed substantially, and recognizing many of the stations would be subject to winter weather risks of damage, the company held back those in more remote areas; their installations are planned in early spring, ready for the beginning of 2021 fire season. The location of those weather stations is shown below in Figure 7.3-1. As displayed in the map, the second phase of stations targeted Scott's Valley, Hornbrook and the greater Yreka operating area. Other population clusters near Tier 2 boundaries are addressed, including Alturas. The expansion of the weather station network is solely intended to expand PacifiCorp's general situational awareness, improve risk modeling efforts in those areas, and, as suggested by the WSD, develop a better understanding of how weather systems are moving across the entire territory. As the company evaluated the feedback regarding establishing cost-benefit analysis to support the expansion of its weather network, the company has been unable to device a means for quantifying the proper level of weather station density, however it plans to further this rationale.

3. Region prioritization

The company utilized its new LRAM model to identify areas where climate-driven fire risk and utility equipment risks resulted in elevated combined scores, after which it calculated distances to available weather stations, using elevation and absolute measurements to score those areas having risk but limited weather. It calibrated those locations using recently added meteorology talent to refine target locations.

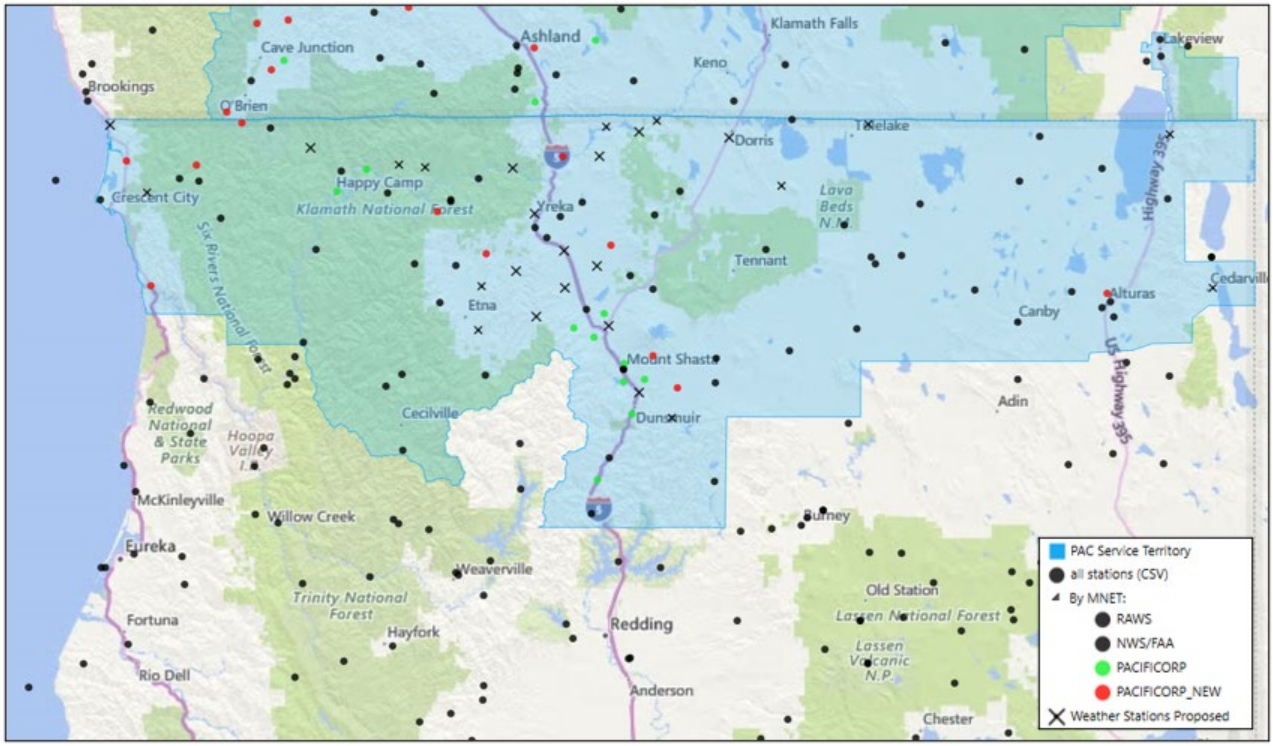
Figure 7.3-1: areas where climate-driven fire risk (shown by blue intensity) and utility equipment risks resulted in elevated combined scores.



4. <u>Progress on initiative</u>

PacifiCorp intends to complete the installations of the 2020 stations in addition to another 12 stations during 2021, complemented by another 14 stations in 2022. Their target locations in the California serviced territory are shown below, where an x marks the proposed location, the green shows the existing network and the red shows the most recent network additions.

Figure 7.3-1: Targeted locations for future weather stations



5. Future improvements to initiative

As the company's newly added meteorology manager gains an understanding of the steps taken to date, there are expected to be enhancements in the areas such as computing, data quantification and risk analysis and advancement of real-time metrics critical for operations and maintenance of the system, particularly during periods of elevated fire risk. Micro-stations cost approximately $13,000 capital and are estimated to require $1,500/year of OMAG, with an expected 10 year life, and RAWS stations are approximately two times the cost, the company hasn't yet established a target density for its network, but has established that as a needed step for the maturing of the program.

Continuous Monitoring Sensors (Distribution Fault Anticipation, SA-3)

DFA technology is intended to function as full-time wave form analysis sensing machine, using relays that continuously sample the wave form, comparing it against a library of potential event forms that are indicative of a circuit anomaly, and alerting when it detects such an abnormality. Previously the company had categorized this activity as part of grid modernization but is adopting SA-3 as its corrected initiative number. This project and its results are also being reporting in the company's pilot projects area, in Section 4.4.1, Pilot 1.

1. Risk to be mitigated

As discussed in Section 4.2.1, utility ignition risks are correlated with fault events. Fault events occur due to some form of contact, equipment failure or damage or other short circuit event occurring on the system. To the extent that continuous monitoring of waveforms enables the identification of an incipient condition, it allows the utility to act pre-emptively, avoiding the fault event.

2. Initiative selection

DFA equipment is intended to serve as a continuous inspection tool that applies machine-learning processes. While the company continues to look for opportunities to improve its inspection process there are situations which may not be visibly or detectable using some of the newly-adopted tools that are part of the enhanced inspection program at the time that the inspections are conducted. DFA is anticipated to fill in that full-time monitoring function that complements the role of routinely patrolled and inspected equipment.

3. Region prioritization

The company began development of a DFA pilot program in 2019 in which DFA devices are scheduled to be commissioned on two of the highest priority circuits in 2021. After assessment using the LRAM, these circuits still rise to the top in terms of fire risk and customer impacts, supporting the need to continue the assessment. In addition, as the opportunity arises to utilize this technology at locations, particularly those having high combined fire risk scores, with high customer impacts in the event of PSPS, where the substation equipment lends itself to placement of the DFA devices and where communication networks exist, the company would extend the application of this pilot technology. Such is the case at the soon to be installed Lassen substation, where two additional DFA devices will be placed coincident with the substation construction (which replaces the company's legacy Mt. Shasta substation).

4. Progress on initiative

PacifiCorp intends to complete the installation of DFA devices on two circuits out of Weed substation (5G45 and 5G83) and two additional circuits out of Lassen substation (5G77 and 5G79) during 2021 covering PacifiCorp's Weed and Mt. Shasta service areas. Based upon the experience at these locations additional substation circuits will be targeted.

5. Future improvements to initiative

The use of waveform analysis is under research development through the Department of Energy's Grid Modernization Lab Consortium efforts. As the company and Texas A&M continue to evaluate this technology and data mine legacy relay records such wave form libraries may serve as repositories that fuel further analysis for incipient faults. Reconciling these libraries and extending the use of this data will substantially alter how the industry is able to pre-emptively address the changing network health.

Fault Indicators for detecting faults on electric lines and equipment

Fault indicators are part of PacifiCorp's standard equipment and either installing new ones or augmenting additional locations is generally being incorporated into Grid Design and System Hardening, particularly as it relates to installation of relays having advanced detection and diagnosis capabilities.

1. Risk to be mitigated

As discussed in Section 4.2.1, utility ignition risks are correlated with fault events. Rapid fault detection and operation increases reliability for customers. Absent this capability system operators may be challenged to effectively and reliably operate the system.

2. Initiative selection

Fault indicators are generally installed in response to experienced fault events and may be more in need in areas where access is particularly challenging.

3. *Region prioritization*
Fault indicators are installed in more remote areas.

4. *Progress on initiative*
Continuation of a variety of fault detection approaches is part of the company's focus within the Grid Design and System Hardening area.

5. *Future improvements to initiative*
Continued exploration of the use of intelligent electric devices is part of the company's approach in Grid Design and System Hardening.

7.3.2.2 Forecast of a fire risk index

PacifiCorp hasn't developed plans to analyze the construct of a fire risk index. It explores risk analysis and fire climate indicators in 4.5.2.

7.3.2.3 Personnel monitoring areas of electric lines and equipment in elevated fire risk conditions

PacifiCorp trains and deploys personnel during periods of elevated fire risk, activating what it has called "watches" or "activations" depending on the extent to which fire climatology indicates elevated fire risk. These personnel perform readiness patrols, may modify system protection settings and monitor the network during the elevated fire risk period.

1. *Risk to be mitigated*
As discussed in Section 4.2.1, utility ignition risks are correlated with fault events. Fault events are more probable during periods of high wind. Coincidence of this with dry conditions can lead to ignitions that spread.

2. *Initiative selection*
Personnel being deployed in the manner described occur during periods of elevated climate risk in areas designated as having high fire risk (i.e. Tier 3, Tier 2).

3. *Region prioritization*
Prioritization has been focused on areas designated as high fire threat district. Application of the newly constructed combined fire scores at zones of protection will introduce additional areas to be considered.

4. *Progress on initiative*
Processes and personnel have become trained on the protocols. The emergency action center has established procedures for on-alert status to be recognized and activated.

5. *Future improvements to initiative*
As after actions are assessed improvements will be identified.

7.3.3 Grid Design and System Hardening

PacifiCorp'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, PacifiCorp is committed to incorporating new technology and engineered solutions. When conditions warrant, PacifiCorp may engage in strategic system hardening, which PacifiCorp interprets to mean replacement of existing assets (or, in some circumstances, modifying existing assets using a new design and additional equipment) to make the assets more resilient. Specific to PacifiCorp's 2020 Wildfire Risk Mitigation Plan, grid design and system hardening are the use of enhanced programs or non-standard designs to specifically manage the electrical distribution and transmission system in high fire threat geographic locations to mitigate wildfire risk.

PacifiCorp's wildfire mitigation system hardening programs are designed in reference to the equipment on the electrical network which could be involved in the ignition of a wildfire or could be suspect to a wildfire event, such as a brush fire, and, therefore, require greater resilience in design. 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 enhance resilience to survive a fire event. No single program mitigates all wildfire risk related to all types of equipment. Individual programs address different factors, different circumstances, and different geographic areas. For example, one program might specifically focus on reducing the potential of arcing between two lines. Another program, however, might involve a systematic reconstruction of an entire line in a particular geographic area of concern, including use of non-wood poles, to support restoration efforts. 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 and operate electrical facilities.

Examples of such programs which are covered in greater detail in this section include installation of non-standard covered conductor, installation of advanced protection, control, and isolation schemes, and use of non-standard pole material specifications and parameters such as fiberglass in place of wood. For each program requested, PacifiCorp focused on wildfire mitigation specific components or initiatives that required additional funding, development, or tracking. Where an existing program was deemed sufficient or where PacifiCorp did not have a wildfire mitigation specific program, notes were included.

7.3.3.1 Capacitor maintenance and replacement program

Capacitor maintenance and replacement is a key component of the company's detailed inspection of overhead distribution line program described in Section 7.9.4.1. Equipment deficiencies such as loose connections or fire risks such as leaks are identified during these inspections and corrective work is planned consistent with the assigned risk or priority level. For example, a capacitor actively leaking oil would be identified and corrected consistent with a Priority A (level 1) condition and reduce wildfire risk.

While this component of the company' detailed inspection of overhead distribution line program reduced wildfire risk, it is considered a standard program with no incremental funding and was included in the company's most recent General Rate Case. For more information, see Section 7.9.4.1.

7.3.3.2 Circuit breaker maintenance and installation to de-energize lines upon detecting a fault

Circuit breakers (or station reclosers functioning as breakers) are generally installed for all distribution circuits and transmission lines to detect fault current and protect equipment if a fault is detected. Circuit breakers are maintained under both the company's existing substation inspection and circuit breaker maintenance standard programs. Circuit breakers are visually inspected and may be identified for corrective work consistent with substation inspections described in Section 7.9.4.15. Additionally, circuit breaker minor and major maintenance activities are performed on either an annual or bi-annual basis

depending on type and operating voltage to facilitate proper operation and inherently reduce wildfire risk. These maintenance activities are important to facilities proper operation and may identify the need for correction maintenance or replacement based on a diagnosed condition. While PacifiCorp's circuit breaker maintenance program inherently reduces wildfire risk, it is considered a standard program with no incremental funding and was included in the company's most recent General Rate Case. However, to support the WSD's desire for increased granularity in data and reporting consistent with Guidance-5, the standard program spend and units were included in Table 12.

Conversely, as outlined in the company's 2018 GRC, PacifiCorp is proactively replacing any circuit breakers to accommodate the advance protection and control schemes, prioritized toward the high fire threat areas, as part of the augmented program described in Section 7.9.4.9.

7.3.3.3 Covered conductor installation

PacifiCorp currently engineers, constructs, and operates overhead conductor consistent with company standards which account for the necessary electrical loading as well as structural competence under standard operating conditions. However, as demonstrated in the risk assessment, overhead distribution conductor can be susceptible to incidental contact with foreign objects or phase to phase contact which, under certain conditions, can result in a fault scenario.

1. *Risk to be mitigated*

During fire season, these fault scenarios pose wildfire risk, because arcing associated with the fault could ignite a fire. During extreme weather scenarios this becomes particularly critical when considering when and where to implement a PSPS event. Therefore, PacifiCorp's covered conductor installation program seeks to retrofit existing distribution and local transmission lines in the highest risk locations and PSPS zones with more resilient technology such as covered conductor and spacer cable.

2. *Initiative Selection*

PacifiCorp's covered conductor installation includes deployment of the following main techniques:

Reconductor with Covered Conductor: Specialized overhead covered conductors can be constructed with additional shielding and enhanced insulating properties to aid in wildfire mitigation. Covered cable has less susceptibility to incidental contact with foreign objects such as branches or Mylar balloons. While insulated cable does not prevent incidental contact from occurring, it reduces the potential that incidental contact will result in a fault event, thereby reducing the wildfire risk. Therefore, PacifiCorp's program includes installing insulated cable on all single-phase overhead conductor circuits within the HFTD.

Spacer Cable Installation: As previously described, overhead three phase conductors can be susceptible to external factors, such as impact loads from tree branches which can result in phase to phase contact and a potential fault scenario. Spacer cable can be installed on multi-phase installations to provide additional resilience, hold the multiple phases apart, and reduce the probability that phase to phase contact can occur. Therefore, PacifiCorp's program includes installing spacer cable on multi-phase overhead conductor circuits within the HFTD.

PacifiCorp's covered conductor program includes all necessary components to install the preferred solution such as but not limited to engineering and design, material design and procurement, circuit

coordination review, hardware design and procurement, and construction/installation. This program also includes the construction and installation of spacer cable consistent with NESC requirements.

3. Region prioritization

This program extends over the full WMP term with initial efforts focused on engineering and program start-up and a general prioritization on PSPS designated areas to reduce risk and work toward eliminating the need for PSPS events. Furthermore, the prioritization of this program aligns with the evolution of the company's risk modeling to ensure efforts and spend target the highest risk areas first.

4. Progress on initiative

Progress has been reported in Table 12 of Attachment 1-2021 Performance Metrics Data Template. While not evident in the data provided in Table 12, significant efforts in 2020 focused on engineering and construction standards as well as procurement of materials should allow PacifiCorp to now ramp up construction quickly. Additionally, the detailed scoping efforts to finalize the yearly initiative elements, should support continued progress beyond 2021 as well as the detailed data requirements in Table 10.

5. Future improvements to initiative

At this time, PacifiCorp does not have firm plans to augment this initiative. Future changes to the initiative may come in the form or reprioritization and bundling of projects to better reflect the evolution of the company's risk modelling.

7.3.3.4 Covered conductor maintenance

See Section 7.9.4 which includes maintenance of overhead distribution and transmission lines. Covered conductor maintenance is included as a part of these maintenance programs.

7.3.3.5 Crossarm maintenance, repair, and replacement

See Section 7.9.4 which describes the maintenance of overhead distribution and transmission lines, including adjacent structures, facilities, and equipment. Crossarm maintenance, repair, and replacement is one element identified through these programs and the replacement component is tracked separately. While details on these maintenance programs can be found in Section 7.9.4, units and cost have been tracked and reported separately in Table 12 to support the WSD's to desire to disaggregate initiatives into programs and PacifiCorp's continued adherence to recommendations of Guidance-10.[21] For example, $272,000 was spent in 2020 replacing 136 crossarms at a unit cost of $2,000 per crossarm.

7.3.3.6 Distribution pole replacement and reinforcement, including with composite poles

As part of PacifiCorp's standard inspection and maintenance programs, poles may be identified for replacement or reinforcement within PacifiCorp'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

[21] See Section 4.6.

utility practice and considered safe with structural capacity to support overhead electrical facilities during standard operating conditions. However, alternate non-wooden construction such as fiberglass or fire wrapping can provide additional structural resilience during wildfire events and, therefore, aid in restoration efforts.

1. *Risk to be mitigated*

In addition to the installation of non-wooden solutions as a part of standard replacement programs or mechanisms, the proactive reinforcement of wooden poles and the accelerated replacement of wooden poles with non-wooden solutions within the HFTD can improve vintage diversity for adjacent pole loading, improve overall structural resilience, reduce wildfire risk, and support faster restoration efforts should a wildfire event happen.

Therefore, PacifiCorp's WMP pole replacement/reinforcement program seeks to identify and proactively address poles most likely to experience a brush fire or other wildfire event in locations that are challenging to access where restoration of electrical components can be lengthy, as well as locations adjacent to roadways where electric utility components, if not reinforced, have the potential to structurally fail during a wildfire event and block egress/ingress routes, delaying non-electric utility restoration activities. Different than many other wildfire mitigation techniques leveraged, PacifiCorp's WMP pole replacement/reinforcement program mitigates wildfire risk through a focus on restoration and control of a wildfire event as opposed to prevention of a spark. PacifiCorp's pole replacement/reinforcement program also includes both transmission and distribution poles.

2. *Initiative selection*

PacifiCorp included, as a component of the company's system hardening efforts, this proactive wooden pole replacement program in both the 2019 and 2020 WMP filings to contemplate proactive replacement or reinforcement of the company's wooden poles with more fire resilient materials. In the company's 2019 WMP, PacifiCorp proposed establishing criteria to assess certain structures at key locations for targeted transition from wood to steel or targeted reinforcement through the application of pole cladding/wrapping. While not specifically known at the time the 2019 WMP was filed, PacifiCorp proposed plan included addressing approximately 4,000 poles to promote greater resilience to wildfire events and support rapid restoration.[22] At this time, no specific breakdown was proposed regarding distribution and transmission poles but was notionally thought to be 60/40 respectively. Additionally, PacifiCorp also proposed developing internal engineering standards and specifications to facilitate the installation of non-standard wildfire risk reducing materials, such as steel or fiberglass poles.

When PacifiCorp began the development of these internal engineering and company standards in 2019, an assessment of optimum material specification was performed and, as a result, steel was determined to be not preferable due to lightning environment, strength reduction when in high heat environment and costs; rather fiber reinforced polymer (FRP) poles or fire wrapped poles.[23]

Therefore, PacifiCorp's 2020 WMP distribution and transmission pole replacement and reinforcement program included both the incorporation of new engineering fiberglass specification for new construction/installations within the HFTD as well as accelerated proactive

[22] See PacifiCorp's 2019 WMP at page 42.
[23] See PacifiCorp's 2020 WMP at page 89.

replacement/reinforcement of existing wooden structures within the HFTD outside of existing inspection and replacement program. PacifiCorp's 2020 WMP proposed accelerated replacement/reinforcement of approximately 4,000 poles and incorporated a 60/40 split between distribution and transmission poles.

PacifiCorp's 2020 WMP also included further development and expansion of the prioritization method referenced in the company's 2019 WMP for pole replacement/reinforcement of the 4,000 poles proposed, incorporating factors such as pole location topography, geographic wildfire tier designation, pole condition, composition, and type, age, and age diversity.

This methodology was developed and applied in 2020 to all wooden poles within Tier II and Tier III to further refine the scope of this program and, as a result, identified 4,326 specific high priority poles that require mitigation to either support ingress/egress or promote faster restoration during a wildfire event. High priority poles less than the average age of all wooden poles within Tier II or Tier III in California (less than 40 years old) were selected for reinforcement or wrapping. PacifiCorp has historically had success with pole cladding, wrapping and fireproof spray coating in advance when fires have threatened its equipment. Conversely, poles with an above average age (40 years or older) were selected for accelerated replacement by the company's preferred non-wooden solution for deployment within the HFTD, fiberglass. This approach intended to balance cost effectiveness to specifically target older poles for accelerated replacement to promote age diversity while simultaneously reducing risk of newer, younger poles. The following table describes the refined scope and update to PacifiCorp's proactive pole replacement program.

Table 7-1: PacifiCorp's 2021 WMP Pole Replacement/Reinforcement Refined Scope

Type of Poles	Total Poles to be Addressed by Program	Replace	Reinforce/ Wrap
Transmission (poles)	1,321	432	889
Distribution (poles)	3,005	1,632	1,373
Total (poles)	4,326	2,064	2,262

3. Region prioritization

Specific to the execution of this program, PacifiCorp first prioritizes pole replacement coincident to other planned programs or projects such as the installation of covered conductor to promote efficiency and fully mitigate the risk in these extreme risk locations. Beyond where coincident with other programs, PacifiCorp will seek to align prioritization of this program with the evolution of the company's risk model to identify where pole replacement should take place as a stand-alone project beyond CY2021.

4. Progress on Initiative

When originally proposed in 2019, PacifiCorp assumed that the program would heavily favor transmission pole replacement and assumed a 60/40 split. However, after applying the prioritization methodology developed to identify poles in hard to access locations to support restoration or adjacent to roadways to support ingress/egress, the program has shifted to focus on distribution pole replacement.

The table below reflects progress made in 2020 as well as planned work through the remaining 3-yr WMP term. Additional information can be found in Table 12 of Attachment 1-2021 Performance Metrics Data Template.

Table 7-2: PacifiCorp's 2021 WMP Pole Replacement/Reinforcement Revised Annual Scope

Year	Total Program	2019[24]	2020	2021	2022	2023[25]
Transmission (poles)	1,321	0	0	51	41	1,229
Distribution (poles)	3,005	0	29	77	231	2,668
Total (poles)	4,326	0	29	128	272	4,054

5. Future improvements to initiative

At this time, PacifiCorp does not have any firm plans to evolve or change this program. However, as the company's risk modeling efforts evolve, PacifiCorp anticipates that changes to the scope of phasing of this program are possible. The specifics of this program and scope may also be augmented as PacifiCorp accumulates additional experience in working with fire resilient materials.

Additional transmission poles are being assessed and potentially replaced as a part of PacifiCorp's pole loading infrastructure hardening and replacement program in Section 7.3.3.13.

7.3.3.7 Expulsion fuse replacement

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, PacifiCorp has identified alternate methodologies and equipment that do not expel an arc for installation within the HFTD.

PacifiCorp's overhead expulsion fuse replacement program includes incorporation of a new engineering standard to be applied to new construction projects throughout the HFTD as well as proactive replacement of existing in-service expulsion fuses along with other system hardening projects throughout the HFTD (such as covered conductor or pole replacements). The new engineering standard is complete and has been incorporated into new construction projects or expansion projects.

Replacement of in-service overhead expulsion fuses requires installation of new overhead equipment tend to not be isolated projects. As expulsion fuses coordinate with other devices on a given circuit, the scope required to replace an expulsion fuse can be quite large. Therefore, as opposed to initiating a separate program, PacifiCorp is incorporating this element into other system hardening programs to embrace maximum planning and spend efficiency (pole replacement, covered conductor replacement, advanced coordination, etc.).

PacifiCorp will continue to evaluate the need for an additional, stand-alone overhead expulsion fuse program should necessary fuse replacements not be sufficiently addressed through other programs. At that time, these fuses will most likely be evaluated and prioritized based on geographic location and

[24] 2019 efforts focused on development of engineering standard and detailed scoping.

[25] While not explicitly requested in supplemental tables, the 2023 scope was provided to provide context for the total program values.

overall wildfire risk (Tier 3/II/Zone 1 or the application of the company's new fire risk combined score) for replacement.

Additionally, radial pole clearing, as included in the company's 2019 WMP and expanded in the 2020 WMP, continues to be an alternative way to materially mitigate the same risk as expulsion fuse replacements. This supplemental vegetation management program helps mitigate the potential risk and impact of overhead expulsion fuses by reducing the available fuel at the base of the pole, along with similar risks from other overhead equipment, within the HFTD until alternate devices can be installed as a part of the broader programs.

7.3.3.8 Grid topology improvements to mitigate or reduce PSPS events

The totality of the company's wildfire mitigation programs include, as a component, improvements to mitigate or reduce PSPS events. Examples of such programs include the application of advanced protection schemes, installation of covered conductor, installation and operation of weather stations, or enhanced inspections and corrections. While the company's many wildfire mitigation programs are designed and focused to reduce the overall wildfire risk, PacifiCorp anticipates that, as these programs evolve, an additional benefit will be realized through the reduction of potential PSPS events.

However, PacifiCorp interprets the grid topology improvements to mitigate or reduce PSPS events to be specific program components which mitigate either the frequency, duration, or overall impact of PSPS events not included in other wildfire mitigation programs such as those noted above.

As many of PacifiCorp's points of delivery (customers) reside within the HFTD and PSPS zones, it is challenging to mitigate or reduce the entire existence of a PSPS event through grid topology improvements alone. Therefore, efficient and effective grid topology improvements mitigate or reduce PSPS events in the company's service territory to focus on augmentation or evaluation of existing circuitry as opposed to complete relocation of assets.

While PacifiCorp only implemented one PSPS event in the state of California during the 2020 fire season, PacifiCorp did monitor elevated risk conditions throughout the year and when required was vigilant while still retaining the processes and capacity to implement a PSPS event. During these time periods, PacifiCorp learned that the ability to efficiently and effectively implement a PSPS event within the company's service territory in a manner that keeps the impact to customers and communities as low as practical is about flexibility, system knowledge, and the capability to make informed decisions based on accurate information to task appropriate action in the moment.

As a result, PacifiCorp's grid topology improvements to mitigate or reduce PSPS events will focus on the evaluation of various scenarios within the company's pre-defined PSPS zones to understand what projects may be able to promote this flexibility and inform decision making. PacifiCorp anticipates that the planned asset hardening projects provide the system flexibility that as weather patterns and specific risks change the company will have the capability to implement reactive switching or isolation points during an event; minimizing customer impact.

While opportunity for additional equipment installations outside the other asset hardening programs may exist, PacifiCorp assumes these projects will be limited in scope and expenditure and will be considered on a case by case basis. At this time, no specific scope or budget has been set aside for this program.

7.3.3.9 Installation of system automation equipment

PacifiCorp interprets system automation equipment to mean all equipment, schemes, engineering, and processes to facilitate advanced detection and coordination on the company's distribution circuits. Previously it had outlined certain forms of automation equipment within the area of situational awareness (i.e. relays functioning as fault locators/detectors) however it has combined all such similar devices within this initiative area.

PacifiCorp's installation of system hardening wildfire mitigation program includes the deployment of distribution and transmission protection and control schemes and equipment, such as relays, circuit breakers, reclosers, and communications equipment, to enhance fault detection capabilities, reduce fault isolation time, improve fault location and record availability, and expedite restoration efforts. Currently, the scope of this program includes 68 projects throughout the HFTD over four years, with completion of

7.3.3.10 Maintenance, repair, and replacement of connecters, including hotline clamps

PacifiCorp does not currently have a specific grid design and system hardening wildfire mitigation program focused on maintenance, repair, and replacement of connectors, including hotline clamps. Replacement of connectors, where applicable, is included in other programs such as installation of covered conductor.

7.3.3.11 Mitigation of impact on customers and other residents affected during PSPS event

PacifiCorp does not currently have an additional grid design and system hardening wildfire mitigation program focused on mitigation of impact on customers and other residents affected during PSPS event outside of the initiatives described in Section 5.3.3.8.

Both of these programs are combined as relevant grid topology improvements pertaining to grid design and system hardening that reduce PSPS events inherently also mitigate the impact on customers. Furthermore, PacifiCorp's additional programs or efforts to mitigate the impact on customers and other residents affected during a PSPS event are described in Section 4.4 and Section 5.6.2.

7.3.3.12 Other corrective action

PacifiCorp's other correction action initiative is also known as the small diameter conductor replacement initiative.

1. *Risk to be mitigated*

Small diameter copper and iron conductors coordinate with devices and line equipment under normal operating conditions and standard protection and control schemes to identify and isolate faults. However, this small diameter conductor is often not able to be compatible with the upstream fusing and relay settings required for fault detection programs, in particular those contemplated in sections of PacifiCorp's plan, creating an arc energy risk under fault conditions. Specifically, under certain fault conditions, the small diameter conductor with fail before the protection scheme is able to operate. As PacifiCorp's advanced fault detection programs reduce wildfire risk, the company's small diameter copper and iron conductor replacement program is viewed as a necessary element of these programs, thereby reducing wildfire risk.

2. *Initiative selection*

The scope of this program includes the replacement of small diameter copper and iron conductors of distribution voltage throughout PacifiCorp's California service territory with aluminum stranded conductor.

3. *Regional prioritization*

Replacement of this small diameter conductor can happen alongside verification of protection control systems (as modeled in the company's probability arc energy methods, described in Section 4.5.2) or installation of system automation equipment to facilitate advanced protection and control schemes or coincident to installation of covered conductor. While critical to reducing wildfire risk, these stand-alone projects are generally located in lower fire risk locations when compared to those of other programs such as covered conductor installation that specifically targets PSPS zones. Therefore, these projects are assigned a lower priority and are not targeted for construction until 2022 and later except where coincident with other programs as describes above.

4. *Progress on initiative*

A high-level summary of the program scope is included below of the both the planned replacements coincident with other projects such as the installation of covered conductor as well as standalone projects not coincident with other line-miles or reconductoring. Specifically, 3.78 and 2.54 miles of coincident work occurs in 2021 and 2022 and 100 miles are proposed for evaluation as stand-alone replacements in 2023 and beyond.

Table 7-3: Small Diameter Conductor Replacement

Component	Total Program	2019	2020	2021	2022	2023
Distribution (line-miles)	106.43	0	0	3.78	2.65	100[26]

Additional details regarding progress can also be found in Table 12 of Attachment 1-2021 Performance Metrics Data Template

[26] Approximation of scope to be refined/evaluated in 2022 for potential execution beginning in 2023 as stand alone work.

5. Future improvements to initiative

As this program evolves, PacifiCorp anticipates continuing to evaluate lower ampacity conductors for coordination risk. As previously indicated, at this time, approximately 100 line-miles have currently been identified for evaluation in 2022 and potential replacement beginning in 2023 as stand-alone projects.

7.3.3.13 Pole loading infrastructure hardening and replacement program based on pole loading assessment program

Over the years, transmission construction and design standards have evolved to reflect improvements in both engineering and modeling, resulting in higher strength and more robust installations. However, as standards evolved, lines are not necessarily rebuilt or replaced until the condition warrants a rebuild or replacement, typically diagnosed proactively during an inspection or performed reactively as a result of equipment mis-operation.

1. Risk to be mitigated

As an expected result, the potential exists for older installations to not meet 2021 design and strength standards. Less than adequate strength margins pose wildfire risk as these lines may become susceptible to extreme weather events. However, modelling and evaluating the strength of older installations can prove challenging as modern datasets such as exact pole height, diameter, lean, and attachment height and characteristics, may not be available.

2. Initiative selection

LiDAR data collection, which allows for highly accurate 3- Dimensional (3D) depictions of pole assets, can be used to supplant existing models and assumptions to identify real time pole loading concerns of poles already in-service. This enhanced analysis can also be used to recommend, and schedule prioritized corrective work such as pole or insulator replacements and pole reinforcement. The specific objectives of PacifiCorp's pole loading LiDAR pilot project in CA were to:

- Identify any transmission poles at risk for structural integrity and recommend corrective action;
- Determine what improvements or accuracy can be made to structural modeling through the collection of LiDAR data;
- Observe differences between CA Heavy (installations > 3000ft elevation) and CA Light (installation < 3000ft elevation) Structural Modeling Cases; and
- Inform additional program funding or risk assessment of other transmission lines.

3. Regional prioritization

Therefore, in recognition of the growing wildfire risk, PacifiCorp has piloted the use of LiDAR to create structural models to calculate pole leading capacity on a subset of the company's transmission lines, namely 4 miles of 1978 vintage line and 19 miles of a 1920/1950 vintage line.

4. Progress on initiative

Regarding objective number one, to date, LiDAR data has been collected and analyzed on a total of 23 transmission line miles in CA to determine the effective remaining strength. PacifiCorp observed positive results through improved identification of poles with pole loading concerns and corrective action to address 134 high priority pole locations is currently being planned. At this time, the detailed correction at each location, which may include pole replacement or reinforcement depending on the nature of the reduced strength, has yet to be completed. Additionally, many of these locations are

coincident to other hardening programs and efforts which may require a change to correction scope. Regardless, PacifiCorp intends to complete this detailed scope, plan, and complete corrective action in 2021/2022. See Table 10 in Attachment 1-2021 Performance Metrics Data Template for more information.

5. Future improvements to initiative

Additionally, PacifiCorp intends to evaluate objectives 2-3 in 2021 to evaluate and quantify program benefits and inform program expansion and funding beyond the pilot project phase. The company anticipates providing a more detailed update in future filings as work on the pilot project progresses. More information can also be found in Section 4.4.

7.3.3.14 Transformers maintenance and replacement

Similar to capacitor maintenance, overhead transformer maintenance and replacement is a key component of the company's detailed inspection of overhead distribution line program described in Section 7.9.4.1. Equipment deficiencies such as loose connections or fire risks such as leaks are identified during these inspections and corrective work is planned consistent with the assigned risk or priority level. For example, a transformer actively leaking oil would be identified and corrected consistent with a Priority A level condition and reduce wildfire risk.

While this component of the company' detailed inspection of overhead distribution line program reduces wildfire risk, it is considered a standard program with no incremental funding and was included in the company's most recent General Rate Case. For more information, see Section 7.9.4.1.

7.3.3.15 Transmission tower maintenance and replacement

Transmission tower maintenance and replacement is considered a part of PacifiCorp's asset management and inspections program, specifically the company's detailed inspections of overhead transmission lines described in Section 7.9.4.2.

7.3.3.16 Undergrounding of electric lines and/or equipment

PacifiCorp recognizes that value may exist in installation of underground electrical equipment. However, in PacifiCorp's experience, undergrounding of electric utility lines tends to be less economical as compared to the installation of overhead electric lines, including the installation of covered conductor. Therefore, at this time, PacifiCorp does not have any grid design and system hardening wildfire mitigation programs specifically focused on undergrounding of electric lines and/or equipment. It will continue to consider this as an option as it works with communities to identify locations where that approach is an effective mitigation for the more significant cost that is estimated.

7.3.3.17 Updates to grid topology to minimize risk of ignition in HFTDs

At this time, PacifiCorp does not have any specific grid design and system hardening wildfire mitigation programs focus on updates to grid topology to minimize risk of ignition in HFTDs. PacifiCorp recognizes that, as weather patterns change and overall modeling and assessments evolve, updates to grid topology is something to continue to evaluate.

Other grid design and system hardening programs include, as a component, grid topology improvements to minimize the risk of ignition in the HFTD. Similar to the company's grid topology improvement to mitigate or reduce PSPS events described in Section 5.3.3.8, PacifiCorp recognizes that it is challenging to mitigate wildfire risk through grid topology changes alone. Therefore, PacifiCorp focuses more on augmentation of existing circuitry through system hardening efforts included throughout Section 5.3.3.

7.3.4 ASSET MANAGEMENT AND INSPECTIONS

PacifiCorp maintains its system and assets consistent with the California General Orders through a range of inspection and maintenance programs. Generally, these programs focus on inspection and correction of overhead energized electric lines, but also extend to intrusive pole testing, substation inspections, and pilot projects to deploy enhanced or alternate diagnostic technology. While the specifics of each asset management and inspection program may be unique, certain themes, namely the risk to be mitigated, the rationale for initiative selection, and regional prioritization, progress, and future improvements are common throughout. In support of the WSD's desire to avoid using equivocating language and reduce repetitive language and discussion, these common themes are specifically discussed below.

1. *Risk to be mitigated*

PacifiCorp's asset management and inspection programs Inspection and correction programs are tailored to identify conditions that could result in premature equipment 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. More specifically, these programs are designed to mitigate the risk associated with equipment mis-operation and failure as well as the susceptibility and vulnerability of the infrastructure to external factors. These programs align with GO95, GO165, and GO 174 and, in certain instances, exceed the regulatory requirements.

2. *Initiative selection*

With the exception of initiatives that exceed regulatory requirements, PacifiCorp's asset management and inspections initiatives are selected to align with GO95, GO165, and GO174 and are often considered standard operations which evolve with the applicable regulation. PacifiCorp's enhanced inspection program, which exceeds regulatory requirements, is discussed in more detail in Section 7.3.4.5.

3. *Region prioritization*

As PacifiCorp's asset management and inspections initiatives are aligned with regulatory requirements and are cyclic, where the scope of each program is required to comply with regulation and is spread across a given inspection or maintenance cycle. For example, the company performs a detailed inspection of overhead distribution facilities on a 5-year cycle. To accomplish this cycle, a portion of the company's overhead distribution facilities are inspected each year to level load resources and manage work. The annual scope of work is also required to ensure alignment with proscribed cycles. Given this compliance related requirements to perform the work, no prioritization is applied at the initiative level. However, within each initiative, prioritization to accomplish the year's require scope is often applied to facilities to preference locations within high risk regions, namely PSPS zones, during certain intervals. For example, the company targets completion of its planned work within PSPS regions prior to the beginning of fire season each year. The scope and phasing of the company's enhanced inspection program is included in Section 7.3.4.5.

4. Progress on initiative

PacifiCorp has included initiative specific progress and spending in Table 12 of Attachment 1-2021 Performance Metrics Data Template. PacifiCorp has fully incorporated the new wildfire mitigation elements into the company's asset management and inspections programs consistent with new regulation. Additionally, high level findings and trends, where applicable, have been included in the detailed subsection for each initiative.

5. Future improvements to initiative

PacifiCorp anticipates that as the research and pilot projects discussed in Section 4.4 progress, existing asset management and inspection programs may be augmented to incorporate lessons learned and, potentially, new techniques. However, PacifiCorp does not have any firm plans at this time.

In addition to the common themes described above, certain elements and protocols are also consistent throughout PaciCorp's asset management and inspection programs and, to provide context, are discussed below.

Utilities protocols relating to maintenance or any electric lines that could directly, or indirectly relate to wildfire ignition

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.

PacifiCorp performs inspections on a routine basis as dictated by both state specific regulatory requirements and company-specific policies. When an inspection is performed on a PacifiCorp asset, inspectors use a predetermined list of condition codes (defined below) and priority levels (defined below) to describe any noteworthy observations or potential non-compliance discovered during the inspection. Once recorded, the company 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 such as California General Orders, and/or company specific policies. This process is designed to correct conditions while reducing impact to normal operations.

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

- **Detailed Inspection** – a careful visual inspections 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 such as California General Orders, nonconformance with PacifiCorp construction standards, infringement by other utilities or individuals, defects, potential safety hazards, and deterioration of the facilities which need to be corrected in order to maintain reliable and safe service.
- **Pole Test & Treat** – an inspection of wood poles to identify decay, wear, or woodpecker damage, which may include pole-sounding, inspection hole drilling, and excavation tests to assess the pole condition and identify the need for any treatment, repair, or replacement.
- **Patrol / 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.

- **Enhanced Visual Inspection** – Visual Assurance Inspection paired with additional data collection such as infrared, ultraviolet, or LiDAR technology to further evaluate and categorize the current status of electric utility assets and inform the need for a prioritization of corrective actions.
- **Condition** – The state of something with regard to appearance, quality, or working order which 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, categorize, 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:
  - Priority A – Risk of high potential impact to safety or reliability which includes, as a subset, imminent threats equivalent to Level 1 conditions;
  - Priority B – Any other risk of at least moderate potential impact to safety or reliability, equivalent to Level 2 conditions;
  - Priority C – Any other risk of at least low potential impact to safety or reliability, equivalent to Level 3 conditions;

PacifiCorp'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 PacifiCorp asset management and reflect both industry best practices and state specific requirements. In general, Visual Assurance Inspections are conducted more frequently, to quickly identify any obvious damage or defects which could affect safety or reliability, and Detailed Inspections are performed less frequently as detailed inspections are more thorough or intrusive. The frequency of Pole Test & Treat is typically dictated based on state specific requirements and, where applicable, is conducted in conjunction with certain Detailed Inspections.

Regardless of the type of inspection, the inspector conducting the inspection will notate any Conditions and assign a Condition Code and Priority Level in PacifiCorp's Facility Point Inspection (FPI) system. Corrections are then scheduled and completed within the correction timeframes established by PacifiCorp asset management, which typical reflect industry best practices or state specific requirements. In all cases, the timeline for Corrections takes into account the Priority Level of any identified Condition. Not surprisingly, a Priority A Condition is addressed on a much shorter timeframe than a Priority B Condition.

Wildfire Mitigation Inspection and Correction Program Enhancements – Fully Implemented

While PacifiCorp's traditional inspection and correction programs maintain regulatory compliance and manage routine operational risk; they also mitigate wildfire risk by identifying and correcting Conditions which, if uncorrected, could ignite a fire. Nonetheless, recognizing the growing risk of wildfire and recent changes to California General Orders, PacifiCorp designed and incorporated additional elements to supplement the company's standard inspection and correction programs, mitigate the growing wildfire specific operational risks, and create greater resiliency against wildfires. These elements were developed in 2018, fully implemented in 2019, and are now considered part of the company's standard operations.

There are four primary elements to these improvements now considered standard operation: (1) creating a fire risk Condition Code; (2) increasing inspection frequencies in Fire High Consequence Areas; (3)

narrowing Correction timeframes for Fire Risk Conditions; and (4) piloting new technologies to facilitate Enhanced Inspections.

Fire Risk Conditions

PacifiCorp currently designates certain Conditions as "Fire Risk Conditions." Each Condition is still assigned a Condition Code (i.e. CONDFRAY for a damaged or frayed primary conductor) – but certain Condition Codes are categorically designated as a Fire Risk Condition. Accordingly, if a Condition is designated under a particular Condition Code associated as a fire risk, the Condition will also be designated as a Fire Risk 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 Risk 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 Risk 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 Risk Condition.

Inspection Frequency

Consistent with California General Order 165 and California General Order 95, PacifiCorp increased the frequency of all three inspections types for assets located in Tier 2 and Tier 3 of the HFTD. Consistent with industry best practices, inspections are PacifiCorp's preferred mechanism to identify Conditions, including those considered to be Fire Risk Conditions. Therefore, an increase in the frequency of inspections should result in more timely identification of potential Fire Risk Conditions.

Table 7-4: Relevant wildfire mitigation inspection frequencies are included in the table below

Asset Classification	Inspection Name	Minimum Frequency
Main Grid Transmission	Safety/Visual Assurance	Every year
	Detailed Inspection	Every 2 years
	Detailed / Pole Test and Treat	Every 10 years
OH Local Transmission	Safety/Visual Assurance	Every year
	Detailed Inspection	Every 5 years
	Detailed / Pole Test and Treat	Every 10 years
OH Distribution	Safety/Visual Assurance	Tier 2 & 3 - Every year Non-Tier - Every 2 years
	Detailed Inspection	Every 5 years
	Detailed / Pole Test and Treat	Every 20 years

Correction Timeframe

Reducing the time allowed for Correction of Fire Risk Conditions, as identified through regular inspections, results in reduced exposure to the wildfire risk. PacifiCorp uses a state specific approach to determine an appropriate scope and timeframe for Corrections of Conditions, including Fire Risk

Conditions. These timeframes reflect a balance between local operation risk from wildfire threats and prudent utility practice. Fire Risk Conditions identified within Tier 2 and Tier 3 within the HFTD are assigned a higher risk level than those outside of the HFTD, and, therefore, are corrected within a shorter timeframe to reduce operational risk. Wildfire mitigation related correction timeframes are consistent with CA GO 95 Rule 18A and are included in the table below:

Table 7-5: Wildfire mitigation related correction timeframes

Priority	Location	Correction Timeframe
A - imminent	Any	Immediately
A	Any	30 days
B	Tier 3	6 months
	Tier 2	12 months
	Non-tier	36 months
B-worker safety	Any	12 months
C	Any[27]	5 years

Piloting New Technologies to Facilitate Enhanced Inspections

PacifiCorp also pilots new technology such as IR that facilitates additional data collection to supplement existing programs and facilitate enhanced inspections. Pilot projects that demonstrate value grow into separate enhanced inspection programs. One example of which is the IR inspection of transmission lines and equipment described in Section 7.3.4.8. Other emerging research projects are described in Section 4.4.

7.3.4.1 Detailed inspections of overhead distribution electric lines and equipment

PacifiCorp's detailed inspection program includes 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 such as California General Orders, nonconformance with PacifiCorp construction standards, infringement by other utilities or individuals, defects, potential safety hazards, and deterioration of the facilities which need to be corrected in order to maintain reliable and safe service. During a given calendar year, PacifiCorp prioritizes inspections of facilities located within the HFTD to occur earlier in the year, specifically Tier 3.

During an inspection, an inspector will document any potential violations or noteworthy observations including potential fire threats, by assigning a Condition Code and Priority Level in PacifiCorp's system of record. The Priority Levels are assigned to align with GO 95, Rule 18, and the conditions codes are specifically designed to categorically pre-determine fire threat conditions as well as other types of conditions. In a typical year, PacifiCorp performs approximately 13,000 detailed inspections of electric distribution facilities and identifies approximately 7,000 conditions that require corrective action. The top

[27] PacifiCorp defines a Fire Risk Condition as having at least moderate potential impact to safety or reliability and, as a result, only assigns a condition code priority of A or B to this subset of Conditions. Therefore, accelerated correction timeframes for Fire Risk Conditions which include specific rules based on geographic wildfire risk location cannot apply to C conditions.

five types of corrective actions required as a result of detailed inspections of distribution electric lines and equipment in 2020 were:

Table 7-6: The top five types of corrective actions required as a result of detailed inspections of distribution electric lines and equipment in 2020

Condition- Description	Fire Risk Condition?	Type of Corrective Action	Quantity (2020)	% of identified in 2020[28]
GO95MLD - MOLDING BROKEN, MISSING OR LOOSE	No; safety condition	Fully Attach or Replace Molding	2,146	27%
GO95HV - HIGH VOLTAGE SIGN MISSING	No; safety condition	Install HV sign	1,312	17%
SVCDEFLC - SERVICE WIRE DEFLECTED OR ABRADED BY VEGETATION (conductor and insulation remain intact)	No[29]; reliability	Clear vegetation; install mucket or guard	587	7%
BIRDDMG – WOODPECKER OR NEST IN PRIMARY	No[30]; reliability	Evaluate for nest's impact to pole strength; pole replacement/repair	554	7%
GO95TCH - GO95-NEED 3" GAP SVC TO POLE/XARM	Yes, if conductor's insulation may be compromised	Create needed clearance	546	7%

PacifiCorp's detailed inspections of distribution electric lines and equipment is a critical program required to maintain regulatory compliance with California General Order 165 and 95. However, the presence of conditions identified during an inspection demonstrates that this standard program provides value beyond strictly maintaining compliance. Table 1 in Attachment 2.3 includes a more extensive breakdown of conditions identified and effectiveness.

7.3.4.2 Detailed inspections of overhead transmission electric lines and equipment

PacifiCorp's detailed inspection program includes 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 such as California General Orders, nonconformance with PacifiCorp construction standards, infringement by other utilities or individuals, defects, potential safety hazards, and deterioration of the facilities which need to be corrected in order to maintain reliable and safe service.

During a given calendar year, PacifiCorp prioritizes inspections of facilities located within the HFTD to occur earlier in the year, specifically Tier 3. While all required inspections are completed within the prescribed cycle, the intent of this prioritization is to inspect facilities located in the highest fire threat areas prior to fire season where the risk is the greatest.

[28] Reflects the percentage of all findings as a result of detailed inspections of overhead distribution lines in CA in 2020.
[29] If conductor is abraded sufficiently that insulation is compromised, an alternative condition is used which would be a fire risk.
[30] If damage is significant enough to compromise structural integrity, an alternate condition is used which is a fire risk

During an inspection, an inspector will notate any potential violations or noteworthy observations including potential fire threats, by assigning a Condition Code and Priority Level in PacifiCorp's system of record. The Priority Levels are assigned to align with GO 95, Rule 18, and the conditions codes are specifically designed to categorically pre-determine fire threat conditions as well as other types of conditions. In a typical year, PacifiCorp performs approximately 3,000 detailed inspections of electric transmission facilities and identifies approximately 500 conditions that require corrective action. The top five types of corrective actions required as a result of detailed inspections of transmission electric lines and equipment in 2020 were:

Table 7-7: Top five types of corrective actions required as a result of detailed inspections of transmission electric lines and equipment in 2020

Condition- Description, Type of Corrective Action	Fire Risk?	Type of Corrective Action	Quantity	% of Identified Conditions Identified in 2020[31]
GO95HV - HIGH VOLTAGE SIGN MISSING	No; safety	Install HV sign	215	30%
BIRDDMG - WOODPECKER OR NEST IN PRIMARY	No[32]; reliability	Evaluate for nest's impact to pole strength; pole replacement/repair	90	13%
GUYNOINS - No guy insulator or is not effectively grounded,	No, safety	Install guy insulator and/or ground	66	9%
GO95STUB - hollowed out butt in pedestrian area or in pedestrian area and less than 8.5' high	No; safety	Remove stub	20	3%
POLEREPL – DAMAGED POLE,	Yes; when located in high fire risk area	Replace pole	15	2%

PacifiCorp's detailed inspections of transmission electric lines and equipment is a critical program required to maintain regulatory compliance with California General Order 165 and 95. However, the presence of conditions identified during an inspection demonstrates that this standard program provides value beyond strictly maintaining compliance. Table 1 in Attachment 2.3 includes a more extensive breakdown of conditions identified and effectiveness.

7.3.4.3 Improvement of inspections

PacifiCorp has incorporated improvements to its standard inspection programs with full implementation in 2019 based on changes to regulatory requirements and California General Order 165. These primary improvements included (1) creating a fire risk Condition Code; (2) increasing inspection frequencies in Fire High Consequence Areas; (3) narrowing Correction timeframes for Fire Risk Conditions; and (4) piloting new technologies to facilitate Enhanced Visual Inspections.

[31] Reflects percentage of all findings as a result of detailed inspections of OH transmission lines in CA in 2020.
[32] If damage is significant enough to compromise structural integrity, an alternate condition is used which is a fire risk.

Additional enhanced inspections are discussion in Section 7.9.4.5.

7.3.4.4 Infrared inspections of distribution electric lines and equipment

PacifiCorp does not have an infrared of distribution electric lines and equipment program at this time.

7.3.4.5 Infrared inspections of transmission electric lines and equipment

PacifiCorp's infrared inspections of transmission electric lines and equipment is considered an Enhanced Inspection, the thoroughness exceeds the requirements of traditional detailed or visual inspections and is entirely supplemental to existing programs. PacifiCorp's current IR inspection program evolved from the 2019 IR inspection pilot program described in PacifiCorp's 2020 CA Wildfire Mitigation Plan (WMP), uses a new technology to proactively identify equipment failure, and aligns with California's Wildfire Mitigation Plan (WMP) guidelines for wildfire mitigation strategy.

1. *Risk to be mitigated*

Effective inspections of PacifiCorp equipment and facilities evaluate conditions which impact reliability and safety and initiate corrective.

The purpose of PacifiCorp's IR (infrared) inspection program on overhead transmission lines is to reduce ignition probability associated with equipment failure using enhanced detection tools which can identify hot spots not detectable through visual inspections. Hot spots on power lines and equipment can be indicative of loose connections, deterioration and/or potential future fault locations. Therefore, identification and removal of hot spots on high risk overhead transmission lines can prevent further deterioration, reduce the potential for equipment failure and faults, and reduce ignition probability related to equipment failure.

2. *Initiative Selection*

As included in the company's 2019 California WMP, PacifiCorp proposed implementing new enhanced transmission line inspections with a focus on proactive identification and prevention of equipment failure. When developed, and included in the 2019 WMP, these inspections were thought to be an annual inspection performed via either helicopter or UAS technology on all overhead transmission lines in the state of California. PacifiCorp also noted in the Company's 2019 WMP that the frequency of proposed programs/inspections reflected PacifiCorp's reasonable best estimate based on available knowledge and prudent utility practices and that PacifiCorp anticipated using data collected during these new inspections to further inform required frequency and anticipates changing the frequency at a future date to better reflect a risk-based approach.

3. *Regional Prioritization*

PacifiCorp implemented an initial pilot project in 2019 to serve as a proof of concept to further evaluate and inform an infrared inspection program. Initially, inspections were planned and prioritized based on risk to ensure that all Tier II, Tier III, and PSPS locations were inspected during Q2, prior to the beginning of fire season. Based on initial successes and lessons learned, which included ensuring a focus on phasing and targeting peak loading conditions during the inspections, this initial pilot was followed up with a second pilot project in 2020 to refine inspection frequency as well as program management and documentation efforts. As a result, IR inspections in 2020 were prioritized and planned to target peak loading or near peak loading conditions as opposed to seasonal

or time based in order to optimize the detection capabilities and effectiveness of the inspections. The prioritization and planning demonstrated positive results and has continued to be a critical component to the inspection program.

4. Progress on Initiative

Since the initial pilot project in 2019, the IR transmission inspection program has identified 5 hot spots specifically using IR technology, primarily at jumper splice/connections. These reflect conditions not typically detectable through a traditional visual inspection. An additional 3 conditions were identified through a simultaneous visual inspection as an incremental benefit to the program. All of the hot spots prioritized as "urgent" have all been corrected, thereby reducing wildfire risk. Other medium to low risk conditions are planned for corrective action. The following table describes the program evolution as well as number of findings and cost effectiveness of findings. Additional information regarding progress can be found in Table 12 of Attachment 1-2021 Performance Metrics Data Template.

Table 7-8: Program evolution findings and cost effectiveness findings

Program Year	Goals / Description	Line-Miles	Cost	# of Findings	$/ findings	Finding/ Line Mile
2019 Pilot Program	☐ Demonstrate capability to detect hot spots through IR inspections ☐ Test the capability of IR technology at base loading as compared to peak loading conditions	1,474	$237k	1	$237k/ finding	1 finding per 1,474 line-miles
2020 Pilot Program	☐ Refine inspection frequency requirements and prioritization ☐ Optimize program management/ documentation	866	$167k	7	$24k/ finding	1 finding per 124 line-miles
On-Going Program (in progress)	☐ Execute newly developed program management processes ☐ Continue to evaluate cost effectiveness and inspection frequency requirements ☐ Gather data on loading baseline recommendations for siting hot spots ☐ Gather data on contributing variables to hot spot identification	700	$80k	TBD	TBD	TBD

5. Future improvements to initiative

Currently, the scope of PacifiCorp's Enhanced Inspection program includes an annual IR inspection via helicopter of all overhead transmission lines within the company's California service territory. PacifiCorp intends to continue to implement this annual program and evaluate its effectiveness which

can be determined based on the number of findings each year. In the future, PacifiCorp may augment the scope of the inspection cycle based on the effectiveness as well as the evolution of the company's risk model.

7.3.4.6 Intrusive pole inspections

PacifiCorp's intrusive pole inspection program, which may include pole-sounding, inspection hole drilling, and excavation tests, is designed to identify decay, wear, or woodpecker damage, assess the condition of wood poles, and identify the need for any treatment, repair, or replacement. While PacifiCorp's intrusive testing can be performed as a stand along inspection, it is most often performed in conjunction with a detailed inspection described in Sections 7.9.4.1 and 7.9.4.2.

PacifiCorp's intrusive poles inspections are performed consistent with the cycle proscribed in California General Order 165. However, the presence of conditions identified during an inspection demonstrates that this standard program provides value beyond strictly maintaining compliance. Specifically, PacifiCorp consistently observes between a 2% and 4% reject rate across its entire service territory as a result of the intrusive pole inspection program. In 2020, approximately 25 poles were identified for replacement as a result of this program.

7.3.4.7 LiDAR inspections of distribution electric lines and equipment

LiDAR data collection allows for highly accurate 3D modeling of assets and any objects within a range of those assets. This model can be used to calculate asset specific pole lean, identify potential compromised clearance or encroachments, evaluate threats and verify exact locations of assets. The identification of these hazards can help prevent fault scenarios and reduce ignition risk.

However, full deployment and application remains unclear. Therefore, PacifiCorp developed and implemented a pilot project to scan and model a select subset of assets using LiDAR technology. Effectiveness of the pilot project was to be determined through the identification of recommended corrective or proactive work not typically identified through traditional visual inspections or processes.

In 2019, PacifiCorp performed LiDAR (Light Detection and Ranging) data collection, analysis, and system modeling on the PacifiCorp network in four select areas of Northern California consisting of 924 line-miles and 12,803 structures. Assets inspected include both transmission and distribution in rural and suburban environments. Contractor services were utilized for data collection via fixed wing aircraft, data processing, and system modeling.

Refer to the below chart and map for details on the assets and geographic areas where this pilot program was implemented:

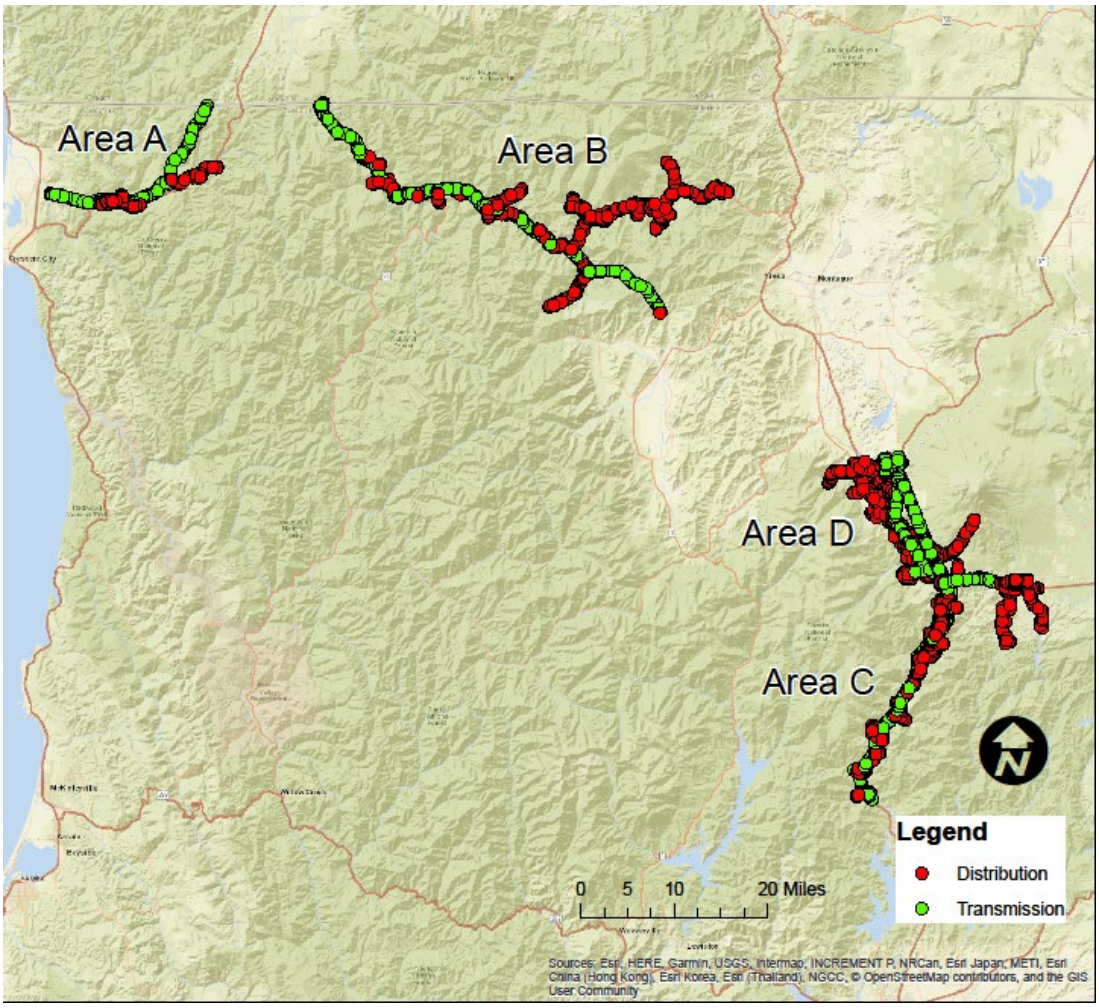
Table 7-9: Asset details where LIDAR pilot program was implemented

Area of Interest	Description	Total OH Line-Miles	Distribution		Transmission	
			Line-Miles	Voltage(s)	Line-Miles	Voltage(s)
A	NW CA Del Norte Substation to Oregon State Line	132	18	12.47 kV	114	115kV

B	Klamath National Forrest Line 33 - Oregon State Line to Junction	174	104	4.16 kV, 12.47 kV	70	69kV
C	North Central CA Line 2 - Shasta to South End	266	99	2.4kV, 4.16kV, 12.47kV, 20.8kV	167	69kV, 115kV
D	Shasta to Weed	352	155	2.4kV, 4.16kV, 12.47kV, 20.8kV	197	69kV, 115kV

TOTAL	***A, B, C, D***	***924***	***376***	***2.4kV, 4.16kV, 12.47kV, 20.8kV***	***548***	***69kV, 115kV***

Figure 7.3-2: Areas where LIDAR pilot program was implemented



PacifiCorp, in conjunction with the service provider, used the collected data to model and, as a paper exercise, identify imminent threats, assess current status and risk, map vegetation densities, and inform future vegetation clearing cycles.

While the collection of data and computer visualization looked promising, field verification of desktop analysis fell short of expectations. It was challenging to turn the data and evaluation into action and meet the original needs of the project and the company found it was dispatching resources to address clearance risks that did not exist, detracting from other critical wildfire mitigation work. PacifiCorp attributes these challenges to the maturity of the technology in this specific application. LiDAR data collection, interrogation, and interpretation is mature in the clearance and strength modeling applications of traditional transmission and distribution overhead assets, but lacks maturity in the segmentation, vegetation fall in risk, and vegetation clearance calculation application. However, PacifiCorp believes there could be future value in the collection of LiDAR to inform asset and vegetation management is evaluating additional methods for implementing this technology in the best manner possible given the sparsely populated service territory. This evaluation is part of Pilot Project 3 discussed further in the research section.

7.3.4.8 LiDAR inspections of transmission electric lines and equipment

See Section 7.9.4.7.

7.3.4.9 Other discretionary inspection of distribution electric lines and equipment, beyond inspections managed by rules and regulations

At this time, PacifiCorp does not have any specific asset management and inspections wildfire mitigation programs focused on other discretionary inspection of distribution lines not included in other programs.

7.3.4.10 Other discretionary inspection of transmission electric lines and equipment, beyond inspections mandates by rules and regulations

At this time, PacifiCorp does not have any specific asset management and inspections wildfire mitigation programs focused on other discretionally inspection of transmission lines not included in other programs.

7.3.4.11 Patrol inspections of distribution electric lines and equipment

PacifiCorp's patrol inspection program includes 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.

PacifiCorp's patrol inspections of distribution electric lines and equipment is a critical program required to maintain regulatory compliance with California General Order 165 and 95. PacifiCorp's patrol inspection program is also critical to reducing wildfire risk through the identification of conditions. As a patrol inspection is less thorough than a detailed inspection, it is expected that fewer findings are identified. For

example, 142 findings were identified in 2020 as a result of patrol inspections compared to 7,909 identified during detail inspections. Nonetheless, the identification of any conditions during a patrol inspection demonstrates that this standard program provides value beyond strictly maintaining compliance. Table 1 in Attachment 2.3 includes a more extensive breakdown of conditions identified and effectiveness.

7.3.4.12 Patrol inspections of transmission electric lines and equipment

PacifiCorp's patrol inspection program includes 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.

PacifiCorp's patrol inspections of transmission electric lines and equipment is a critical program required to maintain regulatory compliance with California General Order 165 and 95. PacifiCorp's patrol inspection program is also critical to reducing wildfire risk through the identification of conditions. As a patrol inspection is less thorough than a detailed inspection, it is expected that fewer findings are identified. For example, 75 findings were identified in 2020 as a result of patrol inspections compared to 709 identified during detail inspections. Nonetheless, the identification of any conditions during a patrol inspection demonstrates that this standard program provides value beyond strictly maintaining compliance. Table 1 in Attachment 2.3 includes a more extensive breakdown of conditions identified and effectiveness.

7.3.4.13 Pole loading assessment program to determine safety factor

At this time, PacifiCorp does not have a specific asset management and inspections wildfire mitigation program focused on pole loading assessment to determine safety factor of in-service assets. Instead, PacifiCorp uses engineering standards and compatible units for various scenarios and grades with inherent safety factors to ensure that the strength of the pole installed is sufficient for the intended use with the applicable safety factors. Inherent to using compatible units and engineering standard equipment is the completion of strength calculations to ensure the pole has sufficient strength for the application. Therefore, the pole loading calculations are performed at the time of installation. Additionally, inherent to the intrusive testing is a measurement of remaining strength. Alternatively, pole loading calculations can be performed to accommodate joint user requests. Therefore, this activity is accomplished as a function of other programs such as new construction or intrusive pole testing.

7.3.4.14 Quality assurance/ quality control of OH inspections

As previously described, inspection and correction programs are the cornerstone of a resilient system. PacifiCorp's 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. Specific to mitigating wildfire risk, these programs identify and correction certain conditions which, if uncorrected, could ignite a fire.

1. Risk to be mitigated

Effective inspections of PacifiCorp equipment and facilities evaluate conditions which impact reliability and safety and initiate corrective actions prescribed in GO95, including fire risk conditions. Therefore, the effectiveness of these programs at reducing operating risk as planned, which includes wildfire risk, relies upon the quality of the inspection itself as well as the proper characterization of any findings. Quality assurance and quality control at PacifiCorp aims to ensure this effectiveness and thereby enable the planned reduction of risk through implementation of the company's inspection programs. Quality assurance and quality control at PacifiCorp generally includes desktop audits and field audits catered to identify gaps in the inspection programs, inspector capability, and corrective actions, thereby increasing inspection result accuracy and reliability.

2. Initiative Selection

To perform QA/QC of inspections, PacifiCorp utilizes a combination of process controls, software tools, company policy, and physical record checking to quickly identify inaccuracies for corrective action, evaluation, root cause analysis and system improvements. Engaging in these activities is a cost-effective means to minimize the risk that inspection results are inaccurate or unreliable. Inspection results are reviewed continuously to confirm that inspections in the HFTD are meeting acceptable standards of performance.

PacifiCorp's main QA/QC components, including enhancements to mitigate wildfire risk, are:

- Physical audits of at least 5% of planned inspections of facilities with a focus fire threats and Tier II and Tier III prioritization
- Software controls which prohibit freeform condition assignment, allowing for result controls, minimizing the amount of human error capable
- A quarterly review of already audited results as a secondary check, including desktop audits
- Annual training with inspectors to address audit findings and improve inspection reliability and accuracy

These components are described in more detail below, including any program enhancements, spend, and evolution consistent with feedback from the WSD and PC-4.

Physical Audits

PacifiCorp's QA/QC physical audits are conducted on a random selection of inspected facilities, where corrections due to inspection results are prioritized as per GO95 priority levels, including an expedited correction time period for conditions classified as a fire risk and in the Tier II and Tier III districts. PacifiCorp emphasizes audits in wildfire risk areas by prioritizing Tier II and Tier III regions for inspection in the first half of the year, which also leads to these regions going through the QA/QC process first. After a physical audit is completed, the audit results are compared with the original inspection results to determine whether or not they conform to the set criteria for reporting of conditions, data entry, and performance of work in accordance with company specifications. Non-conforming results are sent to the inspection contractor for re-inspection along with the required re-inspection time period. As an example, 885 physical audits were performed in 2020 which reflects approximately 6.4% of planned inspections.

Software Controls

In recent years, PacifiCorp has migrated to the use of mobile technologies to record inspection records and findings. A renewed focus to the QA/QC of inspections in 2020 led to the enhancement

of the inspection programs and structure along with the addition of software controls to better ensure inspections and findings are recorded consistent with internal procedures. Non-conforming results are denied. For example, if the inspection program is designed to only allow either an A or B priority assigned to a certain type of findings, an inspector is not able to enter a C Priority. This ensures that findings are not accidentally mischaracterized with a lower priority level than the program is designed to accept.

Quarterly Desktop Reviews

7,802 desktop audits were performed in 2020, which reflects approximately 57% of PacifiCorp's planned inspections of facilities in CA. Additionally, two macro-level desktop audits were conducted quarterly; one desktop audit was conducted by the field inspection support group (standard process as per PacifiCorp internal policy) and another was conducted by a cross functional team of asset management, work planning and operational performance management. The cross functional team desktop audit included a heightened focus on wildfire mitigation by prioritizing review of "fire risk" conditions and conditions in Tier II and Tier III regions for QA/QC and correction.

To support these on-going reviews, a new internal tool was developed and used to evaluate inspection results, automatically isolate open fire risk conditions in plots, facilitate quick data exportation, provide insight about trends, and drive a deeper understanding of the fire risk conditions. Historically, desktop reviews may have consisted of all open conditions generally grouped together without specific focus areas. The new tool automatically identifies potential misalignment with internal procedures, including alignment with fire risk priorities and types. Initial rollout of this new tool proved useful and, as part of the 2021 plan, desktop review of inspection results will continue to utilize this tool and grow to review inspection results within 30 days of input. This will ensure that potential mismatches or mischaracterization of conditions and risk can be immediately addressed. This new quick QA/QC response to inspection results is projected to address the issue while it is fresh in the minds of inspectors, drive continuous improvement and learning opportunities, and increase the accuracy of records and reliability of the inspection results.

PacifiCorp intends to continue quarterly desktop reviews, which typically include a deep dive into trends and risk, bit will add a monthly desktop review of conditions for misalignment with program requirements in 2021.

Annual Training

Annually, PacifiCorp field inspection support conducts annual training for field inspectors in January of each year. This training includes technical content such as NESC code or California General Order requirements as well as program content, such as how to record findings, assess priority, and ensure effectiveness of an inspection and facilitate corrective action. In January 2021, this training included additional content regarding fire risks and broader participation from asset management to ensure alignment in content and priorities. While this training covers PacifiCorp's total service territory, the training did include focused on the specific Tier II and Tier III planned inspections in California and the potential challenges and risks associated with the high fire threat areas. PacifiCorp intends to continue to grow this training with a focus on wildfire mitigation and incorporate lessons learned through the other QA/QC components to foster continuous improvement.

3. Region prioritization

As previously described, PacifiCorp emphasizes audits in wildfire risk areas by prioritizing Tier II and Tier III regions for inspection in the first half of the year, which also leads to these regions going through the QA/QC process first. Additionally, an increase of audits within Tier II and Tier III has scaled with the increased volume of inspections within Tier II and Tier III.

4. Progress on initiative

For the 2020 inspection cycle, approximately $36k was spent on physical audits, desktop audits and updating inspector training. The entirety of the 2020 fulfilled QA/QC inspection plan included all of California, including the Tier II and Tier III fire risk areas. PacifiCorp has included initiative specific progress and spending in Table 12 of Attachment 1-2021 Performance Metrics Data Template

5. Future improvements to initiative

In 2021, PacifiCorp plans to incrementally improve the QA/QC of inspection results by evaluating audit results at the end of the year, identifying gaps or misalignments, conducting a root cause analysis of how to best address issues and correcting them (typically through the annual inspector training in January). At the end of 2021, PacifiCorp will evaluate if additional spend is needed or if gaps can be addressed with revised inspector training.

As part of PacifiCorp's dedication to heightened focus on wildfire mitigation, there are future plans for the QA/QC of inspection results to include evaluating methodologies which further expedite QA/QC in fire risk regions through prioritization of field audits in tier II and tier III regions.

7.3.4.15 Substation inspections

PacifiCorp performs substation inspections on a routine basis consistent with CA General Order 174 requirements. As a part of this program, qualified personnel inspects PacifiCorp's substations in California on a monthly basis which includes the assessment of physical safety, security, and performance of substation components, including fencing, grounding, and major equipment, as well as the performance of minor housekeep tasks to ensure safe and reliable service. These inspections are considered standard operations that provide incremental reduction to wildfire risk. The following table describes the types on inspections performed as a part of this program and planned frequency for each.

Table 7-10: Types of substation inspections performed as a part of this program and planned frequency for each

Type of Inspection	Voltage Class	Frequency
Substation Inspection (including IR)	Bulk Transmission	Annual (12 months)
	Other Transmission	Annual (12 months)
	Distribution	Bi-Annual (24 months)
Substation & Security Inspection[33]	Bulk Transmission	Monthly
	Other Transmission	At least 8 times per year
	Distribution	At least 8 times per year

[33] On average, substation and security inspections are typically performed on all substations on a monthly basis. However, internal policies require that non bulk transmission substations are to be inspections at least 8 times per year.

7.3.5 VEGETATION MANAGEMENT AND INSPECTIONS

PacifiCorp's vegetation management program is modeled on the industry's best practices, including systematic maintenance, scientifically-based pruning to maintain safe vegetation to conductor clearances, tree removal (both incompatible species and hazard trees), tree replacement, cover type conversion, herbicide use and tree growth regulator applications, and the use of specialized tools and equipment. PacifiCorp contracts with vegetation management service providers to perform this work.

The program is designed to identify and correct vegetation conditions that are inconsistent with distinct distribution and transmission specifications identified within the company's Vegetation SOP thereby minimizing and/or eliminating safety and reliability risks posed by trees and other incompatible vegetation that has the potential to encroach upon or grow near power lines. These risks are minimized through implementing vegetation inspection and maintenance activities. The overall objective of the vegetation management program is to minimize vegetation related faults, including any faults which could be a source of fire ignition. PacifiCorp's vegetation management program is compliant with GO 95, Rule 35, and is described in detail in the Vegetation SOP.

Vegetation management conducted in or adjacent to distribution circuit corridors centers on cycle work. In areas located outside of the HFTD, vegetation management work circuit is done every two years; full clearance work is done on a four-year cycle, with interim work at the two-year mark between each cycle. In the HFTD, however, vegetation management work is conducted annually. Where scheduled program work has not been completed prior to the fire season, an incremental patrol is conducted to identify and correct potential wildfire ignition risks. See Section 7.3.1.11.

Vegetation management conducted on or adjacent to transmission line corridors focus on maintaining extended clearances and employing industry practices such as integrated vegetation management (IVM), to promote cover-type conversion thereby preventing any future incompatible vegetation growth disrupting clearances. Because of the nature of transmission lines, wider rights-of-way allow PacifiCorp to generally maintain clearances well in excess of the Minimum Vegetation Clearance Distance (MVCD) required in Table 2 of FAC-003-04. Vegetation maintenance activities are scheduled on an as-needed basis, dependent on results of regular inspections and specific local conditions.

Integral to vegetation management activities for distribution and transmission is the identification and removal of hazard trees. In addition, consistent with PRC § 4292, PacifiCorp requires a ten-foot cylinder of clear space from pole top to bare ground around "subject" poles in state regulated areas to further reduce wildfire ignition risks and increase wildfire resiliency. When appropriate, bare-ground herbicide treatments are used to keep the ten-foot cylinder clear of vegetation. Vegetation management crews working in fire-prone areas are required to adhere to fire restrictions and to receive training related to fire prevention and suppression.

Through implementing the vegetation management program, wildfire ignition risk of vegetation to energized conductor contact is minimized.

7.3.5.1 Additional efforts to manage community and environmental impacts

As part of PacifiCorp's vegetation management program, PacifiCorp representatives and contractors interact with members of the community daily. PacifiCorp has processes in place to manage, minimize, or avoid community and environmental impacts.

1. Risk to be mitigated

Vegetation management activities may result in impacts on communities and/or the environment where the work is conducted. Impacts may be expressed in both the planning and implementation phases of the work.

2. Initiative selection

As a customer courtesy, at least five business days in advance of vegetation management work, customers are notified. Notification includes personal notification, door hangers, mail, and consent forms. These forms of notification also facilitate customer questions, concerns and requests for further coordination in executing the work. When a tree is identified to be removed or herbicide or growth regulators are to be used, PacifiCorp makes reasonable attempts to obtain customer consent. Where customers refuse to allow PacifiCorp to conduct required vegetation management work, attempts are made to further coordinate with the customer to resolve concerns. If resolution cannot be achieved by PacifiCorp's contracted representative, PacifiCorp's Senior Utility and/or Utility Forester will coordinate with the customer to attempt to resolve concerns and acquire customer consent. If this coordination is unsuccessful, PacifiCorp will determine course in conducting the required work.

Through this customer interaction, PacifiCorp will take opportunities to provide or present through discussion, a variety of educational materials regarding tree-power line conflicts and planting the right tree in the right place. This coordination minimizes impacts to the community. Where larger-scale projects are planned that will have community impacts, PacifiCorp coordinates with leadership at the state and local levels, including cities, counties, and neighborhood associations or groups, such as fire safe councils. Additional forms of notifications may also be used, such as automated callouts to customers, letters, social media, and other news media outlets in order to inform community member of planned activities. Where work will take place on municipal, county, state or federal properties, the appropriate authorizing officer or agency representative is notified and coordinated with.

PacifiCorp routinely collaborates with local land managers in obtaining permits, scheduling work, and addressing issues as they arise. PacifiCorp works closely with various local offices of federal agencies to ensure there are approval processes in place for vegetation management work, including hazard tree removals. Annual meetings are held with agencies where applicable, to enhance communication, discuss scope of work, and identify permit requirements and potential environmental impacts of scheduled vegetation management work.

In order to minimize environmental impacts and impacts to other sensitive resources, PacifiCorp conducts environmental reviews (biological and cultural) of vegetation management activities where warranted. Supporting fieldwork and environmental surveys are also conducted where applicable to protect sensitive resources. To facilitate these reviews, minimize timeframe to acquire agency approvals and ensure consistent implementation of process between PacifiCorp and federal land managing agencies, PacifiCorp will continue develop Operations and Maintenance Plans (O&M Plan) in accordance with applicable regulation and guidance that precipitated from joint efforts with the Edison Electric Institute, utilities, and federal agencies to develop a Memorandum of Understanding on Vegetation Management for Powerline Rights-of-Way (dated September 29, 2016) and subsequent passage of legislation by the United States Congress; Section 211 of the Omnibus Appropriations Act of 2018 amended Title V of the Federal Land Policy and Management Act. This legislation established a formal procedure for submission and approval of vegetation management

plans, with an emphasis on standardized, consistent plans and minimizing the need for case-by-case approvals for hazard tree removal.

O&M Plan(s) will establish agreed upon agency review times of proposed maintenance activities based on activity type and presence or absence of sensitive resources that may be impacted. Even with an established O&M Plan, depending upon the scope of the activity and potential for environmental impacts, agency approval timeframes may be prolonged and take several months or longer. The O&M Plan will outline measures to be implemented by PacifiCorp for the protection of sensitive resources based on maintenance activity type, including vegetation management activities. The O&M Plan will also include agreed upon roles and responsibilities of PacifiCorp and the applicable land managing agency to support PacifiCorp's rapid response to correct conditions identified in a timely manner. Development of these plans also serves as an outreach opportunity to land managing agencies to inform and educate them on utility practices.

3. Region prioritization

Implementation of initiatives described above, including current process to notify communities of vegetation management activities, take place where work is planned and is focused in areas where significant vegetation management work is needed (e.g. efforts to remove fire-impacted trees/hazard trees). Notification and coordination are also focused with customers and organizations that have previously requested advanced notice and increased coordination.

To manage environmental compliance PacifiCorp prioritizes environmental reviews and agency coordination based upon project schedule considering agency review and permitting timelines. Projects are reviewed and packaged together where feasible to streamline review and coordination with authorizing agencies.

4. *Progress on initiative*

In response to unprecedented wildfires experienced in PacifiCorp's service territory, PacifiCorp conducted focused outreach to customers within the footprint of PacifiCorp's vegetation management emergency response activities. This outreach included automated callouts, increased field presence to coordinate with and inform customers, and establishing a hotline customer could call seeking additional information.

Development of O&M Plans will be a multi-year effort. PacifiCorp is currently coordinating with the Klamath National Forest (KNF) to develop an O&M Plan. Development of this plans was delayed in 2020 due to COVID-19 and significant wildfire response actions requiring the attention of the KNF. The O&M Plan with the KNF will be completed in 2021. PacifiCorp coordinated with other land managing agencies regarding operational activities, including vegetation management throughout 2020. PacifiCorp also implemented process improvements (standardized biological and cultural reviews) with respect to environmentally screen and evaluate projects to manage environmental compliance and streamline agency reviews.

5. *Future improvements to initiative*

PacifiCorp will continue to seek opportunities to enhance community relations and manage community expectations. PacifiCorp plans to improve and expand the environmental screening process to include a broader scope of project activities in 2021. After completing the O&M Plan with the KNF, PacifiCorp will engage with other land managing agencies within its service territory in 2021 to initiate O&M Plan development with them. In support of this effort, PacifiCorp is also hiring an

additional staff resource to oversee development and long-term implementation of the O&M Plans and associated environmental screening process.

7.3.5.2 Detailed inspections of vegetation around distribution electric lines and equipment

As part of the vegetation management program, PacifiCorp conducts inspections of all distribution lines that are scheduled as part of routine vegetation management maintenance.

1. *Risk to be mitigated*

Trees and other vegetation growing under or adjacent to power lines within striking distance of conductors and electrical equipment, can create safety, service reliability, and ignition risks.

2. *Initiative selection*

As part of vegetation program maintenance, PacifiCorp conducts inspections of vegetation around distribution lines and equipment to identify imminent threats or hazards and vegetation conditions that do not comply PacifiCorp's program standards/specifications. These pre-work inspections are typically conducted within weeks to 1-2 months by contractors prior to the scheduled program work. Inspectors/pre-listers utilize tablets to record vegetation conditions to be corrected.

3. *Region prioritization*

PacifiCorp's service territory in California is divided into three districts. The distribution lines are inspected and managed at the circuit level. PacifiCorp Senior Utility Foresters prioritize scheduling inspections and subsequent corrective work considering HFTD, efficient workload distribution, weather conditions, and resource availability.

4. *Progress on initiative*

In 2020, PacifiCorp completed rollout of the electronic planning and tracking system, Section 7.3.1.6, with few exceptions that will be addressed in 2021. PacifiCorp conducted inspection and corrective work of 909 miles of distribution line that were scheduled for routine cycle and interim maintenance within our service territory in California, which resulted in pruning over 19,000 trees and removal of over 2,800 trees. In 2021, PacifiCorp expects to inspect over 1,500 miles of distribution line associated with routine vegetation management.

6. *Future improvements to initiative*

As PacifiCorp continues to implement its multi-year WMP, the company will continue to evaluate how inspections may be improved by either change to scope, tools, frequency, or correction timeframe. PacifiCorp will continue to implement use of its electronic planning and tracking system by incorporating all pole clearing activities we conduct in California and will continue to identify improvements to the system. PacifiCorp will also continue to investigate and evaluate other technologies such as LiDAR to augment distribution inspections.

7.3.5.3 Detailed inspections of vegetation around Transmission electric lines and equipment

PacifiCorp's vegetation management inspections associated with transmission line are similar to inspections of vegetation around distribution lines. PacifiCorp's detailed inspections of vegetation around transmission electric lines and equipment, like distribution inspections, focus on maintaining clearances, but with transmission, the clearance distances are much greater. Because of the nature of transmission

lines, wider rights-of-way generally allow PacifiCorp to maintain clearances well in excess of the required minimum clearances set forth in the "Minimum Vegetation Clearance Distance" (MVCD).[34] Accordingly, 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. Additionally, PacifiCorp employs IVM practices to prevent vegetation growth from violating clearances. Inspections of transmission lines are both ground and aerial based. In 2020, 129 miles of main grid transmission were inspected throughout our service territory in California and PacifiCorp plans to inspect 129 miles in 2021.

7.3.5.4 Emergency response vegetation management due to red flag warning or other urgent conditions

1. Risk to be mitigated

Weather conditions, such as heat and/or high winds have the potential to generate and spread wildfire when an ignition occurs.

2. Initiative selection

While PacifiCorp is committed to executing the company's planned vegetation management programs, circumstances may still arise where, due to unexpected conditions such as weather, additional risk can be mitigated through supplemental vegetation inspections and corrective work. PacifiCorp does not have emergency response vegetation management actions specific to red flag warnings, however, does adhere with local requirements and restrictions to mitigate ignition risk. During red flag warnings, PacifiCorp may move resources to work in other areas that are not impacted by the red flag warning or are outside of the HFTD, where feasible. Vegetation management personnel also follow local guidance and requirements as they pertain to fire restrictions, such as work hours, utilizing a fire watch following work, and using equipment that minimize potential to cause sparks.

PacifiCorp, however, does have emergency response procedures and programs, such as those related to PSPS events. Prior to initiating a PSPS event and to further inform PacifiCorp T&D Operations of current vegetation conditions, PacifiCorp vegetation management may perform patrols to identify and address potential ignition risks due to vegetation. These PSPS alert patrols may be performed throughout the weather event and/or PSPS event.

3. Region prioritization

Emergency response vegetation management associated with potential PSPS events, is focused in PDZs where the weather event is occurring.

4. Progress on initiative

In 2020 vegetation management conducted several PSPS alert patrols in support of potential PSPS events.

5. Future improvements to initiative

Currently tracking of vegetation identified and addressed during PSPS related patrols is embedded within other production data. PacifiCorp will identify ways to improve tracking of vegetation

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

management actions taken relative to PSP events, to quantify number of inspections conducted, miles inspected, and findings corrected.

7.3.5.5 Fuel management and reduction of "slash" from vegetation management activities

PacifiCorp manages slash through a combination of chipping, lop and scatter, and hauling off site.

1. *Risk to be mitigated*

The completion of both planned and emergency vegetation management work can, in some instances, create smaller vegetation materials such as brush, tree limbs, or shrubs less than six inches in diameter, a byproduct also referred to as "slash." The presence of "slash" from vegetation management activities can contribute to the overall fuel availability along a utility right-of-way. Similarly, vegetation growing at the base of poles can contribute to fuel loading.

2. *Initiative selection*

PacifiCorp conducts fuel management through removal of slash from the tree canopy, chipping debris where accessible, and removes (recycles where practicable) slash in developed areas unless the property owner indicates otherwise. In rural off-road areas PacifiCorp utilizes a lop and scatter and chipping practices to reduce the volume of available fuel within the right of way and adheres with land managing agency requirements.

An integral component of PacifiCorp's vegetation program that influences fuel management and reduction of slash is the appropriate use of herbicide and tree growth regulators as part of IVM. By preventing and/or inhibiting undesirable vegetation growth, the volume of slash can be further reduced. PacifiCorp utilizes herbicides and tree growth regulators where approved by the property owner or land managing agency in targeted areas.

PacifiCorp also annually conducts pole clearing, removal of vegetation around subject poles which further reduces fuel volume.

3. *Region prioritization*

Slash management is conducted throughout PacifiCorp's service territory.

4. *Progress on initiative*

In 2020, PacifiCorp implemented slash management in accordance with the company's Vegetation SOP and through expanded pole clearing. PacifiCorp conducted vegetation clearing of 2,164 poles outside of SRA (Cal Fire state regulated areas), which is incremental to mandated pole clearing activity. In 2021, PacifiCorp plans to clear vegetation at 3,047 poles under the expanded pole clearing project.

In addition, PacifiCorp partners with communities and/or agencies to implement fuel reduction projects. In 2020, PacifiCorp partnered with the Shasta Trinity National Forest on a fuel reduction and highway safety enhancement project. PacifiCorp contractors removed trees adjacent to a transmission right-of-way, which parallels the highway. PacifiCorp also mowed vegetation within the right-of-way to further reduce fuel loading. This work was in conjunction with the forest service while they removed additional trees near the highway for the goals of fuel reduction and decreasing shade for highway safety. In 2021, PacifiCorp will continue to seek opportunities to partner with communities and/or agencies to support fuel reduction projects. In addition, PacifiCorp will continue to implement IVM to promote compatible low-growing vegetation to minimize ignition risks, slash management, and expanded pole clearing activities.

5. Future improvements to initiative

PacifiCorp will continue to seek opportunities to responsibly expand use of herbicide and tree growth regulators as a component to IVM through the development of O&M Plans and agreements with land managing agencies to reduce slash and promote low-growing right-of-way compatible species.

7.3.5.5.1 Expanded Pole Clearing

1. Risk to be mitigated

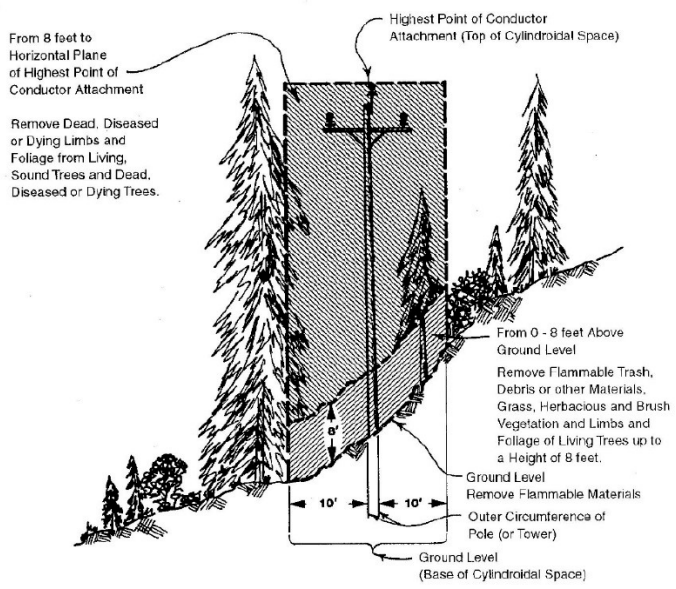
Vegetation at the base of and around poles may provide fuel to a spark from electrical equipment and/or propagate wildfire.

2. Initiative selection

PacifiCorp vegetation management has expanded pole clearing to include Local Responsibility Area (LRA) subject equipment poles located in the HFTD in additional to its existing program in compliance with regulations of clearing State Responsibility Area (SRA) subject poles.

Pole clearing involves the removal of all vegetation within a ten-foot radius cylinder of clear space around a subject pole and the application of herbicides to prevent any vegetation regrowth (unless prohibited by law or the property owner), see Figure below[35].

Figure 7.3-3: Pole clearing



This strategy is distinct from additional clearance and removal activities and requirements because it is not designed to prevent contact between vegetation and a power line. Instead, similar to "slash management", pole clearing is designed to reduce the risk of fire ignition if sparks are emitted from electrical equipment. PacifiCorp intends to implement pole clearing on wildland vegetation in the HFTD around poles which have fuses, air switches, clamps or other devices that could create sparks.

[35] Illustration of pole-clearing requirements (California Department of Forestry & Fire Protection 2008, Figure 3, PRC 4292, 14 CCR 1254, Fire Break Clearance Requirement Around Poles and Towers

After a pole has been cleared, a spark falling within the 10-foot radius would be much less likely to ignite a fire.

3. Region prioritization
Expanded pole clearing activities take place Local Response Areas.

4. Progress on initiative
In 2020, PacifiCorp conducted vegetation clearing at 2,164 poles as part of the expanded pole clearing program. In 2021, PacifiCorp plans to clear vegetation at 3,047 poles under the expanded pole clearing project.

5. Future improvements to initiative
In order to more efficiently manage the expanded pole clearing project, PacifiCorp will track this activity electronically to develop an inventory of poles to be cleared.

7.3.5.6 Improvement of inspections

1. Risk to be mitigated
Vegetation may not be appropriately identified to be addressed or may not be pruned in accordance with PacifiCorp's Vegetation SOP and vegetation may grow faster and encroach upon conductor clearances.

2. Initiative selection
PacifiCorp has initiated incremental inspections prior to the height of the fire season, see Section 7.3.1.11. In addition, PacifiCorp conducts post audit inspections of completed work and addresses any conditions that do not conform with the vegetation program standards/specifications; see Section 7.3.1.13.

These audits not only serve as quality control but provides opportunities for PacifiCorp Senior Utility and Utility foresters to discuss required specifications and engage with the vegetation management contractors performing the work to strive to improve execution of inspections.

3. Region prioritization
Audits and contractor coordination/review is conducted throughout PacifiCorp's service territory

4. Progress on initiative
In 2020, PacifiCorp foresters increased engagement and interaction with vegetation management contractors by establishing recurring meetings to discuss inspection and vegetation management quality and execution. PacifiCorp foresters also provide training to inspectors as discussed in Section 5.4.1.

PacifiCorp continues to seek opportunities for improving inspection quality and the use of technology to augment inspections and determine modifications that may be needed in implementing inspections. In 2020, inspections have been improved through the use of an electronic planning and tracking system. See Sections 7.3.1.19 and 7.3.1.20. Historically, PacifiCorp has tracked vegetation management activities at the local level, generally relying on paper forms, maps, documents, and local knowledge. In recognition of growing wildfire risk, and to move toward improved transparency, efficiency, and data analytics, PacifiCorp has incorporated the use of a work planning and tracking system. Inspectors utilize tablets to document vegetation maintenance activity requirements by

location (e.g. parcel or parcels). This information is then available to the contractors conducting the maintenance work, which allows for improved planning and documentation. Once the work is completed it is recorded in the program in the field via tablets utilized by tree crews. Post-audits are then conducted with findings identified within the system. This increased connectivity between inspector/pre-lister, vegetation management crews, and post-auditor (PacifiCorp foresters or designated third party contractor) results in greater communication and ability to identify recurring issues with inspections and the execution of the work. This also allows for additional granularity in reporting, records retention, and contractor performance.

5. Future improvements

In 2020 PacifiCorp completed initial rollout and implementation of the planning and tracking system and will continue to utilize and improve this system in 2021 to allow for increased data collection and accuracy, analysis, and efficiencies. PacifiCorp will continue to investigate use of other technologies such as LiDAR to augment inspections.

7.3.5.7 LiDAR Inspections of vegetation around distribution lines and equipment

1. Risk to be mitigated

Vegetation contact with conductors creates an ignition risk. Vegetation contact can occur due to tree growth, tree limbs falling or blowing into lines, or uprooted trees falling into lines. Vegetation pruning or removals are the means of mitigating these contact risks, but LiDAR inspections have the potential to determine where mitigation should be performed, quantify the relative risk for vegetation issues between areas, and aid in developing a vegetation inventory.

2. *Initiative selection*

PacifiCorp has been evaluating LiDAR use for vegetation around both distribution and transmission lines through pilot programs utilizing data collected other purposes and small, low-cost demonstrations.

3. Region prioritization

Since the initiative primarily uses repurposed data, most regions were not specially selected by vegetation criteria. For one additional case, the flight path was selected based on helicopter availability and an expectation of high volume of strike trees.

4. Progress on initiative

PacifiCorp completed initial evaluations of LiDAR data analysis from three separate vendors in 2020 and early 2021. These results contained large numbers of false positives for both grow-in and fall-in risks. Use of LiDAR or Hyperspectral data for species identification also produced limited results in initial demos, with either only basic classification of tree type (conifer v deciduous) or large numbers of misidentified tree species. Identification of individual trees through LiDAR data also had large numbers of false positives. In some cases, artificial structures (lamp posts, fences) were identified as trees; and in others, single trees were identified as multiple separate ones. In 2021, PacifiCorp hopes to improve initial LiDAR analysis results through additional work with vendors to reduce false positives and improve tree species classifiers.

5. Future improvements to initiative

PacifiCorp plans to continue working with vendors to improve LiDAR analysis results and make them more viable for integration with vegetation maintenance. PacifiCorp is also exploring additional

technologies or techniques that may be able to perform similar functions to LiDAR. These include vegetation mapping generated from a combination of satellite imagery and LiDAR training data.

7.3.5.8 LiDAR Inspections of vegetation around transmission lines and equipment

Use of LiDAR inspections are being evaluated See Section 7.3.5.7 and Section 4.4.1.

7.3.5.9 Other discretionary inspection of vegetation around distribution electric lines and equipment, beyond inspections mandated by rules and regulations

At this time, PacifiCorp does not have any other discretionary inspection of vegetation around distribution electric lines and equipment.

7.3.5.10 Other discretionary inspection of vegetation around transmission electric lines and equipment, beyond inspections mandated by rules and regulations

At this time, PacifiCorp does not have any other discretionary inspection of vegetation around transmission electric lines and equipment.

7.3.5.11 Patrol inspections of vegetation around distribution electric lines and equipment

1. *Risk to be mitigated*

Risk of wildfire ignition is greater during certain times of the year, such as the height of the fire season, considering weather conditions.

2. *Initiative selection*

For the purpose of further mitigating wildfire risk in the HFTD, PacifiCorp vegetation management has implemented annual vegetation patrols incremental to scheduled program routine maintenance on lines within the HFTD. Correction work is subsequently conducted based on those inspection results.

Beginning in 2019, PacifiCorp implemented “readiness patrols” of overhead lines in HFTD. This initiative facilitates removal and or pruning of vegetation that may pose an ignition risk, such as hazard trees. Prior to the height of the fire season, PacifiCorp conducts these readiness patrols of overhead distribution lines located within HFTD Tier II and Tier III, where program cycle work has not been completed or is not scheduled. Consistent with existing procedures, a Level 1 assessment (ANSI A300 Part 9) is conducted to identify any trees which may have become hazard trees over the course of the prior year and target these trees for removal. In addition, the inspector will identify for pruning or removal of fast-growing vegetation which is likely to violate minimum clearance distances prior to the end of the current growing season.

In conjunction with such annual patrols, vegetation management annually completes correction work based on the patrol results.

3. *Region prioritization*

These patrols are conducted in HFTD.

4. Progress on initiative

In 2020, PacifiCorp inspected 1,059 miles of distribution line in HFTD. In 2021, 1,369 miles of distribution line are planned to be patrolled.

5. Future improvements to initiative

PacifiCorp will continue investigating use of technology such as LiDAR to augment these patrols.

7.3.5.12 Patrol inspections of vegetation around transmission electric lines and equipment

PacifiCorp conducts an additional vegetation management inspection of overhead lines in HFTD. For transmission, this inspection is specific to the segments of line that are within the HFTD. Refer to Section 7.3.5.11 for additional inspection detail.

In 2020, PacifiCorp inspected 323 miles of distribution line in HFTD. In 2021, 348 miles of transmission line are planned for this incremental inspection.

7.3.5.13 Quality assurance / quality control of inspections

1. Risk to be mitigated

Vegetation may not be appropriately identified to be addressed or may not be pruned in accordance with PacifiCorp's Vegetation SOP presenting a risk of contact with conductors.

2. Initiative selection

Audits are critical to ensure vegetation requiring work (pruning and/or removal) are properly identified and the work is subsequently conducted in accordance with vegetation program standards/specifications.

PacifiCorp's Vegetation SOP includes the company's standard procedures and protocols for performing vegetation management audits.

In general, this standard includes routine tree crew audits of transmission, distribution and pole clearing activities where the primary purpose is an assessment of quality assurance. Each audit may include a Forester, crew leader, and the Supervisor. During these audits, observations are documented in the planning and tracking system indicating the required corrective work. During the audit observations are discussed and feedback provided to the vegetation management contractor. Similar to PacifiCorp's other programs, if during the course of the audit, an exception is identified that violates either federal or state law or poses as imminent safety or reliability risk, the audit will be temporarily suspended, the crew may be shut down, and the corrective work will be performed immediately.

3. Region prioritization

Audits are performed on program cycle work and incremental work conducted as a result of annual patrols.

4. Progress on initiative

In 2019, PacifiCorp hired four Utility Foresters with a primary task of conducting post-inspection/audits of vegetation management work completed by PacifiCorp's vegetation management contractors throughout the service territory, prioritizing work within HFTD.

PacifiCorp has also initiated a QA process to require documentation of specific milestones through the course of vegetation management actions including contractor accepted work release, work completed documentation, contractor signed completed work release, post-audit completion and audit findings or exceptions addressed and corrected.

These audits benefit both PacifiCorp and the vegetation management contractor and are considered a best management practice (American National Standards Institute 2006).

5. Future improvements to initiative

In 2021, PacifiCorp plans to post-audit all cycle work and all corrective work as a result of patrols conducted prior to height of fire season.

7.3.5.14 Recruiting and training of vegetation management personnel

PacifiCorp's general approach to recruiting and training of vegetation management personnel can be found in the company's Vegetation SOP. In general, PacifiCorp takes advantage of training that is provided by the company and arboriculture industry and issues materials as needed to educate inspectors on proper identification of defective trees that have the potential to strike the facilities.

7.3.5.15 Remediation of at-risk species

1. Risk to be mitigated

Vegetation contact with conductors creates an ignition and outage risk. At-risk species, with fast growth rates, can increase the risk of contact through vegetation growth.

2. Initiative selection

Remediation of at-risk trees is a subset to the company's vegetation management to achieve clearances around electric lines and equipment program. A PacifiCorp vegetation maintenance program objective is to prevent vegetation from growing-into and making contact with power lines. PacifiCorp has established post work clearance specifications categorized by tree growth rates (see Section 7.3.5.20) in effort to prevent grow-ins as an element, the company's practices and procedures. Vegetation inspections categorize growth by species as: slow, moderate, fast (cycle-buster). Within HFTD, pruning is performed to prevent vegetation from breaching a 4-foot minimum clearance within one year. This may require additional pruning for at-risk species with very fast growth rates.

3. Region prioritization

At-risk species inspection is performed along with other vegetation maintenance inspections. These are performed annually in the HFTD, and bi-annually in other areas.

4. Progress on initiative and plans for next year

PacifiCorp completed vegetation inspection, including at-risk species, on all HFTD areas in 2020, and will continue to inspect these areas annually.

5. Future improvements to initiative

PacifiCorp is accumulating additional information on at risk species with the introduction of digital records and vegetation inventory systems in 2020. We are currently investigating the feasibility of using remote sensing to augment our identification of at-risk tree species. PacifiCorp is conducting

pilot studies (refer to Section 4.4, pilots 3 and 4) using LiDAR and publicly available datasets to identify potential clearances encroachments, potential strike trees, and identify areas with higher risk of vegetation contact and/or greater need for vegetation maintenance work. These pilot studies could include identification of high-risk trees, including fast growing tree species or "cycle busters", to develop a future program incremental to the existing program. High-risk trees include those trees that are otherwise healthy however prone to failure or pose other mode of risk to electrical infrastructure that are incremental (otherwise would not be assessed by) to PacifiCorp's current program. PacifiCorp is continuing to pursue this tactic through implementation of these pilot studies to support strategic efforts.

7.3.5.16 Removal and remediation of trees with strike potential to electric lines and equipment

1. Risk to be mitigated

Trees which are large enough to hit powerlines when uprooted create a risk of ignition or outages. Hazard trees, (dead, dying, diseased, deformed, or unstable) have an increased risk of failure, and therefore a higher strike likelihood.

2. Initiative selection

PacifiCorp identifies hazard trees based on visual inspection by certified arborists. Identified trees are removed, topped, or pruned.

3. Region prioritization

All areas within the HFTD are inspected for hazard trees and mitigation performed annually. Non-fire areas within our service territory are inspected and mitigated along with regular cycle or interim work.

4. Progress on initiative and plans for next year.

PacifiCorp completed hazard tree inspections in HFTD in 2020 and will continue to inspect annually. Tier 3 areas are completed by June 1, and Tier 2 is completed by end of August.

5. Future improvements to initiative

PacifiCorp is accumulating additional information on hazard trees and removal or trimming with the introduction of digital records and vegetation inventory systems in 2020. We are also collecting data on potential strike trees as part of our LiDAR and remote sensing pilots. We are currently investigating the feasibility of using remote sensing techniques to augment our traditional identification of hazard trees. Additionally, as presented in Section 7.3.5.15, PacifiCorp is conducting pilot studies (refer to Section 4.4, pilots 3 and 4) using LiDAR and publicly available datasets to identify potential clearances encroachments, potential strike trees, and identify areas with higher risk of vegetation contact and/or greater need for vegetation maintenance work. These pilot studies could include identification of high-risk trees, including tree species, within strike distance to develop a future program incremental to the existing program to address fall-in risk. PacifiCorp is continuing to pursue this tactic through implementation of these pilot studies to support strategic efforts.

7.3.5.17 Substation inspections

1. Risk to be mitigated

Vegetation contact with conductors creates an ignition risk, and a risk of fire damage to substation equipment. Substation inspections determine where vegetation may pose a current or future risk to substation equipment.

2. Initiative selection

PacifiCorp performs inspections of substations for vegetation along with regular cycle and interim vegetation maintenance.

3. Region prioritization

Substation inspections for vegetation are performed throughout our service territory as part of regular cycle or interim maintenance.

4. Progress on initiative

PacifiCorp performs regular inspections on all substations. Substations within the HFTD are inspected for vegetation annually and other substations are inspected bi-annually.

5. Future improvements to initiative

PacifiCorp has no current plans to change substation inspection practices.

7.3.5.18 Substation Vegetation Management

1. Risk to be mitigated

Vegetation contact with conductors creates an ignition risk, and a risk of fire damage to substation equipment. Removal of vegetation encroachments mitigates this risk.

2. Initiative selection

PacifiCorp performs removals or pruning of any vegetation identified in the substation inspection.

3. Region prioritization

Substation vegetation management is performed throughout our service territory.

4. Progress on initiative and plans for next year.

PacifiCorp completed substation vegetation removals and overhang trimming for all fire areas in 2020 and will continued to perform annual mitigation.

5. Future improvements to initiative

PacifiCorp has no current plans to change substation vegetation management practices.

7.3.5.19 Vegetation Inventory System

1. Risk to be mitigated

Vegetation contact risks are primarily mitigated through trimming or removals. Maintaining clear and complete records of both vegetation work both needed and performed helps accomplish thorough and accurate mitigation of vegetation risks throughout the company's service territory. Refer to Section 4.4., pilot 5.

2. Initiative selection

In 2020, PacifiCorp has adopted and implemented a new records system which includes GIS data and more detailed records for vegetation work following successful implementation of this system in other states. Accumulation of data through this system will provide the backbone for the vegetation inventory.

3. Region prioritization

PacifiCorp is using one system of vegetation records management throughout the company's service territory. GIS records will begin accumulating in the new system in specific locations as those areas are due for previously determined vegetation maintenance work, including regular mitigation in fire threat areas.

4. Progress on initiative

PacifiCorp began implementing more detailed records system in 2020. This record system now includes GIS data and is in use by both PacifiCorp staff and contract workers. The company also began characterizing general vegetation location and volume near assets using publicly available data on tree canopy and more specific information from remote sensing pilot programs. This information provides knowledge of vegetation risks at a system level while more specific data accumulates through ongoing vegetation management field records.

5. Future improvements to initiative

PacifiCorp is investigating options to augment our vegetation data using remote sensing technologies, particularly as a means for growth forecasting. At this time, none of these initiatives have entered the pilot stage, the company may evaluate the feasibility of a pilot related to growth forecasting through remote sensing in late 2021.

7.3.5.20 Vegetation management to achieve clearances around electric lines and equipment

1. Risk to be mitigated

Contact of vegetation with energized conductors and equipment due to vegetation growth or failure.

2. Initiative selection

In order to minimize risk of wildfire, PacifiCorp's vegetation management program conducts cycle maintenance to achieve clearances around electric lines and equipment consistent with Appendix E Guidelines of GO 95, Rule 35, identifies and removes hazard trees and conducts patrols of lines in HFTD where cycle maintenance has not been completed.

PacifiCorp has adopted expanded post work minimum clearance distances, of at least twelve (12) feet for all distribution lines and at least twenty (25) feet for transmission lines under 115 kV and thirty (30) feet for any transmission lines of 115 kV – 230 kV. These minimum clearance distances are consistent with the recommendation in the Appendix E Guidelines of GO 95, Rule 35.

In addition, PacifiCorp prunes vegetation beyond minimum required clearances in multiple ways. First, PacifiCorp uses increased clearance distances on distribution lines for certain species of trees, depending on tree growth rate. PacifiCorp separates vegetation into three categories: (a) slow growing; (b) moderate growing; and (c) fast growing. In all cases, PacifiCorp applies the minimum clearance of twelve (12) feet for slow growing species. In certain cases, PacifiCorp applies an increased clearance for moderate growing and fast-growing species.

Second, PacifiCorp integrates spatial concepts to distinguish between (i) side clearances, (ii) under clearances, and (iii) 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 are

under a conductor. Increasing overhang clearances also reduces the potential for faults due to overhang.

Third, as a practical matter, PacifiCorp almost always prunes beyond the minimum required distances because of the physical structure of the tree. PacifiCorp uses natural target pruning for all prune work. 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. This 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.)

Through conducting patrols of lines in HFTD, see Section 7.3.5.11, PacifiCorp maintains minimum clearance distances and increases frequency of hazard tree identification and removal. More frequent inspections will necessarily improve the identification of hazard trees. Hazard trees identified during annual inspections will, of course, be removed or pruned sufficiently to eliminate the hazard (unless a property owner prevents such work). As a result, some hazard trees will be identified and removed earlier than under the existing program (i.e. which would have then occurred during the next regular cycle).

PacifiCorp's existing Standard Operating Procedures require the removal of hazard trees. Consistent with California law, removal is required when "dead, rotten or diseased trees or dead, rotten or diseased portions of otherwise healthy trees overhang or lean toward and may fall into a span of supply or communication lines." (GO 95, Rule 35; see also Public Resources Code § 4293 ("Dead trees, old decadent or rotten trees, trees weakened by decay or disease and trees or portions thereof that are leaning toward the line which may contact the line from the side or may fall on the line shall be felled, cut, or pruned so as to remove such hazard."). Furthermore, the existing Standard Operating Procedures encourage removal even when removal is not required under GO 95, Rule 35 or PRC § 4293.

Hazard trees are identified through detailed inspections and patrols by field crews performing work. PacifiCorp uses an initial Level 1 assessment, as defined in ANSI A300 (Part 9). Suspect trees are targeted for removal. In many circumstances, obtaining property owner consent to removal is often part of the process. To accomplish removal when a property owner objects to removal, PacifiCorp goes to great lengths to obtain property owner permission, making repeated and reasoned requests by different representatives of the company.

3. Region prioritization

Vegetation management actions are conducted throughout PacifiCorp's service territory.

4. Progress on initiative

PacifiCorp conducted vegetation management activities consistent with its Vegetation SOP and this WMP in 2020 and will implement this initiative in 2021.

5. Future improvements to initiative

PacifiCorp will continue to review opportunities to utilize technology to augment inspections (such as LiDAR) and plan and track work. PacifiCorp previously identified a tactic to further increase overhang clearances within HFTD. This tactic was incorporated minimally into work executed in 2019 and 2020. At a future point in time, PacifiCorp may implement a pilot study to support this tactic.

7.3.6 GRID OPERATIONS AND PROTOCOLS

7.3.6.1 Automatic recloser operations

The way an electrical system is operated can mitigate wildfire risk. PacifiCorp has specific policies to address system operations during fire season. This policy is designed to reduce the potential for ignition of a fire from sparks emitted when a line is re-energized after a disturbance on the line. Recognizing the increasing magnitude of wildfire risk, PacifiCorp's policies were significantly revised in June 2018 to incorporate more conservative procedures designed to reduce the potential of ignition because of a fault on PacifiCorp's electrical network. From a practical perspective, there are two primary subject areas addressed with these revisions: (a) settings for automatic reclosers and (b) line testing after lock-out.

Furthermore, implementing and continuously improving this program requires advanced investigation of fault events to understand the nature and type of faults and whether this program is properly mitigating these events.

Automatic reclosers are currently deployed on various transmission lines and distribution circuits throughout PacifiCorp's service territory. When a line trips open, an automatic recloser may operate to close the circuit very quickly, so long as the cause of a momentary trip has cleared. The reclosing function in an important feature as it allows PacifiCorp to maintain service on a line that has tripped, rather than opening the circuit and de-energizing the line. In general, automatic recloser operation is beneficial, because it reduces outages and improves customer reliability. The actual operation of recloser equipment does not directly present wildfire risk, as the recloser equipment itself does not emit sparks or otherwise pose an ignition risk.

The operation of automatic reclosers, however, indirectly implicates some degree of ignition risk. When a fault is detected on the line, a recloser will trip and reclose based on pre-determined settings in an attempt to re-energize the line. If the cause of the fault is no longer present when the device recloses, the line will re-energize, resulting in limited outage impact to customers. If the cause of the original fault still remains when the device recloses, however, the original fault scenario will be experienced a second time and, depending on the circumstances, potentially result in arcing or an emission of sparks. As a result, in some limited circumstances, the second fault scenario could lead to a fire ignition. Accordingly, automatic recloser settings can have a significant impact on wildfire mitigation.

The issue with line-testing is very similar. If a breaker has "locked-out" – meaning that it has opened and no longer conducts electricity – a system operator will sometimes "test" the line. To test the line, the system operator 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 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 result in the emission of sparks if a fault has not yet cleared when the line is tested. Accordingly, a "no-test" policy reduces the risk of ignition, and a "no-test" policy is applicable in certain circumstances during fire season. In addition, PacifiCorp further restricts these operations during extreme fire weather conditions throughout additional line devices by either remotely or manually modifying these settings. This practice and its role in fire mitigation during designated "watch" periods is further discussed in Chapter 8.

Therefore, PacifiCorp has designed and developed its automatic reclosing operations wildfire mitigation program to include more restrictive system operating procedures during when wildfire conditions are more elevated to reduce this risk.

7.3.6.2 Crew-accompanying ignition prevention and suppression resources and services

Pacific Power maintains firefighting equipment which may be used to respond to small ignitions. These resources may be moved into affected areas as needed to support other districts, i.e. Medford, OR resources are available for use in Yreka, CA. The following is a list of resources and their location:

Table 7-11: List of firefighting equipment and locations

Equipment Description	Location
500 gallon water tanker and pump with ¾ inch high pressure hose	Bend
250 gallon water skid-tank on trailer	Grants Pass
500 gallon water trailer, 2 inch hose	Klamath Falls
250 gallon water skid-tank (requires trailer for movement)	Klamath Falls
500 gallon water trailer, 2 inch hose	Medford
250 gallon fire tank and pump (trailer or pickup loaded)	Pendleton
500 gallon water tanker, 3 inch hose, firefighting equipment	Roseburg
250 gallon fire tank and pump *(trailer or pickup loaded)*	Walla Walla
250 gallon fire tank and pump *(trailer or pickup loaded)*	Yakima

7.3.6.3 Personnel work procedures and training in conditions of elevated fire risk

Pacific Power Emergency Management conducts daily checks of the fire hazard for its service areas and reports those findings to the field employees as appropriate. This includes, but is not limited to, Industrial Fire Protection Level status, weather forecast, wind predictions and other fires in the area. The Pacific Power GIS department also maintains fire detection and notification capability to alert operations and emergency management personnel of a potential fire within a specified distance (five miles, as of this time) of Pacific Power assets. Pacific Power maintains clearance around facilities and powerlines in order to lower the risk of fire damage or ignition. These clearances are consistent with state regulations or, where no state requirements exist, the company's vegetation policies are followed. Pacific Power field employees are trained in detection, prevention and response to fires. Current policies and practices have been put in place with the sole intention of preventing fire ignition or damage. Vehicles are designed and maintained to prevent ignition from high temperature areas and are required to be regularly inspected for grass and debris accumulation which could create an ember and start a fire.

7.3.6.4 Protocols for PSPS re-energization

PacifiCorp describes its PSPS process, including "all clear" designation to facilitate re-energization in Chapter 8. It further describes its emergency plans including restoration actions in Section 7.3.8.9.

7.3.6.5 Stationed and on-call ignition prevention and suppression resources and services

PacifiCorp has not developed plans or procedures for on-call ignition prevention and suppression resources. At this time it coordinates with public safety partners to ensure alignment between utility and emergency sector operations.

7.3.7 DATA GOVERNANCE

7.3.7.1 Centralized repository for data

Deficiencies in the plan are generally identified as a result of self-audits, after action reviews, and progress updates. As described above, each department generally has the capability to monitor and audit progress and identify deficiencies. For example, the Emergency Management department is responsible for conducting after action reviews which include, as a component, action items to close gaps encountered. Audits conducted following asset inspections include detailed reports on findings which are then incorporated into annual training for inspectors.

One area currently identified for improvement at PacifiCorp and identified by the WSD is data governance. PacifiCorp has been working diligently to make progress in its delivery of data consistent with the WSD GIS Data Schema requirements published by the WSD. To date, the company has been able to deliver a substantial portion of the asset data in the format requested and intends to expand this data to include risk events, PSPS, and inspections data in the company's next quarterly filing, scheduled for May 9, 2021.

However, this effort requires the extraction and translation of non-spatial data into GIS format. Similar to monitoring and auditing the WMP, the evolution of the company's GIS data capabilities touches many departments throughout the company and requires an intense amount of input and coordination. While individual departments may have policies, processes, and procedures that determine how to manage key data for operations, PacifiCorp does not have a single, overarching data governance plan. However, the company recognized the need to develop a plan to close this gap, whose progress will continue to be reported in quarterly updates.

Further, the company has identified its intention to build methods to make its operational data sets extensible by proper data mapping into appropriate taxonomy, such that it does not require the creation and maintenance of parallel sets of systems to support both operational and regulatory needs. As described above, these data relationships have begun through the establishment of GIS datasets and are expected to be layered upon through the use of other datasets. As an example, in Section 4.2.1 the company leveraged its legacy outage database, Prosper, to render data consistent with the definition of risk events. This demonstrates the concepts behind this approach, which will continue to be explained as such actions are taken.

7.3.7.2 Collaborative research on utility ignition and/or wildfire

PacifiCorp has provided details regarding its collaboration on research projects in Section 4.4.1. During these activities the company has extracted data appropriate to the organization's needs and made it available in the method best serving their analysis.

7.3.7.3 Documentation and disclosure of wildfire-related data and algorithms

PacifiCorp does not develop company-specific calculations, with the exception of its newly developed LRAM metrics. These calculations and all supporting data are contained in Section 4.5.

7.3.7.4 Tracking and analysis of risk event data

PacifiCorp has leveraged existing data sources to produce metrics supporting its WMPs, some of which are its data sources while others may be external data sources. In a small number of situations that required the development of new databases (such as in the 2019 Decision approving the SMJU WMPs relating to Fire Incident Data Collection Reporting) the company has structured the new applications to be fed from existing sources (to the extent possible). The core data relates to outage data, which is collected and categorized consistent with IEEE 1366 & IEEE 1782 as well as Commission Decisions D.96-09-045 and D.16-01-008, while circuit equipment is derivative of the company's Geographic Information System. In Section 4.2.1 the company demonstrates the data mapping required of its outage data to render risk event data.

7.3.8 Resource Allocation Methodology

7.3.8.1 Allocation methodology development and application

PacifiCorp's resource allocation methodology relies on a general approach, in which the available resources, outlined and date specific deliveries and estimated labor (or material) requirements are outlined. To the extent these volumes exceed available capacity (internally and using standard external resources), the company identifies the need for 1) greater efforts in prioritization, 2) establishment of non-traditional resource pools and 3) reassessment of scheduled work. Of first priority is compliance-based activities, which is viewed as one form of a risk; thereafter, others are prioritized based on geographic wildfire Tier (Tier 2 vs Tier 3) and overall availability of materials. As opposed to prioritizing a certain type of program, PacifiCorp prioritizes the location of work to be completed and groups all potential program aspects applicable at that location into projects. This ensures that all programs on an applicable circuit, line, or combination of circuits and lines are completed at the same time to make efficient use of resources and avoid working in the same location multiple times. Where a wildfire mitigation program requires capital funding and construction, PacifiCorp established a Wildfire Project Management Office in 2020 with a dedicated Wildfire Mitigation Delivery Director responsible for managing resources and execution of programs.

PacifiCorp's general strategy for recruiting, training and retaining is outlined below. The company's annual GO 166 report outlines resources stationed in California and outlines resources available outside but proximate to provide support in California, should such need arise. The company relies upon a strategy of fulltime employee staffing based upon a persistent and steady workload analysis and augments through contracting venues for line service work as well as turnkey project delivery contracting.

Table 7-12: California field resources and staffing strategy

Employee Type	Employee count	Vacancy	Recruitment training retention strategy
Apprenticeship	1	0	PacifiCorp's recruitment and training strategies for key positions rely on collaboration with stakeholders, including local management, labor relations and community relationships. With respect to the recruitment and training of craft personnel, PacifiCorp has multi-year apprenticeship programs. This approach ensures that a pipeline of trained employees are ready to either backfill vacant positions or expand the internal workforce as needed. An apprenticeship includes classroom and job site training, with mandatory assessments before successfully completing the program.
Line Worker	31	2	To aid in providing ongoing training opportunity for line workers a training yard is being built in Bend, Oregon during 2021. This will provide consistency in training modules and processes which will also aid in retention as an investment the skill progression and knowledge of line workers.
Vegetation Management	2	0	With respect to vegetation management, PacifiCorp's recruitment and training strategies focus on management of the contractual relationship with independent contractors. PacifiCorp's vegetation management program is a 100% contracted front-line resource, managed by internal management and the Company's utility foresters. PacifiCorp requires that its utility foresters are certified arborists and certified utility specialists by the International Society of Arboriculture (ISA). PacifiCorp is not directly responsible for the training of the vegetation management workforce, who are employees of an independent contractor.

7.3.8.2 Risk spend efficiency analysis – not to include PSPS

In Section 4.2 the company outlines its intention for developing methods using its LRAM to create risk spend efficiencies; it has complied with the adopted methodology per D.19-04-020, and adhered to the 10 RAMP elements as part of its 2018 GRC. Further, the company offers that it intends to continue to participate in R.18-10-007 in which the SMJUs are being incorporated into the development of S-MAP and

RAMP frameworks, whereupon it will be sufficiently aligned with these procedures to calculate such products.

7.3.9 Emergency Planning and Preparedness

PacifiCorp's emergency planning and preparedness wildfire mitigation programs and overall WMP were developed in support of the company's overall Emergency Response Plan and integrate fully with the Utilities Code section 786.6 and GO-166. This Emergency Response Plan includes the tactics, policies, and procedures which are used in response to any emergency incident or planned event which impacts or has the potential to impact assets or customers within PacifiCorp's service territory. High level elements of this plan include but are not limited to:

- Elevated risk situational awareness notification processes in preparation of a potential emergency;
- Standardized hazard analysis;
- Emergency internal and external communication methods, protocols, and requirements during an emergency;
- Emergency notification protocols and processes;
- Resource availability and predetermined response times between areas of operation;
- Mutual assistance protocols and capability;
- Authority, governance, and key contacts; and
- After action reporting requirements to identify gaps and incorporate lessons learned.

PacifiCorp's Emergency Response Plan follows the National Incident Management System (NIMS) and the Incident Command System (ICS), and it is the foundation for the company's response to all crisis and emergencies. Consequently, PacifiCorp's Emergency Response Plan follows the all-hazards approach, which includes coordinating with other utilities and all levels of government. The plan supports an organized and efficient response to a wide variety of events of differing magnitudes. The all-hazard plan is a management tool providing a scalable response, organizational structure, procedures for information management, operational activities, a smooth transition to restoring normal services and the implementation of post-incident actions.

As previously described, PacifiCorp's emergency planning and preparedness wildfire mitigation programs and overall 2020 WMP were developed in support of the company's overall Emergency Response Plan and integrate fully with the Utilities Code section 786.6 and GO 166.

While PacifiCorp follows an all-hazards approach to emergency management, PacifiCorp recognizes that the specifics of emergency management for wildfire events can vary from other types of emergency management in terms of both preparation and response. For example, the governmental emergency responders with whom PacifiCorp will coordinate will be different in a wildfire as compared to other types of events. For small wildfires, PacifiCorp personnel will likely work directly with firefighters; for larger wildfires, PacifiCorp management will likely coordinate with an incident command center which could involve representatives of both state and federal agencies, likely including the Bureau of Land Management or the National Forest Service. Furthermore, preparation activities, fire precaution levels and relevant tools may differ significantly.

Where appropriate, PacifiCorp's emergency response plan components specific to Fire Prevention, Preparedness and Response not contemplated in the company's Emergency Response Plan have been

included in the Fire Prevention, Preparedness, and Response Plan filed per GO 166 Attachment E. Since originally filed in 2018, PacifiCorp has incorporated additional elements and details such as incorporation of risk assessment, system resilience, and situational awareness aspects from the WMP into the company's Fire Prevention, Preparedness, and Response Plan in an attempt to make the Fire Prevention Plan more analogous to a playbook describing the operational readiness and response in the event of a wildfire.

As with all of PacifiCorp's emergency planning and preparedness programs, the company intends to continue implementation of these programs, incorporate new elements such as training, resources, tools, and processes where appropriate, and translate lessons learned or effectiveness into long term program modification and evolution.

a. Plans to prepare for and restore service, including workforce mobilization (including mutual aid and contractors) and prepositioning equipment and employees

As with any response, PacifiCorp will attempt to preposition personnel and equipment into impacted areas in a proactive manner. However, PacifiCorp understands not every event supports a proactive approach but still maintains the ability to move personnel and equipment into impacted areas after the start of an event. Depending on the size and type of event, PacifiCorp will first deploy its internal workforce and then supplement the workforce with contractors. Should the event grow beyond the ability of the internal and contract workforce, PacifiCorp would reach out to others via mutual assistance agreements.

Electric utilities could call upon other electric companies for emergency assistance, in the form of personnel, material or equipment, to aid in maintaining or restoring electric service when such service has been disrupted by acts of the elements, sabotage or equipment malfunctions. PacifiCorp is a member of several regional and national mutual assistance agreements with electric service providers. Parties to these agreements can request or provide assistance and resources to other members to support the restoration of electrical service when it cannot be restored in a timely manner by the affected company alone. Details regarding membership, activation, notification, resource departure and arrival are all included in PacifiCorp's Emergency Response Plan. PacifiCorp intends to leverage these same programs and elements for emergency management of wildfire events.

b. Emergency communications, including community outreach, public awareness, and communications efforts before, during, and after a wildfire in English, Spanish, and the top three primary languages used in California other than English or Spanish, as determined by United States Census data

Dissemination of timely, accurate, accessible and actionable information to the public is important in all phases of PacifiCorp's incident management. Communications efforts are listed in the WMP, Emergency Response Plan and PSPS Playbook which provide both messaging and cadence for public and stakeholder communications throughout the preparation, response and restoration cycle. The outage restoration call-back program is an automated system that simultaneously initiates call backs to hundreds or thousands of customers providing updated estimated times for restoration and to verify service has been restored. Communication with customers, key internal and external

stakeholders and all levels of management as early as possible is key. The PacifiCorp Joint Information System consists of processes and tools to facilitate communication with the public, news organizations, government entities and external stakeholders through social media, website restoration information, press releases and notification protocols while ensuring the messaging is consistent and comprehensive.

c. Showing that the utility has an adequate and trained workforce to promptly restore service after a major event, considering mutual aid and contractors

PacifiCorp has dedicated resources in the California service territory available to respond as needed to events. In addition to the resources in California, PacifiCorp has internal resources from Oregon and Washington that can be deployed. In the event these resources are insufficient, mutual assistance agreements can also be deployed. The table below provides the approximate count of construction / response craft positions available to support California operations. While this count is relatively representative of available resources, these numbers may fluctuate as personnel change. Additionally, in the event these resources are insufficient, mutual assistance agreements can also be deployed as described in the previous section.

7.3.9.1 Adequate and trained workforce for service restoration

To ensure the identified workforce have the proper wildfire mitigation training, each year refresher training is provided to applicable field employees within the HFTD. This involves reviewing operating practices that reduce wildfire risk while performing routine work and confirming the availability of fire mitigation / suppression tools before fire season.

To ensure adequate workforce levels are available when required, PacifiCorp has access to additional resources in other service territory areas that can be deployed as needed. Additionally, PacifiCorp is a member of mutual assistance agreements with partnering utilities that provides access to even more resources if required when responding to an event.

When an emergency or major event occurs, it is critical the resources tasked with rebuilding infrastructure to restore service are sufficient and work in such a way as to not escalate risk. Similar to when performing planned or routine work, PacifiCorp field operations are able to mitigate some wildfire risk by utilizing specific operating procedures during fire season in heightened fire risk areas.

While PacifiCorp is experienced with and prepared to respond to emergency events, responding to an emergency involving a wildfire event can pose specific challenges. System operators or local emergency response crews may need field operations personnel to gather more extensive information and assess local conditions differently than with other type emergencies or normal operating conditions. Field personnel may also need to use specialized tools or monitor and react to changing weather patterns.

In certain situations, the required resources to respond to an event, or restore after an event can be more than what is available in the local district on a daily basis. For these cases where an event exceeds the local district's capability to respond, PacifiCorp needs to be able to have access to additional resources to ensure adequate resources can be deployed to mitigate or respond to the wildfire event.

While access to available resources is a system wide program the specific wildfire mitigation training is prioritized for staff actively working within the HFTD zones in California. However, as the company may pull from additional resources during an emergency, PacifiCorp provides the training to all applicable employees that might respond to a wildfire event.

In general, as part of the emergency management program, PacifiCorp evaluates exercises and actual response events, by identifying issues raised during the event and documenting lessons learned and corrective action plans. Multiple methods are used to gather exercise and post-action reviews, including participant and observer evaluation forms, remedial action tracking, and post-exercise or after-action incident reviews. Lessons learned may be implemented for inclusion in PacifiCorp's response and restoration procedures and incorporated in the emergency response document.

An effective response to any event is determined by the ability to implement a coordinated response for restoration and recovery activities, which includes, as a component, the availability of an adequate and trained workforce. This determination would be evaluated as part of the post event lessons learned process.

7.3.9.2 Community outreach, public awareness, and communications efforts

Dissemination of timely, accurate, accessible and actionable information to the public is important in all phases of PacifiCorp's incident management. The outage restoration call-back program is an automated system that simultaneously initiates call backs to hundreds or thousands of customers providing updated estimated times for restoration and to verify service has been restored. Communication with customers, key internal and external stakeholders and all levels of management as early as possible is key. The PacifiCorp Joint Information System (JIS) consists of processes and tools to facilitate communication with the public, news organizations, government entities and external stakeholders through social media, website restoration information, press releases and notification protocols while ensuring the messaging is consistent and comprehensive.

Regional Business Managers
PacifiCorp regional business managers maintain company relationships with local government jurisdictions and community organizations. Regional business managers are the primary contact for local leadership and critical customers in their area of responsibility.

District Operations Managers
District operations managers maintain relationships and exchange contact information with local first responders. In the event of a wildland fire, district managers deploy to the jurisdictional agency's Incident Command Post (ICP) to ensure electric safety awareness. The district operations manager acts as the liaison between the ICP and PacifiCorp's Control Center and Emergency Operations Center.

Emergency Managers
PacifiCorp's emergency management team interfaces and maintains relationships with federal and state emergency responders and mutual assistance groups. The emergency manager has contact information for state, county and tribal emergency managers, the state's Emergency Operations Center Emergency Support Functions (ESF) personnel, and the Geographic Area Coordination Centers dispatch centers for fire-related emergency response.

Training, Exercises and Continuous Improvement
An effective response to any incident is determined by the ability to implement a controlled incident command structure and to assume responsibility for restoration and recovery activities. It is critical individuals having responsibility for functions within the incident command system are familiar with their responsibilities and have practiced performing those responsibilities. Individuals identified with primary or secondary responsibility within the command center structure complete an annual review of the overall disaster response and recovery plan. These individuals are required to contribute to post-crisis

and emergency reporting, outlining any issues or concerns regarding their role and responsibilities. The incident command system is activated periodically throughout the year in the normal course of operations. An annual exercise is conducted to ensure that individuals otherwise not involved in incident management on a regular basis are practiced in responding.

PacifiCorp has a goal of continuous incident management improvement. PacifiCorp evaluates exercises and actual response incidents, by identifying issues raised during the exercise or incident and documenting lessons learned and corrective action plans. Multiple methods are used to gather exercise and post-action reviews, including participant and observer evaluation forms, remedial action tracking, and post-exercise or after-action incident reviews. Lessons learned may be implemented for inclusion in PacifiCorp's response and restoration procedures and incorporated in the emergency response document.

7.3.9.3 Customer support in emergencies

In reporting outages, PacifiCorp will continue its use of the company's customer outage management protocols and its real time outage map to inform customers regarding the presence and location of outages as well as the estimated restoration plans, consistent with standard operating practices. While the specifics of the frequency, content, and use of the messaging may change the overall tools and processes will be the same. Details regarding PacifiCorp's PSPS specific notifications, tools, messaging, and notifications have been included in Section 5.3.6.4.

PacifiCorp has also implemented a variety of consumer protections and procedures to assist the company's customers when a disaster impacts their communities, consistent with D.18-03-011. These protections are in addition to routine customer service protections as provided in communicating outages and restoration time estimates as are supported through the company's web portal and customer service organization. In considering which of these protections to implement and the duration of the relief so provided the type, scale, and size of the event are evaluated and a program is developed commensurate with the disaster. Some disasters will warrant greater relief than others. In the case of a larger, vast and far-reaching disaster, it may be reasonable to provide greater relief for a longer duration.

Specific details regarding these programs are included below.

Outage reporting
Specific to wildfire mitigation, PacifiCorp intends to enhance outreach through customer contact center to provide impacted customers with information regarding service interruptions, restoration efforts, along with relief support by adding to the scripts a high-level overview of customer protections, including directing the caller to the company webpage(s).

Support for low income customers
PacifiCorp's support for low income customers program includes the ability to:

- Freeze all standard and high-usage reviews for the CARE program eligibility until 12-month period has lapsed or potentially longer;
- Contact all community outreach contractors, community-based organizations who assist in enrolling hard-to reach low-income customers, to better inform customers of these eligibility changes; and
- Partner with program administrator of the customer funded emergency assistance program for low-income customers and increase the assistance limit amount for affected customers during the following 12-month period.

Billing adjustments
PacifiCorp's billing adjustments include the ability to pro-rate monthly bill and any charges to the date of the emergency or subsequent damage to customer premises and recalibrate approach for estimating energy usage during when premises are unoccupied as a result of the disaster to avoid estimating errors.

Deposit waivers
In the event of a wildfire emergency, PacifiCorp can waive deposit and late fee requirements for one year from the declared emergency.

Extended payment plans
In the event of a wildfire emergency, affected customers with existing service or those seeking to establish service at a new residence, who have prior arrearage, are offered a payment plan with 20 percent due, with equal installments for the remainder for no less than twelve billing cycles with no interest.

Suspension of disconnection and nonpayment fees
In the event of a wildfire emergency, PacifiCorp may suspend disconnection for non-payment and associated fees, and eliminate reporting to credit reporting agencies or any collection services for unpaid

Repair processing and timing
Immediately after the emergency, an assessment is made to identify the premises of affected customers whose utility service had been disrupted or degraded and, if applicable, the meter is removed.

Access to utility representatives
In the event of a wildfire emergency, PacifiCorp will directly contact customers with damaged facilities after the meter is removed from the damaged property and will expedite any work required to reinstate electrical service. Additionally, PacifiCorp will closely coordinate with local agencies to facilitate any permitting requirements and ensure work is completed as quickly as practical.

Community Support Centers
Pacific Power has obtained logistical support for deployment of Community Support Centers should the need arise during a Public Safety Power Shutoff event. Community Support Centers will be established upon recommendation of the Unified Command. The center(s) will be open from 8am to 8pm with the potential to stay open longer based on community needs.

The Community Support Center tent (if needed) is approximately 33ft x 18ft and able to sustain winds of 55mph gusting to 65mph.

Pacific Power personnel will staff the center(s) to assist and provide information to community members.

<u>Siskiyou County</u>

A Community Support Center location is established within each PDZ and will provide the ability for the community to have specific needs met. Services provided include:

- Shelter from environment
- Air conditioning

- Potable water
- Seating and tables
- Restroom facilities
- Refrigeration for medicine and/or baby needs
- Interior and area lighting
- On-site security
- Communications capability such as Wi-fi access, SatPhone, Radio, Cellular phone etc.
- Televisions
- On-site medical support (EMT-A at a minimum, Paramedic preferred)
- Charging stations for Cell Phones, AM/FM/Weather radios, computers, etc.
- Adherence with any existing local, county, state or federal public health orders

Locations:

- Happy Camp PDZ – Happy Camp Community Center
- Shasta PDZ - Mt Shasta Community Center
- Weed and Snowbrush PDZ- Weed Community Center
- Dunsmir PDZ - Dunsmuir Community Center

7.3.9.4 Disaster and emergency preparedness plan

While described in the company's overall Emergency Response Plan, this basic approach is applicable with respect to any type of emergency event including wildfire events ranging from a relatively small wildfire that a local fire suppression agency is able to control, to the larger wildfire events which require a coordinated interagency response. As a result, PacifiCorp's internal response structure is organized for a wildfire event in a manner substantially identical to any other incident requiring an emergency response.

Executive Policy Group
The PacifiCorp Executive Policy Group consists of executives and administrators from key internal organizations and is activated based on the severity of the incident and need for strategic support. As part of the structure, the group collects and analyzes information, makes high-level strategic and procedural decisions, assists in the continuation of critical business processes, and helps facilitate cross-platform incident coordination in support of those responsible for managing the incident. Concerns for public safety is a key consideration in determining the need to activate the Executive Policy Group.

Emergency Operations Center (EOC)
Bringing representatives from various PacifiCorp organizations together in an Emergency Operations Center (EOC) optimizes unity of effort and enables staff to share information, provide policy guidance to on-scene personnel, plan for contingencies, deploy resources efficiently, and generally provide any support necessary. The composition of the team may vary depending on the nature and complexity of the incident.

7.3.9.5 Preparedness and planning for service restoration

Activation of the response function takes place according to the escalating threat, human impacts or severity of the incident. Most local incidents can be handled at the district operating level; but some incidents, like some wildland fires, require resources and support beyond the capabilities and authority of the district or regional operating area. Incidents that threaten the company as a whole (e.g. contagious disease, cyber-attacks), or place the company's stability at risk, may require high level management,

strategic policy and financial decisions, crisis communications or other crisis management functions. Typically, even a relatively large wildfire would not threaten the company as whole, but a large, uncontrolled wildfire threatening catastrophic damage to people and property could require such crisis management functions. Operations return to normal as soon as practical, which typically occurs when the incident no longer needs the support and coordination functions provided by the EOC. If support functions can be managed by individual organizations through normal procedures, operations may return to normal.

If an event is anticipated or advanced warning is received (i.e. a winter storm warning), pre-incident activities may be implemented in advance of an actual event. Forecasts of extreme wildfire conditions may warrant pre-incident activities. These activities may include deploying additional response personnel and resources, customer and stakeholder advanced notification, and situational monitoring of wildfire conditions, such as wind speed, temperature, humidity and fuel conditions (all of which might contribute to the ignition and/or spread of a wildland fire).

The level of response is dictated by the seriousness of the incident. Incidents may be localized, or they may require support from an Emergency Operations Center. Moderate outage events and localized incidents require localized plan activation. In general, however, localized incidents can be quickly resolved with internal resources. These incidents have little or no impact on the public or normal operations and are managed by supervisors in the impacted district or area.

More complex outage events and potential threats which are beyond the scope of local management often require coordination of a considerable amount of resources, extended involvement and contact with internal business units and external stakeholders, and the potential for the incident to expand rapidly. This type of incident disrupts a significant number of customers, includes extended restoration time, or a perceived threat to service exists beyond the level where normal operating practices and local resources are sufficient to respond, and requires Emergency Operations Center activation. This type of incident might include, for example, a wildland fire, severe weather forecasts, or a security threat. Additional personnel from surrounding operations districts may be required to respond.

7.3.9.6 Mutual Assistance

Electric utilities have the ability to call upon other electric companies for emergency assistance, in the form of personnel, material or equipment, to aid in maintaining or restoring electric service when such service has been disrupted by acts of the elements, sabotage or equipment malfunctions. PacifiCorp is a member of several regional and national mutual assistance agreements with electric service providers. Parties to these agreements can request or provide assistance and resources to other members to support the restoration of electrical service when it cannot be restored in a timely manner by the affected company alone.

7.3.9.7 Protocols in place to learn from wildfire events (Lessons Learned)

PacifiCorp leverages existing systems and processes included in the company's Emergency Response Plan to learn from wildfire events in the same manner PacifiCorp learns from any emergency event. Therefore, PacifiCorp does not have a specific program for incorporation of lessons learned that is not already covered in an existing program or through ongoing process improvement.

An effective response to any incident is determined by the ability to implement a controlled incident command structure and to assume responsibility for restoration and recovery activities. It is critical that

individuals having responsibility for functions within the incident command system are familiar with their responsibilities and have practice performing those responsibilities. Individuals identified with primary or secondary responsibility within the command center structure complete an annual review of the overall disaster response and recovery plan. These individuals are required to contribute to post-crisis and emergency reporting, outlining any issues or concerns regarding their role and responsibilities.

The incident command system is activated periodically throughout the year in the normal course of operations. Additionally, an annual exercise is conducted to ensure that individuals otherwise not involved in incident management on a regular basis are practiced in responding.

PacifiCorp has a goal of continuous incident management improvement. PacifiCorp evaluates exercises and actual response incidents by identifying issues raised during the exercise or incident and documenting lessons learned and corrective action plans. Multiple methods are used to gather exercise and post-action reviews, including participant and observer evaluation forms, remedial action tracking, and post-exercise or after-incident reviews. Lessons learned may be implemented for inclusion in PacifiCorp's response and restoration procedures and incorporated in the emergency response plans.

7.3.10 Stakeholder Cooperation and Community Engagement

7.3.10.1 Community engagement

PacifiCorp employs a multi-pronged approach to community engagement and outreach with the goal to provide clear, actionable and timely information to customers, community stakeholders and regulators. The company uses a variety of channels and tactics to maximize its customer reach including its website, bill inserts, emails, community events, social media, printed materials such as brochures and flyers, radio advertisements, messaging collaboration with local agencies and press releases/pro-active media engagement. Due to current limitations amidst the COVID-19 pandemic, the company has utilized webinars and video content to reach customers and community stakeholders in lieu of in-person community events. It is the company's hope that in-person wildfire safety and preparedness events will resume once it is safe to do so.

PacifiCorp also conducts outreach with local government and community-based organizations and routinely provides collateral, such as brochures and safety checklists for distribution through these organizations to customers. As indicated in PacifiCorp's May 15, 2020 filing,[36] the company performs outreach in prevalent languages – which includes Chinese traditional, Chinese simplified, Tagalog, Vietnamese, Mixteco, Zapoteco, Hmong, German and Spanish – and continues its efforts to identify and reach medical baseline and access and functional needs customers in its service territory.

Communication Tactics

PacifiCorp provides wildfire safety and preparedness and Public Safety Power Shutoff (PSPS) targeted public outreach and education through a variety of methods. Targeted areas include communities in Tier 3 designated fire high consequence areas with some overlap into Tier 2 areas depending on media market and distribution channel. The following list of tactics is not meant to be rigid or exhaustive as the company maintains a flexible and dynamic communications plan that is informed by customer survey data, community stakeholder input or community needs:

- Targeted wildfire safety radio, digital, and social ads;

[36] Advice Letter 615-E Regarding Compliance with Ordering Paragraph 1 of Decision 20-03-004.

- Letters to elected officials in high fire threat districts providing updates regarding PacifiCorp's wildfire mitigation plan and community outreach activities;
- Geo-targeted social media posts promoting wildfire safety and preparedness;
- Wildfire safety-related press releases sent to local and regional media outlets; subject matter interviews provided as needed;
- Customers in potential de-energization zones receive wildfire safety and PSPS-specific bill messages;
- Targeted social media and print ads promoting wildfire safety webinars;
- Webinars are recorded and made available on the company's website;
- Wildfire safety and preparedness resource and information center on website;
- Webtools to help customers identify if an address is located within a PSPS area and weather forecasting tools.

In order to ensure that outreach is provided in identified prevalent languages, PacifiCorp has taken the following steps:

- Wildfire safety-specific communications including brochures, handouts, and bill messages are 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."
- Customers with specific language needs can contact the company's customer care number and request to speak with an agent that speaks their language. PacifiCorp 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;
- 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.

Regional Business Manager Community Stakeholder Engagement and Collaboration

PacifiCorp regional business managers (RBM) serve as an essential conduit for company wildfire mitigation and PSPS information and often collaborate with community stakeholders around this topic. In the course of daily business, RBMs frequently interact with key community stakeholder groups including business chambers, city councils, large industrial and commercial customers, critical facility customers (e.g.; hospitals, city water, MUD/PUDs), municipal and rural Fire & Rescue, nursing and hospice centers, school districts, community Firewise groups, tribal emergency management, Rotary and Kiwanis clubs and many other community groups. Their vital role in this ongoing conversation with the communities the company serves cannot be understated.

In these interactions with community stakeholders, the company wildfire mitigation plan might be the focus of the conversation or just an informal update. At times, the RBM will give presentations on the topic to an audience of key stakeholders from a variety of sectors for efficiency sake and to foster greater collaboration. Once initial presentation schedules are set (typically prior to or early into the wildfire season), interval update emails or phone calls and impromptu update meetings may and often do occur based on the stakeholder level of engagement. On occasion, financial support to fund wildfire safety-related equipment or support may be requested by community groups. Constructive stakeholder

feedback has helped evolve and tailor content in brochures and on company wildfire safety webpages. Community stakeholder feedback is consistently encouraged by RBMs.

Topics discussed during RBM wildfire safety and preparedness presentations, meetings or conversations include:

- General wildfire mitigation planning updates;
- Previous wildfire season review;
- System hardening and tree trimming high level overview, sharing work planned and completed;
- Customer outreach and engagement update providing information on communication methods and explore ways to collaborate on messaging and additional customer outreach through alternative methods
- Review company PSPS maps, webpages, print materials and timelines of communications to general public and key stakeholders;
- Set expectations on frequency of information receipt and preferred methods. (Example: Quarterly in person presentations);
- Liaison with local emergency managers to reinforce partnerships and collaboration;
- Updates and overview of community, customer outreach during PSPS event, as needed.

Access and Functional Needs, Medical Baseline Population Engagement

PacifiCorp provides additional PSPS notifications to individuals classified as medical baseline customers in PacifiCorp's customer service system and to individuals who self-identify as having access and functional needs (AFN). 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. PacifiCorp 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. An example is Del Norte Senior Center and Great Northern Services partnering with the company to distribute wildfire safety brochures to households in Crescent City and Weed. The brochures are provided in English and Spanish and a key message encourages customers to contact the company to self-identify as having medical needs dependent on electricity. PacifiCorp has also engaged in meet and confer sessions planned with the parties in this proceeding to coordinate outreach efforts related to CBOs. In 2021,

Additionally, PacifiCorp, through a third party vendor, MDC Research, conducts annual online and phone surveys with customers, including independent living, assisted living and skilled nursing centers and AFN representatives and CBOs (Family and Community Resource Center of Weed, Mount Shasta CRC, Dunsmuir CRC, Happy Camp Family/CRC, Yreka CRC, HUB Communities, Tulelake/Newell FRC, Scott Valley CRC, Helping Right Now, among others) located in potential PSPS areas regarding the company's PSPS and wildfire safety communications.

In-depth interviews conducted with CBOs in PacifiCorp's California service area took place in Fall 2020. The interviews lasted 30 minutes and were conducted virtually. Key findings include:

- CBOs often do receive communications and resources from Pacific Power related to CARE and providing low-income residents with support for paying their electric bills.
- Most communications and resources received about wildfires (from any organization, including government or fire agencies) have been focused on evacuation preparedness, with limited information about general safety or preparation for PSPS events.
- Most report that wildfire safety, preparedness, and PSPS communications are outside the scope of their charter; they would be willing to help spread the word, but typically do not have the available resources to do so without further support.
- The most common methods CBOs currently use to communicate with the community are social media, in-person visits or meetings, and through handing out flyers when clients visit the office.
- General fire safety information is least impactful, as other agencies are already providing information about brush clearing and steps required to mitigate fire risk.
- Special attention should be paid to those with medical needs and limited transportation options; they are most at risk during a PSPS event.

These findings help to inform and evolve how PacifiCorp utilizes CBO communication channels without adding extra burden to these organizations. Thus, the company is seeking additional messaging avenues outside of its currently defined outreach strategy. This involves working with community partners to find appropriate places and spaces to add AFN-specific messages to existing platforms such as CBO emails, brochures, webpages and/or social media pages. This work is ongoing and is carried out by RBMs collaborating with their community stakeholders or direct outreach to community organizations by company corporate communications staff.

Public Safety Power Shutoff Communication Overview

PacifiCorp's Public Safety Power Shutoff event communication and notification plan has two primary systems. First, direct communications, through pre-identified channels, are used to provide detailed notices to key stakeholders, namely public safety partners and critical facilities and critical infrastructure. Second, a series of automated notices (email, text and direct phone calls) to customers, together with published information on the company's website, social media channels, and proactive media outreach, are employed to provide notice to the general public at critical stages of the PSPS process, including for pre-event warnings, an actual event, and re-energization. Medical baseline and access and functional needs customers are provided additional notices. Targeted media outlets that cover identified PSPS areas include:

Media Outlet	City
Weed Press, The	Mount Shasta
Dunsmuir News	Mount Shasta
Mount Shasta Herald	Mount Shasta
Saturday Magazine - KVIP-AM	Redding
Record Searchlight	Redding
KVIP-AM	Redding
KRCR-TV	Redding
KQMS-AM	Redding
Modoc County Record	Alturas
Lassen County Times	Susanville
KCFJ-AM	West Covina

KPOD-AM	Crescent City
Del Norte Triplicate	Crescent City
KCMX-AM	Medford
KDRV-TV	Medford
KFTS-TV	Medford
KMED-AM	Medford
KMVU-TV	Medford
KOBI-TV	Medford
KSYS-TV	Medford
KTVL-TV	Medford
Medford Mail Tribune	Medford
KDKF-TV	Klamath
KFLS-AM	Klamath
Klamath Falls Herald and News	Klamath
KOTI-TV	Klamath

To ensure that the public can access timely and detailed information about both potential and actual PSPS events relevant to a particular location, PacifiCorp has modified its main PSPS webpage, available at www.pacificpower.net/psps. A web-based tool allows members of the public to enter an address into a search bar to determine if that address is in an area which may be subject to a PSPS. An additional online tool is available for members of the public to see the "Public safety power shutoff forecasting" for that area over the following week. The status indicates whether the area is operating as "Normal," whether there is a PSPS "Watch," or whether there is an actual PSPS "Event." Additionally, the company is in the process of building out the weather section of this page to give visitors more insight into real-time weather monitoring through its network of field weather stations. This will consist of language on the page explaining the company weather station network and a link to the MesoWest page.

PacifiCorp has ensured that it has the bandwidth to manage its PSPS website, even under the extremely remote potential that all proactive de-energization zones in PacifiCorp's service territory would be de-energized at the same time. When there is an event, transmission & distribution operations Emergency Operations Center personnel takes on the role of updating the PSPS website. The company's PSPS website is fundamentally a content only (with PSPS area polygons imposed on maps) static site with no dependency on any backend applications. The Pacific Power website performed well serving content during the September 2020 windstorm event where a significant surge in web visits – 200,000+ web visitors with 1.6M+ web page views. This event demonstrated capable broadband performance.

Measuring Community Engagement and Communication Success

In accordance with the Ruling, PacifiCorp and the other small and multijurisdictional utilities (SMJUs) worked together to coordinate survey questions, and prior to formulating and conducting the 2020 surveys, the survey questions and methodology were shared during a meet and confer hosted collectively by the SMJUs.

PacifiCorp and the SMJUs worked closely with MDC Research to develop a twenty-question survey on the effectiveness of its 2020 wildfire preparedness and public safety power shut-off outreach to identify areas of improvement for ongoing outreach. MDC Research is the same organization that developed and conducted the Spring 2020 survey on behalf of the company and will continue to administer surveys on behalf of the company in 2021.

To reduce self-selection and bias, this survey was conducted using a mix of online and phone surveys (515 completed web surveys / 80 completed phone surveys) and were available to customers in English and Spanish. A total of 595 surveys, including 30 from critical customers, were completed between October 27 and November 25, 2020. Additionally, MDC Research conducted interviews with four community-based organizations (CBOs) that operate within PacifiCorp's California service area.

The overall objective of this research was to measure the public's awareness of messaging related to wildfire preparedness and safety. Specific research objectives include:

- Measure awareness of Pacific Power messages related to wildfire preparedness;
- Identify recall of specific message topics;
- Identify recall of message channels;
- Measure recall and understanding of Public Safety Power Shutoff or PSPS;
- Evaluate sources customers are most likely to turn to for information about PSPS;
- Evaluate PSPS experience;
- Explore actions taken by customers to prepare for wildfire season; and
- Measure awareness of Pacific Power's efforts to reduce the risk of wildfires.

Survey Results

A key takeaway from the 2020 survey is that 68 percent of respondents are aware of wildfire safety communications from the company, up from 60 percent in May 2020. Pacific Power remains the primary source for wildfire preparedness information. Additionally, 71 percent recall seeing, hearing or reading the phrase "Public Safety Power Shutoff or PSPS," which is up significantly from May 2020. Additional key findings include:

a. Messaging: Personal preparedness and vegetation management remain the most common messages recalled. Approximately 78 percent of respondents understand the following statement about PSPS: "for areas at a higher risk of fast-spreading catastrophic wildfires, the utility will proactively shut off power during extreme and dangerous weather."

b. Communications Channels: Social networking and television news are the most commonly recalled channels for wildfire preparedness communication. Three in five respondents recalled seeing messages about wildfire preparedness on social media networks or television news at least five times during the last six months. Television news remains the main source of information for those age 65 and older, and also remains the main source of PSPS communication recall. However, compared to May 2020 (58 percent), significantly fewer respondents (45 percent) mention this channel, as well as newspaper, while more recall seeing PSPS information on social media. Approximately 44 percent stated they would first turn to the Pacific Power website for information about a PSPS event, consistent with May results. The Pacific Power website was also rated as the most useful and clear source of wildfire information by those surveyed.

c. Awareness of Wildfire Mitigation Efforts: Recallers, or individuals who remember the information, remain more likely than non-recallers to be aware of Pacific Power's efforts to reduce the risk of wildfire with 62 percent being aware of Pacific Power's efforts to prune vegetation around power lines in higher-risk areas, in line with the May survey findings.

d. Customer Contact and Notification: Approximately 60 percent of respondents are aware they can update their contact information with Pacific Power, and three in five of those stated they have

done so. Over a quarter know whether their address is in a PSPS area and 26 percent are aware of a PSPS map on Pacific Power's website, a significant increase since May 2020 (13 percent).

e. Access and Functional Needs and Language Prevalence: Among respondents reporting that they rely on electricity for medical needs, a third are aware of additional notices from Pacific Power, up significantly from May (15 percent vs 35 percent). All but four respondents for whom English is not the primary language, prefer to receive communications in English. Approximately 99 percent of those surveyed (in both English and Spanish) indicated it would not be helpful to receive communication in another language.

The results of this independent survey demonstrate that PacifiCorp deployed a comprehensive strategy for engaging customers regarding wildfire preparedness and PSPS in 2020. The report further identifies areas for improvement. The company takes these findings into consideration to improve its engagement with community partners, agencies and other CBOs for customer wildfire preparedness and PSPS outreach and engagement efforts in 2021.

The company plans to increase awareness of resources on Pacific Power's website, including how to determine whether a customer's residential or business address is located in a PSPS area and educate more customers of the ability to update contact information and/or identify as AFN-related electricity needs in a residence. Based on the survey results and interviews with CBOs, the company tailoring messaging to highlight important and actionable information for AFN population and engage directly with CBOs in the event of a PSPS. Additionally, the company is seeking AFN messaging opportunities with community partners outside of its traditional communication channels such as placing key messages and call-to-actions on CBO websites, newsletters, emails and printed materials.

7.3.10.2 Cooperation and best practice sharing with agencies outside CA

PacifiCorp has used lessons learned and best practices to expand the PSPS process into other parts of our service territory such as areas deemed a high fire threat in Oregon, Washington and Utah. Through our lessons learned we have been able to develop processes and procedures which are being adopted in other states in coordination with other agencies and jurisdictions.

7.3.10.3 Cooperation with suppression agencies

Similar to PacifiCorp's general approach to emergency management, The Emergency Response Plan has procedures for the integration of utility personnel into the public sector response structure for an incident or event requiring electric utility support and coordination. If the public sector requests personnel to the Emergency Operations Center they will be made available.

PacifiCorp's emergency management team interfaces and maintains relationships with federal and state emergency responders and mutual assistance groups. The emergency manager has contact information for state, county and tribal emergency managers, the state's Emergency Operations Center Emergency Support Functions (ESF) personnel, and the Geographic Area Coordination Centers dispatch centers for fire-related emergency response. District operations managers also maintain relationships and exchange contact information with local first responders regularly. In the event of an incident where emergency operations are established, such as a wildland fire, a district manager or an identified company representative will deploy when needed or requested to the jurisdictional agency's Incident Command Post (ICP) to provide necessary electric utility support and coordination. The district operations manager

or identified company representative acts as the liaison between the ICP and PacifiCorp's Control Center and Emergency Operations Center. Furthermore, PacifiCorp regional business managers maintain company relationships with local government jurisdictions and community organizations. Regional business managers are the primary contact for local leadership and critical customers in their area of responsibility

In preparation throughout the year, PacifiCorp also participates in various regulatory proceedings, town hall meetings, and open house events to engage other industry leaders, community leaders and members, and local emergency response management organization. These events focus on a range of aspects of PacifiCorp's wildfire emergency planning and preparedness programs, including communication protocols, notification protocols, and resource coordination efforts.

7.3.10.4 Forest service and fuel reduction cooperation and joint roadmap

PacifiCorp uses a multi-faceted effort to communicate information regarding wildfire prevention and response to customers. Communication methods include the following: targeted radio public service announcements; social media posts on Facebook and Twitter; informative banners on website homepage, wildfire safety landing page on website; targeted bill messages; press releases posted to our website and distributed to local media; news articles for local chamber publications; prepared talking points for regional business managers; pre-determined outreach to local community authorities and organizations to participate in prevention and preparedness focused town halls; and live informative Facebook events. Additional information regarding PacifiCorp's community outreach, public awareness, and communication efforts can be found in Section 5.3.9.2. The following subsection include detailed descriptions of PacifiCorp's emergency planning and preparedness wildfire mitigation initiatives. Each of these programs is ultimately governed by PacifiCorp's Emergency Response Plan and Fire Prevention, Preparedness, and Response Plan.

8 PUBLIC SAFETY POWER SHUTOFF (PSPS), INCLUDING DIRECTIONAL VISION FOR PSPS

8.1 DIRECTIONAL VISION FOR NECESSITY OF PSPS

Describe any lessons learned from PSPS since the utility's last WMP submission and expectations for how the utility's PSPS program will evolve over the coming 1, 3, and 10 years. Be specific by including a description of the utility's protocols and thresholds for PSPS implementation. Include a quantitative description of how the circuits and numbers of customers that the utility expects will be impacted by any necessary PSPS events is expected to evolve over time. The description of protocols must be sufficiently detailed and clear to enable a skilled operator to follow the same protocols.

When calculating anticipated PSPS, consider recent weather extremes, including peak weather conditions over the past 10 years as well as recent weather years and how the utility's current PSPS protocols would be applied to those years.

PacifiCorp has only utilized a Public Safety Power Shutoff once; therefore, doesn't have a large background of experience to draw from when exploring lessons learned. However, it is the intention that as the WMP initiatives are implemented over the coming years that the need and possibility of utilizing a PSPS will be greatly reduced. It is expected that the culmination of initiatives will result in more granular situational awareness against a hardened system that would provide better insights as to when (if at all) a Public Safety Power shutoff should be utilized and where to minimize impacts to customers. The following section describe in greater detail the PSPS protocols and projected changes in the coming years.

Instructions for Table 8-1:
Rank order the characteristic of PSPS events (in terms of numbers of customers affected, frequency, scope, and duration) anticipated to change the most and have the greatest impact on reliability (be it to increase or decrease) over the next ten years. Rank in order from 1 to 9, where 1 means greatest anticipated change or impact and 9 means minimal change or impact on ignition probability and estimated wildfire consequence. To the right of the ranked magnitude of impact, indicate whether the impact is to significantly increase reliability, moderately increase reliability, have limited or no impact, moderately decrease reliability, or significantly decrease reliability. For each, include comments describing expected change and expected impact, using quantitative estimates wherever possible.

Table 8-1: Anticipated characteristics of PSPS use over next 10 years

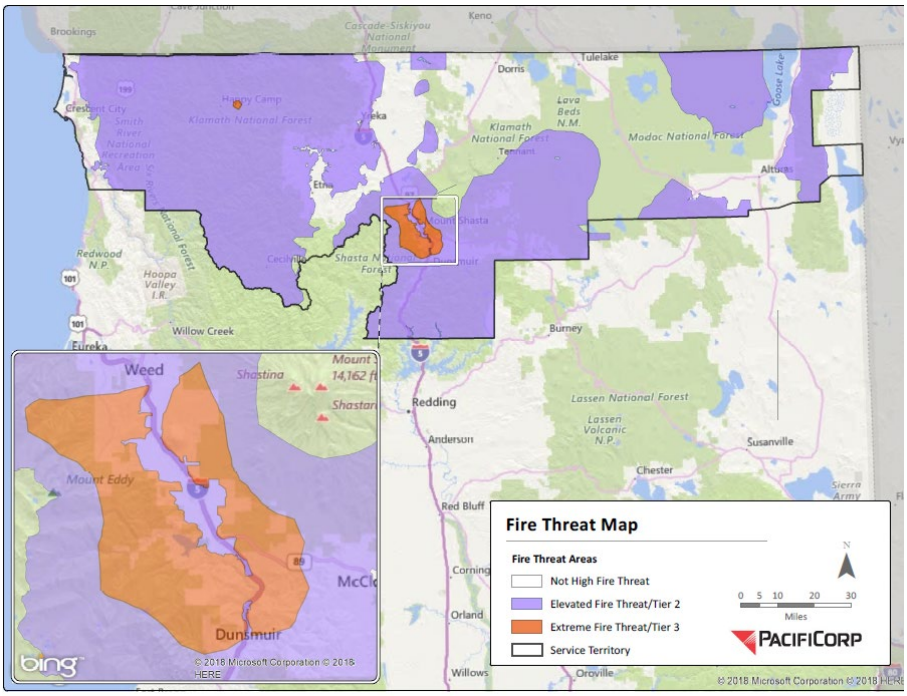
Rank order 1-9	PSPS characteristic	Significantly increase; increase; no change; decrease; significantly decrease	Comments
5	Number of customers affected by PSPS events (total)	Decrease	As mitigation efforts are finished it will remove the exposed circuit segments and those customers served from those segments that are subject to PSPS risk.
6	Number of customers affected by PSPS events (normalized by fire weather, e.g., Red Flag Warning line mile days)	Decrease	As mitigation efforts are finished it will remove the exposed circuit segments and those customers served from those segments that are subject to PSPS risk.
3	Frequency of PSPS events in number of instances where utility	Decrease	As grid configurations and communication technologies are

	operating protocol requires de-energization of a circuit or portion thereof to reduce ignition probability (total)		introduced into the system the ability to remotely reconfigure the network's system protection will remove risk, which will reduce the need for PSPS operations.
4	Frequency of PSPS events in number of instances where utility operating protocol requires de-energization of a circuit or portion thereof to reduce ignition probability (normalized by fire weather, e.g., Red Flag Warning line mile days)	Decrease	As grid configurations and communication technologies are introduced into the system the ability to remotely reconfigure the network's system protection will remove risk, which will reduce the need for PSPS operations.
1	Scope of PSPS events in circuit-events, measured in number of events multiplied by number of circuits targeted for de-energization (total)	Significantly decrease	As the company performs continues to build out its weather network, enhance its LRAM modeling and perform its asset hardening projects the scope of events will reduce.
2	Scope of PSPS events in circuit-events, measured in number of events multiplied by number of circuits targeted for de-energization (normalized by fire weather, e.g., Red Flag Warning line mile days)	Significantly decrease	As the company performs continues to build out its weather network, enhance its LRAM modeling and perform its asset hardening projects the scope of events will reduce.
7	Duration of PSPS events in customer hours (total)	Decrease	As additional modularization occurs within the network, including advancement of grid technologies the duration of PSPS events will reduce.
8	Duration of PSPS events in customer hours (normalized by fire weather, e.g., Red Flag Warning line mile days)	Decrease	As additional modularization occurs within the network, including advancement of grid technologies the duration of PSPS events will reduce.

The following section addresses the regulatory requirements of PSPS events, the methodology applied to identify candidate PSPS zones, the potential impact to customers and communities, triggers for activation, subsequent communications and protocols, as well as lessons learned from 2020 and planned evolution of the program as a whole. Fundamentally this area of the planned is little changed, however the introduction of Vapor Pressure Deficit as a trigger to confirm the need for PSPS is incorporated, based on advancements of its data analytics associated with climate triggers that signal elevated fire risk.

Methodology to Identify Candidate PSPS Zones

PacifiCorp, consistent with other California investor owned utilities, generally constrains PSPS events to Tier 3 areas and has established its plans consistent with regulatory requirements pursuant to Decision D. 12-04-024 (applicable to PacifiCorp pursuant to Resolution ESRB-8) and as adopted in the current PSPS Rulemaking, R.18-12-005. PacifiCorp has two Tier 3 areas within California, as shown in the graphic below.



A Tier 3 designation itself does not require the development of a PSPS plan, rather it identifies high threat locations requiring further evaluation to determine if a PSPS event should be considered for mitigating fire risk.

Nor must the PSPS zone be fully contained within the Tier 3 area; the shape instead is a result of similar risk levels given the weather history and other environmental factors in combination with associated electrical equipment in the area.

PacifiCorp reviewed fire threat, terrain, fire history, fuel characteristics and weather in determining the company's PSPS zones. It also considered wildland urban interface, defensible space, impacts to customers and facilities to establish its proactive de-energization zones. Additional details can be found in Annex A of the company's California Proactive De-Energization Plan.

PSPS Zones & Potential Impact to Customers

PacifiCorp, through its review, identified two primary zones where a PSPS event might be applicable in its California service territory. The two primary zones were further subdivided into smaller areas (shown outlined in the graphic) minimizing customer impact where appropriate based on weather monitoring capability and circuit topology. This approach resulted in five discrete PSPS areas with a mix of circuit topology and customer impacts as summarized in the below table. PacifiCorp has not identified a need for transmission system de-energization as part of its PSPS plans. Should such an action become relevant to its PSPS plans, and it would affect customers not served by the distribution system's PSPS areas it would conduct outreach to the delivery point customers who may be impacted and develop specific plan elements for such actions.

Approximately 20% of PacifiCorp's California customers are located or are electrically-connected to the designated Tier 3 area within its service territory. Thus, it is challenging to mitigate the impacts of PSPS, until sufficient hardening efforts have been delivered to minimize the ignition risk during environmentally favorable periods described in Section 5.3.3. However, as included in Section 5.3.3.8, PacifiCorp continues to evaluate opportunities within the company's pre-defined PSPS zones where projects can promote flexibility, enhance quality and quantity of localized data to inform decision making, and mitigate the impact of potential PSPS events. At this time, the following table includes the five discrete zones and potential customer impact associated with a PSPS events.

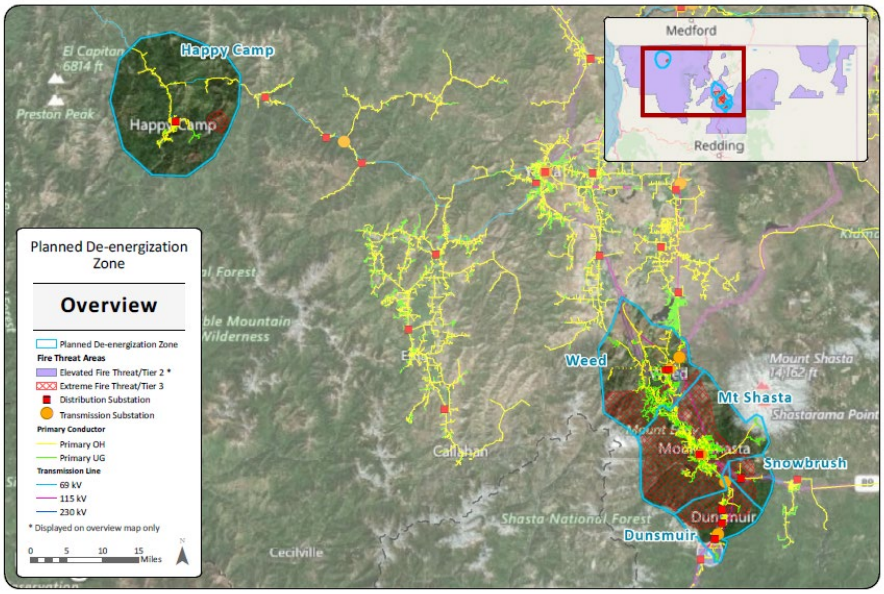


Table 8-2:PSPS area, circuits and customers impacted

	PSPS Name	Substation	# of Circuits	Customers	Distribution OH	Distribution UG
1	Happy Camp	Seiad, Happy Camp	3	865	48.4	5.9
2	Weed	Weed, International Paper	5	2,589	90.5	62.1
3	Mt. Shasta	Mt. Shasta	6	5,074	86.4	76.7
4	Dunsmuir	N & S Dunsmuir, Nutglade	5	1,806	30.0	8.6
5	Snowbrush	Snowbrush	1	17	4.2	1.2
	Total	**9 Substations**	**20**	**10,351**	**259.5**	**154.5**

Setting PSPS Triggers

In order to establish PSPS triggers the company conducted substantial analysis correlating key metrics which are measures of long-term drying (relating to fuel that would be the source of spreading an ignition), climate variables significant in hosting ignitions, and weather that would lead to utility fault events and could spread a fire. From that set of criteria, it established use of KBDI[37] as the metric of fuel

[37] The Keetch-Byram Drought Index (KBDI) which assesses the risk of fire by representing the net effect of evapotranspiration and precipitation in producing cumulative moisture deficiency.

dryness, FFWI6[38] as a fire-supportive climatic metric and wind gusts and speeds to recognize impacts to fault events and fire spread potential. Since its initial analysis setting triggers for its 2019 and 2020 WMPs, the company has performed additional analysis and recognized correlation with a short-term drying measure, vapor pressure deficit (VPD) which measures the departure from normal dryness in an area over the more recent time period (thus complementing KBDI). As mitigations are completed, and other variables become more relevant thresholds will be modified as necessary.

PSPS Triggers – Watch Event

- KBDI Mainly: KBDI >= 622
- KBDI & VPD: KBDI >= 575 & Localized VPD > 94th
- VPD Mainly: Localized VPD >= 97th & KBDI >= 480
- FFWI6 >= 30 and
- Wind gusts >=25 mph OR
- Sustained wind >=16

PSPS Triggers – Activation

- KBDI & VPD: KBDI >= 650 & Localized VPD > 94th
- FFWI6 >= 30 and
- Wind gusts >= 31 mph

To successfully identify, activate, and implement a PSPS event within PacifiCorp's service territory in California, the company monitors weather information from the PSPS areas, uses a list of pre-determined and measurable triggers for activation of a watch event, incorporates additional local knowledge and data to potentially active a PSPS event, and then facilitates continuous monitoring of system conditions to determine when elevated risk conditions subside.

The main process outline is summarized below.

- PacifiCorp utilizes weather systems monitoring to generate a seven-day forecast each business day; based on the criteria, and a potential PSPS activation is triggered.
- When a potential activation is triggered a Public Safety Power Shutoff Event Proposal is prepared and provided to the Vice President of System Operations and the Vice President of T&D Operations which contains the timing details, area, and forecasted duration of the event.
- The Vice President of System Operations and the Vice President of T&D Operations evaluate all relevant information as described in the following subsections, including input from public safety partners to properly characterize and consider impacts to local communities.
- The Vice President of System Operations and the Vice President of T&D Operations decide whether to implement a PSPS event.
- If activated, the company's notification and activation protocols are followed, including activation of the company's emergency management system and customer/public notifications.
- Conditions are continuously monitored during the PSPS event and when elevated risk conditions no longer exist, lines are patrolled for damage, and re-energized, ending the PSPS event.

[38] Hourly Fosberg Fire Weather Index (FFWI) which uses temperature, relative humidity, 10-minute wind-speed factored into a single weather index which is correlated to influence on fire spread, accumulated over a 6 hour period (FFWI6).

Criteria Inputs

Building upon work completed in developing the California state-wide fire map in D. 17-12-024, PacifiCorp utilized weather data, geographic topography, fire probability and ignition data and historic fire data to determine the criteria for triggering proactive de-energization in each of the five PSPS area. While the primary triggers are the same – meaning that a candidate event will be identified based on the same thresholds – it is expected that localized topography and weather conditions will be evaluated in real time prior to making a determination to de-energize any power lines; by using microclimatology information, there may be an opportunity for de-energizing smaller areas at a time. For these reasons, it will be rare for proactive de-energization to be simultaneously activated in multiple PSPS areas. PacifiCorp uses the following measurements as inputs to the PSPS watch criteria.

- Hourly Fosberg Fire Weather Index (FFWI) which uses temperature, relative humidity, 10-minute wind-speed factored into a single weather index which is correlated to influence on fire spread, accumulated over a 6 hour period (FFWI6).
- The Keetch-Byram Drought Index (KBDI) which assesses the risk of fire by representing the net effect of evapotranspiration and precipitation in producing cumulative moisture deficiency.
- Forecasted wind speeds and potential sustained gusts.

Each business day a seven-day forecast is generated internally of the above measurements for PSPS areas highlighting any areas meeting the following levels:[39]

Table 8-3: PSPS threshold levels

PSPS Watch Level 1	PSPS Watch Level 2
☐ KBDI Mainly: KBDI >= 622 ☐ KBDI & VPD: KBDI >= 575 & Localized VPD > 94th ☐ VPD Mainly: Localized VPD >= 97th & KBDI >= 480 ☐ FFWI6 >= 30 and ☐ Wind gusts >=25 mph OR ☐ Sustained wind >=16	☐ KBDI & VPD: KBDI >= 650 & Localized VPD > 94th ☐ FFWI6 >= 30 and ☐ Wind gusts >= 31 mph

While these general values are used to identify PSPS watch conditions, localized criteria and up to date information are incorporated when a determination is made to implement an actual PSPS event as described in the following subsection.

Criteria to Activate

After the first notification is delivered, PacifiCorp actively monitors weather conditions and endeavors to provide customers with additional notifications. During this time PacifiCorp begins actively engaging Public Safety Partners to ensure any relevant input is incorporated from these professionals. When Watch Level 2 levels are forecasted (or measured in actual conditions), PacifiCorp's Emergency Operation Center (EOC) is activated. The Watch Level 2 forecast is confirmed and continuously monitored throughout the potential PSPS event. Customer lists in the subject PSPS area are assembled, and a communication plan is implemented according to the details in Section 4.4.3. PacifiCorp also

[39] While Red Flag Warnings provide the public awareness of heightened fire risk conditions and are considered by PacifiCorp when evaluating any candidate event, such warning do not sufficiently correlate to warrant inclusion as a key input to activation of the proactive de-energization process.

deploys additional resources in the subject PSPS area to monitor local environmental and asset conditions on the ground in real time.

Based on all of the information available to the EOC, the EOC Director, which under normal operation conditions will be the Vice President of T&D Operations, may make a decision to implement a PSPS. In general, barring other unique circumstances, a PSPS would not be implemented unless Watch Level 2 conditions are extremely likely in forecasted weather conditions. At the same time, realization of Watch Level 2 conditions does not necessarily mean that a PSPS is warranted. The EOC Director will consider all available information, including real time feedback from other EOC participants, local field input, recent fire activity, and other pertinent information provided by local emergency management professionals to determine whether PSPS is appropriate. As a matter of practical reality, the EOC Director cannot know if a PSPS will prevent a utility related ignition or not. 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 which would have otherwise occurred was prevented.

8.2 PROTOCOLS ON PUBLIC SAFETY POWER SHUT-OFF

Describe protocols on Public Safety Power Shut-off (PSPS or de-energization), highlighting changes since the previous WMP report:

1. *Strategy to minimize public safety risk during high wildfire risk conditions and details of the considerations, including but not limited to list and description of community assistance locations and services provided during a de-energization event.*
2. *Outline of tactical and strategic decision-making protocol for initiating a PSPS/de-energization (e.g., decision tree).*
3. *Strategy to provide for safe and effective re-energization of any area that was de-energized due to PSPS protocol.*
4. *Company standards relative to customer communications, including consideration for the need to notify priority essential services – critical first responders, public safety partners, critical facilities and infrastructure, operators of telecommunications infrastructure, and water utilities/agencies. This section, or an appendix to this section, shall include a complete listing of which entities the electrical corporation considers to be priority essential services. This section shall also include a description of strategy and protocols to ensure timely notifications to customers, including access and functional needs populations, in the languages prevalent within the utility's service territory.*
5. *Protocols for mitigating the public safety impacts of these protocols, including impacts on first responders, health care facilities, operators of telecommunications infrastructure, and water utilities/agencies.*

PacifiCorp uses an internal escalation process to ensure that it concurrently addresses fire risk mitigation in combination with limiting community impacts from potential de-energization effects. To ensure the highest possible service for customers, the Company established "internal watches" during which the company:

1) Activated the Emergency Action Center,
2) Conducted pre-risk period patrols,
3) Interrogated relays to identify any recent events,
4) Altered system protection control settings,
5) Developed granular forecasts for periods of concurrent elevated risk,
6) Pre-positioned line staff and vegetation personnel to monitor at key locations,
7) Notified public safety partners of elevated concern and the company's mitigation efforts,
8) Actively monitored the network during the period and
9) Upon all-clear notice restored system settings and terminated the EAC.

The company believes that approach best served its customers. As a result, the company intends to conduct its readiness activities similarly in 2021. However, should the conditions escalate sufficiently that PSPS is the most appropriate response, its communication process is outline below.

Proactive De-Energization Customer Communication Process

The process below is specific to notifications prior to an event and is not intended to comply with outreach prior to the wildfire season.

All messaging must be developed and use a common nomenclature that integrates the notification and communication protocols developed for California Statewide Alert and Warning Guidelines.

To meet this requirement, the messages need to include: (1) Who is the source of the warning; (2) What is the threat; (3) Does this affect my location; (4) What should I do; and (5) What is the expected duration of the event.

Communications must also point customers towards education and outreach materials disseminated in advance of each wildfire season.
The plan will deliver notification to customers no matter where the customer is located, deliver clear and understandable information, communicate to customers in different languages, and in a way that addresses different access and functional needs using multiple modes/channels of communication. The required languages are English, Spanish, Chinese, and Tagalog.
The warnings will communicate the possibility of a de-energization event, the estimated start date and time, the estimated duration of the event, and estimated time to restore power. The warnings will also include when customers can expect additional notification and will coincide with the timelines outlined in Table 1.

Timelines
The following timelines may be reduced if changing conditions do not allow for advance notification. In these cases, the company will notify customers as soon as possible and need to include a summary of the circumstances prohibiting compliance to the regulatory requirements in the final report.

Table 8-4: Notification timeline

48 Hours	De-energization Warning
24 Hours	De-energization Warning
2 Hours	De-energization Imminent
1 Hour	De-energization Imminent
Event Begins	De-energization Begins
Re-energization Begins	Re-energization Begins
Re-energization Completed	Re-energization Completed
Cancellation of Event	De-energization Event Canceled

8.3 PROJECTED CHANGES TO PSPS IMPACT

Describe organization-wide plan to reduce scale, scope and frequency of PSPS for each of the following time periods, highlighting changes since the prior WMP report and including key program targets used to track progress over time,

1. *By June 1 of current year*
2. *By September 1 of current year*
3. *By next Annual WMP Update*

By June 1 of the current year
The company intends to continue development of its situational awareness capability, including enhanced time and spatial precision of forecasts for periods of elevated fire threat, leveraging its growing weather network. It will reevaluate PSPS thresholds in light of its new model to determine any needed modifications of areas or other threshold levels.
By September 1 of the current year
The company will have completed a significant first step in its covered conductor installation by September 2021 which will limit impacts from PSPS away from one of its more populated, elevated fire threat areas, near the central portion of Mt Shasta. In the area near the town of Weed it will also have several months of advanced protection and continuous monitoring experience (DFA) which will provide greater information to recognize utility risks that might precipitate the need for PSPS.

By next Annual WMP Update
By the next annual update, PacifiCorp will have had experience in the practical application of its LRAM in managing contemporary risk and anticipates further "dashboard" functionality supporting situational awareness. Greater information, through risk assessment, situational awareness and system monitoring information will enable more strategic application of all mitigation measures, including PSPS.

8.4 ENGAGING VULNERABLE COMMUNITIES

Report on the following:

1. *Describe protocols for PSPS that are intended to mitigate the public safety impacts of PSPS on vulnerable, marginalized and/or at-risk communities. Describe how the utility is identifying these communities.*
2. *List all languages which are "prevalent" in utility's territory. A language is prevalent if it is spoken by 1,000 or more persons in the utility's territory or if it is spoken by 5% or more of the population within a "public safety answering point" in the utility territory*[40] *(D.20-03-004).*
3. *List all languages for which public outreach material is available, in written or oral form.*
4. *Detail the community outreach efforts for PSPS and wildfire-related outreach. Include efforts to reach all languages prevalent in utility territory.*

PacifiCorp describes its outreach plan in greater detail, responsive to each of these points outlined in its PSPS Phase 2 Progress Report and in Section 7.3.12.

8.5 PSPS-SPECIFIC METRICS

PSPS data will be reported quarterly.

***Instructions for PS*PS table:**
In the attached spreadsheet document, report performance on the following PSPS metrics within the utility's service territory over the past five years as needed to correct previously-reported data. Where the utility does not collect its own data on a given metric, the utility shall work with the relevant state agencies to collect the relevant information for its service territory, and clearly identify the owner and dataset used to provide the response in the "Comments" column.

See Attachment 1-2021 Performance Metrics Data Template, Table 11.

[40] See Cal. Government Code § 53112

9 APPENDIX

9.1 DEFINITIONS OF INITIATIVE ACTIVITIES BY CATEGORY

Category	Initiative activity	Definition
A. Risk mapping and simulation	A summarized risk map that shows the overall ignition probability and estimated wildfire consequence along the electric lines and equipment	Development and use of tools and processes to develop and update risk map and simulations and to estimate risk reduction potential of initiatives for a given portion of the grid (or more granularly, e.g., circuit, span, or asset). May include verification efforts, independent assessment by experts, and updates.
	Climate-driven risk map and modelling based on various relevant weather scenarios	Development and use of tools and processes to estimate incremental risk of foreseeable climate scenarios, such as drought, across a given portion of the grid (or more granularly, e.g., circuit, span, or asset). May include verification efforts, independent assessment by experts, and updates.
	Ignition probability mapping showing the probability of ignition along the electric lines and equipment	Development and use of tools and processes to assess the risk of ignition across regions of the grid (or more granularly, e.g., circuits, spans, or assets).
	Initiative mapping and estimation of wildfire and PSPS risk-reduction impact	Development of a tool to estimate the risk reduction efficacy (for both wildfire and PSPS risk) and risk-spend efficiency of various initiatives.
	Match drop simulations showing the potential wildfire consequence of ignitions that occur along the electric lines and equipment	Development and use of tools and processes to assess the impact of potential ignition and risk to communities (e.g., in terms of potential fatalities, structures burned, monetary damages, area burned, impact on air quality and greenhouse gas, or GHG, reduction goals, etc.).
B. Situational awareness and forecasting	Advanced weather monitoring and weather stations	Purchase, installation, maintenance, and operation of weather stations. Collection, recording, and analysis of weather data from weather stations and from external sources.
	Continuous monitoring sensors	Installation, maintenance, and monitoring of sensors and sensorized equipment used to monitor the condition of electric lines and equipment.
	Fault indicators for detecting faults on electric lines and equipment	Installation and maintenance of fault indicators.
	Forecast of a fire risk index, fire potential index, or similar	Index that uses a combination of weather parameters (such as wind speed, humidity, and temperature), vegetation and/or fuel conditions, and other factors to judge current fire risk and to create a forecast indicative of fire risk. A sufficiently granular index shall inform operational decision-making.
	Personnel monitoring areas of electric lines and equipment in elevated fire risk conditions	Personnel position within utility service territory to monitor system conditions and weather on site. Field observations shall inform operational decisions.
	Weather forecasting and estimating impacts on electric lines and equipment	Development methodology for forecast of weather conditions relevant to utility operations, forecasting weather conditions and conducting analysis to incorporate into utility decision-making, learning and

		updates to reduce false positives and false negatives of forecast PSPS conditions.
C. Grid design and system hardening	Capacitor maintenance and replacement program	Remediation, adjustments, or installations of new equipment to improve or replace existing capacitor equipment.
	Circuit breaker maintenance and installation to de-energize lines upon detecting a fault	Remediation, adjustments, or installations of new equipment to improve or replace existing fast switching circuit breaker equipment to improve the ability to protect electrical circuits from damage caused by overload of electricity or short circuit.
	Covered conductor installation	Installation of covered or insulated conductors to replace standard bare or unprotected conductors (defined in accordance with GO 95 as supply conductors, including but not limited to lead wires, not enclosed in a grounded metal pole or not covered by: a "suitable protective covering" (in accordance with Rule 22.8), grounded metal conduit, or grounded metal sheath or shield). In accordance with GO 95, conductor is defined as a material suitable for: (1) carrying electric current, usually in the form of a wire, cable or bus bar, or (2) transmitting light in the case of fiber optics; insulated conductors as those which are surrounded by an insulating material (in accordance with Rule 21.6), the dielectric strength of which is sufficient to withstand the maximum difference of potential at normal operating voltages of the circuit without breakdown or puncture; and suitable protective covering as a covering of wood or other non-conductive material having the electrical insulating efficiency (12kV/in. dry) and impact strength (20ft.-lbs) of 1.5 inches of redwood or other material meeting the requirements of Rule 22.8-A, 22.8-B, 22.8-C or 22.8-D.
	Covered conductor maintenance	Remediation and adjustments to installed covered or insulated conductors. In accordance with GO 95, conductor is defined as a material suitable for: (1) carrying electric current, usually in the form of a wire, cable or bus bar, or (2) transmitting light in the case of fiber optics; insulated conductors as those which are surrounded by an insulating material (in accordance with Rule 21.6), the dielectric strength of which is sufficient to withstand the maximum difference of potential at normal operating voltages of the circuit without breakdown or puncture; and suitable protective covering as a covering of wood or other non-conductive material having the electrical insulating efficiency (12kV/in. dry) and impact strength (20ft.-lbs) of 1.5 inches of redwood or other material meeting the requirements of Rule 22.8-A, 22.8-B, 22.8-C or 22.8-D.
	Crossarm maintenance, repair, and replacement	Remediation, adjustments, or installations of new equipment to improve or replace existing crossarms, defined as horizontal support attached to poles or structures generally at right angles to the conductor supported in accordance with GO 95.

	Distribution pole replacement and reinforcement, including with composite poles	Remediation, adjustments, or installations of new equipment to improve or replace existing distribution poles (i.e., those supporting lines under 65kV), including with equipment such as composite poles manufactured with materials reduce ignition probability by increasing pole lifespan and resilience against failure from object contact and other events.
	Expulsion fuse replacement	Installations of new and CAL FIRE-approved power fuses to replace existing expulsion fuse equipment.
	Grid topology improvements to mitigate or reduce PSPS events	Plan to support and actions taken to mitigate or reduce PSPS events in terms of geographic scope and number of customers affected, such as installation and operation of electrical equipment to sectionalize or island portions of the grid, microgrids, or local generation.
	Installation of system automation equipment	Installation of electric equipment that increases the ability of the utility to automate system operation and monitoring, including equipment that can be adjusted remotely such as automatic reclosers (switching devices designed to detect and interrupt momentary faults that can reclose automatically and detect if a fault remains, remaining open if so).
	Maintenance, repair, and replacement of connectors, including hotline clamps	Remediation, adjustments, or installations of new equipment to improve or replace existing connector equipment, such as hotline clamps.
	Mitigation of impact on customers and other residents affected during PSPS event	Actions taken to improve access to electricity for customers and other residents during PSPS events, such as installation and operation of local generation equipment (at the community, household, or other level).
	Other corrective action	Other maintenance, repair, or replacement of utility equipment and structures so that they function properly and safely, including remediation activities (such as insulator washing) of other electric equipment deficiencies that may increase ignition probability due to potential equipment failure or other drivers.
	Pole loading infrastructure hardening and replacement program based on pole loading assessment program	Actions taken to remediate, adjust, or install replacement equipment for poles that the utility has identified as failing to meet safety factor requirements in accordance with GO 95 or additional utility standards in the utility's pole loading assessment program.
	Transformers maintenance and replacement	Remediation, adjustments, or installations of new equipment to improve or replace existing transformer equipment.
	Transmission tower maintenance and replacement	Remediation, adjustments, or installations of new equipment to improve or replace existing transmission towers (e.g., structures such as lattice steel towers or tubular steel poles that support lines at or above 65kV).
	Undergrounding of electric lines and/or equipment	Actions taken to convert overhead electric lines and/or equipment to underground electric lines and/or equipment (i.e., located underground and in accordance with GO 128).

	Updates to grid topology to minimize risk of ignition in HFTDs	Changes in the plan, installation, construction, removal, and/or undergrounding to minimize the risk of ignition due to the design, location, or configuration of utility electric equipment in HFTDs.
D. Asset management and inspections	Detailed inspections of distribution electric lines and equipment	In accordance with GO 165, careful visual inspections of overhead electric distribution lines and equipment where individual pieces of equipment and structures are carefully examined, visually and through use of routine diagnostic test, as appropriate, and (if practical and if useful information can be so gathered) opened, and the condition of each rated and recorded.
	Detailed inspections of transmission electric lines and equipment	Careful visual inspections of overhead electric transmission lines and equipment where individual pieces of equipment and structures are carefully examined, visually and through use of routine diagnostic test, as appropriate, and (if practical and if useful information can be so gathered) opened, and the condition of each rated and recorded.
	Improvement of inspections	Identifying and addressing deficiencies in inspections protocols and implementation by improving training and the evaluation of inspectors.
	Infrared inspections of distribution electric lines and equipment	Inspections of overhead electric distribution lines, equipment, and right-of-way using infrared (heat-sensing) technology and cameras that can identify "hot spots", or conditions that indicate deterioration or potential equipment failures, of electrical equipment.
	Infrared inspections of transmission electric lines and equipment	Inspections of overhead electric transmission lines, equipment, and right-of-way using infrared (heat-sensing) technology and cameras that can identify "hot spots", or conditions that indicate deterioration or potential equipment failures, of electrical equipment.
	Intrusive pole inspections	In accordance with GO 165, intrusive inspections involve movement of soil, taking samples for analysis, and/or using more sophisticated diagnostic tools beyond visual inspections or instrument reading.
	LiDAR inspections of distribution electric lines and equipment	Inspections of overhead electric distribution lines, equipment, and right-of-way using LiDAR (Light Detection and Ranging, a remote sensing method that uses light in the form of a pulsed laser to measure variable distances).
	LiDAR inspections of transmission electric lines and equipment	Inspections of overhead electric transmission lines, equipment, and right-of-way using LiDAR (Light Detection and Ranging, a remote sensing method that uses light in the form of a pulsed laser to measure variable distances).
	Other discretionary inspection of distribution electric lines and equipment, beyond inspections mandated by rules and regulations	Inspections of overhead electric distribution lines, equipment, and right-of-way that exceed or otherwise go beyond those mandated by rules and regulations, including GO 165, in terms of frequency, inspection checklist requirements or detail, analysis of and response to problems identified, or other aspects of inspection or records kept.
	Other discretionary inspection of transmission electric lines and equipment, beyond	Inspections of overhead electric transmission lines, equipment, and right-of-way that exceed or otherwise go beyond those mandated by rules and regulations,

	inspections mandated by rules and regulations	including GO 165, in terms of frequency, inspection checklist requirements or detail, analysis of and response to problems identified, or other aspects of inspection or records kept.
	Patrol inspections of distribution electric lines and equipment	In accordance with GO 165, simple visual inspections of overhead electric distribution lines and equipment that is designed to identify obvious structural problems and hazards. Patrol inspections may be carried out in the course of other company business.
	Patrol inspections of transmission electric lines and equipment	Simple visual inspections of overhead electric transmission lines and equipment that is designed to identify obvious structural problems and hazards. Patrol inspections may be carried out in the course of other company business.
	Pole loading assessment program to determine safety factor	Calculations to determine whether a pole meets pole loading safety factor requirements of GO 95, including planning and information collection needed to support said calculations. Calculations shall consider many factors including the size, location, and type of pole; types of attachments; length of conductors attached; and number and design of supporting guys, per D.15-11-021.
	Quality assurance / quality control of inspections	Establishment and function of audit process to manage and confirm work completed by employees or subcontractors, including packaging QA/QC information for input to decision-making and related integrated workforce management processes.
	Substation inspections	In accordance with GO 175, inspection of substations performed by qualified persons and according to the frequency established by the utility, including record-keeping.
E. Vegetation management and inspection	Additional efforts to manage community and environmental impacts	Plan and execution of strategy to mitigate negative impacts from utility vegetation management to local communities and the environment, such as coordination with communities to plan and execute vegetation management work or promotion of fire-resistant planting practices
	Detailed inspections of vegetation around distribution electric lines and equipment	Careful visual inspections of vegetation around the right-of-way, where individual trees are carefully examined, visually, and the condition of each rated and recorded.
	Detailed inspections of vegetation around transmission electric lines and equipment	Careful visual inspections of vegetation around the right-of-way, where individual trees are carefully examined, visually, and the condition of each rated and recorded.
	Emergency response vegetation management due to red flag warning or other urgent conditions	Plan and execution of vegetation management activities, such as trimming or removal, executed based upon and in advance of forecast weather conditions that indicate high fire threat in terms of ignition probability and wildfire consequence.
	Fuel management and reduction of “slash” from vegetation management activities	Plan and execution of fuel management activities that reduce the availability of fuel in proximity to potential sources of ignition, including both reduction or adjustment of live fuel (in terms of species or otherwise) and of dead fuel, including "slash" from vegetation

		management activities that produce vegetation material such as branch trimmings and felled trees.
	Improvement of inspections	Identifying and addressing deficiencies in inspections protocols and implementation by improving training and the evaluation of inspectors.
	LiDAR inspections of vegetation around distribution electric lines and equipment	Inspections of right-of-way using LiDAR (Light Detection and Ranging, a remote sensing method that uses light in the form of a pulsed laser to measure variable distances).
	LiDAR inspections of vegetation around transmission electric lines and equipment	Inspections of right-of-way using LiDAR (Light Detection and Ranging, a remote sensing method that uses light in the form of a pulsed laser to measure variable distances).
	Other discretionary inspections of vegetation around distribution electric lines and equipment	Inspections of rights-of-way and adjacent vegetation that may be hazardous, which exceeds or otherwise go beyond those mandated by rules and regulations, in terms of frequency, inspection checklist requirements or detail, analysis of and response to problems identified, or other aspects of inspection or records kept.
	Other discretionary inspections of vegetation around transmission electric lines and equipment	Inspections of rights-of-way and adjacent vegetation that may be hazardous, which exceeds or otherwise go beyond those mandated by rules and regulations, in terms of frequency, inspection checklist requirements or detail, analysis of and response to problems identified, or other aspects of inspection or records kept.
	Patrol inspections of vegetation around distribution electric lines and equipment	Visual inspections of vegetation along rights-of-way that is designed to identify obvious hazards. Patrol inspections may be carried out in the course of other company business.
	Patrol inspections of vegetation around transmission electric lines and equipment	Visual inspections of vegetation along rights-of-way that is designed to identify obvious hazards. Patrol inspections may be carried out in the course of other company business.
	Quality assurance / quality control of vegetation inspections	Establishment and function of audit process to manage and confirm work completed by employees or subcontractors, including packaging QA/QC information for input to decision-making and related integrated workforce management processes.
	Recruiting and training of vegetation management personnel	Programs to ensure that the utility is able to identify and hire qualified vegetation management personnel and to ensure that both full-time employees and contractors tasked with vegetation management responsibilities are adequately trained to perform vegetation management work, according to the utility's wildfire mitigation plan, in addition to rules and regulations for safety.
	Remediation of at-risk species	Actions taken to reduce the ignition probability and wildfire consequence attributable to at-risk vegetation species, such as trimming, removal, and replacement.
	Removal and remediation of trees with strike potential to electric lines and equipment	Actions taken to remove or otherwise remediate trees that could potentially strike electrical equipment, if adverse events such as failure at the ground-level of the tree or branch breakout within the canopy of the tree, occur.

	Substation inspection	Inspection of vegetation surrounding substations, performed by qualified persons and according to the frequency established by the utility, including record-keeping.
	Substation vegetation management	Based on location and risk to substation equipment only, actions taken to reduce the ignition probability and wildfire consequence attributable to contact from vegetation to substation equipment.
	Vegetation inventory system	Inputs, operation, and support for centralized inventory of vegetation clearances updated based upon inspection results, including (1) inventory of species, (2) forecasting of growth, (3) forecasting of when growth threatens minimum right-of-way clearances ("grow-in" risk) or creates fall-in/fly-in risk.
	Vegetation management to achieve clearances around electric lines and equipment	Actions taken to ensure that vegetation does not encroach upon the minimum clearances set forth in Table 1 of GO 95, measured between line conductors and vegetation, such as trimming adjacent or overhanging tree limbs.
F. Grid operations and protocols	Automatic recloser operations	Designing and executing protocols to deactivate automatic reclosers based on local conditions for ignition probability and wildfire consequence.
	Crew-accompanying ignition prevention and suppression resources and services	Those firefighting staff and equipment (such as fire suppression engines and trailers, firefighting hose, valves, and water) that are deployed with construction crews and other electric workers to provide site-specific fire prevention and ignition mitigation during on-site work
	Personnel work procedures and training in conditions of elevated fire risk	Work activity guidelines that designate what type of work can be performed during operating conditions of different levels of wildfire risk. Training for personnel on these guidelines and the procedures they prescribe, from normal operating procedures to increased mitigation measures to constraints on work performed.
	Protocols for PSPS re-energization	Designing and executing procedures that accelerate the restoration of electric service in areas that were de-energized, while maintaining safety and reliability standards.
	PSPS events and mitigation of PSPS impacts	Designing, executing, and improving upon protocols to conduct PSPS events, including development of advanced methodologies to determine when to use PSPS, and to mitigate the impact of PSPS events on affected customers and local residents.
	Stationed and on-call ignition prevention and suppression resources and services	Firefighting staff and equipment (such as fire suppression engines and trailers, firefighting hose, valves, firefighting foam, chemical extinguishing agent, and water) stationed at utility facilities and/or standing by to respond to calls for fire suppression assistance.
G. Data governance	Centralized repository for data	Designing, maintaining, hosting, and upgrading a platform that supports storage, processing, and utilization of all utility proprietary data and data compiled by the utility from other sources.
	Collaborative research on utility ignition and/or wildfire	Developing and executing research work on utility ignition and/or wildfire topics in collaboration with other

		non-utility partners, such as academic institutions and research groups, to include data-sharing and funding as applicable.
	Documentation and disclosure of wildfire-related data and algorithms	Design and execution of processes to document and disclose wildfire-related data and algorithms to accord with rules and regulations, including use of scenarios for forecasting and stress testing.
	Tracking and analysis of near miss data	Tools and procedures to monitor, record, and conduct analysis of data on near miss events.
H. Resource allocation methodology	Allocation methodology development and application	Development of prioritization methodology for human and financial resources, including application of said methodology to utility decision-making.
	Risk reduction scenario development and analysis	Development of modelling capabilities for different risk reduction scenarios based on wildfire mitigation initiative implementation; analysis and application to utility decision-making.
	Risk spend efficiency analysis	Tools, procedures, and expertise to support analysis of wildfire mitigation initiative risk-spend efficiency, in terms of MAVF and/ or MARS methodologies.
I. Emergency planning and preparedness	Adequate and trained workforce for service restoration	Actions taken to identify, hire, retain, and train qualified workforce to conduct service restoration in response to emergencies, including short-term contracting strategy and implementation.
	Community outreach, public awareness, and communications efforts	Actions to identify and contact key community stakeholders; increase public awareness of emergency planning and preparedness information; and design, translate, distribute, and evaluate effectiveness of communications taken before, during, and after a wildfire, including Access and Functional Needs populations and Limited English Proficiency populations in particular.
	Customer support in emergencies	Resources dedicated to customer support during emergencies, such as website pages and other digital resources, dedicated phone lines, etc.
	Disaster and emergency preparedness plan	Development of plan to deploy resources according to prioritization methodology for disaster and emergency preparedness of utility and within utility service territory (such as considerations for critical facilities and infrastructure), including strategy for collaboration with Public Safety Partners and communities.
	Preparedness and planning for service restoration	Development of plans to prepare the utility to restore service after emergencies, such as developing employee and staff trainings, and to conduct inspections and remediation necessary to re-energize lines and restore service to customers.
	Protocols in place to learn from wildfire events	Tools and procedures to monitor effectiveness of strategy and actions taken to prepare for emergencies and of strategy and actions taken during and after emergencies, including based on an accounting of the outcomes of wildfire events.
J. Stakeholder cooperation and	Community engagement	Strategy and actions taken to identify and contact key community stakeholders; increase public awareness and support of utility wildfire mitigation activity; and design,

community engagement		translate, distribute, and evaluate effectiveness of related communications. Includes specific strategies and actions taken to address concerns and serve needs of Access and Functional Needs populations and Limited English Proficiency populations in particular.
	Cooperation and best practice sharing with agencies outside CA	Strategy and actions taken to engage with agencies outside of California to exchange best practices both for utility wildfire mitigation and for stakeholder cooperation to mitigate and respond to wildfires.
	Cooperation with suppression agencies	Coordination with CAL FIRE, federal fire authorities, county fire authorities, and local fire authorities to support planning and operations, including support of aerial and ground firefighting in real-time, including information-sharing, dispatch of resources, and dedicated staff.
	Forest service and fuel reduction cooperation and joint roadmap	Strategy and actions taken to engage with local, state, and federal entities responsible for or participating in forest management and fuel reduction activities; and design utility cooperation strategy and joint stakeholder roadmap (plan for coordinating stakeholder efforts for forest management and fuel reduction activities).

9.2 Citations for Relevant Statutes, Commission Directives, Proceedings and Orders

Throughout the WMP, cite relevant state and federal statutes, Commission directives, orders, and proceedings. Place the title or tracking number of the statute in parentheses next to comment, or in the appropriate column if noted in a table. Provide in this section a brief description or summary of the relevant portion of the statute. Track citations as end-notes and order (1, 2, 3…) across sections (e.g., if section 1 has 4 citations, section 2 begins numbering at 5).

PacifiCorp has complied with this standard throughout the 2021 WMP Update.