



BPA 2020 WILDFIRE MITIGATION PLAN

ABSTRACT

BPA's Wildfire Mitigation Plan covers end-to-end activities related to the mitigation of wildfires across the Federal Columbia River Transmission System.

Message from the Administrator

The threat of wildfire is a growing concern for transmission providers in the Pacific Northwest. Wildfire season is now longer and more destructive than it ever was. For the Bonneville Power Administration, which aims to protect public safety and preserve the reliable delivery of electricity, wildfire mitigation is without question a top priority. While an electric utility and transmission provider can never fully eliminate the risk of fire, we are committed to taking all practical actions available to us to prevent the devastation that a wildfire could bring to the people and communities we serve. This wildfire mitigation plan lays out the steps we are taking to do so.

BPA has always taken a proactive stance when it comes to the management of its transmission assets, and we have a legacy of high reliability to show for it. Following catastrophic fires in the West in 2018, BPA reexamined at its own equipment and practices. We took immediate steps to reduce BPA's risk by reevaluating the criteria we use to determine the priority of repairing or replacing transmission components. As a result, based on the potential for fire ignition, BPA crews have replaced hundreds of transmission components that based on other criteria might not have been replaced so quickly.

But this is not an effort that can be addressed once and then considered complete. That's why BPA has designed a multi-pronged wildfire mitigation strategy that combines world-class vegetation management, strategic asset management and risk-based planning, consistent with BPA's 2018-2023 Strategic Plan. And this is not a stand-alone effort. It is integrated into our Transmission Asset Strategy to ensure that on an ongoing basis, wildfire risks are weighed when determining the priority of work to be completed on our transmission equipment and facilities.

Our understanding of wildfire risk is constantly evolving and becoming better informed. I am confident that as we carry out this plan, our risk-informed methodology and focus on wildfire prevention will help us identify other cost-effective and sound measures that deliver value to our customers and the residents of the Northwest.

And as we have done for more than 80 years, BPA will continue to serve as a trusted steward of the region's valuable federal transmission system. I appreciate all the hard work that went into development of this strategy and remain committed to delivering on BPA's mission, even as the environment we operate in continues to change.

Elliot E. Mainzer
Administrator and CEO
Bonneville Power Administration





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1.0 Introduction/Executive Summary

BPA's wildfire mitigation activities have evolved to include risk-informed business strategies and capabilities and are incorporated into this document. These risk-informed approaches will promote continuous improvement in wildfire mitigation that will allow BPA to deliver value and safely operate the transmission system that provides power and transmission service to utilities and other interconnection customers. This is vital to the flow of electricity across the Western Interconnection.

Fire = Fuel + Ignition Source. This Wildfire Mitigation Plan (WMP) addresses BPA's efforts to mitigate the risk of wildfire ignitions through the recognition of this industry wide fire equation. It is through this lens that we address the solutions included in this document. BPA's right-of-ways, materials, and equipment (our assets) are the key components of the fire equation. In addition to technical measures to address the materials and equipment we own and operate, BPA also employs communication, education, and the assistance of local, state and federal partners that can impact its rights-of-way.

BPA has long standing operational practices that directly or indirectly have provided wildfire mitigation, such as world class vegetation management, customer and community relations, our partnership with the United States Department of Forestry, and field service inspection and maintenance. These practices and relationships have served BPA, and its service territory well.

BPA's efforts to mitigate the risk of wildfires are evolving. Significant progress is being made in Critical Health and Risk methodologies, inclusive of factors that address wildfire ignition or fuel in our asset base. BPA continues to consider and employ existing and emerging solutions that enhance our operational effectiveness in mitigating wildfire risk.

BPA has adopted the Institute of Asset Management's methodologies as its benchmark for asset management. And, making asset management an element of BPA's strategic plan enhances our ability to develop solutions that focus on asset life-cycle management which, in turn, improves risk reducing methodologies in reliability, resiliency, and wildfire mitigation.

BPA will continue to assess increasing impacts from climate change, community growth, and its assets' conditions, as its WMP evolves. This will ensure it applies cost-effective and risk-based solutions in a proactive way to best serve its customers.

This plan includes many technical terms and a lot of dense information. Readers may be particularly interested in information in the following sections:

- **Section 5 — Wildfire Prevention Strategies and Programs:** This section includes a history of methods and mechanisms BPA has employed to mitigate wildfires; describes risk factors associated with wildfires; details BPA's tools for mitigating wildfires to avoid its equipment sparking a fire or mitigating the effects of an already ignited wildfire; and explains how BPA uses tools such as its world-class vegetation management program and other activities to mitigate potential and existing wildfires.
- **Section 7 — Response Guidelines:** This section covers how BPA works internally with Security and Continuity of Operations, Communications and other components to share information about its mitigation efforts and its real-time efforts to mitigate the impact of wildfires on its transmission system. The section also discusses coordination with local fire officials and other wildfire responders.

- **Section 8 — Restoration of Service:** This section describes how BPA field crews and dispatch staff work together to put lines compromised by wildfires back in service. It includes information on the work field crews do to monitor the effects of wildfires on BPA transmission lines and components. It also describes the various circumstances presented by wildfires and the steps BPA takes under each to put assets back in service after a wildfire – whether they were damaged by a wildfire or taken out of service to protect first responders or the BPA transmission system.

The scope of the BPA's wildfire mitigation plan (WMP) includes vegetation management (VM) programs and asset management programs across the entire transmission system lifecycle, including

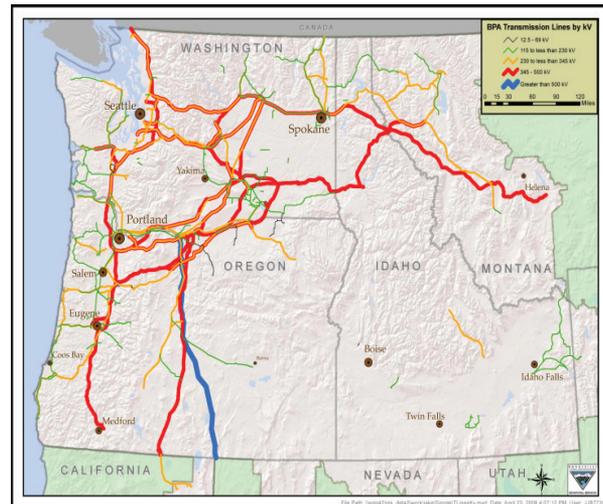
- Operations and maintenance.
- Replacement.
- Disposal.
- Response and recovery.

Additionally, the WMP covers protocols and processes for restoring service after a wildfire. The WMP follows a 2-year refresh cycle, which is in line with BPA's Strategic Asset Management Plan, Transmission Asset Plan, and Integrated Program Review.

1.1 Bonneville Power Administration (BPA)

BPA is one of the nation's largest public utilities with transmission assets touching several Northwest states. BPA owns, operates, and maintains facilities and equipment critical to maintaining the flow of power from generating facilities via more than 15,000 circuit miles of occupying more than 8,500 miles of rights-of-way, and passing through more than 260 substations. Its service area includes Idaho, Oregon, Washington, western Montana and small parts of eastern Montana, California, Nevada, Utah and Wyoming. BPA's mission is to create and deliver the best value for our customers and constituents. BPA's vision is to continue being an engine of the Northwest's economic prosperity and environmental sustainability.

The terrain that encompasses BPA's transmission lines and substations varies greatly, including coastal areas, rain forest and high desert. Each of these areas pose unique wildfire challenges, and require different mitigation solutions.



Most of the generating resources connected to the BPA transmission system provide electricity to retail customers many miles from their source. Because of this, BPA operates long transmission lines and equally long rights of way. Some of these lines are located in areas with extremely strong winds, such as the Columbia River Gorge where sustained wind speeds of 40 mph are not uncommon. Due to the diversity of its service territory with its varying climates and topography, BPA considers ignition variables such as wind, vegetation type, slope, temperature and humidity in the WMP.

1.2 Federal Columbia River Transmission System (FCRTS)

The expansive network described above covers an area totaling more than 300,000 square miles. BPA's history of providing reliable transmission at a competitive cost, has attracted a wide range of interconnection customers.

BPA provides transmission service to its preference customers (approximately 140 public and people's utility districts, municipal electric utilities and electric cooperatives), independent power producers, and investor-owned utilities (IOU). Interconnected resources include federal and other hydroelectric projects, fossil fuel generators, wind plants, solar plant, biomass and other generators.

As it created this plan, BPA performed a gap analysis using Institute of Asset Management (IAM) methods to assess wildfire risk. BPA identified leading practice mitigation competencies including design and maintenance, operations, and situational awareness. BPA ranked each of those competencies with their corresponding maturity to baseline the current state of its wildfire risk mitigation capability. This analysis helped BPA recommend improvements to its physical assets, planning and operations, maintenance capability, and training.

Consistent with the direction of Northern American Electric Reliability Corporation (NERC) regulatory direction on building resiliency into utilities asset management systems (Ref. Docket No. AD18-7-000) the WMP aims to improve design and maintenance standards, and construction activities that allow BPA to rapidly and safely respond to a wildfire event.

The plan includes assessment of new industry practices and technologies that will reduce the likelihood of outage frequency in service and improve the restoration of service. In addition, BPA reviews and incorporates available ignition data for fires throughout the Northwest to build asset management plans targeting those probabilistic sources.

1.3 Policy statement

BPA's overarching goal is to provide safe, reliable, environmentally sustainable and affordable electric service to the region. To meet this goal BPA constructs, operates, and maintains its transmission system in a manner that minimizes wildfire risks. Iterations of this WMP will be coordinated with the bi-annual Strategic Asset Management Plan cycle.

1.4 Purpose

This WMP describes the range of programs, policies, processes, and activities to mitigate the threat posed by its assets for starting or contributing to the spread of a wildfire. This includes policies and care of its transmission assets and management of vegetation in the transmission corridors that house BPA transmission lines and substations. This plan is subject to direct supervision from BPA's Transmission Services Senior Vice President (T-SVP) and primary accountability resides with the Chief Operating Officer (COO).

1.5 Objectives

The primary objectives of this WMP are to:

1. Mitigate the probability that BPA's Transmission assets may be the source of ignition or a fuel source of a wildfire, while continuing to provide reliable transmission service to our customers.
2. Implement a plan that prioritizes safety, situational awareness, preventative methods, and recovery.
3. Maintain a plan that aligns with utility best practice competencies and risk mitigation activities.

2.0 Overview of preventive strategies and programs

This WMP integrates and interfaces with various operating policies and asset management and engineering principles, which are themselves subject to change. As such, this WMP reflects current policies, principles, and standards. Subsequent versions may be necessary to respond to revised policies, principles and standards.

The table below is a general summary of competencies BPA has employed or is considering employing in BPA's programs and activities that support ongoing wildfire prevention and mitigation.

Table 1: Mitigation Competencies

Design and construction
Light Detection and Ranging (LiDAR) Ortho, Oblique and Hyper Spectral Imagery for vegetation management/clearances
Increase overhead wire spacing to reduce wire to wire contact
Pole loading and placement
Transmission line rating remediation
Pole replacement and reinforcement
Wildfire resiliency design
Construction fire prevention program (vehicles, pole protection assets, etc.)
Substation perimeter fencing for security and protection
Inspection and maintenance
Transmission line aerial patrols (helicopter)
Transmission line ground patrols
Transmission line splice assessment program (observed condition only, not Infrared)
Transmission wood pole intrusive inspections
Transmission vegetation right-of-way maintenance
Transmission annual pole clearing program
Marker ball inspection and replacement program
LiDAR inspection of transmission facilities and vegetation
Inspection and maintenance programs for lines and substations
IR inspection of energized overhead facilities and equipment
Drive-by of overhead facilities and equipment (external entities)
Detailed inspection of transmission facilities and equipment
Supplemental inspections of high fire risk areas
Proactive vegetation management
On-ground routine inspection
Operational practices
Disabling reclosing during fire season (Initial Operating Capability)
Transmission and system vegetation management
Special work procedures for high Industrial Fire Precaution Levels
De-energization notifications (internal; field crews, Dispatch and A/E)

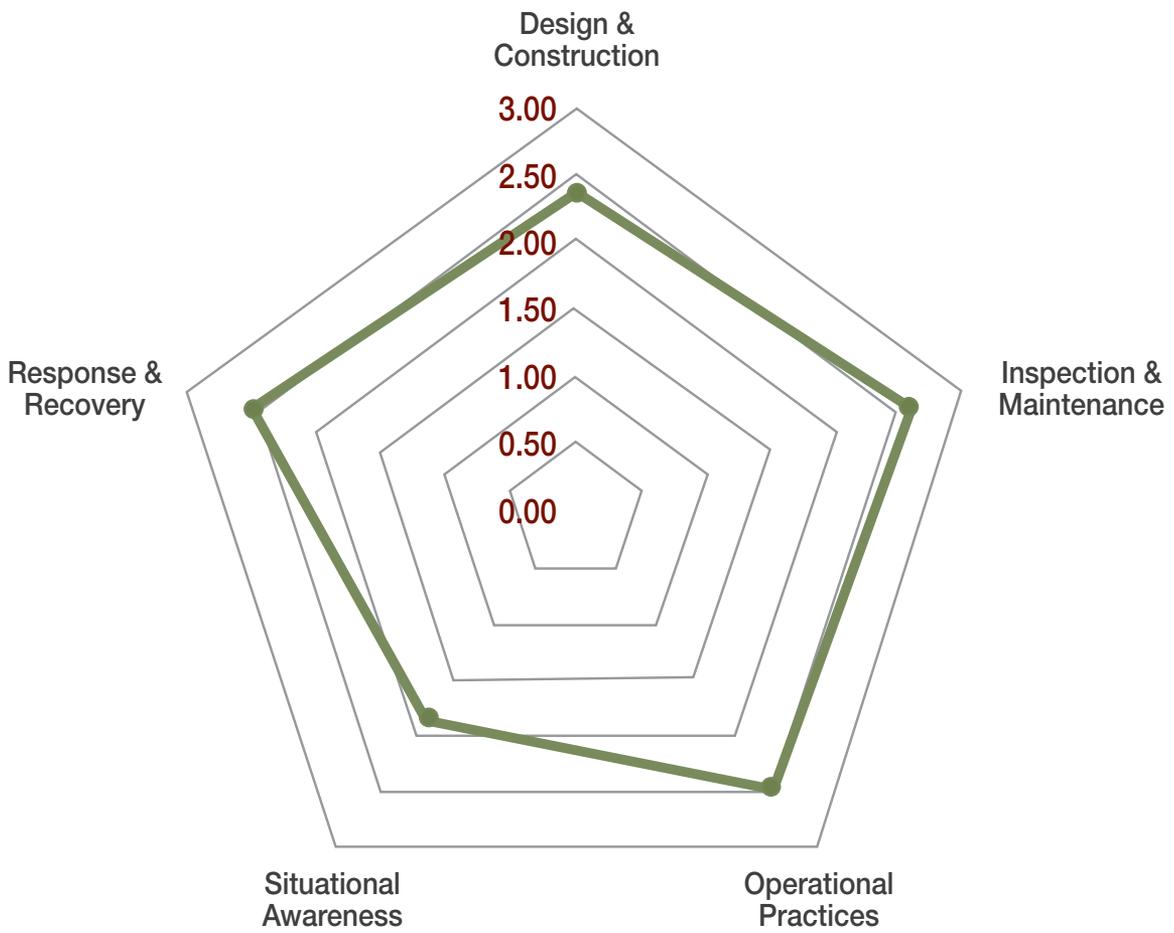
De-energization notifications (external; RC and OASIS, Emergency Responders)
Emergency Operations Planning: fire prevention plan
Hotline procedures
Work procedures, pre-positioned equipment and training for persons working in locations and conditions of elevated fire risks (e.g. High Industrial Fire Precaution (IFPL) levels)
Mobilization for line and vegetation management crews ahead of storms
Existing relationships with local governments and fire safe councils
Transmission encroachment program
Provide liaison to county offices of emergency services (OES) during fire event
Leverage existing relationships with local governments and fire departments
Targeted communications plan
Active environmental safety monitoring
Emergency Operations Center partners with local emergency responders for coordination prior to and during an emergency
High fire threat district vegetation management inspection strategy
Inspecting trees with potential strike path to transmission lines
Expanded pole clearing
Expanded clearance distances at time of maintenance
Patrol and pruning, quality assurance
Proactive vegetation management
Situational/conditional awareness
Weather monitoring in the BPA service area
Coordinate and collaborate with Fire Safe councils and county offices of Emergency Services throughout the year to prepare for high fire risk events
Worker safety training and orientation for transmission vegetation management work
Monitors daily active fires in Pacific NW
Response and recovery
Planned de-energization (of one specific line) during fire season
Critical event communications process and procedures
Strategy for minimizing public safety risk
Emergency response plan for wildfires
Field operations recovery procedures
Reliability Coordinator (RC WEST) wildfire communication coordination

BPA weighted these competencies, or best practices, to measure how well it is implementing them. BPA used the Institute of Asset Management (IAM) competency assessment methodology to assess its competency rating. The total aggregation of these rankings shows BPA has an average maturity of 2.36 out of 3 which indicates a strong awareness and appreciation of all the mitigation activities in the Table 1.0.

To put context to the rating, the scale used in the assessment is as follows:

A three on the scale represents that BPA actively performs the task and can provide consistent documentation and evidence. A 2 represents that BPA performs this work but lacks consistency in delivery or documentation and training. A 1 represents that BPA is aware of that work but does not yet have any process, policy, or procedure in place, or has limited exposure, such as a pilot project. A zero represents being that there is no evidence of that activity taking place currently.

The spider diagram below indicates BPA's self-assessment rating per competency dimension.



3.0 Risk analysis and risk drivers

BPA uses its existing Enterprise Risk Management framework, under BPA policy 231-1, to identify and assess enterprise level risks. This framework is built on the ISO-31000 (International Standards Organization of Risk Management), which takes into consideration both quantitative and qualitative factors to determine the level of inherent and residual levels of a particular risk. An inherent risk level refers to the risk before any mitigations or controls are in place while the residual risk level refers to the risk after all mitigations and effective controls are considered.

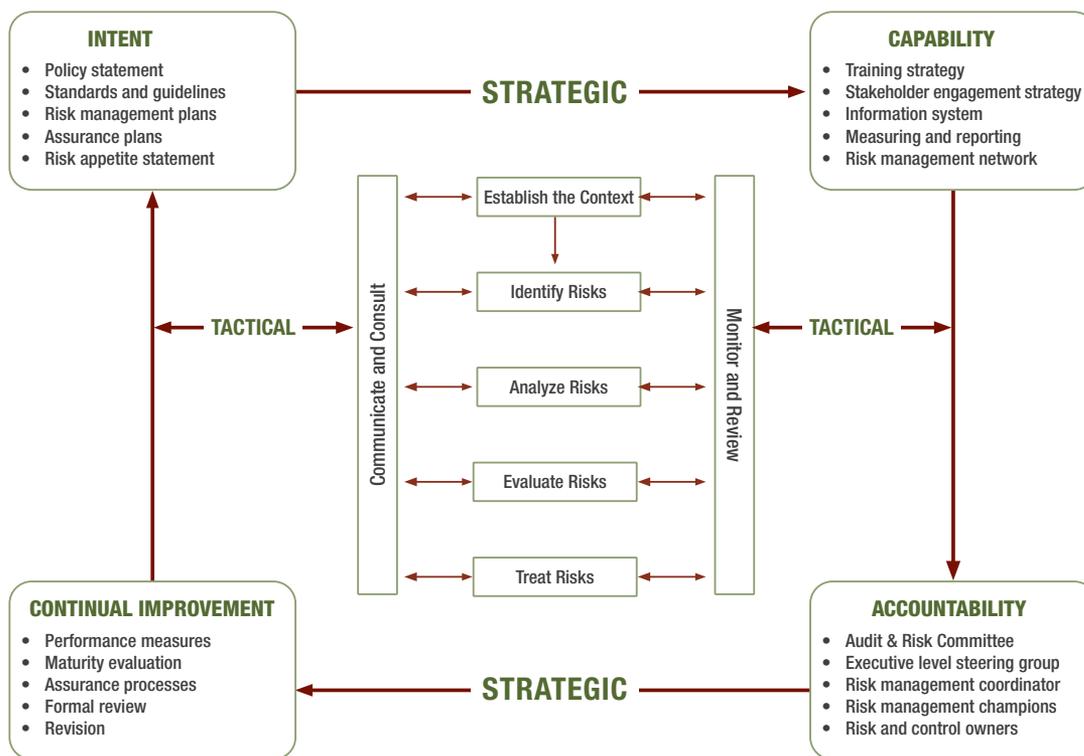


Figure 1: Transmission Risk Based Planning and Prioritization Framework

Transmission Services' Criticality Health and Risk (CHR) methodology is a quantitative method to use varying sources of asset information to understand asset condition to inform probabilistic failure modes and projection of asset failures across the system by asset type. This health architecture is a one-for-one adoption of the Institute of Asset Management (IAM) risk and reliability engineering best practice and considers five risk dimensions of criticality with a 1-7 scale of consequence/impact. These dimensions of risk include financial, compliance, environmental, safety and reliability impacts.

3.1 Contributing factors

The frequency of large wildfires is influenced by a complex combination of natural and human factors including climatic conditions such as temperature, soil moisture, relative humidity, and wind speed; vegetation (e.g. fuel density); forest management practices; and fire suppression techniques (U.S. Global Change Research Program (USGCRP), 2017)). Wildfires have been increasing in number and extent in the region and that trend is projected to continue (USGCRP, 2019; DOE 2015). Wildfires have the potential to significantly impact the energy sector,

which can cause both significant infrastructure damage and disrupt electricity transmission. For example, in 2015, Oregon and Washington had their most severe wildfire season when more than 1.6 million acres burned (USGCRP, 2018). During that fire season, the Goodell Fire resulted in hydro generation shutdowns and de-energization of transmission lines for Seattle City Light (SCL, 2015) and the Soda Fire resulted in significant transmission infrastructure damage for Idaho Power Company (DOE, 2015).

In recent decades the incidence of large forest fires has increased and is projected to continue increasing as temperatures rise (USGCRP 2017). Projected warmer and drier summers and declining snowpack (RMJOC 2018; USGCRP 2017) and correlated decreases in summer soil moisture will increase the risk of wildfires, particularly in forested areas where fuels are abundant (Gergel et al 2017). Climate change is also likely to lead to increases in vegetative fuel. In the Pacific Northwest, the Cascade Mountains are one of the most at-risk areas for increasing wildfire activity while increasing risk for the interior of the region is more modest and uncertain (Dennison et al., 2014; Gergel et al 2017). The chart below shows the increasing trend in large fires in the western US, and is believed to be still relevant due to the consistent slope of the trend.

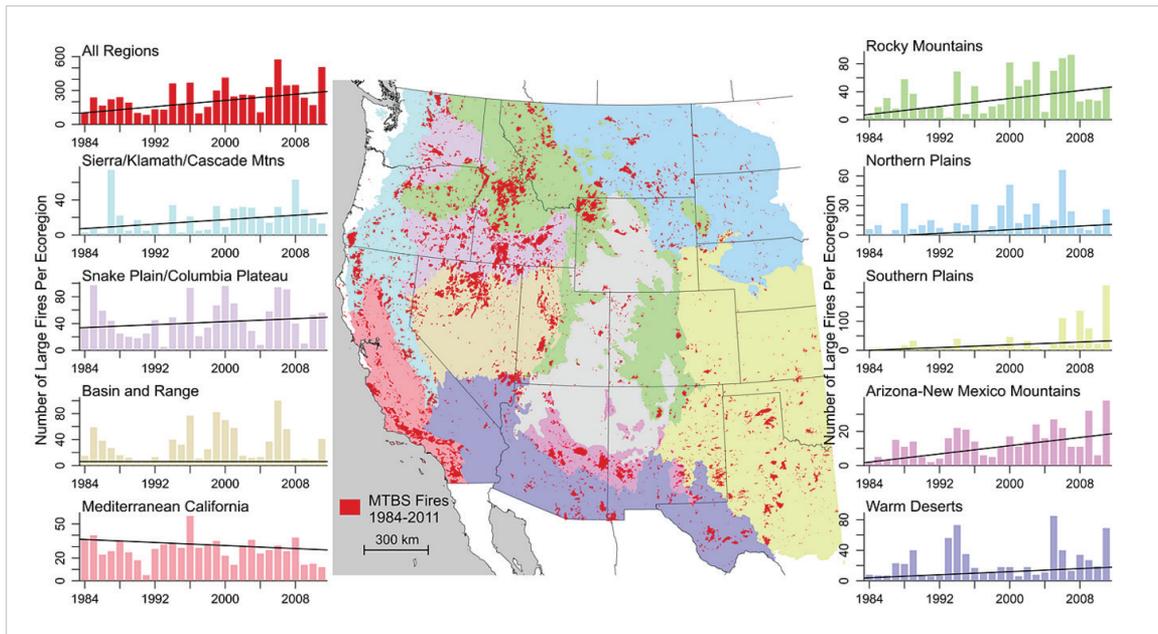


Figure 2. Trends in the number of large fires annually in the Western U.S. These trends indicate significant increases in fire activity across the Western U.S. A notable exception includes the Snake Plain/Columbia Plateau. Source Dennison, et al. 2014)

3.2 Transmission Risk Based Planning and Prioritization Process

The understanding of ignition and how climate drivers trend in time across the BPA system is a key input into the planning process and feeds how risk is quantified by asset location. These trends feed the probabilistic variables overlaid behind the asset locations to predict what assets cause the highest risk of a fire. This is the continued development of capabilities across the Transmission Services organization through adoption of best practice including ISO-31000 methodologies on understanding all critical dimensions of risk including safety, reliability, and compliance, financial and environmental risk. This is done through the Criticality, Health

and Risk (BPA’s Strategic Plan page 26) initiative and will continue to decentralize risk-based decisions including what mitigation actions are taken and how actions are organized across BPA to invest in its asset management activities.

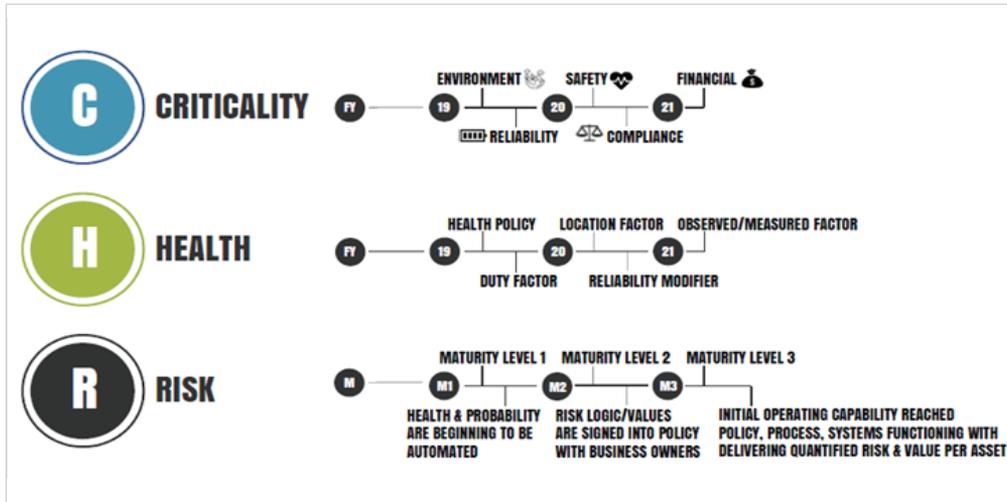


Figure 4: Criticality Health and Risk – Implementation Plan

The implementation plan shown in Figure 4 reflects a phased approach to developing risk scores as automated system outputs. This plan allows multiple work streams of roughly 54 organizations inside of BPA to apply its learnings and deliverables as they are developed in real time. The plan showcases an initial operating capability where all assets recorded in the Cascade asset registry have risk scores with varying levels of statistical confidence.

A Risk score is the quantitative output where the assessment of asset health and the corresponding consequence of that asset failure impact as measured across the five dimensional categories of safety, reliability, compliance, environmental and financial impacts. The mathematics follow ISO-31000 and IAM Reliability Engineering best practice and shows below how this was used to inform capital and maintenance activities associated with wildfire risk.

$$Risk\ Score\ (RS) = TEF * Cp * 10^{CI}$$

Terms:

TEF = Triggered event frequency: A probabilistic function of asset health, where the probability of failure of equipment (PoF) is between 0 – 1 and represents a predicted survival rate based upon the BPA Transmission Health Policy STD-D-27 through a series of mathematical architecture and steps.

Cp = Conditional probability: The probability the risk is realized at that location given the environment’s local nuances and configuration of the surroundings. For the purposes of wildfires, this would be the ignition probability data provided by various Federal Agencies based upon humidity, wind and vegetation type. Cp is a numerical value between 0 – 1.

CI = Consequence/Impact which is measured between 1 (Negligible) to 7 (Catastrophic) and is the indicator of criticality of the asset failure across the five dimensions of risk.

4.0 Transmission asset overview

BPA Transmission Services provides power to the bulk electric system through its transmission assets. The following table depicts a high level description of those asset types. Further details can be found in BPA’s Strategic Asset Management Plan.

Asset Overview

Asset Classification	Asset Description
Transmission line assets	Assets include conductor, transmission structures and switches operating at or above 69 kV (only 69 kV lines tied to generation are considered Transmission assets).
Transmission substation assets	Assets include major equipment such as power transformers, voltage regulators, capacitors, reactors, protective devices, relays, switchgear and control houses.

Table 2: Asset Classification Table

4.1 Service territory and fire threat region

BPA uses data collected and analyzed by various federal agencies to identify and measure the threat of wildfire by location. The variables considered in this analysis are: wind, humidity, vegetation species and fuel volume.

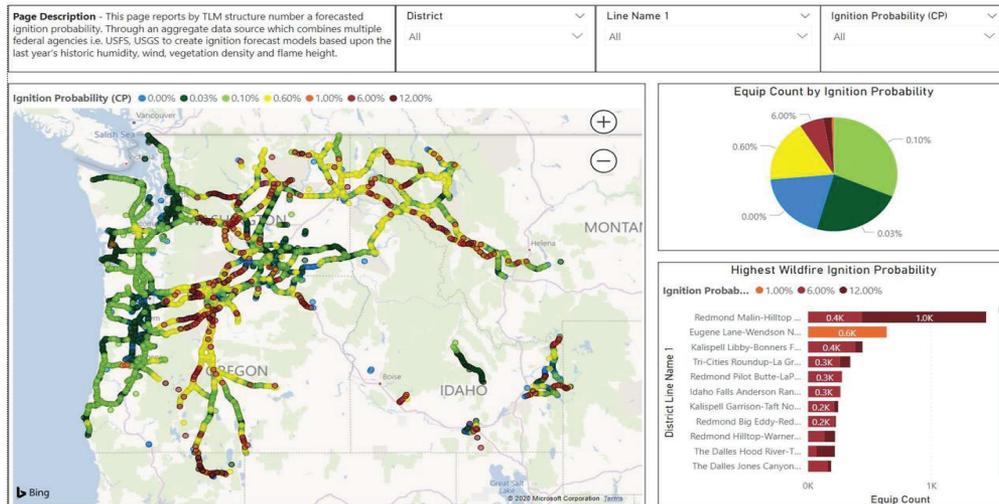


Figure 5: Probabilistic Ignition based upon Feb (2020) from USGS / USFS

The probabilistic analysis of wildfires requires a fundamental planning assumption in its capital and maintenance activities. That assumption is that risk algorithm(s) and methodology requires a snapshot in the threat of wildfire by location. That snapshot in time needs to be close to the start of fire season and needs to be retaken when climatic conditions change significantly. An

example of this would be in June/July unusual rainstorms changing the projected humidity and drought probabilities. Transmission continues to build internal controls to identify sensitivity analysis for specific zones on the system that have higher margin of statistical confidence levels. Examples of this include BPA districts shifting planned activities in coordination with local state fire governing bodies to allow for the most efficient deployment of critical resources.

BPA voluntarily maintains tools such as the fire GIS map, which add value as proactive measures to establish projected fire risk.

4.2 Continuity support for wildfires

BPA's Continuity of Operations and Emergency Management staff participate in national, state and local transmission-related exercises and have a great deal of knowledge of BPA's transmission system and operating protocols.

Emergency Management Specialists are involved in BPA's general wildfire response and provide situational awareness during severe wildfire seasons and during response to wildfires as necessary.

During the Eagle Creek Fire, Emergency Management Specialists provided Incident Management Team Support. The Eagle Creek Fire impacted BPA operations near Cascade Locks, Oregon in summer 2017.

Continuity of Operations and Emergency Management staff will continue to work with BPA Transmission Dispatch and Field Operations in support wildfire mitigation and response.

5.0 Wildfire prevention strategy and programs

BPA has a proven history of holistic measures to address potential wildfire risks. Some of the activities BPA engages in are listed below:

Each year, BPA Transmission Field Services regularly staff's work with local fire agencies during fires events.

BPA vigilantly manages the trees, brush and other vegetation on its rights of way. BPA combines use of LiDAR to help identify vegetation that encroaches designed clearance boundaries to identify spots where inspection and potential clearing are necessary. The LiDAR data and aerial photographs help BPA identify and clear vegetation that could be inadvertently sparked and cause a fire.

During wildfire season in areas where dry conditions conducive to wildfires exist, BPA selectively disables automatic reclosers as a preventative measure where a fire could be started. As an alternative, BPA deploys field staff to visually inspect lines, which is safer. BPA will continue to use, analyze, and modify this practice as necessary. BPA will fold this practice into its existing outage communications plans to ensure they are considered. It will communicate to customers and other stakeholders as the potential for a line to stay de-energized until it can be visually inspected. This practice increases the risk for power to be interrupted for longer than usual, but significantly decreases the risk of fire posed by auto reclosing, or manual testing.

Activity	Risk Factor
Fuel	• Vegetation management
	• Fuels reduction
	• Piloting use of LiDAR and Multi-Spectral Imagery
Asset failure	• Routine maintenance
	• Focused design and construction standards to reduce ignition sources
	• Transmission line detailed inspections and annual patrol
	• No reclosing during fire season on specific circuits
	• Non-expulsion fuses and arrestors
	• Intrusive pole testing and pole replacement
	• De-energization of lines during certain conditions
Contact from object(s)	• Animal/Bird guards
	• Underbuild phase to phase spacing
	• Proactive vegetation management
Wire to wire contact	• Line ratings and clearance analysis through LiDAR
Other	• BPA worker/contractor education on fire ignition sources from normal work activities
	• Fire watch 30 minutes after work completion in high risk areas
	• Pre-positioning fire suppression equipment (e.g. water trailers) to get waivers to work

Table 3: Activities that address wildfire risk factors

5.1 Transmission Operations during wildfire season:

BPA Real-Time Operations uses all situational awareness tools at its disposal to respond appropriately to fire threats. It evaluates information such as on the ground reports, GIS data, CHR data from its field maintenance and planning organizations, fire weather reporting and other resources.

Actions are taken in accordance with established procedures and may include, but are not limited to

- Preventative Actions:
 - ◆ Disabling automatic reclosing.
 - ◆ Order no test orders on facilities.
 - ◆ Requiring onsite inspection before testing faulted equipment.
 - ◆ Pre-emptive de-energization of facilities
- Responsive Actions:
 - ◆ De-energize equipment due to fire.
 - ◆ Dropping load.
 - ◆ Curtailing transmission.

5.2 Transmission Line — Inspections, Observations and Education

BPA has a multi-prong approach to inspecting its transmission lines and observing what is happening around its transmission lines. First and foremost, the safety and reliability of the line is inspected to assess the condition of BPA's facilities and any incompatible vegetation on or adjacent to rights-of-way or facilities. Additionally, there are many external factors which can create risks that can cause or contribute to fires. These external risks can arise when transmission lines cross over or near things such as retail businesses, suburban backyards, construction sites, agricultural land, rural homes, thick forests, trails and campgrounds, arid plains and deep canyons.

Even though public and private property owners, businesses and contractors take precautions, their equipment can come into contact with transmission lines. Routine activities can also contribute to wildfires; for instance, smoke from burning brush piles can conduct electricity and refueling vehicles under lines without proper precautions may cause arcing. While generally unintentional, these contacts or activities may cause damage to transmission lines, poles and other equipment or may cause sparks and trigger fires in the vicinity. BPA equipment or rights of way can also be vandalized and damaged, which may cause sparks and fires.

BPA's multiple inspections programs are described below.

5.2.1 Infrastructure inspections and maintenance

Transmission Services maintains a multitude of time-based and risk-based inspections of its transmission assets. Engineering and technical services develops the work standards and guides. Transmission Field Services performs the inspections and assessments. Performance Level Guides (PLGs) are established to maintain our transmission lines as efficiently and cost effectively as possible while maintaining reliability. It is important that BPA meet its legal and environmental responsibilities while providing safe and reliable service to our customers. A description of the inspections and assessments are summarized in the following sections. These PLGs are described in great detail in Transmission Line Maintenance standard TLM-STD-3-1-8.

5.3.1 Transmission lines — working patrols

Working patrols are necessary to gather information to ensure the integrity and reliability of BPA's Transmission Line System. The working patrol inspects every component in the line section, including terminal spans and substation dead-end structures. The patrol also drives or walks the right-of-way between each structure. Imminent problems are addressed while the patrol is on site. The information accumulated informs planning and scheduling future maintenance to avoid major faults. The working patrol augments the helicopter patrol, providing ground-level evaluation of structures, rights of ways, access roads and brush to conductor clearances. These patrols are described in great detail in TLM standard TLM-STD-4-1-10.

5.3.2 Transmission lines — aircraft patrols (helicopter inspections)

BPA uses helicopters to perform aerial transmission line inspections. BPA and utility best practices have shown that aerial and ground patrols are interdependent and must be combined to achieve effective and economical results. The objective of routine aircraft patrols is to obtain information on facility conditions to determine actions necessary to maintain system reliability. Aerial patrols inspect BPA transmission lines twice a year,

once in the spring and once before fall. These patrols are described in greater detail in TLM standard TLM-STD-4-2-3.

5.3.3 Transmission lines — inspection and treatment of wood poles

The TLM standard describes the inspection and remedial treatment methods routinely conducted on wood poles and their attachments during working patrol. Wood pole decay will progress at generally predictable rates, and its advance can be readily diagnosed in the field, except for in the very early stages. Early detection and treatment is by far the most important and successful step in extending pole service life. BPA's detailed wood pole inspection standard largely follows the Electrical Power and Research Institute (EPRI) field guide, "Visual Inspection of Wood Structures" No. 1018373. These inspections are described in great detail in TLM standard TLM-STD-5-4-3.

5.3.4 Transmission lines — visual inspection of steel structures

The standard is to visually inspect all towers and steel poles from the ground. Typically, a detailed climbing inspection is performed every 10 years. An option for the detailed climbing inspection is an enhanced inspection using a high powered spotting scope, start the inspection procedure by looking for obvious defects. When the inspection is complete a maintenance priority rating assigned. These inspections are described in great detail in TLM standard TLM-STD-4-1-15.

5.3.5 Transmission lines — conductor and accessories inspection criteria

There are numerous types of conductor component defects and damage that occur on transmission lines and accessories. These defects adversely impact the reliability of the transmission system. Thorough inspections, assigning appropriate maintenance condition ratings and making necessary repairs are critical to maintaining the integrity of the system.

This standard familiarizes maintenance personnel with the most common component defects observed on conductor and related accessories. However, it does not depict every type of defective condition that may be found. Sound field judgment based on experience is the determining factor when assigning Maintenance Condition Ratings. Visual inspections are performed for all conductor and ground wire for degradations that can lead to failures.

Inspect and record broken strands, abrasions, low conductor clearance impairments, noisy conductor, galloping, and other conditions that can lead to failures. Record any damage to conductor related accessories i.e. dampers, spacers, mid span splices, dead end fittings and locations of repair rod. These inspections are described in TLM standard TLM-STD-4-1-11.

5.3.6 Transmission Lines — insulator inspection criteria

Insulators are an integral component of the transmission system. Glass and porcelain insulators provide years of reliable service life. Polymer insulators are rarely used except in areas subject to frequent vandalism, contaminated areas and as inter phase spacers. Many BPA insulators are original and nearing the end of their lifecycle. Occasional failures, both mechanical and electrical, have caused system outages that affect reliability. A thorough inspection plan can reduce the number of outages, hence

improving reliability. BPA's detailed inspection criteria largely follow Electrical Power and Research Institute's (EPRI) Field Guide: Visual Inspection of Porcelain and Glass Disc Insulators and Field Guide: Visual Inspection of Polymer Insulators No. 1018377 and No. 1018374.

Visual inspection of insulators is performed by working and aerial patrols. TLM patrols all lines annually. Most mechanical damage and vandalism can be seen from the ground, aided by field glasses. Enhanced inspections may be performed. Aircraft patrols identifying faults, such as flashed insulators, contaminants, etc., from the air. These inspections are described in great detail in TLM standard TLM-STD-4-1-13.

5.3.7 Transmission lines — obstruction marking and lighting inspection

Aerial markings and lighting are applied to transmission structures or wires to improve the visibility of the structure and lines, thereby improving the safety of the public air space.

These aids are used to prevent accidents involving aircraft striking the structure or line. Lights are installed on the highest point of a structure, and aerial markers are installed on the highest wire.

Aerial lighting and markings are inspected during annual working patrols. These inspections are described in great detail in TLM standard TLM-STD-4-1-14.

5.3.8 Vegetation management

BPA manages, directly or by Agreement, all vegetation on BPA Transmission Line Rights-of-Way (ROW), fee-owned lands and easements in order to establish and maintain the safety and reliability of its facilities. BPA's vegetation management program complies with applicable federal reliability standards. Its program uses cost effective methods to proactively manage vegetation and to establish low-growing plant communities along the ROW to minimize the development of potentially threatening or incompatible vegetation.

BPA performs vegetation patrols annually, and this includes inspection and removal of vegetation within and outside of its rights of ways where imminent tree or branch failure would potentially damage Transmission line assets. BPA Vegetation Program Documents and Standards TLM-STD-7-2-13 and 7-2-1 provide the details and internal controls for Bonneville's vegetation management program.

BPA uses LiDAR (Light Detection and Ranging), aerial and ground patrols to monitor vegetation around Bonneville's facilities. LiDAR data is typically acquired on a portion of BPA's circuits annually and the data is provided to annual aerial or ground patrols staff. The program covers both routine scheduled maintenance of the transmission lines, access roads and other facilities as well as emergency or imminent threat vegetation removal. The program sets clearance distances from any vegetation to the transmission line (a conductor). Since conductors move horizontally and vertically based on dynamics such as operating temperature, wind and loading, clearance is evaluated from all possible conductor positions. Clearance also accounts for vegetation that would grow into, bend into, swing into or fall into a clearance distance if not removed. BPA works to establish and maintain vegetation with a mature height or growth that is 25 feet from the Max Sag of the transmission lines. In situations where

this standard cannot be achieved due to legal or physical constraints, it has subject matter experts set a maximum allowable clearance distance under the circumstances. BPA's vegetation management staff, Natural Resource Specialists, contractors and Transmission Linemen who conduct ground patrols, all work to minimize vegetation related fire hazards and remove flammable materials around wood structures. Proactive maintenance during routine operations and prompt action during emergency events maintain system reliability, a safe work environment, and reduces fire danger.

5.3.9 Controlling incompatible uses

Bonneville staff also works to educate public and private landowners about incompatible vegetation as well as activities and structures that pose risks if conducted or present near or under transmission lines. In addition to the annual patrols by BPA field staff observing and reporting on incompatible uses and encroachments, it has a land use review process so developers or landowners can get their planned activities reviewed in advance. BPA evaluates if they can be safely conducted under or near the transmission lines.

6.0 Emerging technologies and operational practices

BPA is committed to developing an industry leading asset management program consistent with its Strategic Plan. Part of that effort includes ongoing benchmarking and incorporating best practices that range from business transformation to new technologies that help inform asset-related decisions. BPA explores new capabilities and risk mitigation practices and when possible, incorporates them into its operations. These technologies include emerging weather sensory data, situational awareness data satellite imagery, cameras and drone inspections to evaluate asset conditions, and machine learning analytical models to help inform decision making for investments.

Areas of ongoing focus are listed below:

6.1 Fire mitigation construction

BPA has built and organized a structure of standards and specifications with review cycles to allow for best practice improvements and incorporating new technologies. These standards and guides include material specifications for construction and design. As BPA learns more about its system's highest risk fire areas it can explore modifying design standards to include different transmission structure materials such as steel poles or lattice structures, rather than wood, which add resiliency to those areas. Other options include wire mesh products that allow for continual maintenance and protection from low-land brush fires. These alternatives can be explored during the design process and during the standard review process allowing Transmission to modify metrics and internal controls to further mitigate the agency's wildfire concerns.

6.2 System capital improvements

BPA's ratepayers and stakeholders expect reliable service at the lowest possible transmission rates consistent with a sustainable business model. BPA's strategy dictates that it must balance the cost-effectiveness of its construction, and maintenance of its capital assets which informs Transmission Services' asset and risk management. To deliver on these requirements, Transmission must assess effective methodologies for investment evaluation and decisions.

BPA is updating its total economic cost modeling tools to determine investment levels by asset type, and Transmission is investigating reliability engineering and portfolio optimization methods and tools to improve decision making over the full asset lifecycle.

6.3 Fire prevention strategies — fire regulations, restrictions, precaution levels and pre-suppression

Bonneville's federal statutory obligations require it to reliably operate and maintain its transmission facilities.¹ Bonneville's modeling of wildfire threats² in combination with its geospatial and CHR³ asset data will continue to inform its work planning and scheduling strategies. Whenever possible given weather, environmental restrictions, and logistics of managing 15,000 line miles housed on 8,500 miles of rights-of-way, routine and non-emergency work will be scheduled during the lowest risk times of the year in high fire risk areas. When that is not possible, or when urgent, unplanned maintenance needs occur, Bonneville is committed to being "fire safe". That means exercising fire safe practices and taking proper precautions while it maintains its transmission lines, and performs vegetation management actions. One example is BPA's Wildfire Smoke Exposure Program, backed by BPA policy 420-1 Occupational Safety and Health. Because smoke from wildfires is comprised of many components, including particulates small enough to enter the lungs. The Air Quality Index (AQI) considers the amount of particulates contained in the smoke and helps to identify stages where we must consider strategies to mitigate health issues. The purpose of the program is to establish guidance that managers shall consider prior to assigning employees to work in areas where smoke from wildfires is present. The program applies to all BPA Employees. Supplemental labor personnel and other contractor requirements are contained within applicable contract documents and are managed and implemented by the appropriate Contracting Officer.

This "fire safe" approach is part of its Situational Awareness, Operational Practices, Asset Management and Vegetation Management strategies and will be employed throughout the year for planning critical work but particularly during fire season. It will also be a part of its Stakeholder Cooperation and Community Engagement strategy.

Bonneville employees and contractors operating and maintaining its transmission lines are and will be continually trained on federal, state or local fire regulations on federal land as well as on private property and state or local public land (non-federal land). These regulations and restrictions are generally based on land ownership. Bonneville has acquired rights to construct, operate and maintain its transmission lines through easements on private land and right-of-way permits or agreements on federal and state public lands.

Bonneville has over two thousand line miles of transmission on federal public lands administered by the United States Forest Service (USFS) or the Bureau of Land Management (BLM). Bonneville is required to follow federal fire regulations on these lands.⁴ The regulations require right of way holders to adhere to public use and industrial use fire precautions and restrictions. Except when responding to an emergency situation, Bonneville must obtain waivers to operate when certain Industrial Fire Precaution levels (IFPL) are in place. The IFPL

¹ 16 USC §838b (2012); 16 USC §824o (2012); NERC Reliability Standard FAC-003-4.

² BPA has modeled the threat locational areas based upon the wind, humidity, vegetation species and fuel volume. See 4.1, *infra*.

³ Criticality, Health and Risk (CHR) initiative.

⁴ The Federal Land Policy and Management Act (FLPMA) and other federal laws require Bonneville to follow the land managers' fire regulations on federal land.

restrictions are primarily focused on “pre-suppression” work.⁵ Pre-suppression involves planning and prevention activities designed to avoid starting fires or to put out any small fires when that can be done safely. The IFPL contain restrictions on the type of work that can be done during higher risk periods unless a waiver is obtained. To obtain a waiver, land managers need to know the nature of the work being undertaken and the power tools being used. When possible, this information will allow the federal land managers to determine appropriate mitigation actions that will allow them to issue a waiver to avoid a work stoppage or interruption.⁶ Federal land managers routinely work with Bonneville to issue waivers to allow work to be conducted with conditions and restrictions in place.

This wildfire mitigation plan will help Bonneville explain to the federal land managers how cross-arms, insulators, arresters, guy wires, splices, clamps, and connectors can, if not replaced or repaired in a timely fashion, increase the risk of fire. This will help demonstrate the importance of timely preventative maintenance and urgently needed repairs in support of attaining IFPL waivers.

There are no federal restrictions that prevent Bonneville from conducting emergency work to restore power or remove vegetation or obstacles from contact with the line.⁷ It will however coordinate with federal land managers whenever time permits.

Notably, Bonneville’s Memorandum of Understanding with the USFS requires it to carry certain firefighting equipment, this equipment is routinely carried by its federal employees and contractors.⁸ Bonneville will follow BLM’s regulation that requires all ROW permit holders to do everything reasonable to prevent and suppress wildfires on or in the immediate vicinity of the right-of-way area.⁹ Bonneville is authorized to remove incompatible vegetation in the ROW and danger trees adjacent to the ROW on federal public lands. Removal is critical to preventing wildfires and assures compliance to federal reliability regulations¹⁰ as well as under the terms of the MOU and other federal land management laws and regulations.¹¹ Bonneville coordinates its routine vegetation management and its routine infrastructure maintenance with USFS per the MOU. There are advance notice and timeframes specified for this work. If urgent work is identified that needs to be expedited, this plan will enable Bonneville to quantify any increased risks of delay s and if necessary, seek an exception to the specified timeframes in the MOU.

⁵ “Presuppression,” as defined in U.S. Forest Service Glossary by U.S. Forest Service, means “Activities required in advance of fire occurrence to ensure effective suppression action, including: (1) recruiting and training fire forces, (2) planning and organizing attack methods, (3) procuring and maintaining fire equipment, and (4) maintaining structural improvements necessary for the fire program.” Suppression means “All the work of extinguishing or containing a fire, beginning with its discovery.” FS Agricultural Handbook No. 104, Glossary of Terms used in Forest Fire Control (U.S.D.A. 1956).

⁶ There are 4 IFPL levels during fire season. At Level I, a post operation fire watch is required unless waived. At Level II (Partial Hootow) and Level III (Partial Shutdown), the use of power saws and other equipment are limited from 1 pm to 8 pm without a waiver. Waivers list the type of precautions Bonneville must take to operate to avoid work restrictions; these include, but are not limited to, only using power equipment with spark arresters or mufflers, prepositioning water trailers, monitoring humidity and wind levels throughout the work day, and having post operation fire watchers. Level IV (General Shutdown) involves shutting down all operations unless there is waiver which requires a fire inspector be in place during operations, although this restriction can also be waived.

⁷ FLPMA, 43 USC §1772(e).

⁸ Bonneville agreed to specific fire prevention and suppression activities as part of its 2016 MOU with the USFS. See Appendix E, Fire Prevention and Suppression Plan. (e.g. a fire extinguisher of at least a 5 B/C rating and a serviceable shovel, comply with current Industrial Fire Precaution Level (IFPL) and any other public use restrictions (PURs) specified by the Forest Service to prevent and minimize the start and spread of fire.) Additionally, on page 20 of the MOU’s Operating Plan, it requires Bonneville to “comply with the restrictions and prohibitions under the applicable IFPL, unless a waiver of the applicable IFPL granting permission to use otherwise prohibited equipment or engage in otherwise prohibited activities is obtained in writing from the Forest Service.” The MOU provides that the Forest Service shall inform Bonneville of any change in the restrictions by 6:00 p.m. local time the day before the change goes into effect.

⁹ 43 CFR §2805.12(4).

¹⁰ NERC FAC 003-4 (or subsequent revisions). Unlike federal fire regulations, the reliability regulations are not based on the type of land on which the transmission lines are located.

¹¹ FLPMA, 43 USC §1772.

Notably, at times, State agencies, such as in Idaho and Montana, have contractual agreements to protect federal USFS and BLM land. Bonneville will follow the directives of an agency in charge of issuing fire restrictions and waivers on federal land.

On nonfederal land, Bonneville, as a federal agency, is not covered by state or local fire regulations. However, it is committed to coordinate with the appropriate agencies and will generally follow advice and precautions recommended by state and local agencies.¹² Notably, state and local agencies not only oversee lands owned by these agencies, they also oversee wildfire management on forest and rangeland primarily in rural areas outside the city boundaries. This fire prevention and suppression work is generally set forth in state law and administrative regulations. This state and local work is undertaken along with private forest and range landowners who are often required to either pay fire protection fees or assessment or provide their own fire protection plans and resources. This plan will also allow BPA to demonstrate to landowners that it is taking adequate precautions in planning and carrying out its work.

The Transmission Line Maintenance (TLM) crews and the Natural Resource Specialists are the primary owners of this “fire smart” operational strategy to maintain access to federal public land and to coordinate with nonfederal public and private landowners.¹³ Additionally, Bonneville staff who issue contracts for vegetation management, construction and maintenance work will assure these contracts provide adequate fire pre-suppression measures and require appropriate coordination with the applicable fire agencies.

6.4 Risk-Informed Vegetation Management

Bonneville will continue to evaluate its vegetation management program. It will examine industry best practices and identify any additional risk informed strategies that could advance its work to minimize wildfire risks. It will use risk assessment tools, including the CHR data, geospatial data, fire GIS mapping, and other risk- based evaluation tools Bonneville may acquire. This risk-informed approach may result in it reprioritizing or adding resources to address high risk fire areas; this work could include modifying the frequency of inspections or taking additional measures to reduce fuel levels. Response Guidelines

7.0 Emergency Response and Preparedness

As a federal Power Marketing Administration, BPA follows federal guidance, including the North American Electric Reliability Corporation (NERC), the Federal Emergency Management Agency (FEMA), and Department of Energy (DOE) Directives and Orders for emergency response activities. Implementation of the National Incident Management System is imbedded in the planning efforts and documentation followed by personnel when responding to wildfires and other incidents.

BPA interacts with other emergency management agencies within its service territory at multiple levels. General coordination of response efforts across the BPA service territory involve actions with our control centers to mitigate impacts to our customers and equipment. Our control centers dispatch resources from our Operations and Management (O&M) Districts for local safety and alignment of efforts. Local responses are commonly performed by the relevant District employees. For larger or multiple impacts in the same time period are raised to the regional managers and finally to the BPA Continuity of Operations and Emergency Management organization.

¹² The prime difference is that it is not legally required to obtain a waiver permit, nonetheless it will assure these agencies and landowners that it will take appropriate precautions to conduct necessary maintenance on its transmission lines.

¹³ TLM Standard GID 3-1-9.

The local fire department or the National Wildfire Coordinating Group notifies BPA's control centers whenever a fire appears to be approaching BPA's infrastructure. BPA's weather and streamflow forecasting workgroup provides real-time weather data including Red Flag areas, thunder & lightning storms and also monitors wildfires in the service territory and provides notifications to the control centers. Dispatched personnel act as agency representatives for the incident management team established to address the event. BPA also provides liaisons for federal, state, tribal, and local governments who regularly coordinate efforts for concerns and are utilized for information sharing.

Safety is a BPA core value. Rerouting power as we experience outages and securing impacted equipment are BPA's primary means of reducing the risk of wildfires that can be started by BPA equipment or existing fires that threaten BPA's assets. BPA regularly communicates through many channels to customers and other stakeholders regarding possible curtailments and restoration timelines. BPA supports many customers, some that perform critical processes that can cost tens of thousands of dollars if disrupted. In some instance, BPA is the only entity capable of transmitting power to specific locations where outages can affect vulnerable entities and individuals. Extended power outages require active communication with customers and coordination with other responding entities.

BPA's Communications workgroup manages awareness via social media and provides communications products and assistance about ongoing and available resources for customers, federal, state, tribal, and local governments. BPA also coordinates with entities to prepare for and respond to potential emergency events. Vegetation management and other preventative measures are used to prepare for and reduce wildfire risk. BPA also modifies procedures to reduce fire risk during peak fire season. Interested individuals are also encouraged to increase their education by accessing Community and Outreach at bpa.gov.

BPA establishes and maintains contact with customers and other stakeholders to keep them informed when preparing for a potential or imminent safety shutoff. BPA has specific personnel assigned to contact federal, state, tribal, and local agencies as well as account executives assigned to all customers.

7.1 Event Communications

When practical, BPA will provide notice to customers when interrupting load due to a fire. This is an unlikely event as the majority of BPA facilities are interconnected and de-energization of one facility does not generally result in interruption of load. BPA will notify its transmission customers of curtailments of transmission due to wildfire through the normal reliability curtailment processes. It is our goal to provide advanced notice but often this is not practical when addressing urgent safety and reliability issues.

BPA interacts with emergency management officials from federal, state, tribal, and local governments and agencies to keep them updated on wildfire mitigation efforts. BPA also works with stakeholders on collaboration and partnership opportunities when developing and implementing strategies.

The following measures can be taken to adapt to climate-driven increased risk of wildfire and to make the transmission system more resilient to this increasing risk.

Adapting to how projected changes in climate change are expected to increase the risk of wildfire:

1. Increased focus on vegetation management practices. Climate change is expected to alter the range and abundance of vegetation and exacerbate the spread of invasive species, pests, and disease (USGCRP 2018). These changes to ecosystems can then increase the

risk of wildfire by throwing off the balance of an ecosystem and providing an abundance of fuel (DOE, 2015; DOI, 2017). BPA may need to be more vigilant about surveying and maintaining transmission right-of-ways.

2. Any foreseeable impact to line sag (and corresponding potential to spark and ignite something) with increasing temperatures that we may need to adapt for in design standards and construction.

[General wildfire resiliency solutions, e.g. vegetation management, design standards, redundancy) are not solely particular to climate change and I assume will be addressed elsewhere]

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8.0 Restoration of service

If a transmission line has been de-energized because a wildfire is burning in close proximity of our transmission lines, BPA's TLM must perform additional steps prior to re-energization. In an event of a wildfire where transmission structures were burned, additional steps must be taken to rebuild the lines.

Steps to restoration of service

BPA work crews must take several important steps prior to restoring electrical service after a wildfire event.

- Patrol
 - ◆ BPA crews patrol the line by ground or by air to look for vegetation in lines and any obvious damage that may prevent safe energization. Depending on the length of the lines, and number of circuits, the patrols can take several hours.
- Repair
 - ◆ During patrol, crews look for potential damage to the lines and poles. Where equipment damage is found, crews use new materials to repair or replace damaged equipment. If

needed, additional crews are dispatched to help. In some cases, Vegetation Management crews may be called in to help clear an area of downed trees or branches that have fallen into the transmission lines.

- Test
 - ◆ Once the lines and poles are safe to operate, the lines and equipment are re-energized by closing the fuse, or breaker to re-energize the line segment.
- Restore
 - ◆ Power is restored and the outage communication system provides notification of power restoration to customers.

Reconstruction after a wildfire

After fire officials have given BPA clearance, BPA work crews can proceed with the assessment and rebuilding effort.

- Assessment
 - ◆ BPA crews must patrol each line segment to determine the extent of damage that has occurred. The patrol involves assessing equipment damage, access issues, and any cleanup / debris removal issues. BPA works with the local agency in charge of the fire to access impacted areas as soon as the area is deemed safe by fire officials. During this phase the Vegetation Management team can be used to assess vegetation damaged by the wildfire that could impact BPA's facilities.
- Planning
 - ◆ After the initial assessment, BPA supervisors, managers and engineers meet to plan the restoration. The team will work with system operations to prioritize the restoration efforts, targeting the circuits that serve the most critical infrastructure needs.
- Mobilize
 - ◆ Based on the size and complexity of the rebuild/restoration efforts, BPA will coordinate the crews and material needs internally if possible. Mutual aid and contractors may be used on an "as needed" basis to provide additional support. Vegetation Management crews can be used for clearing the ROW and any dangerous trees that pose a threat to the restoration crews. BPA maintains an emergency stock of critical materials; though in an instance of widespread catastrophic damage, necessary materials and labor could experience shortages that may delay work.
- Rebuild
 - ◆ The rebuild effort led by BPA will commence as soon as areas become safe and accessible. The lines will be rebuilt with a mix of temporary and/or permanent structures as determined during planning. The initial efforts will be to get the lines up and restore the damaged circuits. Depending on the extent of damage, demolition may be performed concurrently or after crews start installing new facilities. BPA will incorporate new materials and technologies as indicated and available.
- Restore
 - ◆ BPA, mutual aid, or contract crews will restore electric services to our customers as soon as possible after the wildfire. Depending on the extent of damages, customers may have to perform repairs on their facilities prior to having full electric service restored. These are coordinated on an as needed basis.

9.0 Accountability of the WMP

BPA's Chief Operating Officer has ultimately accountability for this plan. BPA's Senior Vice President of Transmission Services has overall responsibility for this WMP and its execution. Other BPA executives have substantive responsibilities in support of this plan.

9.1.1 BPA responsibilities for components of this plan

The following list depicts the primary composition of responsible organizations supporting this plan.

- Chief Operating Officer
- SVP, Transmission Services
- VP, Transmission Planning and Asset Management
- VP, Transmission Field Services
- VP, Transmission Engineering and Technical Services
- VP, Transmission System Operations
- VP, Transmission Marketing and Sales
- Dir, Transmission Technology
- EVP and Chief Risk Officer
- Chief Administrative Officer

9.2 Metrics and assumptions for measuring WMP performance

BPA has developed, or is developing, transmission system capabilities through various initiatives as outlined in its Strategic Asset Management Plan (SAMP) or other directional documents that impact wildfire mitigation. Some of these enhancements will provide input to wildfire mitigation management such as CHR and reliability standards. Other enhancements come from third party vendors providing products and services such as real time fire mapping. And, BPA's collaborative relationships with other utilities and agencies, such as the USFS, provides forums to explore meaningful metrics. As industry wildfire mitigation program standards and measures continue to develop, BPA will identify relevant metrics to measure this plan's effectiveness. Targeted metrics for the current cycle of this WMP include developing two SMART wildfire mitigation measures and placing them into practice.

9.3 Maintenance performance targets

BPA has a host of metrics that support its maintenance programs. It is BPA's target to complete 100% of the right asset maintenance at the right time. New capabilities like Secondary Capacity Model and CHR will improve BPA's targeting and execution of maintenance work while giving consideration to cost and risk. This means targeted patrols and maintenance intervals that are risk and value based instead of time based. By 2022, BPA aims to incorporate ignition risk studies to prioritize these maintenance tasks.

9.4 System enhancement capital program

Transmission asset management's capital and maintenance plans are outlined in the SAMP and Asset Plan. These plans cover a long term planning horizon for capital and the replacement/maintenance strategies per program for the entire portfolio of assets and

are direct feeds into IPR/CIR. The SAMP covers the current state and describes planned asset management improvements, maturity and competencies needed to effectively and efficiently manage the entire lifecycle of BPA assets that deliver electric transmission and telecommunication services. The SAMP aims to provide alignment between the agency strategy, Transmission Business Model, stakeholder requirements, organizational objectives and resulting asset management objectives to ensure assets are managed and measured and creating and delivering value to the region. Capital projects are approved on an annual basis at the programmatic level but are flexible enough to address unforeseen and immediate mitigation of system performance and risks.

9.5 Monitoring of the WMP

The WMP will be reviewed annually for the purpose of updating the plan as needed to reflect knowledge gained in the preceding year and modified accordingly. A more formal review will be done every two years in coordination with BPA's Strategic Asset Management Plan. BPA prepares for annual wildfire season in advance and utilizes this plan as strategic and operational guidance.

9.5.1 Responding to identified deficiencies

At any time, identified deficiencies in the plan will be addressed by the responsible parties governing the plan.

9.5.2 Processes and procedures

Operations are conducted via procedures, policies, regulations, and standards that ensure consistency, of work planned and executed in support of this WMP.

9.5.3 Inspection standards

Transmission Services utilizes various standards that ensure desired quality is achieved. These standards are embedded within inspection and maintenance program practices. These programs support or address wildfire risk and mitigation criteria.

9.5.3.1 Transmission system inspection and maintenance

A variety of industry practices are used to ensure transmission system assets are managed in a way that minimizes risks associated with wildfire. The follow are examples of mitigating activities.

Potential ignition sources are inspected through the following activities.

- Line inspections and patrolling
- System monitoring for abnormalities
- CHR analysis and prioritization
- Design and work standards
- Potential fuel sources are inspected through the following activities.
- Vegetation management
- GIS

- USFS collaboration
- Ground patrolling
- Design and work standards

9.5.3.2 Inspection and maintenance objectives

Through inspection activities, maintenance plans are developed and executed consistent with annual planning and emergency response call-outs. Plans are routinely updated and prioritized based on the most current information available. These inspection and maintenance programs focus on the following objectives.

- Protect employee, contractor, and public safety
- Mitigate wildfire risks resultant of BPA transmission system assets
- Ensure compliance to the variety of regulatory and BPA policies
- Protect and ensure the availability and reliability of the system
- Continually improve through learning, evaluating and implementing appropriate leading practices
- Manage system assets via life-cycle cost modeling
- Employ Institute of Asset Management standards to provide the best value from system assets

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