



BPA 2024 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 Bonneville Power Administration published its inaugural Wildfire Mitigation Plan (WMP) in 2020 and added a Public Safety Power Shutoff (PSPS) procedure to the WMP released in 2022. 2024 marks the fourth year that BPA will coordinate its wildfire mitigation efforts under a distinct plan.

This year, we are building on the lessons we've learned since 2020. This updated WMP includes the following improvements:

- Lessons learned since considering and implementing PSPS implementation between 2021 and 2023.
- Evolving wildfire modeling and data integration in partnership with the Pacific Northwest National Laboratory that informs prioritization of vegetation management and maintenance work on transmission lines posing the greatest wildfire threat.
- Infusion of lessons learned applying the International Wildfire Risk Mitigation Consortium Maturity Model, which has helped our experts better understand current BPA programs and activities in relation to general utility threats. This has resulted in year-over-year improvements to our plan and activities.

In addition to improving the way we manage vegetation and repair equipment that presents a wildfire risk, we began applying fire retardant to our wood poles in 2022. This measure helps reduce the spread of wildfires that threaten our rights-of-way and adds a protective element to our transmission system.

Climate change continues to lengthen wildfire season and increase the fire-related threats to utility systems across the Pacific Northwest and the country. Wildfires are devastating to utilities and other industries, but even more so to people who lose their lives, property, and cherished belongings to these catastrophic events.

BPA is committed to continually improving its WMP to prevent, mitigate, and quickly recover from the devastation wildfires can wreak on the people and communities we serve. I am proud of the work we have done and will do as we improve the preventative measures outlined in this plan.



A handwritten signature in black ink that reads "John Hairston". The signature is fluid and cursive, with a large initial "J" and "H".

John Hairston

Administrator and CEO
Bonneville Power Administration



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1.0 Introduction/Executive summary

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

Fuel + Ignition Source = Fire. Looking through the lens of this wildfire equation, the 2024 Wildfire Mitigation Plan (WMP) encompasses BPA's efforts to mitigate the risk of wildfire ignitions. Specifically, the WMP includes several technical safety and preventative measures related to the materials and equipment owned and operated by BPA as the agency recognizes its potential components of the wildfire equation. The plan also includes communication and coordination tactics with local, state, and federal partners to support collaborative wildfire mitigation efforts across BPA's service territory.

BPA has long-standing operational practices that have directly or indirectly provided wildfire mitigation. This includes world-class vegetation management, customer and community relations, partnerships with wildfire experts like the Pacific Northwest National Laboratory (PNNL), and field service inspection and maintenance. These practices and relationships have served BPA, its customers, and its service territory well.

BPA is actively growing its efforts to mitigate the risk of wildfires. The agency is making significant progress in asset management value framework maturation, inclusive of factors that address wildfire ignition or fuel in BPA's asset base. BPA continues to evaluate and deploy existing and emerging solutions that enhance operational effectiveness in mitigating wildfire risk. BPA is also expanding its focus to take into consideration more local impacts to communities surrounding Public Safety Power Shutoff (PSPS) decisions.

BPA has adopted the Institute of Asset Management's methodologies as its benchmark for asset management. By making asset management an element of BPA's 2024–2028 Strategic Plan¹, it enhances abilities to develop solutions that focus on asset lifecycle management that, in turn, improves risk-reducing methodologies in reliability, resiliency, and wildfire mitigation.

BPA will continue to assess factors of climate change, community growth, and asset conditions as its wildfire mitigation program evolves and to ensure the agency applies cost-effective and risk-based solutions in a proactive way to best serve its customers.

The scope of BPA's WMP includes asset management and vegetation management programs across the entire transmission system lifecycle:

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

Additionally, the WMP covers protocols and processes for restoring service after a wildfire. The WMP will be updated in alignment with BPA's Transmission Strategic Asset Management Plan (SAMP) and Integrated Program Review (IPR).

¹ BPA, "2024–2028 Strategic Plan." Available at <https://www.bpa.gov/-/media/Aep/about/who-we-are/strategic-plan/2024-2028-strategic-plan.pdf>

1.1 Bonneville Power Administration

Bonneville Power Administration (BPA) is a nonprofit federal power marketing administration based in the Pacific Northwest. Though BPA is part of the U.S. Department of Energy (DOE), it is self-funding and covers its costs by selling its products and services. BPA is one of the nation's largest public utilities with transmission assets touching several Northwest states.

BPA owns, operates, and maintains transmission facilities and equipment critical to sustaining the flow of power from

generating facilities via more than 15,000 circuit miles of lines, which occupy more than 8,500 miles of rights-of-way (ROW) and pass 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 customers and constituents. BPA's vision is to continue being an engine of the Northwest's economic prosperity and environmental sustainability.

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

Most of the generating resources connected to the BPA transmission system provide electricity to retail customers many miles from their source. As a result, BPA operates long transmission lines and equally long ROWs. 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 multiple ignition variables in the WMP.

Asset locations

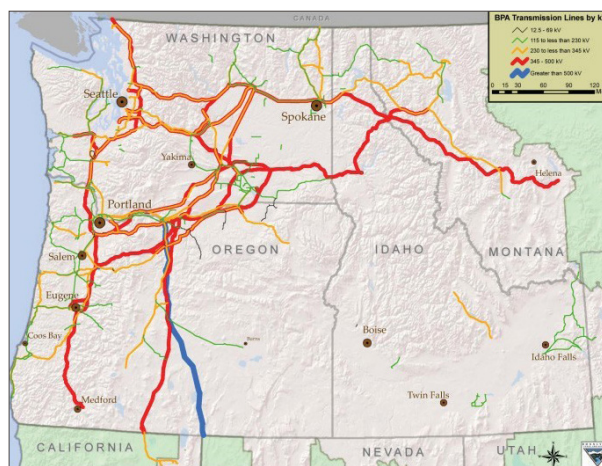


Figure 1.

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 utility districts, municipal electric utilities, electric cooperatives, and others — independent power producers, and investor-owned utilities. Interconnected generation resources include federal and other hydroelectric projects, fossil fuel, wind, nuclear, solar, and others.

As it created this plan, BPA performed a maturity assessment using the International Wildfire Risk Mitigation Consortium (IWRMC) method to assess wildfire competencies. BPA

ranked each competency with their corresponding maturity to reflect 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 communications.

Consistent with the North American Electric Reliability Corporation (NERC) regulatory direction on building resiliency into utilities' asset management systems, the WMP aims to improve design and maintenance standards and improve construction activities that allow BPA to respond to a wildfire event rapidly and safely.

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

1.3 Policy statement

BPA's mission as a public service organization is to create and deliver the best value for its customers and constituents to provide an adequate, efficient, economical, and reliable power supply. BPA's vision is to advance the Northwest power system by providing high reliability and low rates consistent with sound business principles, responsible environmental stewardship, and accountability to the region.

To meet its mission and vision, BPA constructs, operates, and maintains its transmission system in a manner that minimizes wildfire risks. Iterations of this WMP will be coordinated to align with Transmission SAMP and IPR revision cycles.

1.4 Purpose

This WMP describes the range of policies, programs, processes, procedures, and activities to proactively mitigate threats posed by its assets for starting or contributing to the spread of a potential wildfire. This includes policies and care of its transmission assets and management of vegetation in the areas that contain BPA transmission lines and substations.

1.5 Objectives

The primary objectives of this WMP are to do the following:

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 the region and the customers served.
2. Implement a plan that prioritizes safety, situational awareness, preventative methods, and restoration.
3. Maintain a plan that improves wildfire resilient competencies and risk mitigation activities.

2.0 Accountability of the WMP

BPA's chief operating officer (COO) has ultimate accountability for this plan. Reporting to the COO, BPA's senior vice president of Transmission Services is the owner of the WMP and is responsible for its execution. Other BPA executives have substantive responsibilities in support of this plan, including revising and implementing policies, programs, processes, and procedures.

2.1 BPA responsibilities for components of this plan

The following officials and their organizations support the implementation of this plan.

- Chief Operating Officer
- Senior Vice President, Transmission Services
- Vice President, Transmission Planning and Asset Management
- Vice President, Transmission Field Services
- Vice President, Transmission Engineering and Technical Services
- Vice President, Transmission System Operations
- Vice President, Transmission Marketing and Sales
- Director, Transmission Technology
- Executive Vice President and Chief Risk Officer
- Chief Administrative Officer

2.2 Metrics and assumptions for measuring WMP performance

BPA has developed and continues to refine wildfire prevention measures related to the transmission system through various initiatives as outlined in the Transmission SAMP and other directional documents that impact wildfire mitigation. Some of these measures will provide input to wildfire mitigation management, such as the asset management value framework maturation and reliability standards. Other measures come from third party vendors providing products and services such as wildfire modeling. BPA's collaborative relationships with other utilities and organizations, such as PNNL, provides forums to explore meaningful metrics. As industry wildfire mitigation program standards and measures continue to evolve, BPA will identify relevant metrics to measure this plan and the agency's effectiveness.

BPA participates with a variety of peer utilities and organizations to share knowledge, data, and process development information. BPA has membership in the following organizations:

- Centre for Energy Advancement through Technological Innovation (CEATI)
- Electric Power Research Institute (EPRI)
- International Wildfire Risk Mitigation Consortium (IWRMC)
- North American Transmission Forum (NATF)

2.3 Maintenance performance targets

Maintenance services are established for each asset type and/or asset sub-types. The maintenance service defines the task, task type, and task frequency that are grouped into services and scheduled through the maintenance management system for the asset. The service structure can support routine maintenance and tasks that are unique for model type, age, and condition variables.

Asset condition is influenced by the efficacy, timeliness, and minimization of maintenance-induced errors. Transmission Services rigorously monitors maintenance service performance and backlog tracking for most critical assets, as described in more detail in Section 5.2.

2.4 System enhancement capital program

Transmission Asset Management's capital and maintenance plans are outlined in the Transmission SAMP and Asset Plan. These plans cover the long-term planning horizon for capital and the replacement/maintenance strategies for BPA's entire portfolio of assets. The plans feed directly into the IPR.

The Transmission SAMP covers the current state of assets and describes planned asset management, maturity, and competency improvements needed to effectively and efficiently manage the entire lifecycle of BPA assets that deliver electric transmission and telecommunication services. The Transmission SAMP provides alignment between the agency strategy, the Transmission Business Model, stakeholder requirements, organizational objectives, and resulting asset management objectives to ensure assets are managed and measured optimally to deliver value to the region.

2.5 Monitoring of the WMP

The WMP will be reviewed annually to reflect knowledge gained in the preceding year and will be modified accordingly, as needed. A more formal review will be completed in coordination with BPA's Transmission SAMP and IPR cycles. BPA prepares for annual wildfire season in advance and utilizes this plan as strategic and operational guidance.

Identified improvements will be continuously documented during the review cycle and incorporated in the WMP update. BPA specific organizational level policies, programs, processes, and procedures that support the WMP will be updated based on their respective review cycles.

2.6 Lessons learned

Each year, a lessons learned exercise is conducted to gather feedback from subject matter experts (SMEs) involved in the identification, response, and restoration activities involving wildfires. The exercise consists of interviews with individuals or small teams where feedback is grouped into six distinct categories. Comments are then classified as a strength (something done well), an improvement (something improved upon), or a recommendation (areas of maturity). Key takeaways are recommendations for improvement derived from the SME feedback interviews and lessons learned group discussions.

For ease in analyzing the feedback received from these interviews, the information is classified into the following six categories:

- **Communication:** Includes subject areas for customer outreach, policies/ procedures, and reporting. Communication is a large task in a major, widespread event.
- **Coordination:** Covers the interaction that occurs between numerous organizations involved with wildfire mitigation. Refers to the combination of all internal activities that would operate and interact during a wildfire event to achieve unity of action in the pursuit of managing and restoring the transmission grid.
- **Decision-making:** Includes subject areas for prioritizing data-driven decision-making, de-energizing, auto re-closing, re-energizing, and authority for making decisions.
- **Planning:** Includes subject areas for the WMP, policies, data/assessments, and documentation.
- **Support:** Includes topics relating to resources without direct transmission responsibility such as supply chain, access to locations (state of access roads, landowners, vehicles, etc.), fleet, equipment, real property, photogrammetry, logistics, and staffing levels.
- **Technology:** Covers data and information systems used for situational awareness, communication, data analysis, and decision-making.

BPA's wildfire lessons learned exercise provides valuable information that is integrated with other wildfire mitigation priorities to continuously improve wildfire competencies, programs, and plans.

Lessons learned feedback

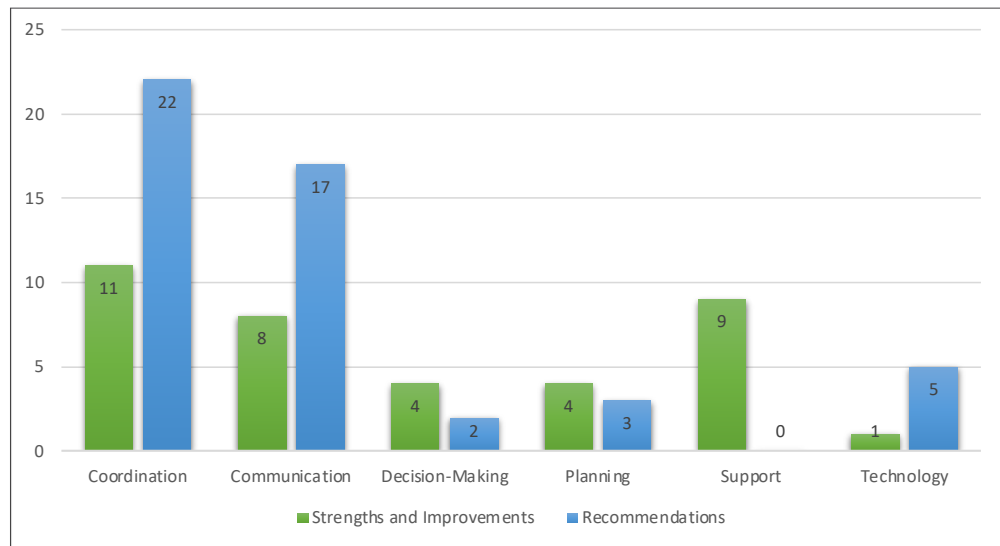


Figure 2. Breakdown of feedback received from 2023 lessons learned interviews.

3.0 Risk analysis and trends

Since early 2022, BPA has contracted with wildfire physicists, geospatial analysts, and data scientists at PNNL to develop probabilistic wildfire risk models within its service territory. A few of the many variables considered in this analysis are wind, humidity, vegetation types, and fuel volumes. Transmission Services continues to mature internal capabilities to conduct sensitivity analyses within the transmission system. The analyses help inform planned activities in coordination with local, state, and federal entities to allow for the most efficient deployment of critical resources.

BPA also voluntarily maintains tools such as the public-facing Wildfire Activity in the BPA Service Area map,² which communicates projected wildfire risk and conveys wildfire ignitions using federal and state data sources.

3.1 Contributing factors and trends

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 wildfire suppression techniques.³ Wildfires have the potential to significantly impact the energy sector as they can cause both significant infrastructure damage and disrupt electricity transmission.

In recent decades, the incidence of large forest wildfires have increased and are expected to continue increasing as temperatures rise due to the climate crisis. Projected warmer and drier summers, declining snowpack, and correlated decreases in summer soil moisture will increase the risk of wildfires, particularly in forested areas where fuels are abundant.⁴ 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. Figures 3 and 4 show general trends in wildfire incidents and burned areas in Oregon and Washington.^{5,6,7}

Wildfire incidents in Oregon and Washington, 1998–2023

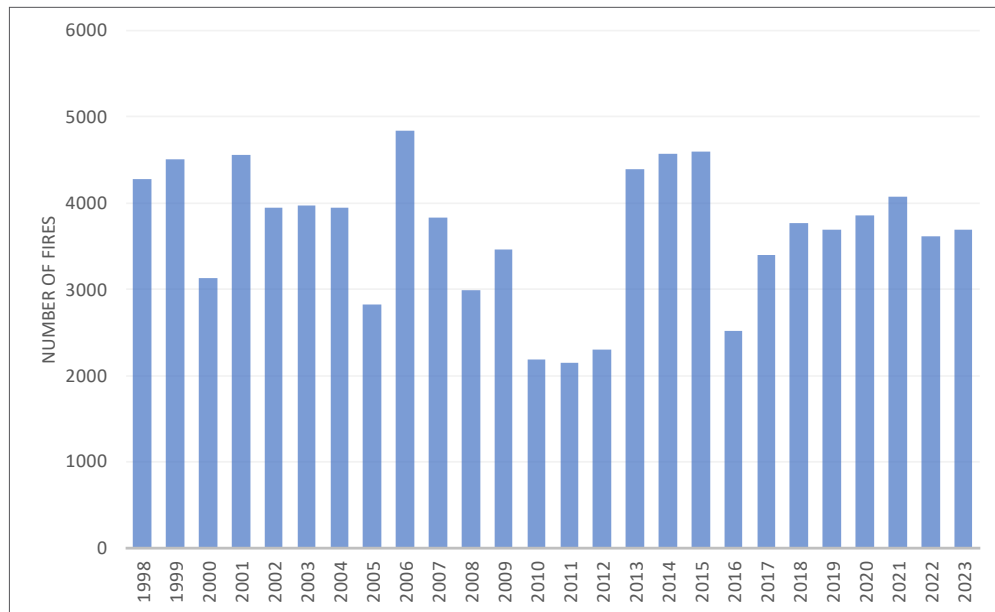


Figure 3.

²/ BPA, "Wildfire Activity in the BPA Service Area." Available at <https://data-bpagis.hub.arcgis.com/apps/BPAGIS:wildfire-activity-in-the-bpa-service-area-1/explore>

³/ USGCRP. U.S. Global Change Research Program. Fifth National Climate Assessment. 2023. Available at <https://nca2023.globalchange.gov/>

⁴/ Gergel, Diana R., Bart Nijssen, John T. Abatzoglou, Dennis P. Lettenmaier, and Matt R. Stumbaugh. "Effects of Climate Change on Snowpack and wildfire Potential in the Western USA. *Climatic Change* 141, no. 2 (2017): 287- 299. <https://doi.org/10.1007/s10584-017-1899-y>

⁵/ NICC. National Interagency Coordination Center. Wildland Fire Summary and Statistics Annual Report 2008. Available at https://www.nifc.gov/sites/default/files/NICC/2-Predictive%20Services/Intelligence/Annual%20Reports/2008/annual_report_2008_508.pdf

⁶/ NICC. National Interagency Coordination Center. Wildland Fire Summary and Statistics Annual Report 2013. Available at https://www.nifc.gov/sites/default/files/NICC/2-Predictive%20Services/Intelligence/Annual%20Reports/2013/Annual_Report_2013_508.pdf

⁷/ NICC. National Interagency Coordination Center. Wildland Fire Summary and Statistics Annual Report 2023. Available at https://www.nifc.gov/sites/default/files/NICC/2-Predictive%20Services/Intelligence/Annual%20Reports/2023/annual_report_2023_0.pdf

Area burned in Oregon and Washington, 1998–2023

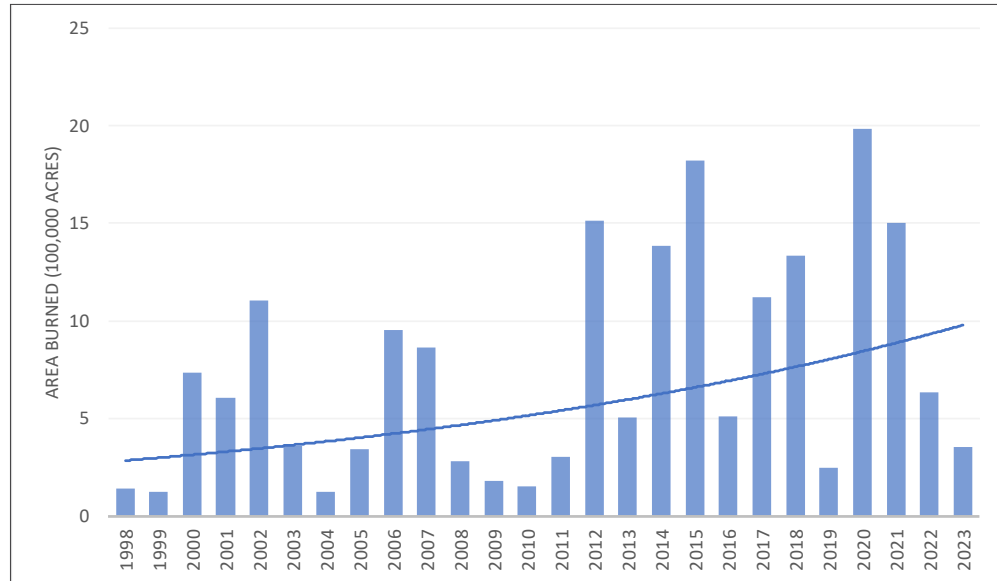


Figure 4.

The wildfire season is lasting longer and starting earlier.^{8,9} Figure 5 shows that from 1984 to 2001, the wildfire season peaked in August, and from 2002 to 2020, it peaked in July.

Comparison of monthly burned area due to wildfires in the United States between 1984–2001 and 2002–2020

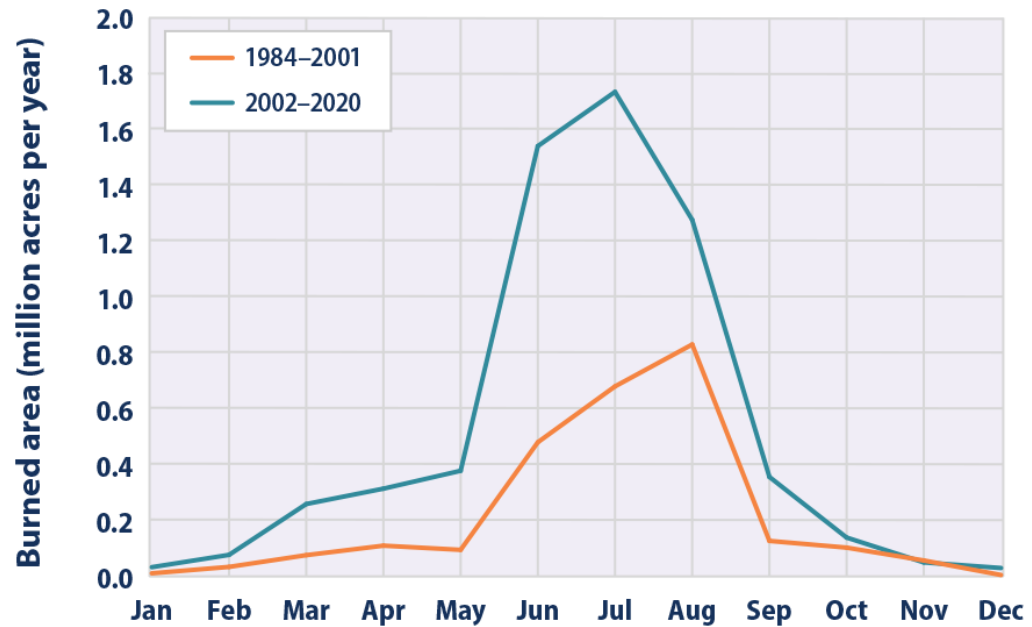


Figure 5. Comparison of annual distribution of burned area due to wildfires in the United States between the first half of the period of measurement (1984–2001) and the second half (2002–2020).

⁸/ MTBS. Monitoring Trends in Burn Severity. 2022. Available at www.mtbs.gov/direct-download

⁹/ EPA. United States Environmental Protection Agency. Climate Change Indicators: Wildfires. Figure 6. Available at <https://www.epa.gov/climate-indicators/climate-change-indicators-wildfires#ref28>

3.2 Transmission risk-based planning and prioritization process

Understanding how drivers of ignition and climate trend in time across the BPA system is a key input into the planning process and feeds how BPA quantifies risk by asset location. These trends feed the probabilistic variables overlaid with the asset locations to provide a data-informed understanding of relative wildfire risk.

3.3 Asset management value framework

Transmission Services is developing a risk-based decision-making value framework, capturing the organization's key value measures, financial parameters, and risks, in alignment with overall organizational goals. Transmission Services will use the value framework, when implemented systematically, to evaluate and prioritize potential investments that enable the comparison of projects across programs. Until it is automated, the value framework will be manually implemented to support subject matter assessments and discussion in a more standardized fashion.

3.4 Risk management

BPA uses its existing Enterprise Risk Management framework to identify and assess enterprise-level risks. This framework is built on the ISO 31000 (International Standards Organization), which takes into consideration both quantitative and qualitative factors to determine the level of a particular risk.

4.0 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 document reflects current policies, programs, processes, and procedures as of its publication date. BPA may revise or adopt new policies and standards between publications. Subsequent versions of the WMP will reflect changes made since the issuance of the last plan and identify new or revised policies, programs, processes, and procedures.

4.1 Competency assessment

In 2022, BPA adopted the IWRMC Maturity Model. The purpose of the model is to better understand the current state of BPA's programs and activities in relation to general utility threats from wildfire and to build a roadmap for continuous improvement. SMEs across BPA completed self-evaluations of competencies as shown in Figure 6. BPA's overall score increased from 2022 to 2023.

Updates to mature BPA's wildfire mitigation program since the WMP last published in 2022 include, but are not limited to, the following:

- Maturation of wildfire modeling including development of enhanced geospatial tools that support planning, engineering, operations, and data-informed decision making. Also led to new retrospective wildfire analysis capabilities.
- Continued development of the PSPS program, including updates to process documentation and year over year data comparisons.
- Creation of a tool to track situational risks dependent on asset health; enables enhanced data-informed decision-making for transmission operations.

- Continued industry engagement and benchmarking with other with external agencies, utilities, and industry peers.
- Continued proactive communication with regional customers and stakeholders to prepare for wildfire season.
- Continuation of internal PSPS and Storm & Wildfire Incidence Response table-top exercises to sustain preparedness and train personnel.
- Implementation of wood pole wildfire retardants and research into new, non-wood pole materials.
- Established additional granular expenditure tracking to enable more thorough, accurate financial reporting.
- Enhanced internal BPA team collaboration to help expedite planning and execution of asset repair and replacement projects to prioritize wildfire mitigation activities.

2022 BPA IWRMC Maturity Model, results by category



Figure 6.

4.2 Overview of wildfire mitigation hierarchy

The wildfire mitigation hierarchy depicted in Figure 7 reflects the holistic enterprise efforts surrounding how BPA mitigates wildfire risk. These efforts include system hardening, situational awareness modeling, wildfire season-specific relay/control practices, extreme risk days, and finally, PSPS as a last resort.

Activities, such as long-term planning and investment tactics using new wildfire resiliency metrics, demonstrate BPA's proactive, ongoing system hardening efforts. With the maturation of situational awareness tools improving system condition visibility, BPA scales resources as needed. Finally, as a last resort, during the most extreme risk days, BPA can decide to enact a targeted PSPS de-energization.

Wildfire mitigation hierarchy

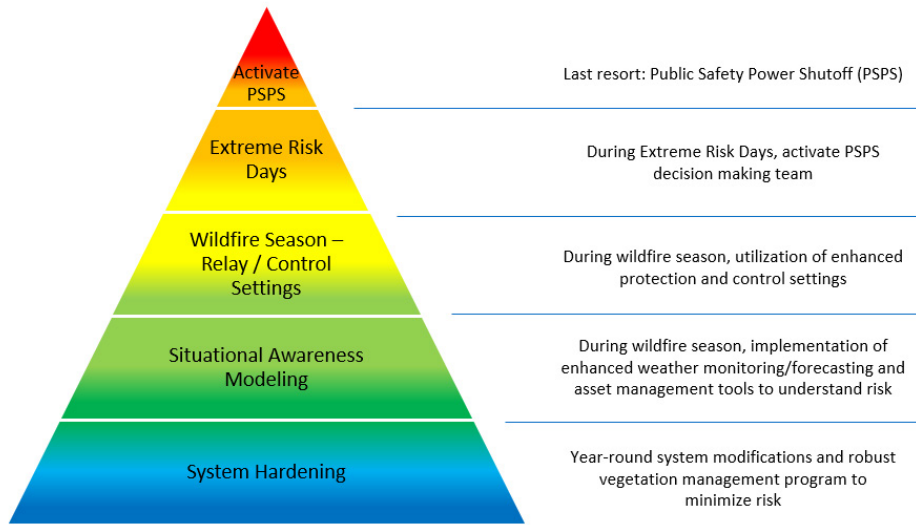


Figure 7.

5.0 Wildfire mitigation measures

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

Risk Factor	Activity
Fuel	Vegetation management
	Fuels reduction
	Data-informed decisions based on Light Detection and Ranging (lidar), multi-spectral imagery, and wildfire models
Asset failure	Transmission line detailed inspections and annual patrol
	Routine maintenance
	Focused design and construction standards to reduce ignition probabilities
	No re-closing during fire season on specific circuits
	Non-expulsion fuses and arrestors
	Intrusive pole testing and pole replacement
Contact from objects	De-energization of lines during certain conditions
	Animal/bird guards
	Wire spacing to reduce phase-to-phase contact
	Proactive vegetation management
Other	Line ratings and clearance analysis through lidar
	BPA worker/contractor education on fire ignition sources from normal work activities
	Wildfire watch 30 minutes after work completion in high-risk areas
	Pre-positioning wildfire suppression equipment (e.g., water trailers) to get waivers to work
	Coordination and collaboration with local fire wildfire fighting districts or emergency services entities and county offices year-round to prepare for high-risk wildfire events

BPA vigilantly manages the trees, brush, and other vegetation on its ROWs. BPA uses lidar combined with aerial photographs to help identify spots where inspection and potential vegetation clearing are necessary, preventing foliage from encroaching on designed clearance boundaries and inadvertently sparking a fire.

During wildfire season in dry areas conducive to wildfires, BPA selectively disables automatic re-closers as a preventative measure and deploys field staff to visually inspect lines prior to re-energization. BPA uses, analyzes, and modifies the practice of disabling select automatic re-closing as necessary. BPA discloses use of this practice in its outage communication plans to ensure customers and other stakeholders are informed of the potential for a line to stay de-energized until it can be visually inspected. While power may be interrupted for longer than usual, this practice significantly decreases the risk of fire posed by auto reclosing or manual testing.

5.1 Transmission operations during wildfire season

BPA Real-Time Operations uses situational awareness tools at its disposal to respond appropriately to wildfire threats. The team evaluates information such as ground reports, Geographic Information System (GIS) data, asset condition data from field maintenance and planning organizations, wildfire weather reporting, and other resources.

Real-Time Operations takes procedure-established actions that may include, but are not limited to, the following:

- Preventative Actions
 - Disabling automatic re-closing
 - Order no test orders on facilities
 - Requiring onsite inspection before testing faulted equipment
 - Pre-emptive public safety power shutoffs
- Responsive Actions
 - De-energize equipment due to fire
 - Dropping load
 - Curtailing transmission

5.2 Transmission line inspections and observations

BPA has a multi-prong approach to inspecting its transmission lines and observing surrounding conditions. First and foremost, BPA deploys field crews to inspect the safety, reliability, and condition of its lines and facilities. Additionally, BPA identifies and responds to threats in its ROWs created by landowners or the public that could cause wildfires.

5.2.1 Asset inspections

BPA performs routine infrastructure inspections to inform planning and scheduling of future asset maintenance for system reliability. BPA's planning and engineering teams use reported field condition assessments to prioritize maintenance and replacement needs. Areas of inspection include, but are not limited to, the following.

- Wood poles, crossarms, and cross braces
- Steel structures
- Disconnect switches
- Guy systems and anchor rods
- Conductors and accessories
- Insulators
- Fiber-optic cables and accessories
- Grounding
- Obstruction marking and lighting

5.2.1 Land use inspections

Several external factors exist that can increase the risks of causing or contributing to wildfires. For example, external risks can arise when transmission lines cross over or are near 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 in 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 often unintentional, these contacts or activities may damage transmission lines, poles, and other equipment; cause sparks and trigger wildfires in the vicinity; and/or pose public safety and electrocution risks. BPA equipment or ROWs can also be vandalized and damaged, which may cause sparks and wildfires.

BPA field staff conduct annual patrols of ROWs to report incompatible uses and encroachments. The agency also has a land use review process that allows developers or landowners to get their planned activities reviewed in advance. BPA evaluates if these plans can be safely conducted under or near the transmission lines.

5.3 Vegetation management

BPA manages, directly or by agreement, all vegetation on BPA transmission line ROWs, fee-owned lands, and easements to establish and maintain the safety and reliability of its facilities. BPA's Vegetation Management program complies with applicable federal reliability standards. The 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. The goal of vegetation clearing in BPA ROWs is to manage vegetation that supports transmission reliability and reduces wildfire risks, while also adhering to BPA's commitment to environmental stewardship.

BPA performs vegetation patrols annually, which includes inspecting and removing vegetation within and outside of its ROWs where tree or branch failure would potentially damage transmission line assets. The Vegetation Management program strives to ensure all vegetation on ROWs, easements, and fee-owned land is managed according to BPA's legal rights and applicable standards to establish and maintain the safety and reliability of its facilities.

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 conductor positions. Clearance also accounts for vegetation that would fall, grow, bend, or swing into a clearance distance if not removed.

BPA establishes and maintains vegetation with a mature height or growth that is 25 feet below the maximum sag of the transmission lines. In situations where this standard cannot be achieved due to legal or physical constraints, BPA has subject matter experts set a maximum allowable clearance distance for the specific circumstances. BPA's vegetation management team and transmission line workers conduct ground patrols to minimize vegetation-related wildfire hazards and remove flammable materials around wood structures.

Proactive maintenance during routine operations and prompt action during emergency events maintain system reliability and safe work environments while mitigating wildfire risk.

BPA uses lidar, aerial, and ground patrols to monitor vegetation around its facilities. Lidar data is typically acquired on a portion of BPA's circuits annually and the data is provided to aerial and/or ground patrol staff.

Prior to the completion of a construction project, all vegetation clearances must be verified to ensure the vegetation management activities meet BPA's standards prior to the line being energized. Certain targeted high-risk areas are re-evaluated to ensure vegetation clearances are upheld.

5.4 Emerging technologies and operational practices

BPA is committed to developing an industry-leading asset management program consistent with its 2024–2028 Strategic Plan. Part of that effort includes ongoing benchmarking and incorporating best practices that range from business transformation to modern technologies that help inform asset-related decisions. BPA explores new capabilities and risk mitigation practices, and when possible, incorporates them into its operations.

Fire retardant wrap applied to wood pole



Figure 8.

5.4.1 Wildfire mitigation design

BPA has built and organized a library of standards and specifications for design and construction with review cycles to allow it to adopt best practice improvements and incorporate modern technologies. As BPA learns more about its system's highest wildfire risk areas, the agency explores modifying design standards to best prepare for wildfire events.

One design standard update undertaken focuses on increasing the resiliency of wood poles and pole structures along transmission lines. Guided by wildfire risk models and inherent knowledge of field conditions, BPA Transmission Engineering devised a data-informed decision procedure to determine where wildfire retardants or non-wood pole options should be installed. These alternatives are explored during the design and standards review processes, allowing modification of metrics and internal controls to further mitigate the agency's wildfire concerns.

Furthermore, researching multiple protective measures for wood pole structures led BPA to select employable wildfire retardant methods based on the following criteria: climbing capability, potential to trap water, ease of installation, usable life, and ability to repair. An environmental review and cost analysis were also completed.

One of the recommendations includes an intumescent-coated fiberglass mesh wrap designed to protect all wood species and treatments of wood utility poles from wildfire damage. The wrap expands when exposed to extreme heat, and tests have proven it provides excellent flame resistance and can withstand years of outdoor weathering.

5.4.2 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 strategic plan dictates that it must balance the cost-effectiveness of its construction and maintenance of its capital assets with risk management. To deliver on these requirements, Transmission Services must assess effective methodologies for investment evaluation and decisions.

5.4.3 Fire prevention strategies, regulations, restrictions, precaution levels and pre-suppression

Federal statutory obligations require BPA to reliably operate and maintain its transmission facilities.¹⁰ Agency modeling of wildfire threats, in combination with its geospatial and asset data, will continue to inform its maintenance and construction work planning and scheduling strategies. When circumstances such as weather, environmental restrictions, and the logistics of managing 15,000 line miles contained within 8,500 miles of ROWs allow, routine and non-emergency work will be scheduled during the lowest risk times of the year in high-wildfire-risk areas. When routine or non-emergency work is impossible, or when urgent, BPA takes the "fire safe" approach by completing unplanned maintenance in order to proactively protect public safety and prevent the spark and spread of wildfire.

Additionally, BPA adopted a Wildfire Smoke Exposure Program because smoke from wildfires is comprised of many components, including particulates small enough to enter the lungs. The Air Quality Index considers the number of particulates contained in smoke and helps to identify stages where strategies must be considered to mitigate health issues. The purpose of the program is to establish guidance that BPA managers consider prior to assigning staff to work in areas where wildfire smoke is present.

This "fire safe" approach is incorporated into BPA's situational awareness methods, operational practices, and asset management and vegetation management strategies. BPA employs the approach throughout the year, but particularly during wildfire season, for planning critical work, and uses the approach in its stakeholder cooperation and community engagement strategy.

BPA is aware of varying jurisdictional regulations on federal, state, local, and private lands. The applicability of these various standards generally depends on who owns the land, but as a federal agency, BPA is only required to follow federal regulations. BPA has acquired real property rights that include the rights to construct, operate, and maintain its transmission lines on private land, and has acquired similar rights via ROW permits or agreements on federal and state public lands. BPA is currently evaluating the need for enhanced wildfire mitigation and prevention training for all field staff.

BPA has over 2,000 miles of transmission lines on federal public lands administered by the United States Forest Service (USFS) or the Bureau of Land Management (BLM) and is required to follow federal wildfire regulations on these lands.¹¹ The regulations require ROW holders to adhere to public use, industrial use, and other wildfire precautions and

¹⁰ 16 USC §838b; 16 USC §824o; NERC Reliability Standard FAC-003-4.

¹¹ The Federal Land Policy and Management Act (FLPMA) and other federal laws require Bonneville to follow the land managers' wildfire regulations on federal land.

restrictions. Except when responding to an emergency, BPA may request waivers or variances to undertake activities that would otherwise be restricted. Prior to making a request, BPA evaluates possible ignition risks associated with delaying maintenance and considers potential risks of starting a wildfire while the repair or maintenance is being conducted during high wildfire risk times. The federal land manager has the discretion to grant a variance or waiver when appropriate criteria are met and mitigations are in place. Federal land managers routinely work with BPA to issue waivers to allow for important maintenance work with conditions and restrictions in place.

Wildfire mitigation modeling and analysis helps BPA explain to federal land managers how timely preventive maintenance and repairs of specific transmission line equipment and vegetation in and along a ROW reduce the risk of wildfire, even if the work requires issuance of waivers. If BPA identifies urgent work that needs to be expedited, the agency's wildfire risk analysis and modeling help it quantify any increased wildfire risks if the work is delayed.

Federal law requires BPA to conduct emergency work to restore power or remove vegetation or obstacles from contact with the line. BPA will, however, coordinate in advance with public land managers whenever time permits.

Notably, BPA's 2017 Memorandum of Understanding (MOU) with the USFS requires advance coordination on maintenance activities and includes a wildfire prevention and suppression plan designed to prevent and minimize wildfire. BPA also follows 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 ROW area.¹²

As a federal agency, BPA is not governed by state or local wildfire regulations on non-federal lands. Pursuant to state law and administrative regulations, state and local agencies may oversee wildfire management on forest and rangeland primarily in rural areas outside of city boundaries. This state and local work is undertaken along with private forest and range landowners, who are often required to either pay wildfire protection fees, perform assessments, or provide their own wildfire protection plans and resources. BPA's WMP demonstrates to landowners that precautions are being taken in planning and carrying out work.

BPA's transmission line maintenance crews and vegetation management specialists are the primary owners of this "fire safe" operational strategy to maintain access to federal public land and to coordinate with nonfederal public and private landowners. Additionally, BPA staff who issue contracts for vegetation management, construction, and maintenance work will assure these contracts provide adequate wildfire pre-suppression measures and require appropriate coordination with the applicable wildfire agencies.

5.4.4 Risk-Informed vegetation management

BPA will continue to evaluate its Vegetation Management program, examine industry best practices, and identify any additional risk-informed strategies that could advance its work to minimize wildfire risks. The Vegetation Management program will use risk assessment tools, geospatial data, and other risk-based evaluation tools acquired by BPA in the future to achieve improvement. This risk-informed approach may result in BPA reprioritizing or adding resources to address high-risk wildfire areas, such as modifying the frequency of inspections or taking additional measures to reduce fuel levels.

¹²/ CFR §2805.12(a.4).

6.0 Emergency response and preparedness

As a federal power marketing administration, BPA follows federal guidance including the Federal Emergency Management Agency (FEMA) and DOE directives and orders for emergency response activities. Implementation of the National Incident Management System (NIMS) and Incident Command System (ICS) are 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 wildfire response efforts across the BPA service territory involve actions with its control centers to mitigate impacts to customers and equipment. BPA's control centers dispatch resources from operations and maintenance districts for local safety and alignment of efforts. Local responses are commonly performed by the relevant district employees. For larger or multiple impacts to BPA's transmission system in the same period, BPA will elevate the level of its response coordination accordingly. This can mean BPA raises coordination from a local response to an agencywide response.

The local wildfire department or the National Wildfire Coordinating Group (NWCG) notifies BPA's control centers when a wildfire is approaching BPA's infrastructure. BPA's Weather and Streamflow Forecasting workgroup provides real-time weather data that includes National Weather Service Red Flag Warning (NWS RFW) areas and thunder and lightning storms. The group also monitors wildfires in the service territory and provides notifications to the control centers. Dispatched BPA 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 and share information.

Rerouting power during outages and securing impacted equipment are BPA's primary means of reducing the risk of its equipment igniting a wildfire or preventing existing wildfires from damaging transmission assets. BPA regularly communicates to customers and other stakeholders through many channels regarding curtailments and restoration timelines. BPA supports many customers, including some that perform critical processes and would cost the customer resources if power is disrupted. In some instances, BPA is the only entity capable of transmitting power to specific locations where outages can affect vulnerable entities and communities. Extended power outages require active communication with customers and coordination with other responding entities.

BPA Communications manages awareness via social media and provides communications products and assistance about ongoing and available resources for customers and federal, state, tribal, and local governments. BPA also coordinates with entities to prepare for and respond to potential emergency events. Interested individuals are encouraged to access www.bpa.gov to learn more about BPA's wildfire response and mitigation efforts.

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

6.1 Continuity support for wildfires

BPA adopted the ICS to help coordinate response, restoration, and recovery efforts. BPA's Continuity of Operations and Emergency Management staff participate in national, state, and local transmission-related tabletop exercises and contain vast 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 respond to wildfires as necessary. Continuity of Operations and Emergency Management staff continue to work with BPA transmission dispatch and field operations in support of wildfire mitigation and response.

6.2 Event communications

When practical, BPA will provide notice to customers when it is necessary to interrupt load due to a wildfire. BPA will notify its transmission customers of curtailments of transmission due to wildfire through the normal reliability curtailment processes. It is BPA's goal to provide advanced notice, but often this is not practical when addressing 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. BPA's Continuity of Operations and Emergency Management Office tests and maintains the agency's emergency notification system for BPA decision-makers and incident support staff to accurately respond.

7.0 Public Safety Power Shutoff (PSPS)

During wildfire season, typically May through October, there may be extreme conditions or weather triggers that require BPA to de-energize transmission assets to reduce the risk of ignition. These extreme weather triggers are based on industry best practices that address imminent wildfire danger and geospatial analysis of wind and humidity. BPA's criteria for standing-up its PSPS team to decide whether to de-energize assets proactively are when wind gusts exceed 60 mph within NWS RFW areas as the conditions correlate to warm temperatures and low humidity.¹³ BPA has calibrated these variables to its robust design standards.

BPA uses data from internal and external sources to make PSPS decisions. Examples include vegetation types, urban density, asset density, asset health, ignition probability, wildfire behavior, wind, humidity, and line/load criticality.

BPA recognizes the impacts to the region that come with a PSPS de-energization and is committed to making these decisions in a timely and data-informed manner. BPA's Transmission Operations organization and NERC-certified dispatchers retain the right to de-energize assets proactively for any reason, based on system conditions. As Figure 7 illustrates, PSPS de-energization is a last resort. If a PSPS decision is enacted, BPA will initiate its communication processes to its impacted utility wholesale customers and regional outreach.

In the event of a PSPS, BPA's constituent and tribal account executives will communicate information to federal, state, local elected officials, tribes, and other important stakeholders. BPA does its best to avoid overlaps with other utility outreach to state, local elected, and emergency management officials by coordinating communication efforts with the affected utilities.

As the event unfolds, BPA will work with impacted utilities and, if asked, augment customer utility outreach through providing information to local media and social media channels to ensure residents and others are aware of the situation. BPA will not engage in any other outreach efforts to end-use customers (residents, businesses, etc.) unless a customer utility specifically requests it.

¹³/ National Weather Service, "What Is a Red Flag Warning?" available at https://www.weather.gov/media/lmk/pdf/what_is_a_red_flag_warning.pdf, accessed Nov. 9, 2023.

Re-energization after a PSPS event begins after the extreme weather event has passed and line crews are cleared to enter the area. BPA crews then patrol the de-energized lines and inspect for obvious damage and vegetation within the ROW that may prevent safe re-energization. When field crews find damages, they will isolate the impacted area(s) and perform repairs as quickly and safely as possible. In some instances, temporary solutions to restore power may be implemented while permanent repairs are planned. Depending on the extent of damage, utility customers may need to perform repairs on their facilities prior to having full electric service restored; these efforts are coordinated on an as-needed basis. Once the lines and structures are safe to operate, re-energization occurs followed by communications procedures similar to de-energization messaging.

Appendix

List of acronyms	
BLM	Bureau of Land Management
BPA	Bonneville Power Administration
DOE	Department of Energy
ICS	Incident Command System
IPR	Integrated Program Review
IWRMC	International Wildfire Risk Mitigation Consortium
NERC	North American Electric Reliability Corporation
NWS RFW	National Weather Service Red Flag Warning
PNNL	Pacific Northwest National Laboratory
PSPS	Public Safety Power Shutoff
ROW	Right-of-Way
SAMP	Strategic Asset Management Plan
SME	Subject Matter Expert
USFS	United States Forest Service
WMP	Wildfire Mitigation Plan



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