Avista Utilities

Wildfire Resiliency Plan

Avista has been delivering safe and reliable electric energy for over 130 years. Our history is one of collaboration with communities and customers to ensure a balance of safety, economic vitality, and of stewardship. Recent wildfires have galvanized our commitment to public safety, emergency preparedness, and to protect our regional economy. Wildfires represent a growing threat to homes, businesses, and our way of life. This Wildfire Resiliency Plan represents Avista's commitment to mitigating potential wildfire risk associated with the delivery of electricity. It also affirms our commitment to working closely with community leaders, with property owners, and emergency first responders.

This Plan leverages the Company's experience with responding to adverse weather and environmental conditions including wildland fires. It also represents the knowledge of Avista's employees, that of peer utilities, together with fire protection and land management agencies. This is who we are.

Heather Rosentrater

Senior Vice President, Energy Delivery and Shared Services

Date: May 28, 2020

This report reflects the combined effort of many Avista employees. Though many hands were involved in the development of this document and their contributions should not be overlooked, I would like to acknowledge several key individuals without whom this report would not have been possible. To Bob Brandkamp for doing the early work to quantify wildfire risk and for leading the PNW Utility Wildfire Forum and the Spokane County Fire District committee. To Greg Hesler for initiating the 'call to action' and for his counsel throughout this process. To David Howell for his unwavering leadership & personal support and for responding to Greg's call to action. And finally, to Heather Rosentrater for making Wildfire Resiliency one of her top priorities and for lending her voice to the issue. Many voices, one message.

Thank you all for your time, involvement, counsel, and commitment to this effort.

David James, Wildfire Resiliency Plan Manager

_____

Members of the Wildfire Steering Committee approve this document.

David Howell Director, Electric Operations	Bruce Howard Sr. Director, Environmental Affairs	Bob Brandkamp Sr. Manager, Enterprise Risk
Elizabeth Andrews Sr. Manager, Revenue Requirements	Casey Fielder Manager, Corporate Communications	Annie Gannon Manager, Communications
Alicia Gibbs Manager, Asset Maintenance	Greg Hesler Vice President, General Counsel & Chief Compliance Officer	

Executive Summary

Objective

This report details the recommended response to the increasing threat of wildfires within Avista's service territory. The recommendations within this report seek to reduce the risk of wildfire from the interaction of Avista's energy delivery system and the environment as well as the impacts of wildfire to Avista's system. These recommendations represent Avista's initial Wildfire Resiliency Plan. The Plan will be periodically reviewed to ensure consistency with industry best practices and that it is providing benefits to customers and the communities Avista serves.

Background

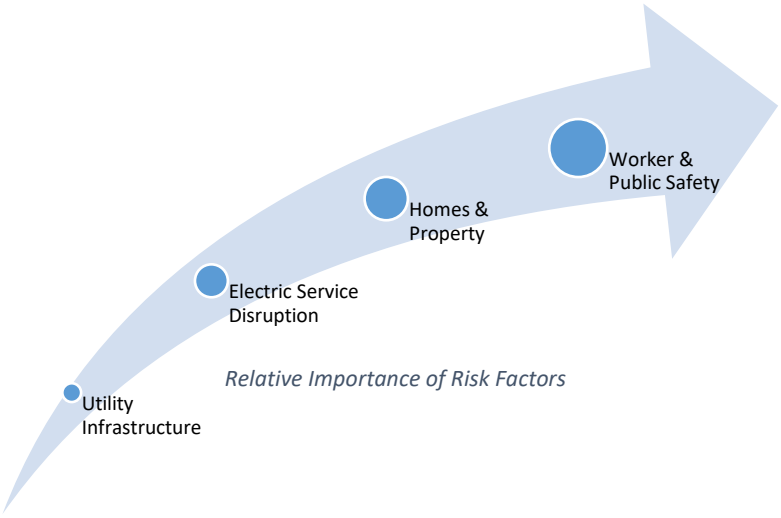
Avista's Wildfire Resiliency Plan reflects the Company's 130-year operating history combined with recent efforts to quantify and respond to the financial, safety related, and service reliability risks associated with wildfires. Risks are not static and this Plan will be updated to align with environmental, political, financial, and other factors that influence those risks. Plan objectives include focus in the following strategic areas:

- Protect lives and property
- Ensure emergency preparedness and align operating practices with fire threat conditions
- Protect Avista's energy delivery infrastructure

Protecting Lives and Property

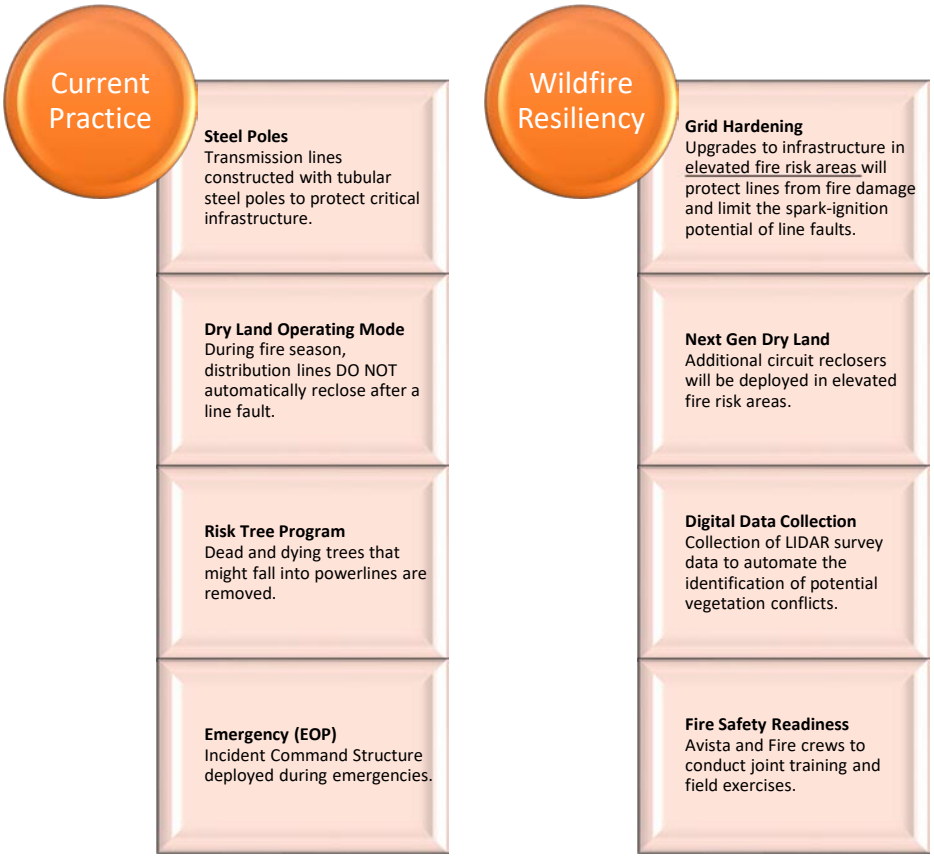
Though many elements of this plan focus attention on Avista's transmission and distribution infrastructure and the effort to reduce spark ignition events, the reader should not lose sight of the plan's primary objective: to protect lives and property by reducing the number of utility involved wildfires. In November 2018, 18,804 structures were destroyed and 85 residents lost their lives in the wildfire at Paradise, California. Though investigations continue, it is clear that the initiating action involved one of PG&E's transmission towers. This fact spurred actions by utilities across the nation, including Avista, to mitigate the potential for causing such fires.

Avista provides electrical service to over 380,000 customers with many customers living in elevated fire risk areas. A key factor in Avista's plan is how best to reduce the likelihood of a wildfire caused by Avista's electric operations. The recommendations contained in this plan are based on the ability to reduce the risks associated with public and worker safety, the risks to property and infrastructure, and to lessen the impact of electric system outages. The relative importance of those risks is indicated in the graphic.



Past Fire Mitigation

Avista has a long history of responding to adverse operating conditions including wildfires. In October of 1991, 60 mph winds combined with persistent drought sparked over 90 fires in the Spokane area.[1] Most of those fires were the result of vegetation contacts with powerlines. More recent fires in the Colville and Davenport operating districts have also influenced operating, maintenance, and design construction practices. This Plan builds upon that experience to mitigate the risk of wildfires. A few examples are shown below:



Increased Frequency and Severity of Fire Activity

The number and size of wildfires is increasing throughout the western United States. Data from the United States Forest Service (USFS) indicates that the number of large fires (>1000 acres) has tripled since 1970. Also, the duration of fire season has grown by over 100 days. A report from NASA's global science department summarizes the situation indicating six underlying trends.[2]

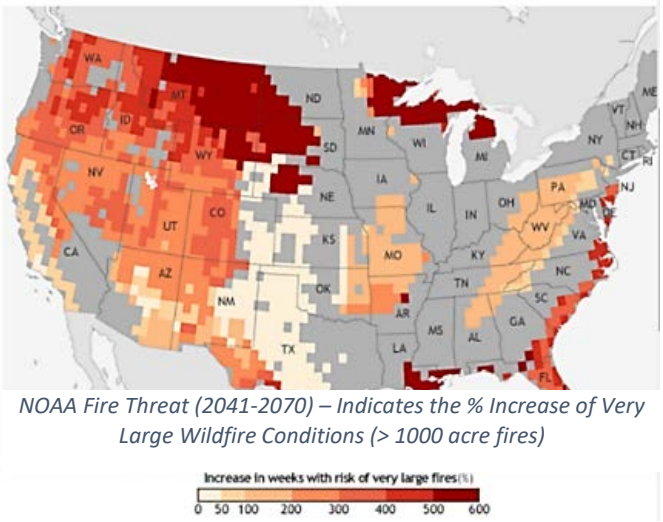
[1] Spokesman Review, 8/21/15 "Firestorm 1991"
[2] NASA, global science, www.climate.nasa.gov/blog/2830

1. ***There are more fires*** (61% of fires in the western U.S. have occurred since 2000)
2. ***And those fires are larger*** (since 1950 acres burned per year has increased 600%)
3. ***A small percentage of the west has burned*** (11% of land mass impacted since 1950)
4. ***The same areas keep burning*** (~33% of land is subject to cyclic wildfire activity)
5. ***Fires are burning more coniferous forest than any other type of landscape*** (since 2000, wildfires have shifted from burning shrub-lands to coniferous forest)
6. ***Wildfires are going to have a big impact on our future*** (climate simulations from National Oceanic and Atmospheric Agency (NOAA) researchers suggest a 200-500% increase in the number of large fires by mid-century)

40% of Avista's distribution and 20% of transmission lines are located in elevated fire threat areas. 123,300 Avista electric customers reside in these areas.

Washington State's Department of Natural Resources is responsible for fire suppression on over 13 million acres of private and state owned forest lands. Its 2015 forest health report states that, "*Nearly 2.7 million acres of eastern Washington forestland need treatment to be more resilient against insects, disease, and wildfires*." That report recommends a variety of treatments including mechanical thinning and prescribed burns. To compound the issue, there are two million Washington homes located in elevated fire threat areas.[3]

Researchers at NOAA predict that by mid-century (2041-2070),[4] the conditions for 'very large fires' will substantially increase throughout the western United States. The graphic on the right indicates the percentage increase for very large fires. Note that areas of eastern Washington and northern Idaho suggest a 300% to 400% increase. This trend, based on NOAA climate studies, combined with development in fire prone areas is projected to make wildfire one of the most significant environmental threats in the western United States.[5]



NOAA Fire Threat (2041-2070) – Indicates the % Increase of Very Large Wildfire Conditions (> 1000 acre fires)

[3] Washington Dept. of Natural Resources Forest Health, www.dnr.wa.gov/ForestHealth
[4] National Oceanic and Atmospheric Administration, www.climate.gov
[5] Caitlyn Kennedy, "Risk of Very Large Fires Could Increase Sixfold by Mid-Century in the US," Climate.gov, August 26, 2015, https://www.climate.gov/news-features/featured-images/risk-very-large-fires-could-increase-sixfold-mid-century-us

Public Safety Power Shutoff

In November 2018, a wildfire near Paradise, California burned over 18,000 homes and resulted in 85 fatalities. No wildfire in modern history has created an industry response equivalent to the 'Camp Fire'. The California Public Utilities Commission mandated that utilities develop fire mitigation strategies. As a result, major utilities in California pre-emptively shutoff power to prevent spark-ignitions from overhead powerlines. This system is known as Public Safety Power Shutoff (PSPS).[6] Though Avista is closely monitoring the situation in California and continues to work closely with utility peers including PacifiCorp, Pacific Gas & Electric, San Diego Gas & Electric, and Southern California Edison, at this time Avista does not plan to pre-emptively shutoff power to mitigate the risk of wildfire.

This report details 28 individual recommendations aimed to reduce the risk of wildfires. Many of those elements support a system that Avista developed in the early 2000s. This system is known internally as Dry Land Mode or Dry Land Conditions (page 28). Avista operations and engineering staff support enhancements to the existing Dry Land system and believe it provides a balanced approach to mitigating wildfire risk while maintaining electric service during fire season. As detailed in this report, Avista's Dry Land Mode system involves both identifying electric circuits that operate in elevated fire risk areas and the reconfiguration of protection systems. Several elements of this plan support enhancements to that system including:

- Development of a Fire-Weather Dashboard (computerized fire risk prediction system)
- Annual electric distribution fuse coordination report (optimal protection)
- Recloser event reporting (continuous improvement of protection systems)
- Dry Land Mode engineering review (comprehensive system review)
- Dry Land Mode 'trigger' (initiate seasonal protection based on fire risk threshold)
- Midline recloser communication
  (retrofit existing circuit reclosers with monitoring & control equipment)
- Additional midline reclosers in elevated fire threat areas
  (aligning system protection with fire risk)
- Wildland Urban Interface (identify elevated fire risk zones)
- Substation SCADA (retrofit existing substation with monitoring & control systems)

It is impossible to prevent all tree contacts or equipment failures associated with the electric delivery system. However, by adding defense strategies specifically designed to reduce spark-ignition sources, Wildfire Resiliency represents a holistic approach to safeguarding human lives, property, and infrastructure against the threat of utility involved wildfires.

[6] Public Safety Power Shutoff – California PUC – www.cpuc.ca.gov/deenergization

Goals and Objectives of Avista's Wildfire Resiliency Plan

Emergency Operating Plan — **Emergency Response**

- To prepare and train for episodic wildfire events. To recognize wildfire as a recurring threat to utility infrastructure, the communities we serve, Avista employees and customers.

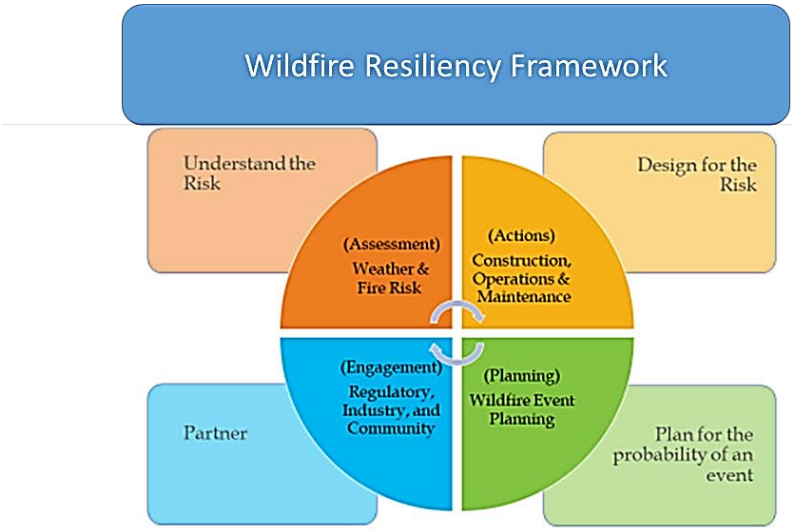
Promote Safety — **Protect Life and Property**

- To protect physical assets, property, and human lives against the threat of wildland fires. To recognize fire potential as a manageable risk element of Avista's operating and maintenance strategies.

Financial Protection — **Safeguard Company Assets**

- To mitigate the probability and consequence of direct financial and liability costs associated with large scale fire events.

Throughout the development of this Plan, a model framework has been used to balance risks, costs, and benefits. Collaboration extended well beyond the internal walls of Avista to include voices from the community, fire protection professionals, regulators, utility peers, and professional service and material suppliers.



Understand the Risk *– Combining infrastructure data with fire threat and weather conditions to yield a 'fire risk potential' metric.*
Design for the Risk *– Adapt transmission and distribution materials and construction to minimize the potential for utility involved fire ignition.*
Plan for an Event*- Prepare field and office support staff through training and field simulation exercises.*
Partner with others *– Collaborate with others to leverage the strengths of various partners and create a stronger response system for all involved.*

Wildfire Resiliency Plan Elements

This Plan includes 28 individual recommendations grouped into four categories. These categories are similar to other utility wildfire plans including those from PG&E, SDG&E, SCE, and PacifiCorp:[7]

Enhanced Vegetation Management

Situational Awareness

Operations & Emergency Response

Grid Hardening & Dry Land Mode

- **Grid Hardening** – by replacing infrastructure in fire prone areas, the likelihood of a spark-ignition source is mitigated and critical infrastructure is protected from the impacts of fire.
- **Vegetation Management** – by identifying potential conflicts on an annual basis and prioritizing those risks from highest to lowest, Wildfire Resiliency aligns resources with risk metrics.
- **Situational Awareness** – by adding line and monitoring equipment, system operators can respond quickly to variable weather and fire threat conditions.
- **Operations & Emergency Response** – through training and simulation, Avista personnel will be better prepared to work with fire professionals during an event.

Plan recommendations also reflect cost prudency and were adopted on their basis to:

- Leverage existing asset programs and operating practices
- Promote public safety
- Mitigate financial risk

The following tables provide more information about the recommendations.

Grid Hardening and Dry Land Mode			
Recommendation	**Current State**	**Future State**	**Benefits**
Transmission Fire Retardant (FR) Program	FR paint program requires refresh every 3-5 years	Genic Fire-Mesh wrap with 20-year expected life	Will reduce operating expense to maintain fire protection of transmission wood poles
Transmission Line Inspection	Aerial surveys to identify structure defects (reliability based)	Aerial and ground inspections to identify structure defects (fire risk based)	Reduce transmission fire ignition events which are less likely than distribution related fires, but generally result in larger fires
Dry Land Operating Mode (DLM)	Seasonal implementation (single mode)	Adapted to fire-weather metrics (multi-mode)	By aligning DLM modes with weather and fire threat conditions, operators can balance service reliability with fire risk potential

[7] California Public Utilities Commission, www.cpuc.ca.gov/wildfiremitigationplans/

Grid Hardening and Dry Land Mode			
Recommendation	**Current State**	**Future State**	**Benefits**
Transmission Grid Hardening	Condition-Based Steel Conversion	Risk-Based Steel Conversion	Reduce likelihood of damage to Avista transmission assets. 20% of Avista's transmission assets are located in elevated fire threat areas
Distribution Grid Hardening	Condition based pole, conductor, and equipment programs	Risk based approach to replacing equipment and conductors associated with spark-ignition potential	Reduce likelihood of distribution related fires. 40% of Avista's distribution assets are located in elevated fire threat areas

Enhanced Vegetation			
Recommendation	**Current State**	**Future State**	**Benefits**
Digital Data Collection	Human based ground and aerial inspections	Augment with computer automated analysis to identify vegetation encroachment and structural defects	Allows for scenario based planning of treatment options and serves as the QA tool to assess the efficacy of previous field work
Fuel Reduction Partnerships	No formal program	Partnering with Fire Agencies to remove fuels near critical infrastructure	Strengthens relationships between Avista and fire first responders and reduces fire severity threats to infrastructure
Widen Transmission Rights-of-way	No formal program	Align right-of-way boundaries to fire risk potential	Protect critical infrastructure and serve as fire break
Annual Risk Tree	Cadence based program (e.g. 1-3 years)	System-wide effort to annually identify and remove dead, dying, and diseased trees	Reduce tree fall-ins, which are 3 times more likely to occur than grow-ins
Public Outreach "Right Tree, Right Place" Campaign	General information available to all customers	Work with customers in elevated fire risk areas to remove tall growing trees from underneath powerlines	Reduces the risk of tree grow-ins and subsequent spark-ignition sources

Situational Awareness			
Recommendation	**Current State**	**Future State**	**Benefits**
Fire-Weather Dashboard	Weather forecast data subject to individual interpretation	By combing weather forecast and fire threat condition data, operating personnel will have clear guidance relative to likelihood and potential impact of fires	Promotes a more consistent approach among operations and emergency managers
Additional Distribution Circuit Reclosers	Based on system protection and reliability performance	Deployed in elevated fire threat areas. Reflects a risk-based strategy	Supports the evolution of Avista's Dry Land operating mode to align with forecasted weather and fire threat conditions

Situational Awareness			
Recommendation	**Current State**	**Future State**	**Benefits**
Substation Supervisory Control & Data Acquisition (SCADA)	SCADA added to new or reconstructed substations. Reflects a condition based approach	Enables control and monitoring of substation equipment including circuit reclosers in elevated fire risk areas	(as stated above)

Operations and Emergency Response			
Recommendation	**Current State**	**Future State**	**Benefits**
Emergency Operating Procedure & Avista Incident Command Representative	No formal wildfire policy	Avista EOP to delineate wildfire from other storm events. Avista to offer assistance at all fire ICS.	Coordinate Avista system restoration with fire protection and evacuation activities
Wildfire Performance Metrics	None	Develop fire-specific performance metrics to ensure that Plan objectives are being met	Supports the adaptation of the Resiliency Plan to meet current operating and environmental conditions
Wildland Urban Interface (WUI) map	Developed in Q3/2019	Categorize Avista T&D infrastructure with respect to fire ignition potential and fire impact consequence	Focuses vegetation management and grid hardening efforts in the highest fire risk areas
Emergency first responder training	No formal program	Annual fire safety training to Avista field personnel and electrical hazard training to fire protection personnel	Promotes safety of first responders and supports a variety of partnering activities including fuel reduction and fire adapted communities
Expedited Fire Response	Draft MOU under consideration with Spokane Fire Districts (2020 Pilot Project)	Fire agency personnel to investigate transmission line faults during fire season	Suppress fires before they have an opportunity to spread

The Wildland Urban Interface (WUI)

The interface area between forest lands and human development is referred to as Wildland Urban Interface (WUI). Homes and businesses located near the WUI are most at-risk from the impact of wildfires and are often located in rural areas that lack fire suppression resources.

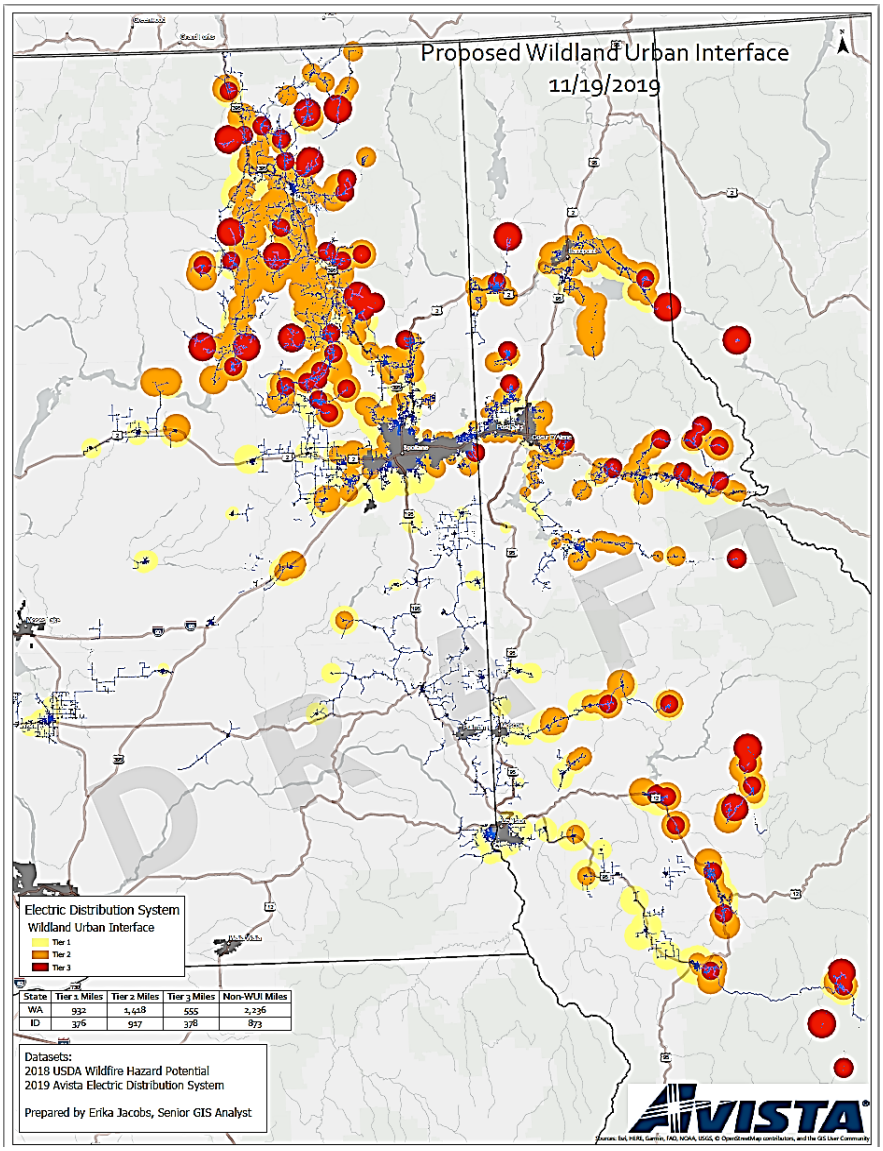
In 2019, Avista's GIS Technical Group created a WUI map for the electric service territory based on the following principles:

- **Fuel Concentration** – areas identified as having moderate to high fuel concentrations were considered. Fuels data was derived from the U.S. Department of Agriculture's Wildfire Hazard Potential map.[8]
- **Housing Density** – parcels smaller than 20 acres were included in the analysis but highly-developed urban areas were excluded. Urban areas do not meet the definition of Wildland Urban Interface because fuel canopies are dispersed and fire protection is readily available.

The WUI map helps to identify and prioritize areas of greatest risk and serves to inform the recommendations and operational decisions related to wildfire resiliency. The Plan denotes the

[8] U.S. Department of Agriculture, data.nal.usda.gov/dataset/wildfire-hazard-potential…….

combination of WUI Tiers 2 & 3 as "elevated fire threat areas". These areas comprise 40% of Avista's electric distribution and 20% of the high-voltage transmission systems. Elevated fire threat levels are depicted in orange (Tier 2) and red (Tier 3) highlighted areas. Portions of the map not highlighted are classified as Non-WUI and represent areas with low fuel concentrations, very low housing densities, or large urban areas (> 10,000 population).



The Plan denotes the combination of WUI Tiers 2 & 3 as "elevated fire threat areas". These areas comprise 40% of electric distribution and 20% of transmission systems. Elevated fire threat levels are depicted in orange (Tier 2) and red (Tier 3). Portions of the map not highlighted are classified as Non-WUI and represent areas with low fuel concentrations, very low housing densities, or densely populated urban areas.

Summary of Risks and Costs

Precise identification of the risk-cost for any given year is not realistic, and for wildfires, there is a significant difference between small fire events which can occur many times per season versus a large scale event which may occur once every few years. Therefore, in order to represent a more realistic picture of relative risks and costs, a 10-year planning horizon was adopted.

Risk and cost values shown in the following table represent a 10-year planning horizon, and include both incremental operating expenses as well as capital improvements to infrastructure. Capital plan elements are projected to sunset in 10 years but the majority of expense items are on-going and are generally related to vegetation management. In simple terms, risk is the product of the probability of an event and financial consequence:

Risk = (The likelihood of occurrence, or probability) X (The financial impact of an event)

Inherent Risk - describes the current state risk level and reflects defense strategies already in place.

Managed Risk - describes the future state risk level with the addition of Wildfire Resiliency elements.

The values shown for risk are percentage based and reflect a range for each category. Note that vegetation and grid hardening risk scores indicated a bounded range because the probability of occurrence is based on the frequency of forced outages, and the frequency of electrical outages is well understood. However, an event's impact can vary widely based on several factors including weather, fire risk levels, emergency response, and location. Note that the managed risk scores represent future state levels and lower levels of event probability and event outcome. The column labeled 'Risk Reduction' indicates the average percentage difference between current state and future state risk levels.

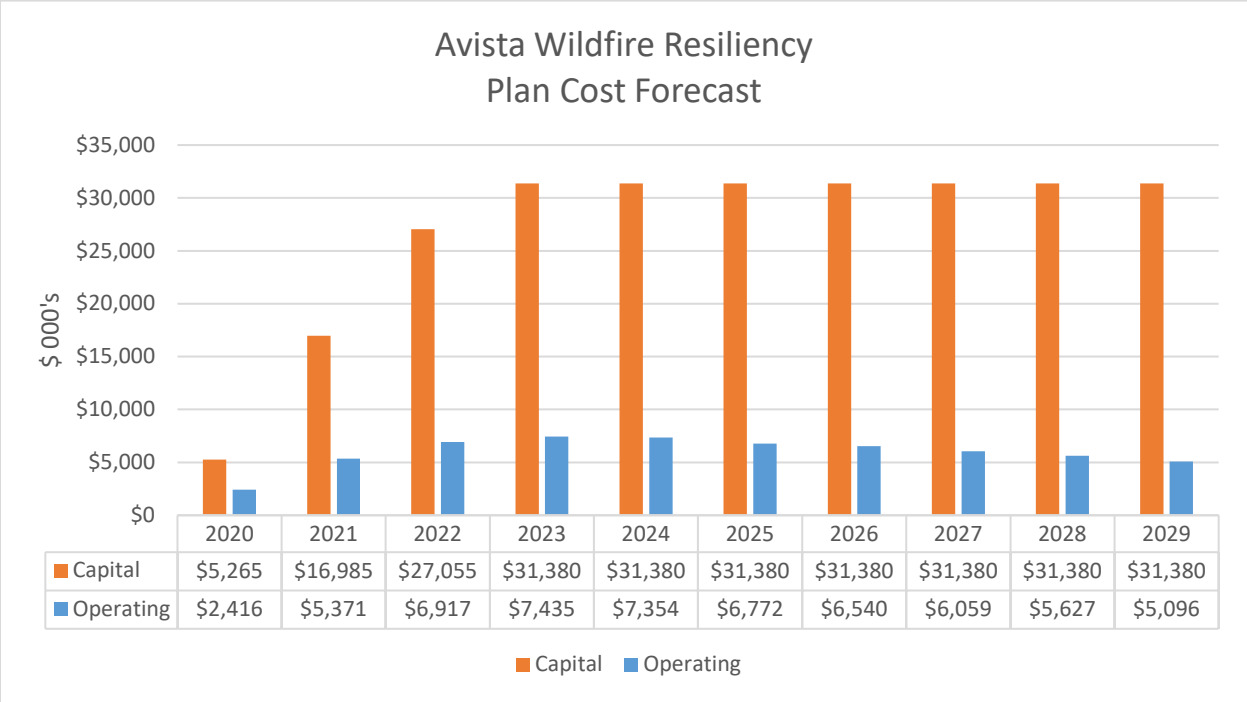
Resiliency Risk and Cost Summary-Washington and Idaho Electric

2020-2029 Operating Horizon	Inherent Risk (range %)	Managed Risk (range %)	Risk Reduction (avg %)	10-yr Capital Investment ($)	10-yr Operating Expense ($)
Enhanced Vegetation Management	48.3-100	3.2-14.5	88%	$5,100,000	$51,175,000
Situational Awareness	25.9-100	0.8-1.1	98%	$17,965,000	$1,019,000
Operations & Emergency Response	19.7-100	5.3-23.4	76%	$300,000	$2,378,000
Grid Hardening & Dry Land Mode	41-100	0.7-2.7	98%	$245,600,000	$5,014,000
Plan Total	**44.1-100**	**2.8-12.5**	**89%**	**$268,965,000**	**$59,586,000**

As noted, the wildfire resiliency program includes electric system (Washington and Idaho) capital investments of $268,965,000 over 10 years with corollary operating expenses of $59,586,000. Expenditures are illustrated on the following page from 2020 through 2029.

The single largest capital investment is grid hardening of the electric distribution system. This accounts for $193,200,000 invested in distribution systems located in elevated fire risk areas and another $44,000,000 invested in the transmission system to convert from wood to steel poles. These two Plan elements account for 88% of total capital spend. For operating expense, three elements: T&D digital data collection, annual risk tree, and the public safety initiative 'right tree right place' account for

$42,700,000 (72%) over the same 10-year period. Though, this Plan includes 28 recommendations to mitigate the risk of wildfire, these five elements account for 85% of the total program investments.



	2020	2021	2022	2023	2024	2025	2026	2027	2028	2029
Capital	$5,265	$16,985	$27,055	$31,380	$31,380	$31,380	$31,380	$31,380	$31,380	$31,380
Operating	$2,416	$5,371	$6,917	$7,435	$7,354	$6,772	$6,540	$6,059	$5,627	$5,096

Potential Operating & Maintenance Expense Cost Reductions

The goal of wildfire resiliency is to reduce the overall risk associated with wildfires. In short, the benefits of this Plan are largely measured in terms of risk reduction for all parties involved. However, we recognize the potential for costs savings and cost shifts from operating and maintenance expense activities towards capital investment. The overall impact of cost savings is speculative until the Plan becomes operational and performance data can be analyzed. However, one objective of this Plan is to reduce the number of equipment failures and tree related outages and by doing so, avoid emergency response. Consider a hypothetical scenario whereby Wildfire Resiliency reduces these outages by 10%.

From 2014 to 2018, the electric distribution system experienced 6,200 outages per year. This corresponds to an annual frequency index (SAIFI) of 1.1 with a duration index (SAIDI) of approximately 2 hours and 20 minutes. On average, 67 customers were impacted during each outage.

Equipment failures and tree related outages account for approximately 1,000 outages per year and it is these outages that wildfire resiliency aims to mitigate through grid hardening and enhanced vegetation management. If those outages were reduced by just 10% (100 outages), the reduction in customer impact would equate to $990,780 per year.[9] Again, this is a hypothetical exercise to illustrate the Plan's value proposition.

[9] Based on Avista Asset Management Risk Analysis Standard (service interruption cost = $63 per customer* hour)

The following table lists several potential cost savings opportunities associated with wildfire resiliency.

Plan Element	Benefit	Cost Savings/Shift
Annual Risk Tree and Right Tree Right Place Programs	Improved System Performance (fewer outages)	Reduced spend on emergency response and unplanned repairs
Digital Data Collection	Automates data gathering process for vegetation and structure condition inspection	Reduces field inspection activities. Enables automated QA/QC functions
Grid Hardening	Improves System Performance (fewer outages)	Reduced spend on emergency response and unplanned repairs
Situational Awareness (communication & control systems)	Enables remote monitoring and control of equipment	Reduced service related truck rolls
Operations & Emergency Response	Better prepared and equipped first responders	Reduces the risk of injury and accidents

It should be noted that this Plan indicates program level spend estimates and does not differentiate between incremental and embedded costs. Though many Plan elements represent incremental costs, some activities will simply be absorbed by the workforce. For example, annual fire safety training will occur at monthly safety meetings which are well established. This imbedded cost is estimated at $1,300,000 over 10-years. However, the bulk of the Plan elements including enhanced vegetation management and grid hardening represent additional activities and incremental costs. As previously indicated, these categories account for 85% of overall program costs.

Conclusion

The risk of large wildfire events is increasing across the western United States. The recent fires in California serve to illustrate that utility operating risks are increasing due to wildfires. Managing this risk is critical for customers, communities, investors, and the regional economy. Avista has taken a proactive approach for many years to manage wildfire risks, and through this Plan, the Company has identified additional wildfire defenses. The goals, strategies, and tactics set forth in this Plan reflect a quantitative view of risk. Additional research, conversation and analysis with Avista's operating staff and steering group provided critical qualitative and contextual information that also shaped the recommendations. This combination of quantitative and qualitative analysis ensures the recommendations are robust, well-rounded, thoughtful, and align with the Plan objectives.

Comprehensive risk analysis indicates a cumulative 10-year financial risk of at least $8 billion dollars. This value includes the accumulated risks associated with all 28 Plan recommendations and should not be interpreted as a precise financial estimate. A better metric is the percentage of risk mitigation which reflects a 90% reduction for the overall Plan.

Though planned investments in infrastructure and vegetation maintenance defenses represent the bulk of costs, human investments in training, partnerships, and engagement with customers are core components of Wildfire Resiliency.

Wildfire Resiliency represents a departure from traditional utility strategies aligned with meeting customer demand (capacity) and maintaining service continuity (reliability). Avista's strategy aligns with other utility wildfire plans by adding defenses in four key areas: vegetation management, grid hardening, situational awareness and operations and emergency response.

Avista has a long history and tradition of 'doing the right thing' for our customers and the communities we serve. Working together to promote safety and manage the risk of wildfire is not a new concept but simply one that will be built upon.

End of Executive Summary_____

Partnering with Others

The Western Energy Institute

The Edison Electric Institute

Washington Department of Natural Resources

Idaho Department of Lands

AEGIS Insurance

PNW Utility Wildfire Group (PSE, PAC, CHPD, IPC, NWE, PGE, AVA)

The University of Idaho

Idaho Smart Growth Initiative

Spokane County Fire Districts

City of Spokane Fire Department

Spokane Valley Fire Department

Palouse County Fire Districts

Spokane Emergency Management

NOAA & NWS (Weather)

Washington Utilities and Transportation Committee (WUTC)

Idaho Public Utilities Commission (IPUC)

Washington Dept. of Natural Resources (DNR) Utility Taskforce

Western Governor's Association

West Coast Utility Commission Seminar (Vendors)

Quantum Spatial

Genics Corporation

Geo Digital Corporation

Western Weather

The Eaton Corporation

TROVE Corporation

TABLE OF CONTENTS

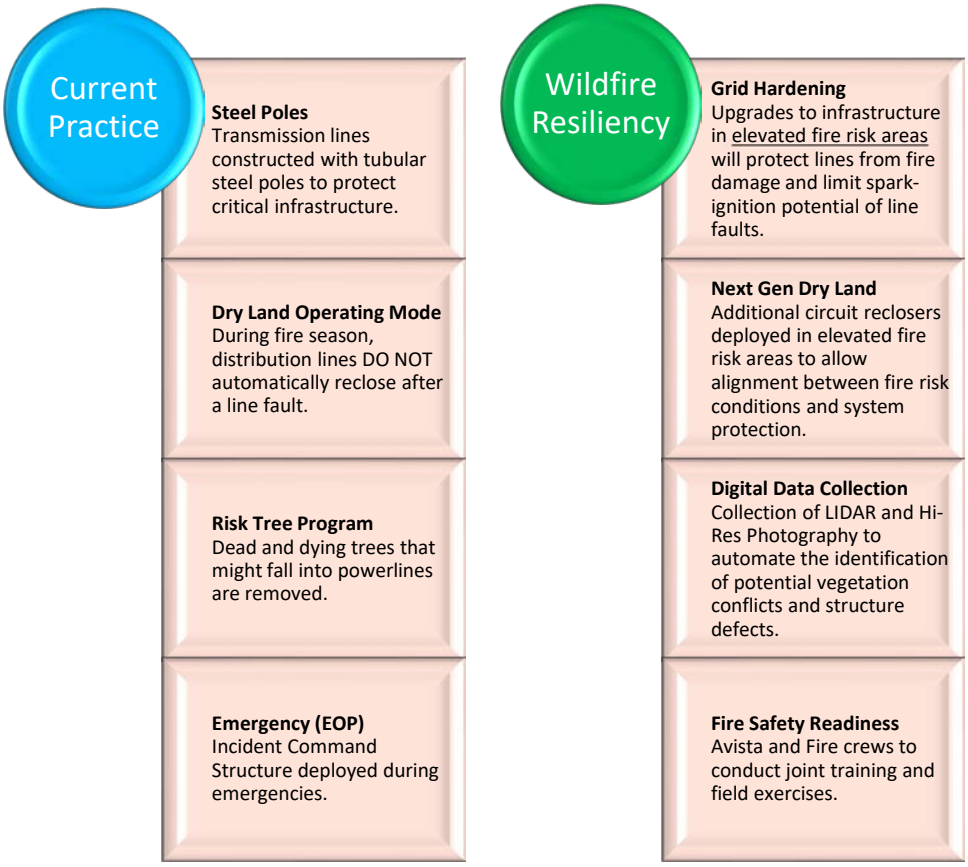
Wildfire Resiliency Plan Overview

Avista's Wildfire Resiliency Plan reflects the Company's 130-year operating history combined with recent efforts to quantify the financial risk of wildfires. Risks are not static and this Plan will adapt and evolve over time to align with environmental, political, financial, and other factors that influence those risks. The foundation of this Plan is the monetization of risk resulting in a series of recommendations to:

- Protect Avista's energy delivery infrastructure
- Enhance vegetation management programs and reduce tree contacts with powerlines
- Deploy additional system monitoring and control equipment
- Align operating practices and emergency response with fire threat conditions

Past Fire Mitigation

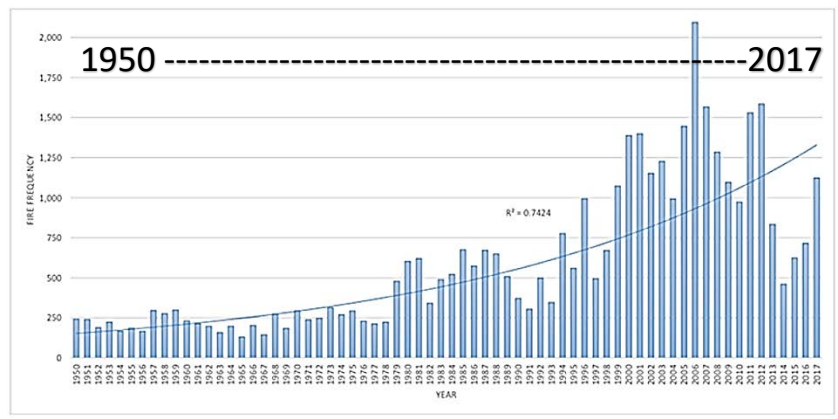
Avista has a long history of responding to adverse operating conditions including wildfires. In October of 1991, 60 mph winds combined with persistent drought sparked over 90 fires in the Spokane area.[10] Most of those fires were the result of vegetation contacts with powerlines. Recent fires in the Colville and Davenport operating districts have also influenced operating, maintenance, and design construction practices. This Plan builds upon that experience by leveraging current defense strategies and focusing efforts in elevated fire risk areas. A few examples are shown below:



[10] Spokesman Review newspaper, "Firestorm 1991", August 21, 2015 publication

Increased Frequency and Severity of Fire Activity

The number and size of wildfires is increasing throughout the western United States. Data from the United States Forest Service (USFS) indicates that the number of large fires (>1000 acres) has tripled since 1970. Also, the duration of fire season has grown by over 100 days. The graph below indicates wildfire frequency from 1950 to 2017.[11]



Over the past six decades, 61% of fires in the western U.S. have occurred since 2000.

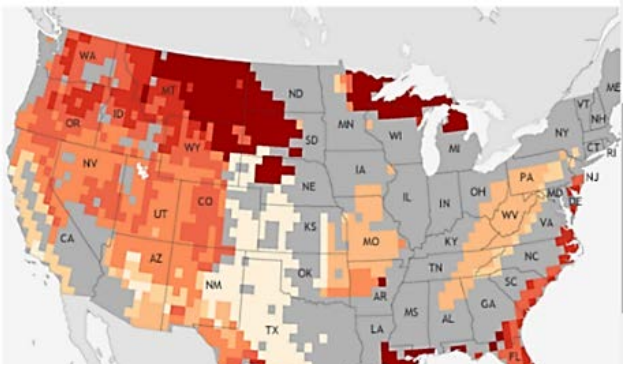
40% of Avista's distribution and 20% of transmission lines are located in elevated fire threat areas. 123,300 Avista electric customers reside in these areas.

Washington State's Department of Natural Resources is responsible for fire suppression on over 13 million acres of private and state owned forest lands. Its 2015 forest health report states that, "*Nearly 2.7 million acres of eastern Washington forestland need treatment to be more resilient against insects, disease, and wildfires*."[12] That report recommends a variety treatments including mechanical thinning and prescribed burns. To compound the issue, there are two million Washington homes located in elevated fire threat areas.

In September of 2015, the Carpenter road fire impacted 64,000 acres of land near Davenport, WA and damaged 42 structures. The costs to suppress this fire exceeded $200 million.[13]

[11] NASA, www.climate.nasa.gov/blog/2830
[12] Washington Department of Natural Resources 20-year Forest Health Plan (2017)
[13] Spokesman Review newspaper, Carpenter Road Fire, September 15, 2015

Researchers at the National Oceanic and Atmospheric Agency (NOAA) predict that by mid-century (2041-2070), the conditions for 'very large fires' will substantially increase throughout the western United States.[14] The graphic shown to the right indicates the percentage increase for very large fires. Note that areas of E. Washington and N. Idaho indicate a 300% to 400% increase. The combined trends of more frequent and larger fires combined with development in fire prone areas is projected to make wildfire one of the most significant environmental threats in the western United States.



NOAA Fire Threat (2041-2070) – Indicates the % Increase of Very Large Wildfire Conditions (> 1000 acre fires)

Wildfire Resiliency Plan Goals

Objective:

This report details Avista's recommended response to the increasing threat of wildfires to the energy delivery system. The plan will be periodically reviewed to ensure that it is consistent with industry best practices and continues to provide benefits to customers and the communities Avista serves.

Goals of the Wildfire Resiliency Plan

The stated goals of this Plan are:

1. **Emergency Preparedness** – to prepare and train for episodic wildfire events. To recognize wildfire as a recurring threat to infrastructure, the communities we serve, Avista employees and customers.

2. **Promote Public & Worker Safety** – To protect physical assets, property, and human lives against the threat of wildland fires. To recognize fire potential as a manageable risk element of Avista's operating and maintenance strategies.

3. **Financial Protection** – To mitigate the probability and consequence of direct financial costs and liability associated with large scale fire events.

Risk Assessment

Wildfire Risk Framework

Recommended actions described in this Plan are based on Avista's Enterprise Risk Model and Asset Management risk methodology. In addition to risk analysis, a model framework was established to help guide the process for identifying, quantifying, and adopting recommendations.

[14] Internet source: www.climate.gov/news-features/featured-images/risk-very-large-fires-could-increase-sixfold-mid-century-us

Understand the Risk – Combining infrastructure data with fire threat and weather conditions to yield a 'fire risk potential' metric.

Design for the Risk – Adapt transmission and distribution materials and construction to minimize the potential for utility involved fire ignition.

Plan for an Event- Prepare field and office support staff through training and field simulation exercises.

Partner with Others – Direct collaboration with Fire Protection Agencies and customers to reduce fuel loadings near homes and powerlines.

Risk Assessment Methodology

The recommendations in this report are based on their ability to reduce the operating and financial risk of wildfires. Understanding how to quantify risk is fundamental to understanding the content of this report.

In order to illustrate this concept, consider the risk of distribution pole fires. Pole fires are a common occurrence on overhead electric distribution system and generally occur when dust and other contaminates accumulate during a prolonged period of drought. In most years, the drier months of July through September present the most likely period to experience a pole fire. For each pole fire there is an associated risk cost.

On average, Avista experiences 92 pole fires per year. In most cases, Avista crews use fire suppression equipment to contain the fire and repair any damage. In some instances, pole fires are conveyed to the ground and can spread quickly under the right fuel and weather conditions. Wildfire Resiliency risk modeling considered three potential impacts:

Public Safety – the cost of injuries associated with Avista employees and the general public.

Service Reliability – the costs associated with service disruption based on the Department of Energy's Interruption Cost Estimator (ICE). For Avista customers, this value is $63 dollars per customer-hour.

Financial Impact– the replacement costs of infrastructure (direct) and third party claims to reimburse for property damage, timber loss, and fire suppression (indirect).

The following table provides an example of outcomes and impacts.

Outcome	Probability per event	Impact Cost ($)		Risk Cost ($)		Notes
		Optimistic	Pessimistic	Optimistic	Pessimistic	
Direct Financial	1	$1,500	$7,500	$1,500	$7,500	Avista crews responding to pole fires
Indirect Financial (minor)	0.1	$5,000	$20,000	$500	$2,000	3rd Party costs (e.g. suppression)
Indirect Financial (large)	.002	$100,000	$2,000,000	$200	$4,000	Ground fire spread by wind and fuel loading
Safety-Employee	.05	$2,500	$75,000	$125	$3,750	Employee injury ranging from minor burn to back or shoulder injury
Safety-Public (minor)	.01	$10,000	$50,000	$100	$500	Injury
Safety-Public (major)	.001	$2,000,000	$10,000,000	$2,000	$10,000	Fatality
Reliability (minor)	0.7	$200	$2,000	$140	$1,400	Service point (2-15 customers)
Reliability (moderate)	0.25	$18,000	$30,000	$3,600	$6,000	Lateral circuit (140-240 customers)
Reliability (major)	0.05	$190,000	$378,000	$9,500	$18,900	Feeder circuit (1500-3000 customers)
Total (per event)				$14,515	$48,800	
Inherent Risk = 92 events/year x $/event				**$1,335,380**	**$4,489,600**	Pole fire risk cost per year.
Inherent Risk over 10-year planning horizon (assumes level rate)				**$13,353,800**	**$44,896,000**	*This is illustrative of the range used in the Wildfire Resiliency Plan for a sub element of distribution grid hardening*

The table on the previous page reflects the inherent risk (current state) of pole fires. Poles fires are mitigated by replacing wood crossarms with fiberglass units. In the above example, the outcome scenario or impact would remain unchanged but the probability of occurrence would be drastically reduced.

For illustration purposes, if one assumes an 80% efficacy rate, the new risk costs ranges from $2,670,000 to $8,880,000 reflecting a median risk reduction of $23,300,000 over the 10-year planning horizon. This value would then be compared to cost estimates to determine if the treatment is warranted.

In May and June of 2019, a series of Wildfire Risk Workshops were facilitated by Avista's Business Process Improvement team to assess the overall risk cost of wildfires. Six individual workshops were held over a 15-day period involving 30 employees. Over 160 treatments were identified and nearly half of those were analyzed for their risk reduction capacity. Ultimately, 28 treatments were carried forward and serve as the individual recommendations in this report.

Pole fires generally occur on wood poles with wood crossarms. Since the early 2000's, Avista has adopted fiberglass crossarms as the standard unit. Replacing wood crossarms in elevated fire risk areas is a component of Wildfire Resiliency.

The Wildland Urban Interface (WUI)

An additional element of risk reduction includes the prioritized application of solutions. Recommendations within this report consider geographic location and apply risk reduction measures in areas with higher fire threat potential.

Homes and businesses most at-risk from the impact of wildfires are those located near the boundaries of forest lands and in rural areas that lack fire suppression resources. In 2019, Avista's GIS Technical Group created a Wildland Urban Interface map based on the following principles:

Fuel Concentration – Areas identified as having moderate to high fuel concentrations were considered in the analysis. Fuels data was derived from the U.S. Department of Agriculture's Wildfire Hazard Potential map.[15]

Housing Density – Parcel's smaller than 20 acres were included in the analysis but highly-developed urban areas were excluded.[16] *Urban areas do not meet the definition of Wildland Urban Interface*.

[15] USDA, Wildfire Hazard Potential, 2018
[16] Avista GIS System, Electric Distribution Service Connections

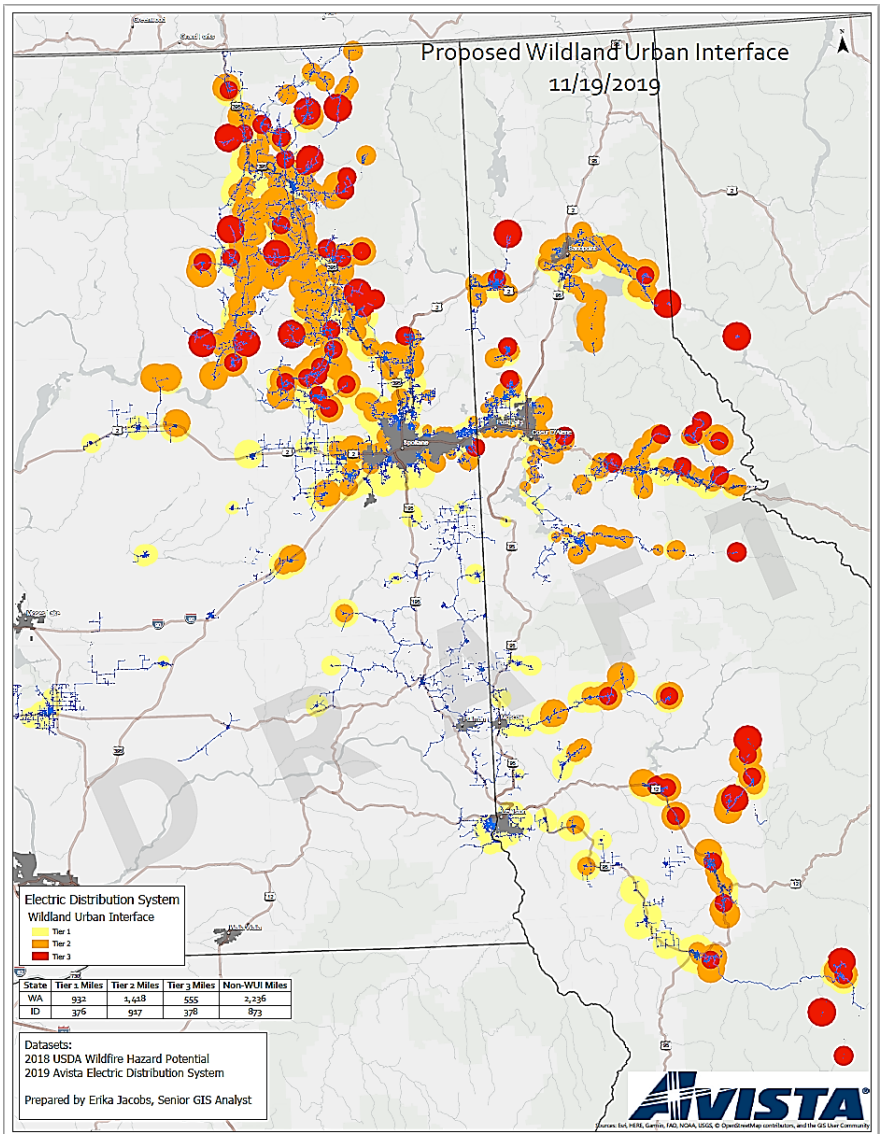
WUI Risk Levels – Similar to the work done in California, Avista's WUI identifies three wildfire risk levels:

Tier 1 – Moderate levels of fuel and low to moderate housing densities (low)

Tier 2 – Moderate to high levels of fuel and moderate housing densities (medium)

Tier 3 – High fuels levels and moderate to high housing densities (high)

Avista's Wildland Interface Map



This Plan describes the combination of WUI Tiers 2 & 3 as "elevated fire threat areas". These areas comprise 40% of the electric distribution and 20% of the transmission systems. Elevated fire threat levels are depicted in orange (Tier 2) and red (Tier 3) highlighted areas. Portions of the map not highlighted are classified as Non-WUI and represent areas with low fuel concentrations, very low housing densities, or densely populated urban areas.

Many of the elements described in this Plan will be deployed only in elevated fire threat areas including grid hardening, digital data collection, and fire-specific aerial inspections.

Plan Recommendations Summary

This Plan contains 28 individual recommendations grouped into four categories. These categories are similar to other utility wildfire plans including those from PG&E, SDG&E, SCE, and PacifiCorp and include:

- **Grid Hardening** – Replacing infrastructure in fire prone areas, the likelihood of a spark-ignition source is mitigated and critical infrastructure is protected from the impacts of fire.
- **Enhanced Vegetation Management** – Identifying potential conflicts on an annual basis and prioritizing those risks from highest to lowest, Wildfire Resiliency aligns resources with risk.
- **Situational Awareness** – Adding line and monitoring equipment, system operators can respond quickly to variable weather and fire threat conditions.
- **Operations & Emergency Response** – Through training and simulation, Avista personnel will be better prepared to work with fire professionals during an event.

Plan recommendations reflect cost prudency and were adopted on their basis to:

- Leverage existing asset programs and operating practices
- Promote safety and safe practices
- Mitigate financial risks to property and infrastructure

The following tables provide more information about the recommendations.

Grid Hardening and Dry Land Mode			
Recommendation	**Current State**	**Future State**	**Benefits**
Transmission Fire Retardant (FR) Program	FR paint program requires refresh every 3-5 years	Genic Fire-Mesh wrap with 20-year expected life	Will reduce operating expense to maintain fire protection of transmission wood poles
Transmission Line Inspection	Aerial surveys to identify structure defects (reliability based)	Aerial and ground inspections to identify structure defects (fire risk based)	Reduce transmission fire ignition events which are less likely than distribution related fires, but generally result in larger fires
Dry Land Operating Mode (DLM)	Seasonal implementation (single mode)	Adapted to fire-weather metrics (multi-mode)	By aligning DLM modes with weather and fire threat conditions, operators can balance service reliability with fire risk potential
Transmission Grid Hardening	Condition-Based Steel Conversion	Risk-Based Steel Conversion	Reduce likelihood of damage to Avista transmission assets. 20% of Avista's transmission assets are located in elevated fire threat areas
Distribution Grid Hardening	Condition based pole, conductor, and equipment programs	Risk based approach to replacing equipment and conductors associated with spark-ignition potential	Reduce likelihood of distribution related fires. 40% of Avista's distribution assets are located in elevated fire threat areas

Enhanced Vegetation			
Recommendation	**Current State**	**Future State**	**Benefits**
Digital Data Collection	Human based ground and aerial inspections	Augment with computer automated analysis to identify vegetation encroachment and structural defects	Allows for scenario based planning of treatment options and serves as the QA tool to assess the efficacy of previous field work
Fuel Reduction Partnerships	No formal program	Partnering with Fire Agencies to remove fuels near critical infrastructure	Strengthens relationships between Avista and fire first responders and reduces fire severity threats to infrastructure
Widen Transmission Rights-of-way	No formal program	Align right-of-way boundaries to fire risk potential	Protect critical infrastructure and serve as fire break
Annual Risk Tree	Cadence based program (e.g. 1-3 years)	System-wide effort to annually identify and remove dead, dying, and diseased trees	Reduce tree fall-ins, which are 3 times more likely to occur than grow-ins
Public Outreach "Right Tree, Right Place" Campaign	General information available to all customers	Work with customers in elevated fire risk areas to remove tall growing trees from underneath powerlines	Reduces the risk of tree grow-ins and subsequent spark-ignition sources

Situational Awareness			
Recommendation	**Current State**	**Future State**	**Benefits**
Fire-Weather Dashboard	Weather forecast data subject to individual interpretation	By combing weather forecast and fire threat condition data, operating personnel will have clear guidance relative to likelihood and potential impact of fires	Promotes a more consistent approach among operations and emergency managers
Additional Distribution Circuit Reclosers	Based on system protection and reliability performance	Deployed in elevated fire threat areas. Reflects a risk-based strategy	Supports the evolution of Avista's Dry Land operating mode to align with forecasted weather and fire threat conditions
Substation Supervisory Control & Data Acquisition (SCADA)	SCADA added to new or reconstructed substations. Reflects a condition based approach	Enables control and monitoring of substation equipment including circuit reclosers in elevated fire risk areas	(as stated above)

Operations and Emergency Response			
Recommendation	**Current State**	**Future State**	**Benefits**
Emergency Operating Procedure & Avista Incident Command Representative	No formal wildfire policy	Avista EOP to delineate wildfire from other storm events. Avista to offer assistance at all fire ICS.	Coordinate Avista system restoration with fire protection and evacuation activities
Wildfire Performance Metrics	None	Develop fire-specific performance metrics to ensure that Plan objectives are being met	Supports the adaptation of the Resiliency Plan to meet current operating and environmental conditions

Operations and Emergency Response			
Recommendation	**Current State**	**Future State**	**Benefits**
Wildland Urban Interface (WUI) map	Developed in Q3/2019	Categorize Avista T&D infrastructure with respect to fire ignition potential and fire impact consequence	Focuses vegetation management and grid hardening efforts in the highest fire risk areas
Emergency first responder training	No formal program	Annual fire safety training to Avista field personnel and electrical hazard training to fire protection personnel	Promotes safety of first responders and supports a variety of partnering activities including fuel reduction and fire adapted communities
Expedited Fire Response	Draft MOU under consideration with Spokane Fire Districts (2020 Pilot Project)	Fire agency personnel to investigate transmission line faults during fire season	Suppress fires before they have an opportunity to spread

Plan Recommendations by Category

Grid Hardening & Dry Land Mode

Nearly 10% of Avista distribution outages are related to equipment and conductor failures. These include transformers, overhead conductor, connectors, insulators, and larger equipment like circuit reclosers and voltage regulators. Over 600 outages per year occur due to these failures. Recent data from the California State Fire Authority (CAL FIRE) indicates that over 1,000 utility involved fires occurred in California during 2018. The breakdown of that data is shown below and indicates that 38% of utility events were related to utility equipment. CAL FIRE estimates that utility ignition sources account for approximately 10% of wildfires across the state, while data from Washington State indicates a range of 4-6% for the Pacific Northwest region.[17] Though the contribution is relatively low, wildfires are increasing in both size and number across the western United States, and represent a significant risk to companies.

As part of the Wildfire Resiliency Plan, Avista will track fire ignition data associated with powerline electrical faults.

2018 California Utility Involved Fires (source: CAL FIRE)	# of ignitions
Vegetation Contact	552
Equipment	151
Downed Wire	218
Fuse	35
Animal	117
Total	**1,073**

Currently, Avista does not track fire ignition events associated with transmission or distribution line faults. As noted, Avista's Outage Management System (OMS) is the system of record for T&D customer outage records, and, in many instances, forms the basis of fire probability used in this report.

Annual Avista Electric Distribution Unplanned Outages (source: Avista 2014-2018 OMS Data)	
Vegetation Contact	6.2%
OH Equipment/Conductor	9.5%
Pole Fire	1.5%
Public Fire	2.1%
Wind	26.1%
Animal	9.0%
Car Hit Pole	2.8%
Storm Related & UG	42.7%

Between 2014 and 2018 the breakdown of Avista's distribution system outages is summarized in the table on the left. Based on this information and subsequent risk analysis, the grid hardening objectives are:

1. Reduce the number of spark ignition events on the distribution system (Event Probability)
2. Reduce wildfire impact to transmission lines (Event Outcome)

[17] Western Utility Commission Wildfire Seminar, Portland OR, April 2019

As part of Wildfire Resiliency, Avista will focus grid hardening efforts in the Wildland Urban Interface Tier 2 and 3 areas (elevated fire risk). The program includes:

- Transmission Wood Pole Fire Retardant Protection (Fire-Mesh Wrap)
- Transmission Line Fire Inspection Program
- Transmission Grid Hardening (Wood to Steel Pole Conversion)
- Dry Land Mode engineering review
- Dry Land Mode standing operating procedure (initiating)
- Distribution Midline Recloser in WUI Areas
- Distribution Grid Hardening

Grid hardening efforts reflect the bulk of capital investment in the Wildfire Resiliency Plan. On average, equipment and conductor failures account for 10% of all forced outages and reducing those outages is a primary objective of this Plan. Many sources of powerline outages are difficult to control, including winter storms, strong wind events, thunderstorms, and public caused outages including vehicular accidents and trees that are felled through powerlines. However, by upgrading powerline conductor and equipment, these failures are manageable and represent a cost effective means to reduce the overall number of spark-ignition events. Take for instance, pole fires.

The mechanism that causes pole top fires is well-known and is related to insulator leakage current which increases during periods of hot, dry weather when insulators become covered with dust and other contaminants. This leakage current can be concentrated between wood to wood contacts such as the contact point between wood crossarms and wood poles. In the early 2000's, Avista began using fiberglass crossarms and this has virtually eliminated fires on poles with the new fiberglass crossarms. As part of Wildfire Resiliency, wood crossarms on structures located in elevated fire areas will be replaced with fiberglass units. Grid hardening risk levels and costs are summarized in the table below.

Grid Hardening & Dry Land Mode operations	2020-2029
Inherent Risk Exposure (category %)	41-100
Managed Risk Exposure (category %)	0.7-2.7
Risk Mitigation (average %)	98%
Total Operating Expense	$5,014,000
Total Capital Investment	$245,600,000

*Various internal reports including the Wildfire Summary Risk Analysis and Wildfire Resiliency Cost Plan included a numbering system used to track individual Plan elements. For example, the Plan element designated as "**D-16/17 Distribution System Grid Hardening**" is described on the next several pages. That numbering system is maintained throughout this report to assist with continuity between various internal reports and datasets.*

D-16/17 Distribution System Grid Hardening

Recommendation:		Replace aging and obsolete equipment in elevated fire risk areas (40% System)
Cost:		$23,000,000/year Capital Investment ($193,200,000 total over 10 years)
Benefit:		Reduced fire events caused by Avista's electric distribution system.

Distribution grid hardening represents the single largest infrastructure investment in this Plan. Pole fires, together with equipment failures, can potentially be reduced by replacing aging and deteriorated poles, equipment, and conductors. Though Avista has well-established programs to replace poles, conductor, and equipment, existing programs are condition-based and aligned with reliability objectives. Wildfire grid hardening objectives are focused on reducing the number of spark ignition events. The following activities are included in the distribution grid hardening plan:

- Replace wood crossarms with fiberglass units
- Remove small copper wire
- Install wildlife guards (e.g. fuse holders, lightning arrestors, and transformer bushings)
- Replace wood poles with steel poles at 'high value' locations
  (e.g. highway crossings, corner poles, and heavy equipment poles)
- Eliminate open wire secondary districts
- Install wedge/bail clamps at hot tap connection points

Pole fires are a significant contributor to wildfire risk. Each year there are approximately 90 pole fires on Avista's distribution system, and the vast majority are related to wood on wood contact between crossarms and poles.

The combination of wood poles with fiberglass crossarms rarely cause pole top fires. This is a proven tactic for reducing the risk of utility involved fires and is a component of distribution grid hardening.

Avista adopted the use of fiberglass crossarms in the early 2000's and has been replacing wood units steadily since that time. However, many wood crossarms remain on the system. By replacing wood crossarms in elevated fire risk areas, the number of pole fires can be significantly reduced. Of the grid hardening efforts listed above, this is the most cost effective treatment to reduce fire risk. The following table lists current outage rates for each treatment. The data is from the 2014-2018 operating period and reflects an annual rate.

Material Unit	Outage Driver	Annual Outage Rate (#/yr.)	% of System Outages
Wood Crossarms	Pole Fires	92	1.5%
Small Copper Wire	Primary Conductor Failures	81	1.3%
Wildlife Guards	Animal related outages	557	9.0%
Secondary Wire Districts	Secondary Conductor Failures	101	1.6%
Hot Tap Connection	Primary Connector Failures	69	1.1%
	Totals	**1,087**	**14.5%**
Source	*Avista OMS 2014-2018*		

Risk Evaluation: Distribution Grid Hardening

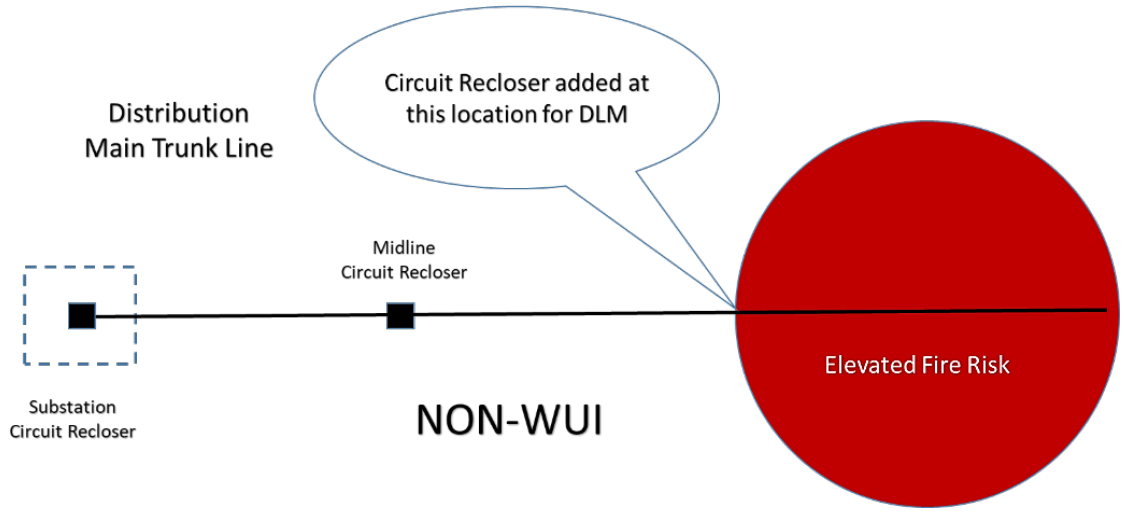
D-16/17: Distribution Grid Hardening	2020-2029
Inherent Risk Exposure (category %)	39.3-94.5
Managed Risk Exposure (category %)	0.3-1.9
Risk Mitigation (average %)	98%
Total Capital Investment	$193 million

D-13 Additional Dry Land Mode Circuit Reclosers

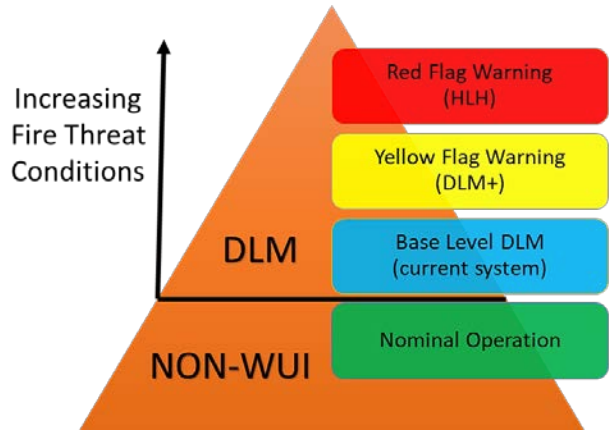
Recommendation:	To install additional circuit reclosers in elevated fire threat areas (40% System)
Cost:	$600,000 Capital Investment ($5,400,000 total over 10 years) $44,400 Operating Investment ($444,000 total over 10 years)
Benefit:	Provide protection schemes that can adjusted for the wildfire threat based on the operating location.

Midline circuit reclosers are often deployed on long distribution lines where substation-based equipment cannot adequately protect the entire length of the circuit. Urban distribution lines are typically 5 to 10 miles in length, while rural counterparts can extend hundreds of miles. As noted, Avista is evaluating its current dry land program and, although that work is on-going, there is consensus that additional equipment will help delineate elevated fire threat and non-WUI areas. It is estimated that upwards of 75 modern reclosers will be installed on the system, which is approximately one additional

recloser for every two rural distribution circuits. The situation is illustrated on the following page where elevated fire threat areas exists near the end of a distribution line.



By adding circuit reclosers at strategic locations, Avista Distribution Operations can re-task those devices during periods of elevated fire danger to operate in fire protection mode rather than reliability mode. A proposed scheme is illustrated in the block diagram below.



Avista has used a summer operating strategy or "Dry Land Mode" since the early 2000's. Avista anticipates adapting DLM to fire threat conditions and re-tasking circuit reclosers to align with field conditions.

D-6 Dry Land Mode Effectiveness Study

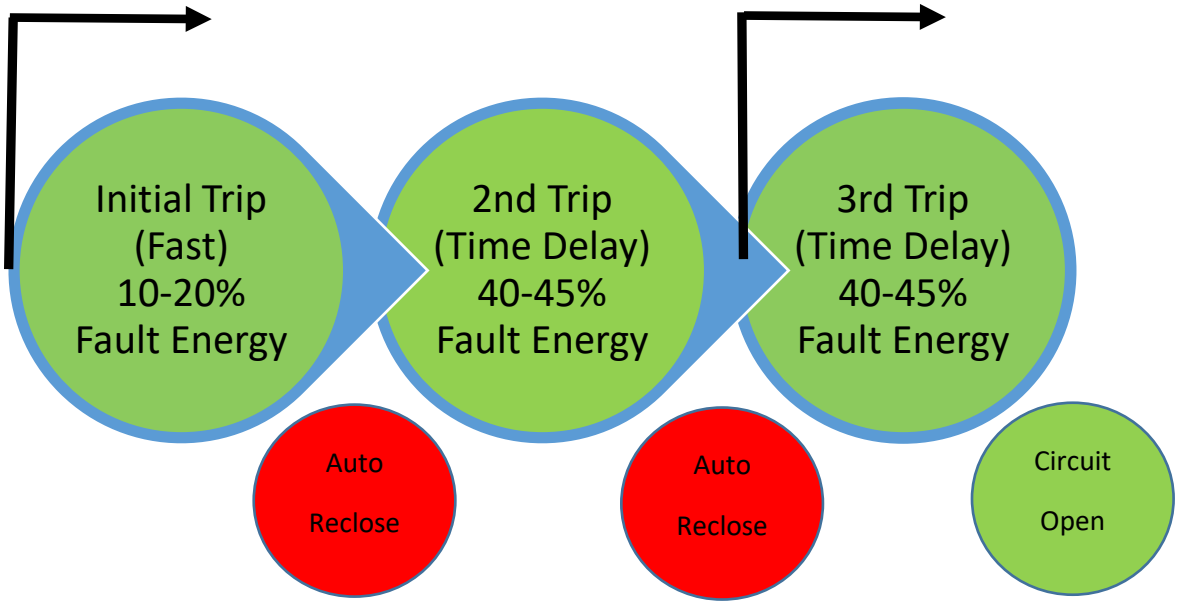
Recommendation:	To conduct an engineering review of Avista's Dry Land Mode protection scheme (in-process since March 2020)
Costs:	$100,000 Operating Expense (2 year engineering review)
Benefit:	More timely and responsive protection schemes that minimize fault energy and reduce the potential to start a wildfire.

During fire season, Avista operates a significant portion of the distribution system in what is referred to as Dry Land Mode (DLM). Electric circuits in DLM mode are operated with auto-reclosing and instantaneous overcurrent tripping disabled. In this configuration, faults that occur on lateral circuits are

cleared through fuse action while faults on trunk segments are cleared via circuit reclosers. During the Avista wildfire workshops, engineers agreed that the dry land operating system could be improved. A small work group was formed including several area engineers, the manager of protection engineering, and electric servicemen. The group is expected to issue recommendations prior to the 2020 fire season.

Most Avista circuit reclosers are configured with three automatic breaker trips and two reclose settings. Normal and DLM modes are illustrated below.

Normal Configuration **DLM**



The initial recloser trip is generated via instantaneous overcurrent relay and accounts for only 5-10% of total fault energy. The remaining recloser trips occur via time-delay relays and are coordinated with downstream fuse devices. If the fault is located downstream of a fuse, the fuse will blow and isolate the faulted segment. However, if the fault is located on the main trunk line, the circuit recloser will go through the automatic trip-reclose sequence to a final open, or lock-out condition. As the illustration suggests, by limiting the circuit recloser to a single, time-delay trip, fault energy can potentially be reduced by up to 60%.

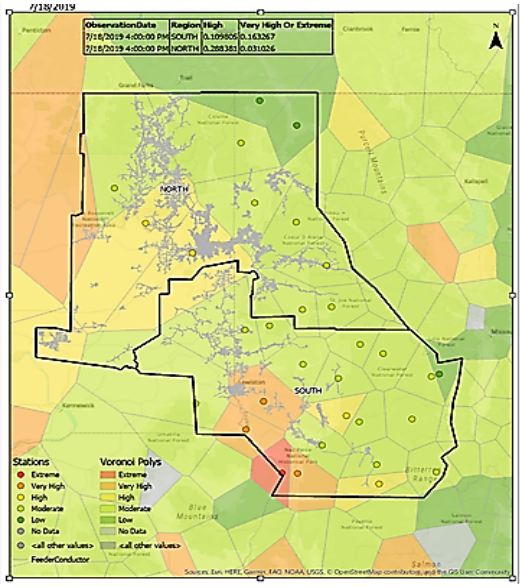
D-8 Dry Land Mode Trigger

Recommendation:	To develop a fire threat index to determine when Avista initiates Dry Land Mode (complete, June 2019)
Costs:	$2,000 Operating Expense per year ($20,000 over 10 years)
Benefit:	System operations that are consistent with wildfire risk.

In 2019, Avista's Technical Services group created a system to gather information from the Wildland Fire Assessment System (WFAS)[18] and used that information to determine when the distribution system would be set to dry land conditions. The DLM "trigger" was established as:

1) When 30% of Avista's Electric Operating area is designated as "High" fire threat, or
2) When 10% of the operating area is designated as "Very High"

By providing a clear metric, Avista aligns its operations with fire threat conditions.



The GIS Technical Services group created a fire threat index map for electric operations. This daily report for July 18, 2019 is shown for the north and south operating areas. Areas indicated with yellow, orange, and red highlights are associated with High, Very High, and Extreme fire danger.

Data Source: USFS/WFAS, Missoula Montana

Risk Evaluation: Dry Land Mode Operating Program (D-6, D-8, and D-13)

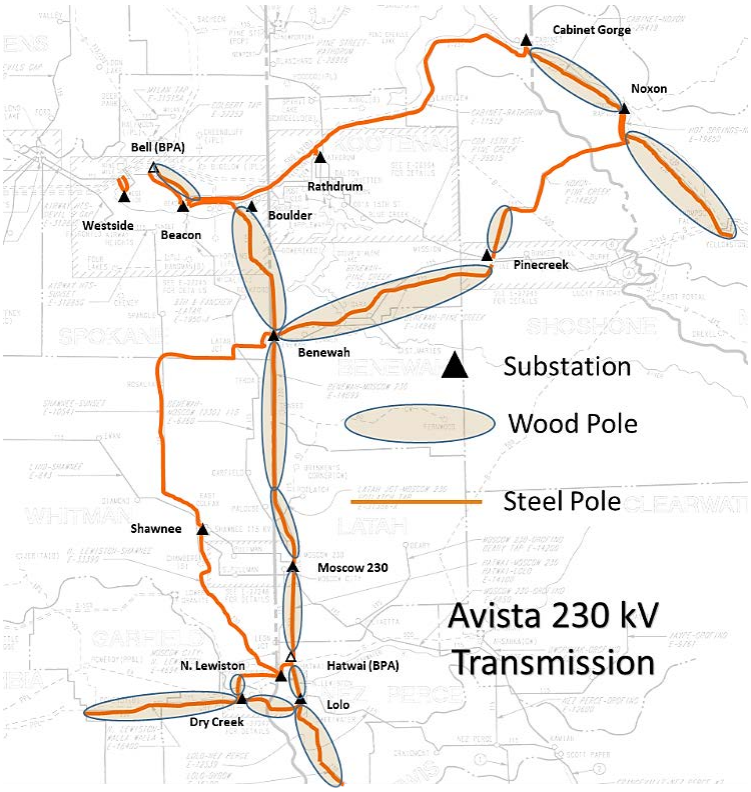
Dry Land Operating Program	2020-2029
Inherent Risk Exposure	$43-69.6 million
Managed Risk Exposure	$6.2-17.4 million
Risk Mitigation (average %)	83%
Total Operating Expense	$564,000
Total Capital Investment	$5.4 million

[18] Wildland Fire Assessment System (USFS), Missoula MT, wfas.net

ST-12 Transmission System Grid Hardening

Recommendation:	To convert wood poles to steel structures in elevated fire threat areas (20% System)
Cost:	$5,000,0000 Capital Investment ($44,000,000 total over 10 years)
Benefit:	Reduce the impact of wildfire on Avista's operating system.

Avista began installing tubular steel transmission poles in the late 1980's, with full adoption of steel as a standard material item in 2006. Since then, reconstruction projects have converted a number of circuits from wood to steel, and that trend will continue. Though Avista is committed to steel conversion, one of the objectives of the Wildfire Resiliency Plan is to accelerate that process in fire prone areas. The largest capital transmission investment in this Plan is wood to steel conversion, at a cost of $44 million dollars over a 10-year period. As noted, a significant risk to transmission lines is the impact from wildfires.



Avista's 230 kV system was initially built in the late 1950's and early 1960's, after the construction of the Noxon Rapids and Cabinet Gorge dams. In 2003, portions of the system were upgraded as part of the West of Hatwai agreement with Bonneville Power. Several wood lines were converted to steel during that time period including:

Beacon-Boulder-Rathdrum
Benewah-Shawnee (new line)
Beacon-Bell #5

The average age of transmission wood poles is 54 years (2020 data).

Risk Evaluation: Transmission Grid Hardening (Wood to Steel Pole Conversion)

ST-12: Transmission Grid Hardening	2020-2029
Inherent Risk Exposure (category %)	n/a
Managed Risk Exposure (category %)	n/a
Risk Mitigation (average %)	n/a
Total Capital Investment	$44 million

ST-10 Transmission Inspection Program

Recommendation:	To conduct annual fire threat assessments of the transmission system
Cost:	$200,000 Operating Expense ($2,000,000 total over 10 years)
	$300,000 Capital Investment ($3,000,000 total over 10 years)
Benefit:	Identify and repair system defects prior to failure.

Visual inspection of assets is a fundamental tenet of any preventative maintenance plan. This is a widely accepted process for generation power plants and electrical substations, but inspection of thousands of miles of powerlines presents unique challenges. Transmission Engineering has conducted annual aerial inspections for many years, and Avista will continue to leverage that experience. By identifying defects before they present as equipment failures, inspections help to minimize fire ignition events. While current programs are geared towards identifying reliability risks (e.g. Osprey nests, gunshot insulators, cracked crossarms, woodpecker damage, etc.), a wildfire based approach focuses attention on other factors:

A. Logging or other construction activities near powerlines
B. Excessive conductor sag over agricultural or roadway areas
C. Corroded attachment hardware
D. Disruptions or changes to the ground profile
E. Unauthorized attachments or encroachments
F. Thermal issues (e.g. hot splices or connectors)
G. Wood debris slash piles in right of way

This list is not intended to be a complete list, but rather to contrast the differences between conventional inspections based on reliability and those focused on preventing utility involved wildfires.

Increasingly, UAVs or Drones are being used to inspect powerlines. Avista plans to deploy this technology as part of Wildfire Resiliency.

Risk Evaluation: Transmission Inspection

ST-10: Transmission Inspection Program	2020-2029
Inherent Risk Exposure	$4-59 million
Managed Risk Exposure	$1.1-2.6 million
Risk Mitigation (average %)	94%
Total Operating Expense	$2 Million
Total Capital Investment	$3 Million

ST-6 Transmission Wood Pole Fire Retardant Protection

Recommendation:	Wrap wood poles with a fire-resistant material.
Cost:	$250,000 Operating Expense ($2,450,000 total over 10 years)
Benefit:	Protect wood poles in grassland areas from the impacts of fire.

Fire damage to the Lolo-Oxbow 230 kV line in the early 2000's prompted Transmission Engineering to initiate a fire retardant (FR) wood pole painting program. Wood transmission structures are painted near ground line, which is an effective means of preventing damage caused by ground fires. Though Avista has experience with Osmose 'Fireguard', the paint product must be reapplied every three to five years and the maintenance expense is on-going.

Avista has participated in a number of peer utility forums including Western Energy Institute's Wildfire Task Force.[19] At that meeting, Southern California Edison (SCE) discussed their work with Genics Corporation to develop a wire mesh product that is chemically reactive to extreme heat. As of this writing, SCE has installed Fire-Mesh on over 1,300 poles and plans to fire wrap 20,000 more poles in 2020. Avista will adopt this program as part of their effort to protect transmission system wood poles from the impact of grassland fires.

On March 3rd, 2020, Avista conducted a field test of the Genics Fire-Mesh product. An FR wrapped pole was subjected to a 30-minute fire and sustained only minor damage. Unlike FR paint, this mesh product does not require on-going maintenance and can be applied much more easily than paint.

Risk Evaluation: Wood Pole Fire Retardant Protection

ST-6: Wood Pole FR Mesh-Wrap Protection	2020-2029
Inherent Risk Exposure	$9.6-28 million
Managed Risk Exposure	$4.3-4.8 million
Risk Mitigation (average %)	76%
Total Operating Expense	$2.45 Million

[19] Western Energy Institute Wildfire Meeting, July 19-20,2019, SDG&E

Enhanced Vegetation Management

Vegetation management is an integral part of maintaining overhead electric distribution and transmission lines. Historically, utilities have trimmed and removed trees with a focus on improving reliability and reducing the frequency of outages. With the increasing threat of wildfires as a result of poor forest health, past fire suppression activities and periods of prolonged drought, Avista plans to enhance vegetation management practices especially in elevated fire threat areas.

2014 Windstorm Damage North Spokane

For the five year period from 2014 to 2018, there were nearly 2,000 tree related events on Avista's electric distribution network.[20] Though tree induced fire outcomes are not specifically tracked, consensus among Avista operating personnel suggests that vegetation contacts with overhead powerlines represent a significant fire hazard. This is consistent with other utility risk assessments.

This Plan recommends the following enhanced vegetation management activities:

- Transmission and distribution system digital data collection (LIDAR)
- Fuel reduction partnerships
- Widening transmission rights of way
- Annual risk tree surveys
- Review and support of the Right Tree, Right Place customer safety initiative

The ten year cost forecast to implement a fire-informed, enhanced vegetation management program is approximately $51 million dollars and will supplement current maintenance activities. These wildfire specific vegetation management activities would be implemented in addition to, not in place of, the regular five-year vegetation management cycle to maintain system reliability. The forecast of risks and investments is summarized below.

Enhanced Vegetation Management	2020-2029
Inherent Risk (range %)	48.3-100
Managed Risk (range %)	3.2-14.5
Risk Mitigation (average %)	88%
Total Operating Expense	$51.2 Million
Total Capital Investment	$5.1 Million

[20] Avista Outage Management System, 2014-2018 dataset

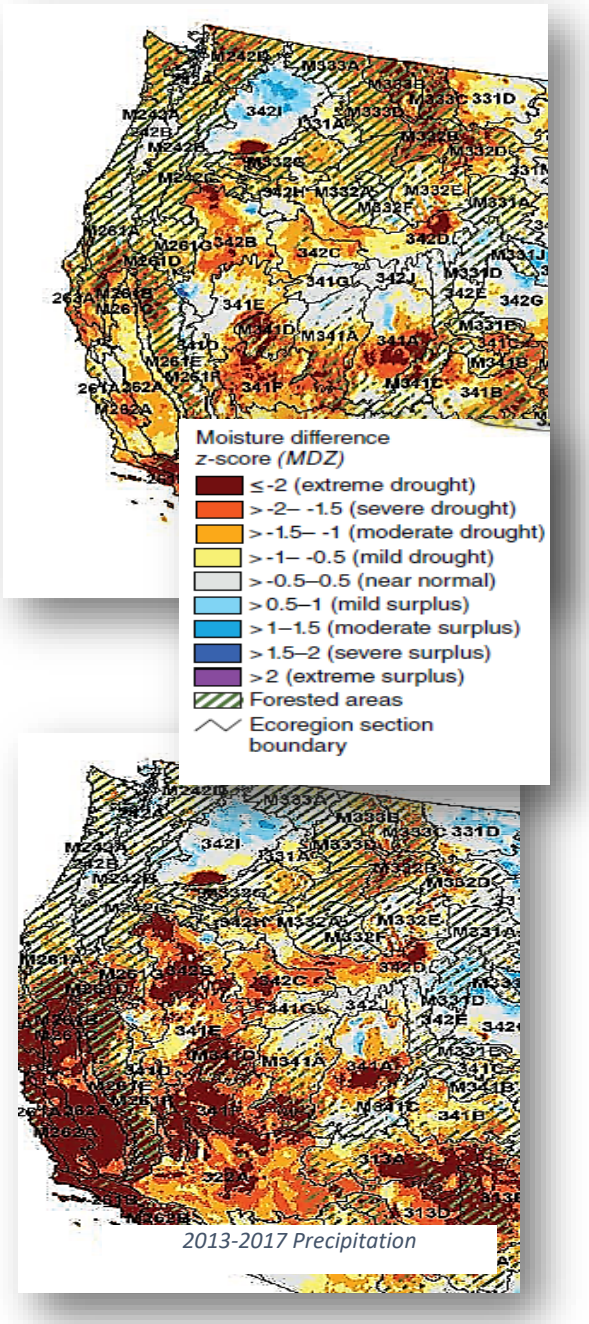
D-10 Electric Distribution Annual Risk Tree

Recommendation:	To identify and remove dead, dying, and diseased trees, or 'risk trees' adjacent to distribution lines. (100% System)
Cost:	$2,500,000 Operating Expense ($25,500,000 total over 10 years)
Benefit:	Reduce interaction between vegetation and Avista's distribution facilities.

In order to identify 'at-risk' trees, Avista plans to use a combination of traditional, ground-based inspections and aerial digital data collection. By identifying trees that are dying or diseased, Avista can remove those trees that represent a fall-in risk to nearby powerlines.

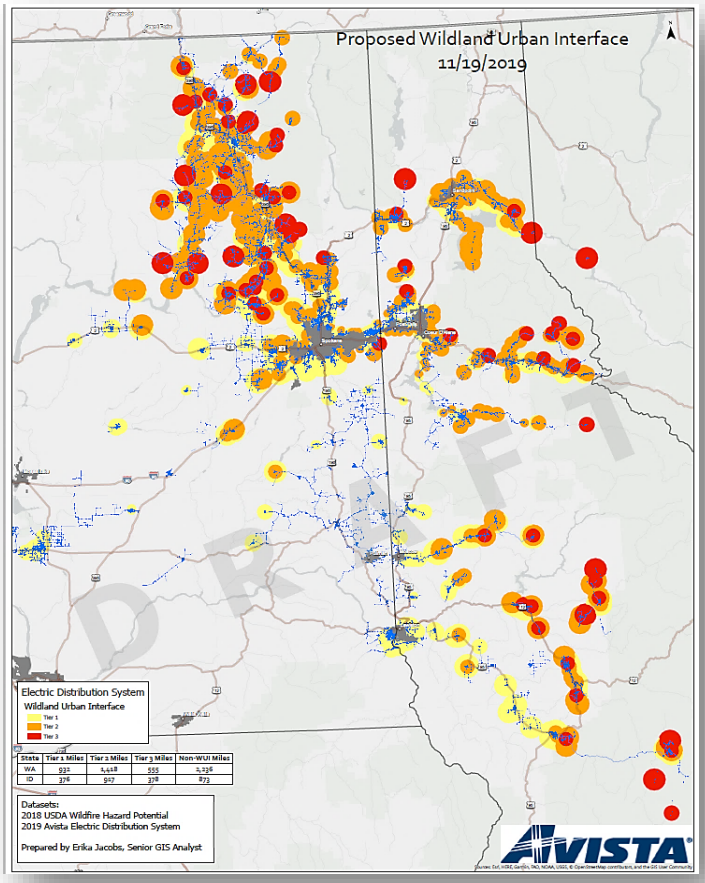
In total, 40% of Avista's distribution system is located in elevated fire risk areas (see the WUI map on the following page). During the five year period between 2014 and 2018, 603 trees fell into electric distribution lines during the late spring and summer months (May-September). In total, trees account for nearly 400 outages per year with fall-in events outnumbering grow-ins by nearly a 3 to 1 margin. In short, most tree related outages are caused by trees located outside of the right-of-way falling into powerlines. And, vegetation contacts during periods of moderate to high winds represent a significant contributor to the fire risk profile. This is a combination that the Wildfire Resiliency Plan aims to mitigate.

Forests face an increasing threat of insects, drought, and poor land management. A warming climate is contributing to these factors and there is general consensus among foresters that significant stem loss will occur over the next several decades. The 2017 USDA Forest Health report includes drought statistics that indicate wide-spread drought conditions from



2013-2017 Precipitation

2015 to 2017[21], with many areas rated as severe to extreme (see illustration). One might observe that this is only a 3-year period and not indicative of an underlying trend. However, data from the 5-year period from 2013 to 2017 indicates an even deeper drought, especially throughout California and the desert southwest.



Wildland Urban Interface (WUI)

Avista's WUI map indicates the potential for utility caused wildfires and their impact to homes and communities. It also represents where treatment plans will be targeted. Elevated fire threat is noted as the Tier 2 (orange) and Tier 3 (red) areas and encompasses 40% of Avista's electric distribution system.

Risk Evaluation

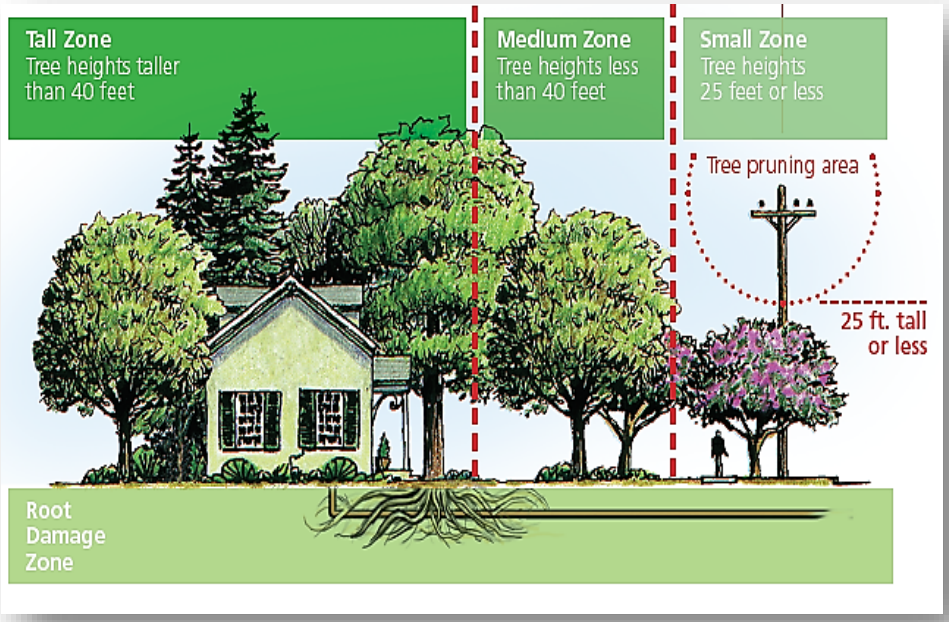
The risk of trees falling into powerlines represents a significant financial cost, with the 10-year inherent risk estimated that exceeds $2.8 dollars. The risk and cost-benefit estimates are indicated below.

D-10: 100% Annual Risk Tree Program	2020-2029
Inherent Risk Exposure (category %)	21.8-44.3
Managed Risk Exposure (category %)	2-9.5
Risk Mitigation (average %)	83%
Total Operating Expense	$25.5 Million

[21] U.S. Department of Agriculture, fs.fed.us/foresthealth/publications/conditionsreport_2017.pdf

D-11 Public Safety Initiative: "Right Tree, Right Place"

Recommendation:	To contact customers located in elevated fire threat areas and work with them to remove tall growing trees near powerlines (40% System).
Cost:	$1,000,000 Operating Expense ($9,600,000 total over 10 years)
Benefit:	Reduce interaction between vegetation and Avista's operating system.



"Right Tree, Right Place"

Avista currently supports an approach to vegetation management called "right tree, right place." Through this approach, Avista seeks to educate landowners about utility-compatible trees, and publishes a brochure, which states, "*Avista provides a no-cost inspection and mitigation to make the following certain tree-related situations safe*." The brochure includes a graphic (above) indicating that only Type I, low growing, trees should be planted near powerlines.

In the five year period from 2014 to 2018, there were 322 tree 'grow-in' incidents during the fire season (May-September). Like tree fall-ins, these incidents tend to happen during windy days and thus elevate the risk of starting and spreading a fire.

From a wildfire resiliency perspective, there is opportunity to build on and reshape this program, which may include additional agency partnerships and public outreach, to minimize the fire-related risks presented by trees coming into contact with Avista's electric system.

By partnering with fire agencies, such as Washington Department of Natural Resources and the Idaho Department of Lands, Avista can reach residents living in elevated fire threat areas and work with them

to remove incompatible trees. By incentivizing owners to remove tall growing trees, Avista can reduce the risk of fire and the need to trim trees in the future.

It is recommended that a "right tree, right place" program be established similar to Avista's energy efficiency rebate program. It would allow customers to submit a request and select from a list of qualified contractors. This would ease the burden on internal resources and encourage local tree trimmers to become line clearance certified. In this Plan, the recommendation would focus on areas associated with elevated fire risk. An additional element of this program would be partnership with fire agencies, such as Washington Department of Natural Resources and the Idaho Department of Lands, and to work with agency partners to create fire-adapted communities.

Type 1 low growing trees are compatible with utility overhead powerlines and pose little or no threat to their operation.

Risk Evaluation

Trimming customer owned trees is a known dissatisfier. Customers sense a loss of control and perceive the activity as 'happening to them' rather than 'occurring for them'. By providing customers with a choice about removing trees, we promote a partnership focused on fire prevention rather than utility operations.

D-11: Right Tree, Right Place Campaign	2020-2029
Inherent Risk Exposure	$563-1,145 million
Managed Risk Exposure	$2.3-28.2 million
Risk Mitigation (average %)	98%
Total Operating Expense	$9.6 Million

D-14 Distribution Digital Data Collection

Recommendation:	Annual digital surveys of the elevated fire threat areas. Includes computer post processing (40% System).
Cost:	$1,000,000 Operating Expense ($7,750,000 total over 10 years)
Benefit:	Identify conflicts between vegetation and system structural defects.

This element is similar in scope and function to ST-5 “Transmission Digital Data Collection” whereby LIDAR surveys, high resolution photography, and infrared images would be collected on Avista’s overhead distribution lines. The project scope is limited to elevated fire threat areas.

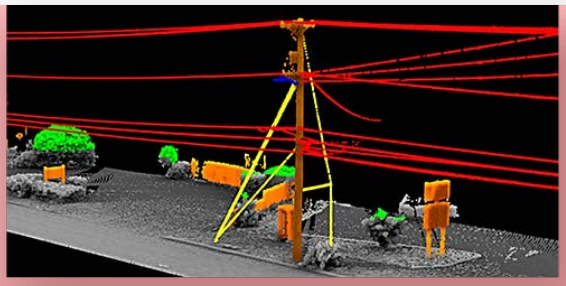
Avista operates 7,600 miles of overhead primary distribution lines, and nearly 40% of those facilities are located in elevated fire threat areas. However, unlike transmission, distribution lines have lateral, branch circuits that make aerial surveys difficult. Ground based techniques, similar to Google Earth’s Street View Project, may be deployed in combination with conventional and drone aircraft.

Electric Distribution Outage Rates (Events/Year)

10%	*600 Overhead Equipment Failures*
6.5%	*400 Tree Related*
3%	*200 Underground Equipment*
50%	*3,100 Wind & Weather*
30.5%	*1,890 Other Sources*

(Source data: Avista outage management system 2014-2018)

Avista maintains distribution vegetation on a five year cycle, or about 20% of the system per year. This includes trimming trees and removing trees. This is a reliability-based approach generally known as ‘routine maintenance’. By deploying annual digital inspections, Avista will transition towards a more ‘risk-informed’ approach combining elements of fire threat risk (i.e. WUI Map and Infrastructure Health Index) with the volume of vegetation and the proximity to energized lines and equipment. Though this treatment is justified solely on its ability to identify potential vegetation conflicts, high resolution photography and infrared imagery also support structural inspections. A number of use cases have been identified.



LIDAR Survey

LIDAR USE CASES:

- Vegetation Volume & Proximity (Grown-in Risk)
- Danger Tree (Fall-in Risk)
- R/W Encroachment (buildings, roads, utilities)
- Joint Use Inventory (billing)
- Conductor Line Clearance (NESC Violations)

Hi Res Photo

Infrared Image

IMAGERY USE CASES:

- Equipment Damage (broken x-arms, leaking transformers)
- Change Detection (open fuse bank, bird nest, attachment)
- Hot Spot Detection (splices, connectors, insulators)
- Equipment Inventory (added to GIS system of record)

Risk Evaluation

Annual risk tree and digital data collection rank at the top of treatment options to reduce the opportunity for powerline fire ignitions. Maintaining an accurate inventory of both infrastructure and vegetation in the elevated fire threat areas is a critical component of fire resiliency.

D-14: Distribution Digital Data Collection	2020-2029
Inherent Risk Exposure (category %)	21.8-44.3
Managed Risk Exposure (category %)	1.0-4.4
Risk Mitigation (average %)	92%
Total Operating Expense	$7.75 Million

ST-5 Transmission System Digital Data Collection

Recommendation:	Annual digital survey of the transmission system (100%).
Cost:	$750,000 Operating Expense ($6,825,000 total over 10 years)
Benefit:	Identify potential conflicts with vegetation and structure defects.

Avista operates 700 miles of 230 kV and 1,570 miles of 115 kV transmission lines throughout eastern Washington, northern Idaho, and western Montana.[22] Vegetation management of the transmission grid is subject to NERC regulation FAC-003-4 which requires that all 230 kV and select 115 kV circuits be patrolled annually to assess vegetation growth both in the right-of-way (encroachment) and adjacent to the right-of-way (fall-in risk). Since 2006, Avista has conducted annual aerial patrols as part of the Company's Transmission Vegetation Management Plan (TVMP).[23] The regulatory focus on transmission has helped reduce conflicts between vegetation and powerlines, and adding fire-informed, risk-based elements to existing programs, Wildfire Resiliency aims to build upon that success.

Increasingly, utilities are using LIDAR (light detection and ranging) to assess vegetation encroachment of overhead powerlines. The ability to collect survey data via an aerial platform is a significant advantage over ground-based techniques. This technology is helping vegetation managers identify, prescribe treatments, and audit field work using machine learning computer algorithms.

Since transmission lines are linear features and located within established corridors, data can be collected via fixed wing aircraft equipped with multiple instruments including LIDAR, Hi-Resolution cameras, and near-infrared detectors.

By collecting data annually, Avista vegetation and asset managers can detect changes from year to year, including unauthorized encroachments, as well as assess the proximity to vegetation, and quantify the risk of tree fall-ins. Transitioning from human based inspections to digital data collection will have a substantial impact on data accuracy, work processes, productivity, and record keeping.

[22] 2019 Avista Quick Facts
[23] Avista Transmission Vegetation Management Plan, see Addendum

Risk Evaluation

The relatively low risk of contact between vegetation and transmission lines reflects Avista's commitment to comply with NERC regulation FAC 003-4. Between 2014 and 2018, only 21 tree related outages were reported on the transmission system.[24] Though collecting digital data will improve our ability to identify both tree grow-in and fall-in risks, benefits extend beyond vegetation management and include the ability to automate the structure inspections, detect thermal hot-spots, and conduct field work audits.

ST-5: Transmission Digital Data Collection	2020-2029
Inherent Risk ($)	$9.6 - $17.7 Million
Managed Risk ($)	$0.9 - $2.4 Million
Risk Mitigation (average %)	88%
Total Operating Expense	$6.8 Million

ST-9 Conforming Transmission Rights-of-Way

Recommendation:	Widen transmission line rights-of-way in elevated fire risk areas (20% System)
Cost:	$500,000 Capital Investment ($5,000,000 total over 10 years)
Benefit:	Reduce interaction between vegetation and Avista's transmission facilities.

Typically, transmission line corridors are established via negotiations with private landowners and include a centerline description and specify width (e.g. 50-100 feet wide). Avista transmission lines have standard width requirements:

- 230 kV – 100 feet
- 115 kV H-frame (2 pole) – 60 feet
- 115 kV single pole – 50 feet

Although, variations exist in particular circumstances, standard corridor widths provide sufficient clearance between conductors and adjacent vegetation. However, some historic transmission line easements do not meet today's standards and elevate the risk of vegetation contacts. Likewise, transmission circuits located in public road rights-of-way do not necessarily allow Avista to manage vegetation on adjacent properties.

CDA-Rathdrum 115 kV along US Hwy 95

The photograph on the right shows a 115 kV line routed along US Highway 95 near Hayden, Idaho. Trees located on the adjacent property cannot be managed without

[24] Avista Outage Management System, 2014-2018 dataset

owner consent. By addressing these areas through easement acquisition, Avista reduces vegetation risks.

Risk Evaluation

At the time of this report, Avista has not conducted a complete inventory of corridor agreements. It is important to note that easements obtained prior to 1950 are generally 'non-width specific'. Although courts have interpreted these easements as conforming to current standards, the risk of disputes with adjacent landowners still exist. Likewise, circuits located on public road rights-of-way do not allow for vegetation management on adjacent properties.

While the cost-benefit ratio for this activity is relatively low, benefit calculations from the fire risk workshops did not take into account the ability to maintain and reconstruct facilities. Expanding corridor 'rights' drives benefits that go beyond the risk of wildfire.

ST-9: Conforming Transmission Rights-of-Way	2020-2029
Inherent Risk Exposure	$4.8 - $8.8 Million
Managed Risk Exposure	$0.2 - $1.4 Million
Risk Mitigation (average %)	88%
Total Capital Investment	$5 Million

ST-7 Fuel Reduction Partnerships

Recommendation:	Participate in annual fuel reduction efforts conducted by the local Fire Districts (e.g. Washington DNR, Idaho IDL)
Cost:	$167,000 Operating Expense ($1,500,000 total over 9 years)
Benefit:	Reduce fuel loading near operating facilities and strengthen working relationships with fire first responders.

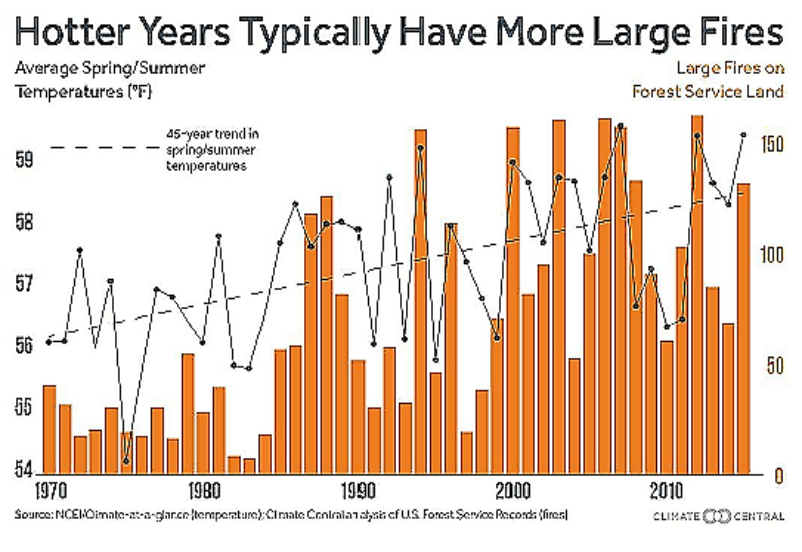
The Washington Department of Natural Resources (DNR) has embarked on a 20-year plan to improve forest health on 2.7 million acres of forest land in central and eastern Washington. As Hilary Franz, Washington Commissioner of Public Lands, states: ***"We have a forest health crisis in our state……. Hot, dry conditions coupled with diseased and dying forests are leading to explosive wildfires."***[25] In 2017, a record number of wildfires (1,850) cost Washington taxpayers over $150 million in suppression costs alone. Since 1970, both the number and size of wildfires has increased substantially. The United States Forest Service (USFS) estimates that large fires have tripled in number since 1970 and the length of the wildfire season is now 100 days longer.[26]

[25] Internet Website: dnr.wa.gov
[26] Climate Central, Western Wildfires, 2016

By partnering directly with fire protection agencies including the Washington Department of Natural Resources and the Idaho Department of Lands, Avista plans to work alongside forest thinning and brushing crews to remove excess fuels and to reduce the severity of future fires. Projects that remove fuels near critical infrastructure such as the Beacon Hill area (see photograph) are an opportunity to both reduce fire risk and to strengthen relationships between Avista and fire protection personnel. Over the course of Plan development, Avista has met with several fire protection agencies and a recurring theme has emerged: *It is important that Avista operating personnel maintain strong working relationships with local and state fire agencies*. This Plan contains opportunities to strengthen those relationships through joint training and simulation exercises, joint efforts to promote fire-adapted communities, and through fuel reduction projects.

In 2018, a fire erupted on Beacon Hill near Avista's main office building and threatened several transmission circuits. Residents were evacuated as the fire spread to over 100 acres. Over 50 fire engines responded to the blaze.

The following graph illustrates the correlation between hotter summers and large fires on federal lands.



IN IDAHO, THE NUMBER OF LARGE FIRES ON FEDERAL LANDS HAS INCREASED FROM 10 (1970) TO OVER 30 PER YEAR.

IN 2009, OVER 1.5 MILLION ACRES OF FEDERAL LANDS WERE IMPACTED BY WILDFIRES IN IDAHO.

While Federal and State efforts to improve forest health involve widespread thinning and prescribed burns, Avista's approach will target areas adjacent to critical infrastructure and be performed in conjunction with local fire districts. Recent work with local fire districts, together with the Idaho Department of Lands and Washington DNR, have already identified several potential projects.

Risk Evaluation

While Avista cannot reasonably marshal resources to impact forest health on a landscape level, it can support local efforts to conduct mechanical thinning and prescribed burns. Avista plans to invest $150,000 annually to assist with local efforts to reduce fuel loading.

ST-7: Fuel Reduction Partnerships	2020-2029
Inherent Risk Exposure	$15 - $29 Million
Managed Risk Exposure	$3 - $29 Million
Risk Mitigation (average %)	27%
Total Operating Expense	$1.5 Million

D-4 Incorporating Vegetation Management into Distribution Designs

Recommendation:	Incorporate vegetation clearing into distribution design packages (addition to work process)
Cost:	$10,000 capital labor ($100,000 total over 10 years)
Benefit:	Reduce interaction of vegetation with Avista's distribution facilities.

During the Avista Wildfire Risk Workshops, participants cited examples of electric distribution designs in conflict with existing vegetation. By incorporating vegetation treatment into the design process, potential conflicts are addressed prior to construction. This is largely a training exercise for the Construction Project Coordinator (CPC) department, but does add to the overall design effort and requires coordination between construction and vegetation management functions.

Risk Evaluation

D-4: Incorporating Vegetation Management into Distribution Designs	2020-2029
Inherent Risk Exposure	$20 - $278 Million
Managed Risk Exposure	$10 - $21 Million
Risk Mitigation (average %)	90%
Total Capital Investment	$100,000

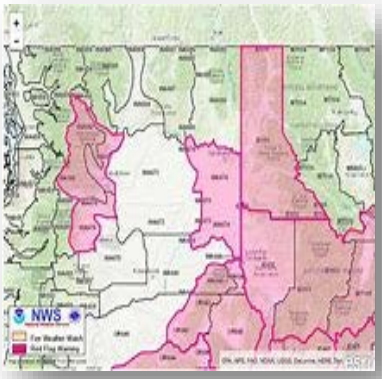
Situational Awareness

The ability to monitor and control electric transmission and distribution equipment is critical when responding to wildfires. This effort will leverage existing systems including Transmission SCADA (supervisory control and data acquisition), Distribution DMS (distribution management system), and AMI (automated meter infrastructure or "smart meters"). These systems are known technologies and offer scalable opportunities to enhance wildfire resiliency.

In addition to leveraging existing systems, Avista will develop a "Fire-Weather" dashboard, combining elements of weather forecasting and fire threat assessment. This computerized system will help system operators, district managers, and area engineers make informed decisions related to fire risk potential and estimated fire impact spread & severity.

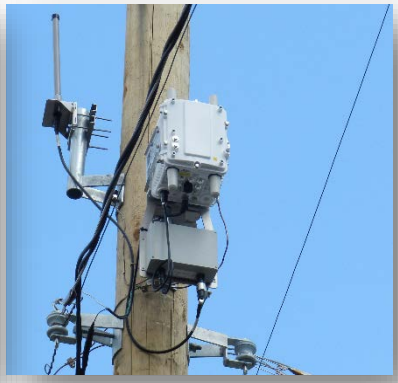
Avista's Wildfire situational awareness plan consists of three elements:

- Fire-Weather Dashboard
- Substation Supervisory Control & Data Acquisition (SCADA)
- Distribution Midline Equipment Communications



Fire-Weather Dashboard

Substation SCADA



Midline Communications

The 10-year cost to fully implement these treatments is $19 million dollars and may mitigate the current state categorical risk by as much as 98%. A summary forecast of costs and risks are shown below.

Situational Awareness	2020-2029
Inherent Risk Exposure	$151 – $585 Million
Managed Risk Exposure	$5 - $7 Million
Risk Mitigation (average %)	98%
Operating Expense 2020-2029	$1 Million
Capital Investment 2020-2029	$18 Million

D-15 Substation SCADA

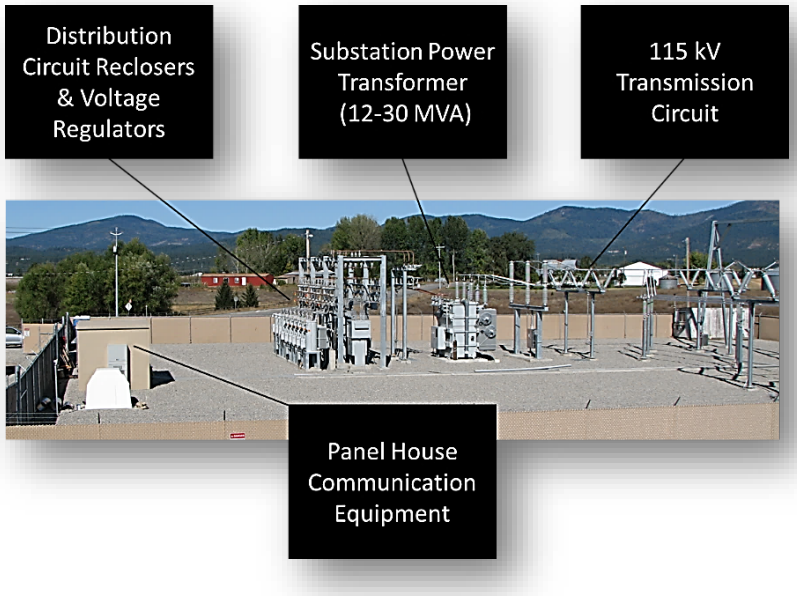
Recommendation:	To retrofit supervisory control and data acquisition systems (SCADA) into elevated fire risk area substations (40% Distribution System).
Cost:	$2,000,000 Capital Investment ($17,000,000 total over 10 years) $9,700 Operating Expense ($97,000 total over 10 years)
Benefit:	Provide ability to adjust protection equipment based on the imminent fire risk and weather conditions.

33 Avista Substations are not currently equipped with control and monitoring systems (SCADA)

Supervisory Control and Data Acquisition systems or SCADA, are used in many industries to monitor and control manufacturing plants, national defense systems, and utility infrastructure, including generation plant and transmission circuit infrastructure. These systems, originally deployed in the late 1960's and early 1970's, have matured to current 'fourth generation' web-based systems. Avista operates approximately 176 substations, ranging from very large, 500 MVA 230-115 kV transmission stations, to small, rural distribution stations. While Avista's transmission system is fully SCADA integrated, a number of distribution stations are not equipped with remote monitoring and control systems. A majority of these rural stations are located in elevated fire risk areas.

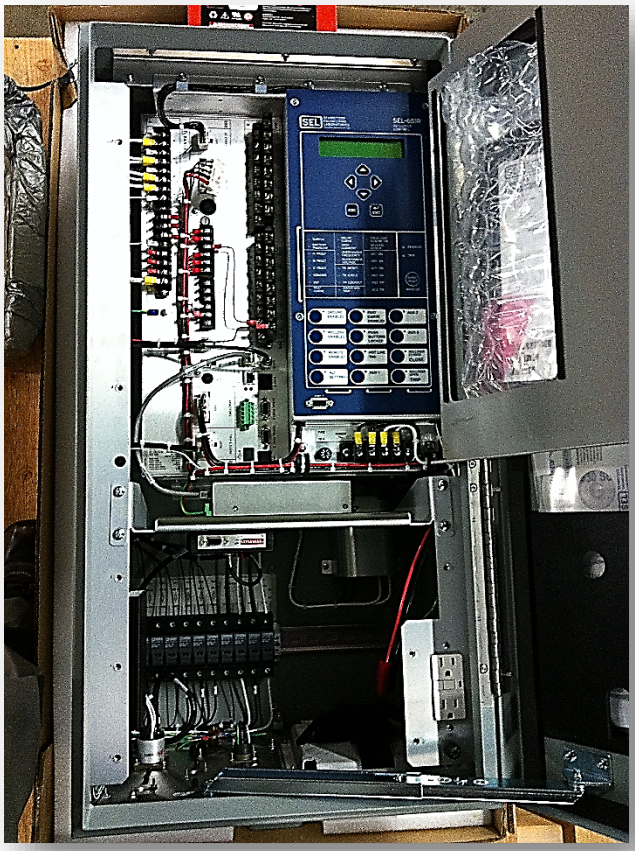
Avista operates 33 substations without SCADA. These stations are effectively 'dark', without any remote sensing, monitoring, or equipment control systems. Though substations are designed to operate autonomously, the inability to adjust protection systems based on weather conditions or de-energize electrical circuits in an emergency elevates the safety risk for emergency first responders.

One of the elements of Avista's strategy is to align circuit protection schemes with fire threat conditions (see Dry Land Mode). During the fire season, Avista operates a number of distribution lines in non-reclosing mode, which reduces fault energy by 40-50%. However, weather forecasts that indicate high temperatures and high winds may warrant a more sensitive protection regime, such as Trip-Reclose-Trip, where circuit reclosers rely on instantaneous rather than time-delay tripping. This could reduce fault energy by as much as 70-80%.



By adding SCADA, system operators can issue instructions to recloser units and effect changes. Without these systems, servicemen must be dispatched to the substations to manually effect the

change. In a dynamic system, manual intervention is not practical and may lead to prolonged customer outages and elevated risk.



Circuit Recloser Relays

Modern circuit reclosers are controlled via microprocessor relays. In this photograph, a Schweitzer SEL-351R relay is being tested prior to installation. Equipment connected to communication systems (SCADA & DMS) are continuously monitored and capable of remote operation. This functionality is an important element in Avista's wildfire strategy.

Risk Evaluation

Avista plans to install SCADA at 33 substations based on their location within the Wildland Urban Interface. Elevated fire threat areas (Tier 2/3) would be prioritized over non-WUI and WUI Tier 1 areas.

D-15: Substation SCADA	2020-2029
Inherent Risk Exposure	$132 - $547 Million
Managed Risk Exposure	$0 - $1.6 Million
Risk Mitigation (average %)	100%
Total Operating Expense	$97,000
Total Capital Investment	$17 Million

D-12 Distribution Management System (DMS) Communication

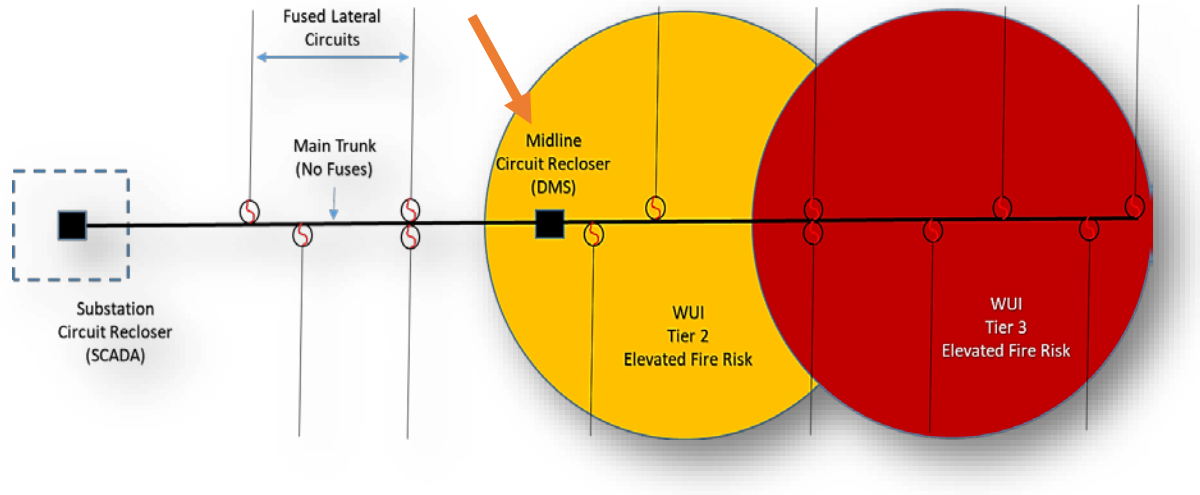
Recommendation:	To retrofit circuit reclosers with communication systems and enable control and monitoring of equipment in elevated fire threat areas (40% System).
Cost:	$60,000 Capital Investment ($540,000 total over 10 years)
	$30,000 Operating Expense ($272,000 total over 10 years)
Benefit:	Extending communications for circuit reclosers enables remote operation, and allows operators to align protection schemes with current fire threat conditions

As part of the 2010 Spokane and Pullman Smart Grid projects, Avista installed a Distribution Management System, or DMS, to collect data from circuit reclosers, voltage regulators, and capacitor banks. DMS is similar to SCADA, but is specific to distribution and can collect data from both substation and powerline devices. However, a number of circuit reclosers located in elevated fire risk areas lack communications and are not included in the DMS system. Extending communications to these devices is like the SCADA initiative and will enable remote monitoring and control of these devices.

Emergency first responders rely on Avista's ability to de-energize electric lines near wildfires

Electric Distribution Line Protection

Avista operates 7,600 miles of overhead distribution line and 40% of that system is located in elevated fire risk areas. This diagram indicates a typical distribution configuration, with a main trunk protected via circuit reclosers (substation and midline) and lateral circuits protected via fuse links. Circuit reclosers are similar to household breakers and operate (open) when fault overcurrent is detected. Faults that occur on lateral circuits are interrupted when a fuse link opens (thermal operation).
By adding communications to midline circuit reclosers, Avista adds monitoring and control functionality, including the ability to operate the device remotely.



Fuse Link Assembly Cutout

Midline Circuit Recloser

Risk Evaluation

Extending communications to circuit reclosers enables remote operation and allows operators to adapt protection schemes to align with current fire threat conditions. For example, Avista may install Hot Line Holds (one shot tripping, no automatic reclose) during red flag warnings. Reducing the potential for spark ignition is an important component of Avista's strategy and adapting system protection to fire threat conditions helps to achieve those goals.

D-12: DMS Communications	2020-2029
Inherent Risk Exposure	$14.6 - $29 Million
Managed Risk Exposure	$250,000 – 280,000
Risk Mitigation (average %)	99%
Total Operating Expense	$272,000
Total Capital Investment	$540,000

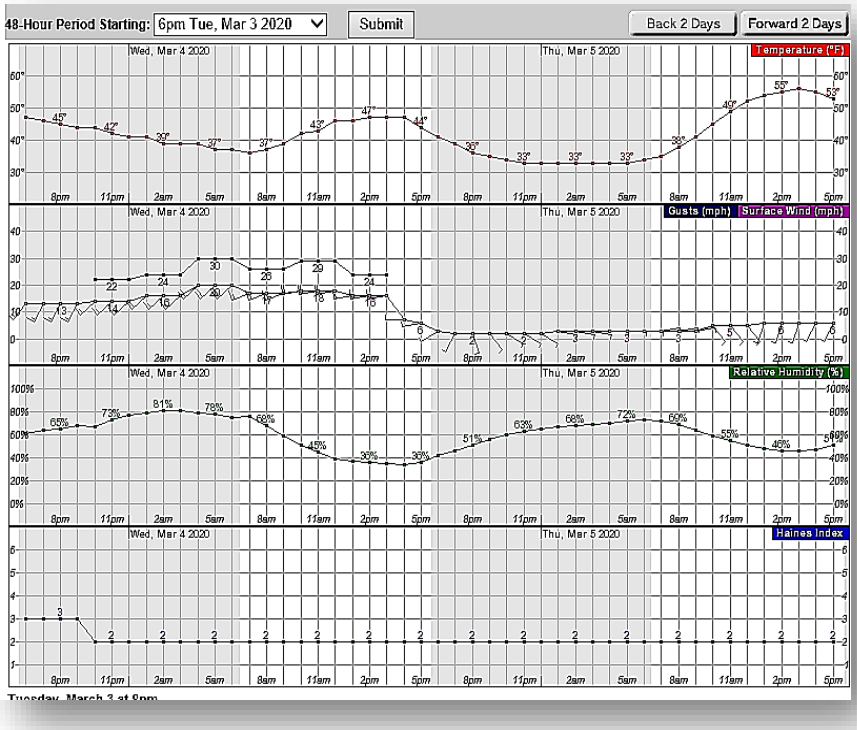
ST-2 Fire-Weather Dashboard

Recommendation:	Combine weather forecast and fire threat data into a fire predictive, web-based program.
Cost:	$150,000 Capital Investment ($425,000 total over 3 years)
	$75,000 Operating Expense ($650,000 total over 10 years)
Benefit:	Better understand and respond to the potential impact of weather conditions on Avista's operating system.

The Wildland Fire Assessment System (WFAS) operated by the USFS in Missoula, Montana, provides near real time information on fire threat conditions. This information is an important tool in determining both the probability and impact of wildfires.

Avista System Operations declared "Dry Land Operating Conditions" on July 23, 2019 based on data from the Wildland Fire Assessment System (WFAS).

The precision of weather forecasting and, especially, micro climate forecasting, has significantly improved over the last few decades. Advancements in forecasting, coupled with broadband communication has made weather information more available than ever before. Prevailing weather conditions, including temperature, humidity, and especially wind, are key factors in fire behavior. By combining fire threat information with forecasted weather, system planners, operators, and field personnel are better equipped to predict and respond to wildfires.



Data from the National Weather Service for Post Falls, Idaho (3/3/20). Temperature, humidity, and wind levels are important factors in predicting wildfires.

By combining information from the Wildland Fire Assessment System (WFAS) and the National Weather Service (NWS), Avista will be able to quantify fire risk by service territory. An example is shown below. *At the time of this report, a detailed scoping of the "Fire-Weather Dashboard" is not yet complete.*

July 16, 2020	48 Hour				96 hour			
Service Area	Temp F°	Wind mph	Fire Index	DLM	Temp	Wind	Fire Index	DLM
	Hi/Lo	Gust/Sust			Hi/Lo	Gust/Sust		
Sandpoint	82/54	12/4	M	NOM	95/78	52/22	EC	HLH
CDA	86/58	16/5	M	NOM	101/82	62/45	EC	HLH
Kellogg	80/50	12/5	H	NOM	92/68	51/20	EC	HLH
St. Maries	82/50	14/4	H	NOM	95/66	32/15	E	TRT
Lewiston	92/68	28/16	H	NOM	112/85	12/5	H	NOM
Grangeville	85/58	36/15	E	TRT	108/76	8/4	H	NOM
Colville	88/58	8/2	M	NOM	102/80	16/6	H	NOM
Deer Park	82/54	6/2	L	NOM	98/75	12/6	H	NOM
Spokane	86/54	4/2	M	NOM	99/74	16/9	H	NOM
Othello	88/62	12/2	M	NOM	100/78	5/2	M	NOM
Davenport	85/56	8/4	M	NOM	96/76	6/2	M	NOM
Pullman	78/55	22/14	H	NOM	95/69	12/8	H	NOM

*Legend: Fire Index (**L**ow, **M**oderate, **H**igh, **E**xtreme, **E**xtreme **C**atastrophic)*
Dry Land Mode (Nominal, Trip-Reclose-Trip, Hot-Line-Hold)

This is illustration indicates how fire threat indicators might be combined with weather forecasts to influence Avista's operating systems, such as Dry Land Mode. Other activities, including EOP pre-activation and staging first responders, may also be informed through this system.

Risk Evaluation

Developing a fire-weather dashboard will not reduce fire risk on a standalone basis, however, this information is vital to adapting operations and emergency response to the potential for wildfire.

ST-2: Fire-Weather Dashboard	2020-2029
Inherent Risk Exposure	$4.8 - $8.8 Million
Managed Risk Exposure	$4.3 - $4.8 Million
Risk Mitigation (average %)	33%
Total Operating Expense	$650,000
Total Capital Investment	$425,000

Operations & Emergency Response

The primary objective of Wildfire Resiliency is to reduce the number of utility involved ignition events and to minimize the damage of infrastructure due to wildfires. The bulk of that effort is rooted in long-term planning and implementation of methods to clear vegetation away from powerlines and to protect infrastructure from fire damage. Meeting these objectives requires a steadfast and committed approach to investing in the energy delivery system. Wildfires will continue to occur, and Wildfire Resiliency includes support elements such as first responder training, defining the role of engineering during major events, and establishing wildfire metrics.

Historically, Avista's response to wildfire has been similar to other large scale weather events, with a focus towards outage service restoration. Though major storms present employee and public safety challenges, wildfire is particularly acute with respect to safety. In addition to mitigating the risk of wildfire, Avista plans to:

1. Prioritize public and worker safety over customer restoration.
2. Recognize wildfire response as a shared responsibility with other emergency first responders.
3. Use performance metrics to adjust and align planned future actions.

Plan elements in this category include:

- Emergency Operating Program (EOP) document review & fire incident command representative
- Transmission design review of major events
- Wildfire performance metrics
- Emergency first responder training
- Expedited fire response (2020 pilot project)
- Comprehensive fuse coordination review
- Circuit recloser event reporting
- Fire ignition tracking system
- Fire suppression chemical additive
- Wildland urban interface layer in Avista's GIS data system
- ARCOS system wildfire notification operating procedure

The cost to align operating tactics with Wildfire Resiliency is $2.7 million over 10 years. However, this is projected to reduce risk exposure by several hundred million dollars.

Operations & Emergency Response	2020-2029
Inherent Risk Exposure (category %)	19.7-100
Managed Risk Exposure (category %)	5.3-23.4
Risk Mitigation (average %)	76%
Total Operating Expense	$2,378,000
Total Capital Investment	$300,000

Transmission & System Operations

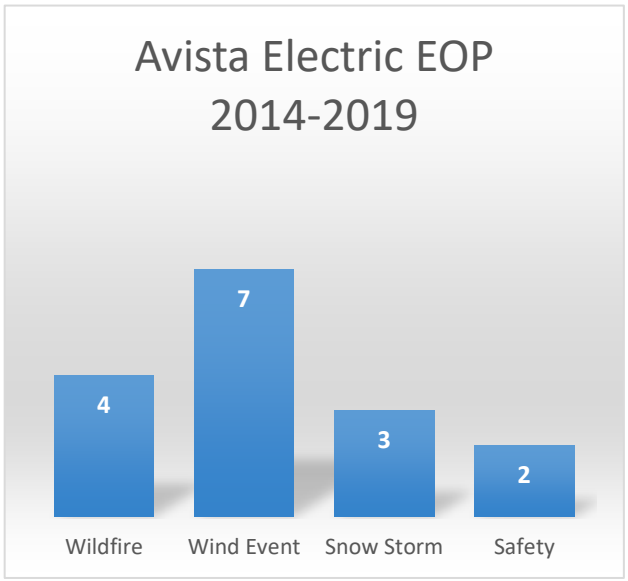
Recommendation:	ST-1 Formalize EOP response to large scale wildfire events ST- 3 Transmission engineering review after major events ST-4 Establish wildfire resiliency metrics ST-8 Conduct annual fire safety and electrical hazard training ST-11 Expedited fire district response following transmission line faults
Cost:	$160,000 Operating expense ($1,593,000 total over 10 years) $10,000 Capital investment ($100,000 total over 10 years)
Benefit:	Enhanced awareness and response to wildfire events.

Five treatments are described in this section which encompass the overall energy delivery operating environment. Those elements include:

- Emergency Operating Program Review & Fire Incident Command Representative
- Transmission Design Review of Major Events
- Wildfire Performance Metrics
- Emergency First Responder Training
- Expedited Fire Response (2020 Pilot Project)

ST-1 Emergency Operating Program (EOP)

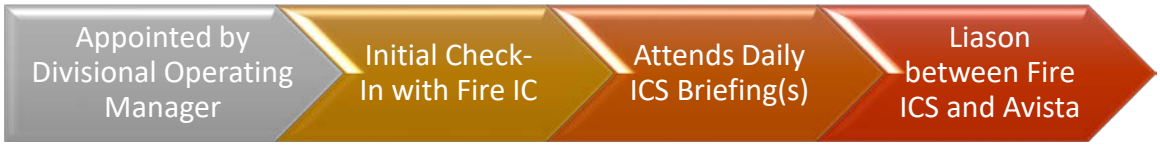
Since 2014, Avista has activated the electric EOP, or incident command structure, 16 times, including the Company's largest event, the windstorm in November of 2015. By declaring an EOP, Avista operations shifts to emergency response, with service restoration as the primary objective.



Wildfires present a number of safety related challenges. In August of 2015, Avista activated an EOP in response to numerous wildfires across the service territory. The largest of these fires was the Carpenter Road Fire near Davenport, Washington which impacted 64,000 acres and involved over 1,000 firefighters. Evacuation orders were issued for residents throughout the Springdale-Hunters area and approximately 42 structures were damaged or destroyed by the blaze. Though Avista has a long history of responding to wildfire events, it recognizes wildfire as separate and distinct from storm events. Therefore, Avista plans to implement the following changes to its EOP program:

1. **Conduct an EOP document review to align with Wildfire Resiliency**
2. **Formalize resource commitments to Fire Incident Command (Avista Fire Representative)**

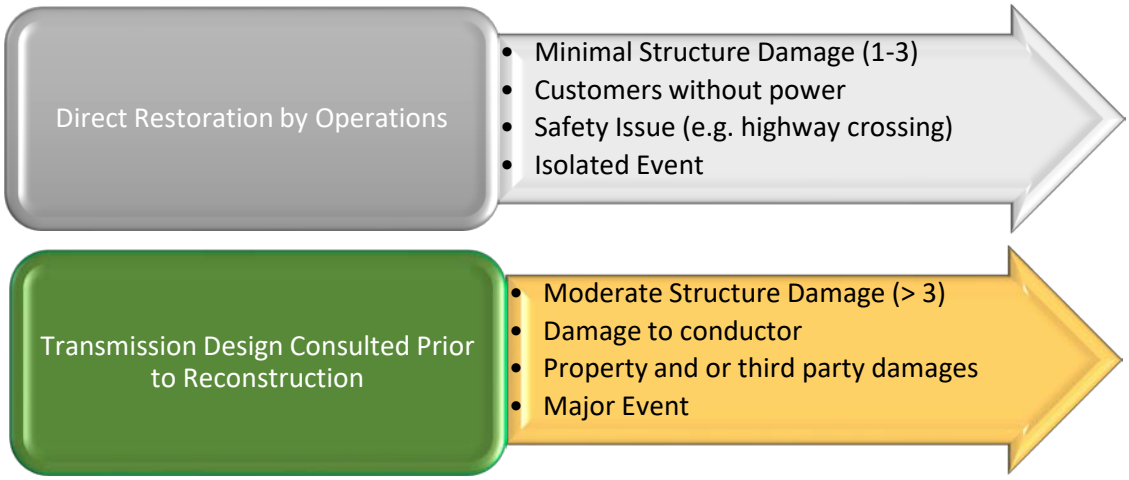
In most large wildfire situations, local response (city, county) is superseded by state and federal authorities. In Washington State, the Department of Natural Resources is responsible for most non-federal fire suppression, and in Idaho, the Department of Lands takes the lead. In either state, responses to fires larger than 100 acres triggers a Fire Incident Command Structure (ICS). While Avista has a long history of working closely with fire protection agencies, **divisional operations managers have committed to embed Avista field personnel into the Fire ICS**. A basic flow-process diagram is indicated below. The primary duty of the Avista representative is to serve as the liaison between the fire Incident Commander and Avista.



Embedding Avista Personnel into Fire Incident Command Structure

ST-3 Transmission Design's Role in Major Event Response

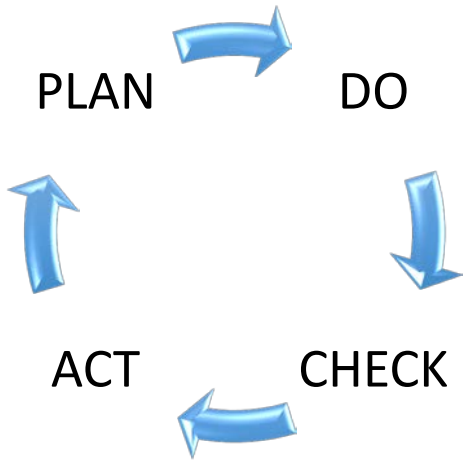
The reconstruction cost of overhead transmission lines ranges from $500,000 to over $1 million dollars per mile. This is in sharp contrast to electric distribution facilities which typically range from $150,000 - $250,000 per mile in rural areas. During the wildfire workshops, engineers and system operators estimated that wildfires impact transmission lines 2 to 4 times per year. Though electric operations is responsible for restoration, during large scale events, transmission design shall be consulted to conduct damage assessments prior to reconstruction.



ST-4 Wildfire Program Metrics

Electric reliability is determined through a series of metrics established by the Institute of Electrical and Electronics Engineers (IEEE), and includes outage frequency and duration. Indices such as MAIFI (momentary outage frequency), SAIDI (sustained outage duration), and CEMI (customers experiencing multiple interruptions) are commonplace throughout the industry. In contrast, fire metrics are characterized as the number of acres burned, suppression costs, structures damaged, and injuries. Though Avista does track some fire-related information, such as the number of pole fires, it does not have a systematic approach to quantify the effectiveness of wildfire resiliency measures.

It is recommended that Avista implement a set of performance measures to quantify and better understand the risk of wildfire on operating systems. The performance measures should allow for evaluation and continuous improvement.



The **Plan-Do-Check-Act** model is a continuous improvement technique also known as the Deming Circle or Shewhart Cycle. Establishing wildfire metrics partially fulfills the 'Check' component and drives adjustments to Plan strategies and tactics. Though the Plan must adapt to ever-changing climatic, social, and political influences, the objectives are clear: Emergency Readiness, Public Safety, and Financial Protection.

ST-8 Wildfire Training for Avista First Responders

Avista electric operations employees are located in 12 districts ranging from Colville to Grangeville and from Kellogg to Othello. Avista employs over 550 electric line workers who are trained as emergency first responders. As part of this Plan, divisional managers are responsible for conducting basic fire training at one of their monthly safety meetings. Where feasible, managers would involve a fire agency professional to conduct training in the April-May timeframe prior to start of fire season. Though there is consensus among division managers that Avista first responders should have basic firefighting and fire safety training, a core tenant of this Plan is to promote and strengthen relationships with fire agencies. By conducting joint training and emergency response simulations, Avista plans to support those key relationships.

ST-9 Expedited Fire Response

It is recommended that Avista implement expedited response for potential fire related disturbances on the transmission system.

Avista's outage management system (OMS) is used to track electric events on both the transmission and distribution networks. As noted, sustained distribution outages are 50 times more prevalent than transmission events. However, 80% of transmission events are characterized as momentary and generally involve the automatic reclosing of circuit breakers to restore power. Though distribution line faults may cause spark ignitions, distribution events generally involve Avista crew response. However, if a transmission line successfully trips and then recloses, no Avista response is triggered.

During the development of this Plan, Avista engaged fire agency professionals, including Washington DNR and Idaho IDL, together with Spokane County Fire Districts. It was through these conversations that the concept of **Expedited Fire Response** was developed. During dry land mode operations, Avista System Operator will initiate a 911 call whenever there is an isolated transmission fault. Subsequently, fire fighters will be dispatched to the scene.

At the time of this report, a Memorandum of Understanding (MOU) is under review with Spokane County Fire to conduct a 'pilot project' during the 2020 fire season. For purposes of the pilot, the program will extend only to the Spokane County boundaries, and will align with Avista's seasonal declaration of Dry Land Conditions (typical July-September).

Risk Evaluation

The following table summarizes the risks and estimated 10-year costs associated with the transmission system elements of wildfire operations and emergency response.

2020-2029 Risk & Costs (Transmission & System Operations)					
	Inherent Risk ($ Millions)	Managed Risk ($ Millions)	Risk Mitigation (%)	Capital Investment ($)	Operating Expense ($)
EOP & Fire ICS	$13.65	$13.65	0		$50,000
Engineering Design Review	$3.95	$1.65	58%	$100,000	
Wildfire Metrics	$13.8	$2.45	82%		$150,000
First Responder Training	$2.05	$0.6	71%		$1,300,000
Expedited Response	Not evaluated	--	--	--	$93,000
Total	**$33.5M**	**$18.3M**	**75%**	**$100,000**	**$1,593,000**

Electric Distribution Operations

Recommendation:	D-1 Conduct annual distribution fuse coordination assessment D-2 Evaluate circuit recloser event data to ensure nominal operation D-3 Track the number of powerline caused fire ignitions D-5 Add chemical additives to field crew 'water cans' D-7 Deploy the Wildland Urban Interface data-set to the GIS system D-9 Use ARCOS to notify key personnel in the event of wildfire
Cost:	$70,000 Capital Investment ($200,000 total over 3 years)
	$78,500 Operating expense ($785,000 total over 10 years)
Benefit:	Enhanced distribution operations and fire response.

Six elements are included in this section:

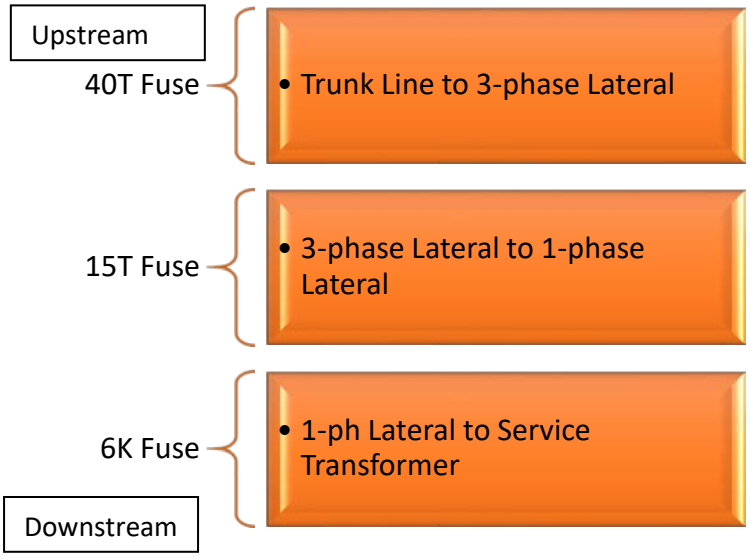
- Fuse Coordination Study
- Circuit Recloser Event Reporting
- Fire Ignition Tracking System
- Fire Suppression Water Additive
- WUI Layer in Avista GIS
- ARCOS Wildfire Notification System

As noted, electric distribution facilities account for 6,200 unplanned outages per year with a number of these events occurring during the fire season. Though the bulk of distribution risk reduction is associated with enhanced vegetation management and grid hardening, those treatments occur on a long term planning horizon. Elements described in this section inform the near-term operating horizon.

D-1 Fuse Coordination Study

It is recommenced that Avista ensure proper fuse sizing and coordination on an annual basis.

Fuses are an important element in the protection of electric distribution systems. Avista's distribution system is configured as a trunk and lateral system, with lateral circuits protected via fuse links and trunk lines protected via circuit reclosers. Avista's Area Engineers are accountable for ensuring that fuse sizes and types operate in a coordinated fashion. In simple terms, fuses closest to loads are smallest with increasing fuse size towards the trunk connection (see illustration).



D-2 Circuit Recloser Event Reporting

It is recommended to analyze recloser event reports to determine that protection systems are operating nominally.

Protection Engineering keeps a log of all transmission line circuit breaker operations and ensures that devices and relays are operating nominally. As communication systems become available to distribution devices, so does the ability to remotely access data from circuit reclosers. To ensure that reclosers are operating nominally and are coordinated with downstream fuse links, it is imperative that system events be analyzed by technical staff.

D-3 Fire Ignition Tracking System

It is recommended to implement a fire ignition tracking system to better understand and respond to fire events.

As noted, Avista's Outage Management System (OMS) is used to track electric outages, and includes information such as: tree fall-ins, car hit poles, wind, animal, underground cable, overhead equipment, and etc. ***Fire*** is listed as an outage category, but generally relates to structure fires. Also listed is ***Pole Fire***, which occurs when excessive electrical tracking leads to hot-spots between wood crossarms and poles. However, the OMS system does not include provisions for tracking outcomes beyond direct customer impacts (e.g. customer duration without power). Though still in development, Avista plans to extend mobile data collection devices (e.g. tablet computers) to field first responders. This would replace paper products, including Avista's damage response form. In order to determine if Wildfire Resiliency treatments are effective, it is important that utility involved fires are tracked by first responders.

Utility grade tablet computers are being deployed to conduct damage assessment and to document field repairs. This collection process will include provision to capture fire ignition events.

D-5 Fire Suppression Water Additive

It is recommended to use chemical additives in Avista fire suppression water cans to extend the efficacy of water blankets.

Electric line and vegetation field crews are often required to adhere to state and federal fire-related work restrictions. In many situations, field crews are required to spray their work area with water prior to activity. This helps prevent fire ignitions generated by spark emitting devices such as power drills and saws. Water evaporates rapidly during hot days, but there are a number of chemical additives that delay this process and extend the effectiveness of water blankets. The Fire Protection Research Foundation (www.nfpa.org/founation) conducted analysis in 2013 to determine the effectiveness of several chemical additives. By using one of the chemical additives, Avista plans to increase the effectiveness of water blankets and water based fire suppression tools.

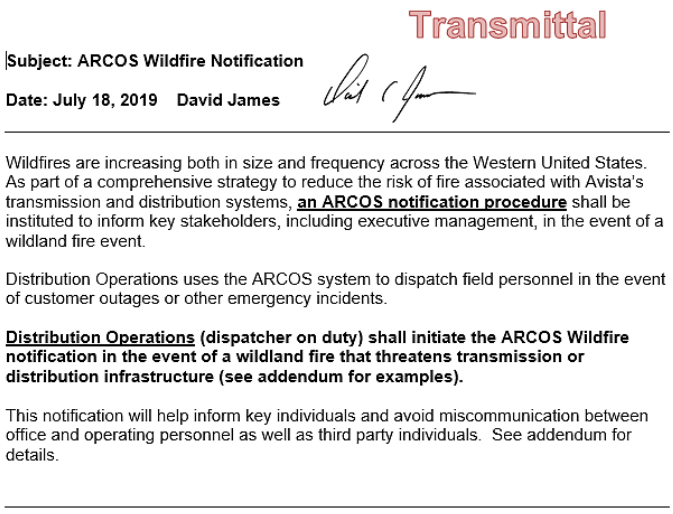
		Class A			
Product	UL Listed to NFPA 18	Structural	Wildland	Deep-Seated	Radiative Resistance
Biosolve		X			
Bioversal QF		X			
BlazeTamer			X		
Boldfoams		X			
Cold Fire	X	X			
Denko Emulsifier					
drench		X			
Emulsi Flash					
F-500	X	X		X	
First Class	X	X	X	X	
Fire Blockade	X	X			
Fire Cap Plus	X	X			
Fire Out!					
FireAde 2000	X	X			
FireIce			X		X
Flame Freeze		X			
Flameout	X	X			
Fomtec Foams		X			
Hi Combat A	X	X			X
Hydrex		X			X

D-7 WUI Layer in Avista GIS System

In September of 2019, Avista developed a Wildland Urban Interface map based on the USDA's 2018 Wildland Hazard Potential and Avista's distribution system. This map helps identify and prioritize the work required to clear vegetation hazards and to 'harden' electric lines. The WUI map was developed by Avista's GIS Technical Services group and as of this writing, the WUI map is being published to the Company's GIS applications. GIS Technical Services has the lead on this effort (see addendum D-7 Wildland Urban Interface for a more complete description).

D-9 Wildfire Notification System

In July of 2019, Avista Distribution Operations added provisions for wildfire notification to their ARCOS emergency call-out system. This system allows Distribution Operations to dispatch messaging to first responders and key stakeholders. The Wildfire Notification system sends SMS text messages and emails to a pre-determined list of recipients. The Wildfire Resiliency Plan manager is responsible for updating this list and coordination with the Distribution Operations Manager.



Transmittal

Subject: ARCOS Wildfire Notification

Date: July 18, 2019 David James

Wildfires are increasing both in size and frequency across the Western United States. As part of a comprehensive strategy to reduce the risk of fire associated with Avista's transmission and distribution systems, **an ARCOS notification procedure** shall be instituted to inform key stakeholders, including executive management, in the event of a wildland fire event.

Distribution Operations uses the ARCOS system to dispatch field personnel in the event of customer outages or other emergency incidents.

Distribution Operations (dispatcher on duty) shall initiate the ARCOS Wildfire notification in the event of a wildland fire that threatens transmission or distribution infrastructure (see addendum for examples).

This notification will help inform key individuals and avoid miscommunication between office and operating personnel as well as third party individuals. See addendum for details.

Risk Evaluation

The following table summarizes the risks and estimated 10-year costs associated with the electric distribution elements of wildfire operations and emergency response.

2020-2029 Risk & Costs (Electric Distribution Operations)					
	Inherent Risk ($ Millions)	Managed Risk ($ Millions)	Risk Mitigation (%)	Capital Investment ($)	Operating Expense ($)
Fuse Coordination	$74	$4.9	93%		$200,000
Recloser Event Reporting	$51.5	$4.85	91%		$400,000
Fire Ignition Tracking System	$339.5	$129.5	62%	$200,000	$100,000
Fire Suppression "Wetting" Agent	$317.5	$38.5	88%		$50,000
WUI Layer in GIS	Not evaluated	--	--	--	$30,000
ARCOS Wildfire Notification	Not evaluated	--	--	--	$5,000
Totals	**$783**	**$177.8**	**77%**	**$200,000**	**$785,000**

Conclusion

Summary of Risks, Benefits, and Costs

The risk and cost expenditures shown in the following table represent a 10-year planning horizon from 2020 to 2029. Note that the Plan includes both operating expense elements as well as capital improvements to infrastructure. Capital elements are planned to sunset after 2029 but the majority of the expense items are on-going and generally related to vegetation management.

While project/program cost estimates are normal and routine, assigning financial risk to these fire resiliency measures is new. Avista is committed to reducing the risk of wildfire by incorporating cost justified and prudent measures. Fire resiliency is an important element among many in determining capital and operating expenditures, and funds are not unlimited. It is not feasible to eliminate the fire risk to the electrical system.

The column labeled 'inherent risk' is based on the current state risk for each operating category and indicates the range of risk from optimistic (low) to pessimistic (high). The values are specific to each category with the high end of the range normalized to 100 basis points. The next column labeled as 'managed risk' indicates the risk reduction by adding wildfire resiliency defenses (future state). Note that defenses with a high confidence of success were selected and the cumulative impact of choosing 'the best of the best' is to drive the risk exposure downward. The column labeled 'risk mitigation' compares the midpoint of the inherent risk range to that of the managed risk range.

Wildfire Resiliency Risk Benefit and Cost Summary

2020-2029 Operating Horizon	Inherent Risk (range %)	Managed Risk (range %)	Risk Mitigation (%)	Capital Investment ($)	Operating Expense ($)
Grid Hardening & Dry Land Mode	41-100	0.7-2.7	98%	$245,600,000	$5,014,000
Enhanced Vegetation Management	48.3-100	3.2-4.5	88%	$5,100,000	$51,175,000
Situational Awareness	25.9-100	0.8-1.1	98%	$17,965,000	$1,019,000
Operations & Emergency Response	19.7-100	5.3-23.4	76%	$300,000	$2,378,000

Addendum

This version is printed without addendum materials. A full report version will be available later and will include the following supporting materials:

1. Wildland Urban Interface Map (WUI), November 2019
2. Wildfire Risk Summary, Proposed Actions, September 2019
3. Wildfire Resiliency Cost Plan, January 2020
4. Wildfire Resiliency Plan, Project Charter, March 2019
5. Standard Operating Procedures, internal memos, various dates
6. Transmission Vegetation Management Plan (NERC, TVMP)
7. Transmission Maintenance Inspection Plan (NERC, TMIP)
8. Distribution Vegetation Management Plan