BEFORE THE WASHINGTON UTILITIES AND TRANSPORTATION COMMISSION

DOCKET NO. UE-22_____

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REPRESENTING AVISTA CORPORATION

Avista Utilities
Wildfire Resiliency Plan

2022

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Contents

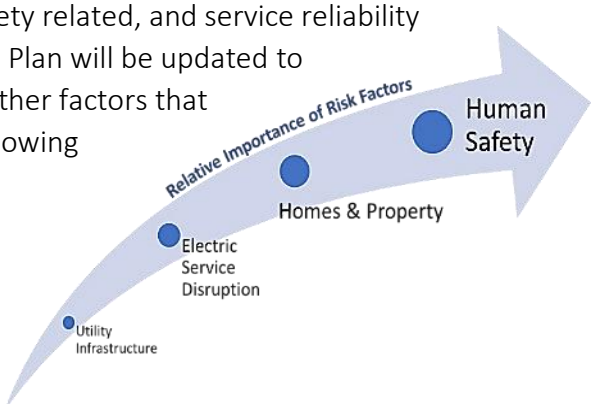
Executive Summary

Objective

This report details Avista's response to the increasing threat of wildfires now predominant throughout the western United States. The recommendations in 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 human lives, property, as well as utility infrastructure. These recommendations represent the first revision to Avista's original 2020 Wildfire Resiliency Plan (June 2020). The Plan will be periodically reviewed to ensure consistency with industry best practices, to update information, and to ensure that the associated work is continuing to provide 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 current environmental, political, financial, and other factors that influence those risks, but will always be focused on the following objectives:



- Protect human lives, physical assets, and property against the threat of wildland fires through the implementation of Plan programs and Company operations.
- Prepare and train for episodic wildfire events, ensure emergency preparedness, and align operating practices with fire threat conditions.
- Protect Avista's energy delivery infrastructure and mitigate the probability and consequence of direct financial and liability costs associated with large scale fire events.

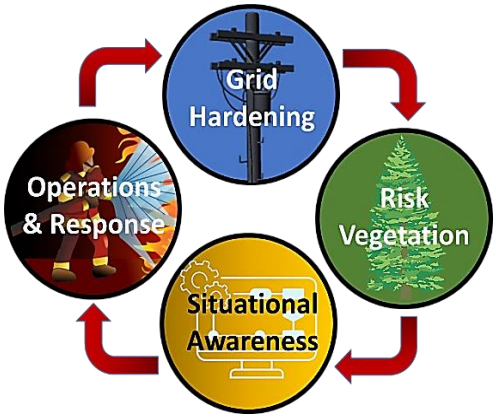
The recommendations contained in this Plan are based on the ability to reduce wildfire-related risk while considering impacts to customer service reliability and costs. The Wildfire Plan recommendations consider inherent risk (no defenses) and managed risk (with defenses), forecasted risk reductions, and investments needed to fund the programs necessary to achieve the Plan's objectives. Avista's Wildfire Program is expected to span a 10-year period from 2020 to 2029.

Plan Categories

Avista provides electrical service to over 396,000 customers across a 30,000 square mile service territory[1] that is quite diverse, including desert areas, croplands, heavily forested areas, along with cities and towns. Many customers live in elevated fire risk areas, otherwise known as the Wildland Urban Interface or "WUI Zones" which are the transition zones between forested and populated areas, basically, where the human-built environment meets the natural environment.[2] More than 87,000 Avista electric customers reside in WUI Zones 2 or 3 which is synonymous with 'high fire threat district'.[3] Approximately 40% of Avista's distribution and 20% of transmission lines are located in these zones. These customers and infrastructure elements are at greatest risk of catastrophic wildfires and thus are the focus of our mitigation efforts.

Wildfire Resiliency represents a departure from traditional utility strategies aligned with meeting customer demand (capacity) and maintaining service continuity (reliability). The goal of Avista's Wildfire Resiliency Plan is to reduce the likelihood of a wildfire caused by Avista's electric operations, reduce the risks associated with utility involved fires, and to lessen the degree and impact of electric system outages. The Plan mitigates wildfire risk through four categories:

1) Infrastructure Grid Hardening
2) Risk-Based Vegetation Management
3) Situational Awareness
4) Emergency Operations and Response



Each of these categories and their goals of reducing wildfire potential and impact will described in this report, including an update on the status of programs as well as budgets and plans for the 2022 fire season. *Note that 2021 comparison final numbers for this report will not be available until after the first of the year, at which time they will be updated.*

Wildfires Are Increasing in Size and Frequency

Why is this work so important? 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.[4]

[1] Avista 2021 Quick Facts, https://investor.avistacorp.com/static-files/c9d21691-a5eb-4273-b4b9-710d3fde5c29
[2] The U.S. Forest Service defines WUI areas as human developments that are within ½ a mile of natural resource and/or highly vegetated wildland areas. Housing density directly correlates to wildfire both because people cause fires and because structures intensify wildfire since they contain flammable materials and produce significant embers. The U.S. Department of the Interior states that as many as 90% of wildfires in the U.S. are caused by people. Source: "Facts + Statistics: Wildfires," Insurance Information Institute, https://www.iii.org/facts-statistics-wildfires
[3] This count is based on electric meters minus streetlights and area lights within each WUI zone, limited to WUI zones 2 and 3.
[4] "The Age of Western Wildfires," Climate Central, pages 2 & 3, https://www.climatecentral.org/wgts/wildfires/Wildfires2012.pdf

According to NASA's Earth Observatory, heat waves and drought as well as a century of fire suppression[5] and a rapid increase of human populations have combined to make large, destructive fires more likely. In fact, 9 of California's top 10 largest fires in history have occurred in the last five years; two of these fires burned over one million acres each.[6] About 3% of California's land surfaces burned between 1970-1980; from 2010-2020 that number increased to 11%.[7] NASA notes the following statistics:[8]

1. ***There are more fires*** (61% of fires in the western U.S. have occurred since 2000.)
2. ***Fires are larger*** (Since 1950 the number of acres burned per year has increased 600%.)
3. ***Actually, only a small percentage of the west has burned*** (Only 11% of western land mass has been impacted since 1950 though it seems like much more.)
4. ***The same areas keep burning*** (Almost a third of the burned land has seen repeated fire 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 forests.)
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.)

Persistent drought conditions, climate change leading to "fire-likely" weather patterns, lengthening fire seasons, and increased human development in fire prone areas have combined to make wildfire one of the most significant environmental threats in the western United States.[9] The Washington Utility and Transportation Commission (WUTC) specifically addressed the risk of wildfire in Avista's 2021 General Rate Case Order, stating: *"As we address each of the Parties' proposals concerning the wildfire issues presented in this case, we first must ask the most important question: are Avista's current and recent wildfire circumstances extraordinary? The answer is a resounding 'yes.'"*[10] Both the Washington and Idaho Utility Commissions endorse Avista's plan for meeting this challenge together with the programs proposed to reduce wildfire risk.[11]

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[5] For the last few decades, a policy of total fire suppression allowed unnaturally dense and overgrown forest stands, creating "ladder fires" that easily spread to treetops, which are the hottest, most intense, and most destructive type of fires. Source: NASA Earth Observatory, https://earthobservatory.nasa.gov/images/148913/a-multi-dimensional-fire-challenge

[6] Rosemary Izaguirre, "Worst Fires in California History: Dixie, Camp and More," Los Angeles Times, August 24, 2021, https://www.latimes.com/california/story/2021-08-24/worst-fires-in-california-history-dixie-camp-and-more and "What's Behind California's Surge of Large Fires?" NASA Earth Observatory, September 13, 2021, https://earthobservatory.nasa.gov/images/148908/whats-behind-californias-surge-of-large-fires

[7] "What's Behind California's Surge of Large Fires?" NASA Earth Observatory, September 13, 2021, https://earthobservatory.nasa.gov/images/148908/whats-behind-californias-surge-of-large-fires

[8] Kasha Patel, "Six Trends to Know About Fire Season in the Western U.S.," NASA Global Climate Change, December 2018, https://climate.nasa.gov/blog/2830/six-trends-to-know-about-fire-season-in-the-western-us/

[9] 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

[10] Washington Utilities & Transportation Commission, Dockets UE-200900, UG-200901, and UE-200894 (Consolidated) FINAL ORDER 08 / 05, page 81. https://www.utc.wa.gov/casedocket/2020/200900/docsets

[11] Washington Order UE-200900 UG-200901 UE-200894 - Final Order 08 05 - Avista.pdf, https://www.utc.wa.gov/casedocket/2020/200900/docsets. Idaho Order FINAL_ORDER_NO_34883.PDF, https://puc.idaho.gov/Fileroom/PublicFiles/ELEC/AVU/AVUE2005/OrdNotc/20201231Final_Order_No_34883.pdf

The Wildfire Resiliency Plan

Avista has long history of responding to adverse operating conditions including wildfires. This Plan incorporates that knowledge and experience to develop a model framework that balances risks, costs, and benefits. Collaboration in developing the strategies for the Plan extend beyond the expertise of Avista and include voices from the community: fire protection professionals, government regulators, utility peers, land-use agencies, professional service and material suppliers, and more. This broad-based input led to a wildfire strategy exhibiting a set of well-rounded, common-sense approaches that the Company is applying to both operating practices and on-the-ground treatments.

Activity	*Existing Program*	*Wildfire Program*
Transmission Steel Poles	Install steel poles to protect infrastructure	Replace wood with steel in high fire risk areas to reduce spark potential & protect infrastructure
Dry Land Mode	During fire season distribution lines DO NOT auto-reclose after a fault	Rather than a global effort, zero in on at-risk lines with levels of Dry Land Mode operations
Circuit Reclosers	Add as needed	Add a targeted number each year in elevated fire risk areas
Risk Tree	Dead and dying trees removed based on 1–3-year inspection cycle	Use digital data to automate identification of vegetation issues on a 1-year cycle
Emergency Response	Use existing Emergency Operating Procedures (EOP) for wildfires	Develop a wildfire-specific EOP and partner with outside agencies on response

Figure 1. Existing Programs & Wildfire Enhancements

The Plan leverages existing asset programs and builds upon operating experience. Many existing programs have demonstrated benefits related to reducing the risk of fire or in making the system more resilient, such as vegetation management and transmission steel pole replacements. Other programs are new to Avista, including LiDAR and satellite imaging to quantify vegetation risk, cross-training with fire professionals, and the development of a fire risk monitoring system known as the "Fire Weather Dashboard." All of the Wildfire programs, new or re-tooled, work in concert to provide a robust, prudent, and sensible approach to the wildfire issue. Though planned investments in utility infrastructure and vegetation maintenance represent the bulk of costs, human investments in training, partnerships, and engagement with customers are an important feature of Wildfire Resiliency. We believe that preparation and relationships, though difficult to quantify, add immense value and reduce risk.

Avista has a tradition of 'doing the right thing' for 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 commands a unified and holistic response.

Determining Risk

The recommendations in this report are based on their ability to reduce the operating and financial risks associated with wildfires. As noted, these are:

- **Financial** – the replacement cost of infrastructure (direct) and third-party claims for property damage, timber loss, and fire suppression (indirect).
- **Safety** – the cost of injuries associated with Avista employees or the public.
- **Reliability** – the cost associated with service disruption based on the Department of Energy's Interruption Cost Estimator (ICE).[12]

Precise identification of the risk-cost of any given year is not realistic, and for wildfires, there is a significant difference between small fires which may occur many times each season versus a large-scale event which may only occur once every few years or less. Therefore, in order to represent a realistic picture of relative risks and costs, the monetized risk and cost expenditures for Wildfire are spread across a 10-year planning horizon. Note that the Plan includes both maintenance operating expenses as well as capital investment to infrastructure. Capital investments are projected to sunset in 10-years, but the majority of maintenance elements will be on-going and largely related to vegetation management.

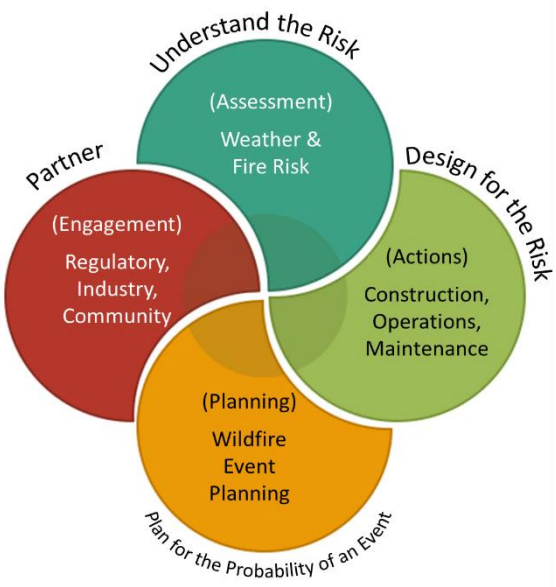
Avista used the following model framework to assess the risk of wildfire:

Understand the Risk – Combine system performance data with fire threat and weather conditions to yield a 'fire risk potential' metric.

Design for the Risk – Adapt transmission & distribution materials and construction standards to minimize the potential for spark-ignition.

Plan for an Event – Prepare field and office support staff as well as key partners through collaboration, training, and information sharing.

Partner with others – Partner with fire protection agencies and customers to reduce fuel loadings near homes and powerlines.



While program and infrastructure cost estimates are routine, the monetization of risk or 'risk cost' is a relatively new concept. In simple terms, risk is the product of:

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

[12] The Interruption Cost Estimate (ICE) Calculator is a tool designed for electric reliability planners at utilities, government organizations or other entities that are interested in estimating interruption costs and/or the benefits associated with reliability improvements. Utilities are provided a tool to apply these costs to their own customer base. https://www.icecalculator.com/home

In order to estimate these risk-cost values, Avista convened a series of Wildfire Workshops in May of 2019. Six workshops were held over a 15-day period involving over 30 participants. This effort resulted in a summarized (Table 1) as well as individual Risk Summary Tables (example shown in Table 2). These tables indicate "**existing risk**," which describes the existing risk level without defenses and "**managed risk**," which describes a future state risk with defenses in place.

During the Workshops participants assigned impact and risk scores to each potential element based on performance data and expected benefits. For example, consider the existing monetized risk associated with utility pole fires:

2020-2029 Operating Horizon	Existing Risk ($ Millions)	Managed Risk ($ Millions)	Capital Investment ($)	Operating Expense ($)
Grid Hardening	$1,383 - $3,372	$23 - $91	$246,174,759	$6,862,372
Enhanced Vegetation Management	$6,244-$12,923	$412 - $1,872	$0	$59,069,317
Situational Awareness & Dry Land Mode Operations	$151 - $585	$5 - $7	$35,703,680	$675,000
Operations & Emergency Response	$269 - $1,363	$73 - $319	$2,510	$0
Totals	$8,048 - $18,242	$512 - $2,289	$281,880,949	$66,606,689

Table 1. Wildfire Program Summarized Risk Reductions

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*

Table 2. Risk/Impact Determination Table for Pole Fires

This table is provided for illustration purposes only. Note that uncertainty is managed by using pessimistic (worst case) and optimistic (best case) projections for event likelihood and impact. Forecasting risk is not an exact science and whenever possible, Avista developed a range of expected outcomes and benefits.

Cost Forecasting

Avista is committed to reducing the risk of wildfire by deploying cost justified and prudent measures. Wildfire risk is an enterprise-level initiative among many others when allocating capital and operating budgets. In response, Avista pledges to make the Wildfire Plan goals reasonable and as cost-effective as possible based on the best data and science available.

The table below indicates actual expenditures for 2020 and 2021 (to date), and budget level projections for 2022 to 2029. This table includes projected costs over the ten-year period and will be updated regularly as information becomes available. *Note that these are not the final numbers for 2021. Those will not be available until mid-January when this report will be updated.*

Wildfire Resiliency over the 10-year operating horizon reflects a capital investment of $282 million with a corollary operating expense cost estimated at nearly $67 million dollars.[13] The largest capital investments over the 10-year period are associated with grid hardening and the risk-based vegetation management program. While capital plan elements are projected to decline significantly in ten years, after which most of these programs will sunset, the majority of operating expenses are ongoing and are generally related to vegetation management. Both capital and operating expense levels are expected to flatten by 2025 and remain so during the balance of the ten-year period.

AVISTA WILDFIRE PLAN PROGRAMS	*Actual*	*Expected*	*Projected*								*10-Yr. Total*
	2020	2021	2022	2023	2024	2025	2026	2027	2028	2029	Total
Capital											
Grid Hardening	$3,189,759	$17,150,000	$22,795,000	$25,350,000	$27,350,000	$29,720,000	$29,720,000	$30,300,000	$30,300,000	$30,300,000	$246,174,759
Situational Awareness	$228,680	$1,675,000	$2,250,000	$2,150,000	$3,650,000	$5,150,000	$5,150,000	$5,150,000	$5,150,000	$5,150,000	$35,703,680
Operations & Response	$2,510	$0	$0	$0	$0	$0	$0	$0	$0	$0	$2,510
TOTAL CAPITAL	***$3,420,949***	***$18,825,000***	***$25,045,000***	***$27,500,000***	***$31,000,000***	***$34,870,000***	***$34,870,000***	***$35,450,000***	***$35,450,000***	***$35,450,000***	***$281,880,949***
O&M											
Grid Hardening	$315,372	$947,000	$700,000	$700,000	$700,000	$700,000	$700,000	$700,000	$700,000	$700,000	$6,862,372
Risk Vegetation Management	$1,789,817	$4,350,000	$6,985,000	$7,134,500	$7,385,000	$6,535,000	$6,535,000	$6,285,000	$6,085,000	$5,985,000	$59,069,317
Situational Awareness	$0	$0	$150,000	$75,000	$75,000	$75,000	$75,000	$75,000	$75,000	$75,000	$675,000
TOTAL O&M	***$2,105,189***	***$5,297,000***	***$7,835,000***	***$7,909,500***	***$8,160,000***	***$7,310,000***	***$7,310,000***	***$7,060,000***	***$6,860,000***	***$6,760,000***	***$66,606,689***
TOTAL	***$5,526,138***	***$24,122,000***	***$32,880,000***	***$35,409,500***	***$39,160,000***	***$42,180,000***	***$42,180,000***	***$42,510,000***	***$42,310,000***	***$42,210,000***	***$348,487,638***

Table 3. Wildfire Programs Actual Expenditures and Budget

[13] All operating expenses provided in this report reflect incremental amounts above existing expense levels and are specific to the wildfire resiliency plan.

Infrastructure Grid Hardening

The single largest capital investment in the Wildfire Plan is grid hardening of the electric system, whose primary goal is to reduce the number of spark ignition events and to make the system more resilient to the impacts of wildfire. Grid hardening programs are key to protecting customers and as well as the electric transmission and distribution systems.

GRID HARDENING	Actual	Expected	Projected								10-Yr. Total
	2020	2021	2022	2023	2024	2025	2026	2027	2028	2029	Total
Capital											
Distribution Hardening	$3,114,920	$11,075,000	$18,595,000	$21,150,000	$23,150,000	$25,520,000	$25,520,000	$26,100,000	$26,100,000	$26,100,000	$206,424,920
Trans. Grid Hardening Steel Conversion	$73,567	$6,000,000	$4,000,000	$4,000,000	$4,000,000	$4,000,000	$4,000,000	$4,000,000	$4,000,000	$4,000,000	$38,073,567
Transmission Inspection/Construction	$1,272	$75,000	$200,000	$200,000	$200,000	$200,000	$200,000	$200,000	$200,000	$200,000	$1,676,272
TOTAL CAPITAL	***$3,189,759***	***$17,150,000***	***$22,795,000***	***$25,350,000***	***$27,350,000***	***$29,720,000***	***$29,720,000***	***$30,300,000***	***$30,300,000***	***$30,300,000***	***$246,174,759***
O&M											
Wood Pole Fire Resistant Mesh Wrap	$178,000	$617,000	$550,000	$550,000	$550,000	$550,000	$550,000	$550,000	$550,000	$550,000	$5,195,000
Transmission Inspection/Construction	$137,372	$330,000	$150,000	$150,000	$150,000	$150,000	$150,000	$150,000	$150,000	$150,000	$1,667,372
TOTAL O&M	***$315,372***	***$947,000***	***$700,000***	***$700,000***	***$700,000***	***$700,000***	***$700,000***	***$700,000***	***$700,000***	***$700,000***	***$6,862,372***
TOTAL	***$3,505,131***	***$18,097,000***	***$23,495,000***	***$26,050,000***	***$28,050,000***	***$30,420,000***	***$30,420,000***	***$31,000,000***	***$31,000,000***	***$31,000,000***	***$253,037,131***
Notes:	** Steel conversion dollars based on 17% of transmission in WUI risk red/orange and 25k/structure 230 and 15k/structure 115.*										
	** Transmission Inspection budget includes follow-up work.*										
	** Genic fire mesh $90/pole (assume H-frame $500/structure 500 structures/year - 8 structure/miles - 62.5 miles/year)*										

Table 4. Wildfire Program Grid Hardening Actual Expenditures and Budget

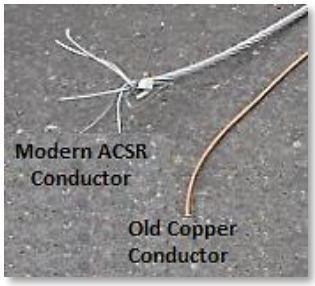
The primary activities included in the Grid Hardening strategy are:

- *Distribution Infrastructure Upgrades*
- *Conversion of Transmission Wood to Steel Poles*
- *Fire Resistant Wood Pole Wraps*
- *Transmission Inspections*

Distribution Infrastructure Upgrades/Grid Hardening. Distribution grid hardening represents the single largest capital investment in the Plan. The Distribution Grid Hardening program targets portions of circuits located in high risk fire areas with the goal of reducing spark ignition outages. Though Avista has well-established programs to replace poles and equipment, existing programs are condition-based and support reliability objectives. The Wildfire Plan's Distribution Grid Hardening program takes a holistic approach, targeting portions of circuits located in high risk fire areas. Pole fires, together with equipment failures which can lead to spark-ignition events, can be mitigated through:

- Replacing wood crossarms with fiberglass (to prevent pole fires)
- Changing out obsolete small copper wire with modern steel-reinforced aluminum wire

Fiberglass Crossarm



Many of Avista's copper wire conductors are between 80-100 years old

- Installing wildlife guards to reduce animal related events
- Replacing obsolete equipment and devices (e.g. lightning arrestors and fuses)
- Replacing end-of-life poles (at times with steel)
- Eliminating open wire secondary districts
- Swapping 'high value' wood poles for steel (prevents burn down damage)[14]
- Installing wedge connected stirrups[15] to provide protection and additional strength at hot tap connection points
- Undergrounding facilities on a case-by-case basis when cost-justified.

In the early 2000's Avista, like the many utilities, began installing fiberglass crossarms to replace wood units. This change virtually eliminated pole fires by removing the wood to wood contact between the support arm (crossarm) and the wood pole. This contact point channels electrical 'leakage' current, and under the right environmental conditions, sufficient channeling of leakage current can lead to spontaneous pole combustion.[16] Though not electrically rated, fiberglass crossarms are inherently a high impedance material and limit leakage current. They do not rot or decay over time, and are much lighter while being up to six times stronger than wood.[17] In addition, fiberglass crossarms are inherently self-extinguishing, so perform well in fire situations.[18] **Avista has never experienced a pole fire with a fiberglass crossarm**.

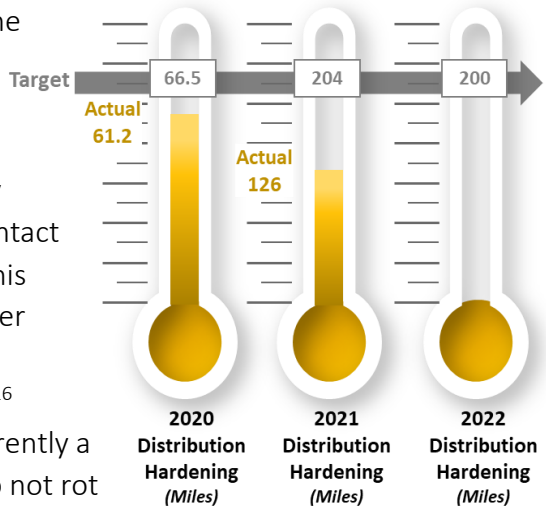


Figure 2. Distribution Grid Hardening Work Through November 2021

Issue	5-Yr. Average (# per year)
Pole Fires	75.4
Crossarm Failures	18.4
Primary Conductor Failure	144.8
Secondary Conductor Failure	179
Birds and Animals	582.4

Table 5. 5-Year Average Outage Rate

Table 5 indicates the annual average rate of grid hardening-related outages over the last five years (2016-2020). It is these

[14] At Avista, Distribution typically uses steel poles in "high value" locations such as high-volume traffic areas, railroad, highway, and river crossings, at hard angles, or if access for maintenance is particularly difficult.
[15] The traditional hot line tap is attached via a bolt. Over time this type of connection can come loose and arc and spark and can melt through the conductor, dropping it to the ground. The wedge connected stirrup device prevents the hot tap from being directly connected to the conductor, reducing spark potential, and the stirrup attaches in such a way that if the connection loosens and if the stirrup melts, the conductor is still intact and does not fall to the ground.
[16] John Lauletta, "The Industry's Most Definitive Pole Fire Fact Sheet," https://www.exacterinc.com/resources/uploaded/Brochures/Exacter%20Pole%20Fire%20Fact%20Sheet%20Final.pdf
[17] Terry Shank, "Fiberglass Crossarms as the Wood Alternative: More than the Simple Reasons," June 5, 2020, https://www.creativecompositesgroup.com/blog/fiberglass-crossarms-as-the-wood-alternative-more-than-the-simple-reasons
[18] Megan Headley, "Utilities Ready to Invest in FRP Solutions," March 5, 2020, http://compositesmanufacturingmagazine.com/2020/03/utilities-ready-to-invest-in-frp-solutions/

non-weather, controllable events that are the focus of grid hardening, as each incident represents a potential spark-ignition event.

Steel Transmission Pole Conversion. Avista has systematically replaced wood transmission poles with tubular steel since 2006 on an age and condition basis as well as for new construction projects. As part of the Wildfire Plan, this conversion practice is focused on making the transmission system more resilient to the impacts of wildfire in high fire threat areas.

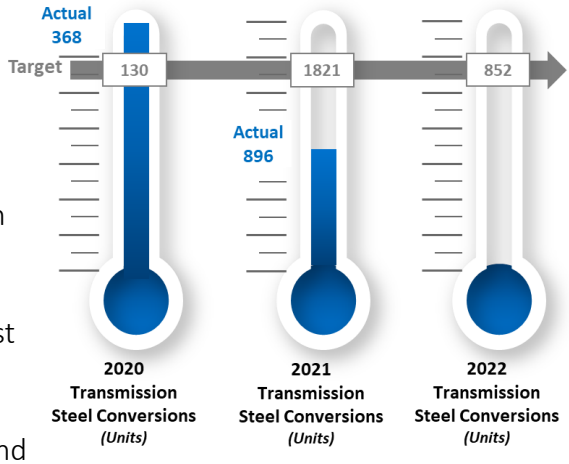


Figure 3. Transmission Steel Pole Conversion Work Through November 2021

Initially, in order to quantify the portions of the transmission grid most at risk, the areas identified by Avista's WUI map were focused on. This year Avista is factoring in additional information related to recurrence, extent, and impact of past fires. Fire occurrence data is available from the Monitoring Trends in Burn Severity (MTBS)[19] and is managed by the Earth Resources Observation and Science Center (EROS)[20] and the USDA Forest Service Geospatial Technology and Applications Center (GTAC).[21] This data includes locations, fire perimeters, acreage, start date, and fire type for all fires over 1,000 acres between 1984 and 2018. Fire data for 2019 and 2020 was unavailable from MTBS so was obtained from the National Interagency Fire Center (NIFC).[22]

Avista used the MTBS and NIFC fire maps to assess previous impact zones on the transmission grid. This allowed analysts to better understand the impact of historic fires and which specific segments of transmission infrastructure are most vulnerable.[23] In short, it created the road map for focusing the wood to steel pole conversion efforts on areas of the system m ost at risk.

Transmission Wood Pole Fire Mesh Wrap. In grassland and low vegetation areas, Avista has historically used a fire-resistant paint to protect the base of poles from fire. However, starting in 2020, we transitioned to a new fire-resistant mesh product which has a much longer

Fire resistant paint tends to crack or peel after about 5 years, so the Company is moving to wire mesh wrap.

Fire mesh can last more than 20 years and requires no maintenance.

[19] https://www.usgs.gov/centers/eros/science/monitoring-trends-burn-severity?qt-science_center_objects=0#qt-science_center_objects
[20] EROS studies land change based on millions of satellite images it collects. https://www.usgs.gov/centers/eros
[21] GTAC provides maps of forest service land, insect and disease areas, landscape change, and more. Combined with the EROS satellite images, it creates a comprehensive data source related to monitoring trends in fires, active fire mapping, and predictive services. https://www.fs.usda.gov/about-agency/gtac
[22] https://data-nifc.opendata.arcgis.com/datasets/nifc::wfigs-wildland-fire-perimeters-full-history/about
[23] Some of our lines experience fairly frequent wildfire activity, which is known through "tribal knowledge" but has never been statistically tracked or evaluated before.

life compared to fire resistant paint. In Avista's experience, the paint lasts 3-5 years as compared to the 15-20 year expected life of the fire-resistant mesh.[24] These pole wraps will be used in areas prone to grassland or sage-shrub fires.[25]

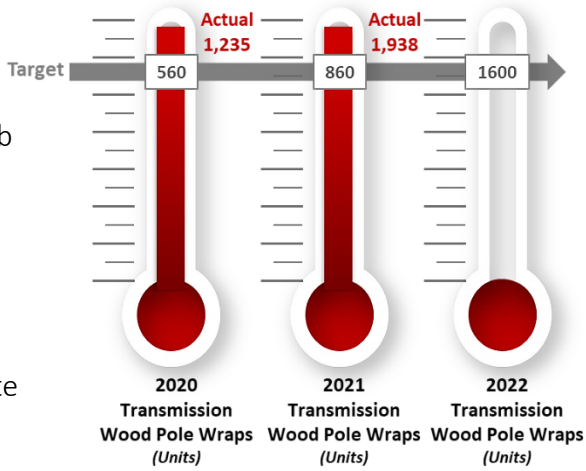


Figure 4. Wood Pole Fire Mesh Wrap Work

Transmission Inspections. Avista's Transmission Engineering Department has conducted annual aerial and ground inspections for many years, as required by NERC regulations.[26] Avista is leveraging that experience to mitigate against potential spark-ignition events. In 2020, Avista conducted detailed inspections of all lattice-type steel structures to identify both structural and electrical defects that might result in a spark-ignition incident. In 2021, the focus turned towards close inspection of conductor splices on specific 230 kV lines. By supplementing aerial and ground patrols with additional fire-focused inspections such as thermal imaging, high resolution photography and direct electrical testing, Avista is better able to identify potential fire hazards.

Risk-Based Vegetation Management

Effective 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 reliability and a reduction in outages. Avista has a long history of using the best science with respect to vegetation management including deploying tree growth inhibitors, using herbicides, together with cycle-based trimming and hazard tree removals. However, the increasing risks associated with wildfire demand even more attention and resource commitment to vegetation.

Avista currently performs routine annual vegetation management that consists of cycle trimming and risk tree inspections. Note that Avista's definition of "risk tree" is a tree with the potential of imminent fall-in hazard to energized facilities. Historically this work was conducted in tandem with one line clearance contractor using a five-year cycle focused on about 1,500 miles (20% of the system) each year. In 2020 the program was separated into two distinct programs, with routine maintenance (cycle trimming) remaining in the general program, but risk or danger tree aligning with the Wildfire Plan.

[24] The fireproof mesh is comprised of fire-resistant, intumescent material that swells in the event of a fire. The swelling isolates the pole from the fire.
[25] Replacing a steel pole averages about $25,000 to $35,000 per pole. Steel mesh wrap costs about $200 per pole.
[26] NERC Reliability Standard FAC-003, https://www.nerc.com/pa/Stand/Reliability%20Standards/FAC-003-4.pdf requires inspection of 100% of the interconnected transmission grid annually. Avista's Transmission Maintenance Inspection Plan (TIMP) further requires inspection of all transmission lines each year.

Avista's Wildfire Risk-Based Vegetation Management goal is to perform risk tree inspections across 100% of the transmission and distribution system every year. This a marked departure from the previous practice of assessing only 20% of the electric distribution system for danger trees. Our goal is to identify every dead, dying, diseased, or defective tree within strike distance of a powerline and remove that tree as is practical.

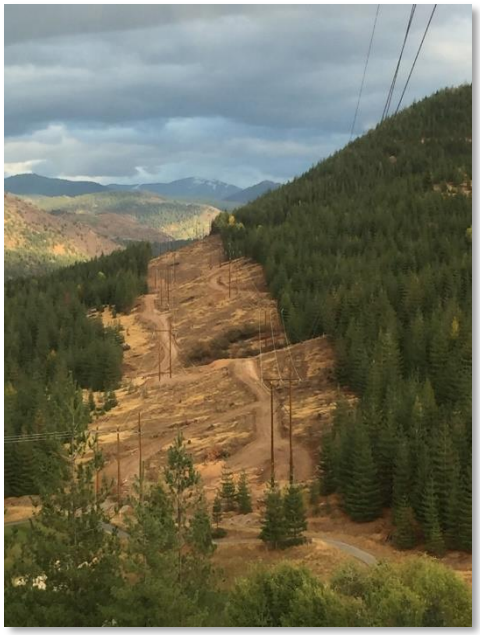
RISK VEGETATION MGMT.	Actual	Expected	Projected								10-Yr. Total
	2020	2021	2022	2023	2024	2025	2026	2027	2028	2029	Total
O&M											
Transmission Digital Data LiDAR (GeoDigital)	$491,422	$500,000	$750,000	$750,000	$750,000	$750,000	$750,000	$750,000	$750,000	$750,000	$6,991,422
Distribution Digital Data Satellite (AiDASH)	$59,282	$250,000	$535,000	$535,000	$535,000	$535,000	$535,000	$535,000	$535,000	$535,000	$4,589,282
Fuel Reduction Partnerships	$0	$0	$300,000	$300,000	$300,000	$300,000	$300,000	$300,000	$300,000	$300,000	$2,400,000
Distribution Annual Risk Tree	$1,239,113	$3,600,000	$5,050,000	$5,049,500	$5,050,000	$4,200,000	$4,200,000	$4,200,000	$4,200,000	$4,200,000	$40,988,613
Customer Choice Right Tree Right Place	$0	$0	$350,000	$500,000	$750,000	$750,000	$750,000	$500,000	$300,000	$200,000	$4,100,000
TOTAL O&M	$1,789,817	$4,350,000	$6,985,000	$7,134,500	$7,385,000	$6,535,000	$6,535,000	$6,285,000	$6,085,000	$5,985,000	$59,069,317
TOTAL	$1,789,817	$4,350,000	$6,985,000	$7,134,500	$7,385,000	$6,535,000	$6,535,000	$6,285,000	$6,085,000	$5,985,000	$59,069,317
Notes:	* Transmission LiDAR Costs based on GeoDigital $450/mile with full system inspection in 2022.										
	* Fuel Reduction Partnership dollars are estimated at ~$1k per acre.										
	* Distribution Risk Tree estimate from based on 100% Risk Tree coverage for Dx system.										
	* Customer Choice Right Tree includes Public Outreach, Media messaging, and remove/replace program.										
	* Distribution imaging costs based on AiDash Contract at 70$/miles for 7650 miles OH System (2021 reflects a negotiated price to establish baseline).										

Table 6. Enhanced Vegetation Management Programs Actual Expenditures and Budgets

The table shown above indicates the incremental investments for risk vegetation management from 2020 through 2029 . Note that the first few years are expected to require more significant resources in the risk tree program as we work through the backlog of hazard trees. After the initial years of treatment, the program will reduce expenditures as efforts are directed towards addressing each previous year's mortality.

Elements of the Risk Vegetation Management program include:

- *100% (Systemwide) Annual Risk Tree Identification*
- *Transmission System LiDAR Imaging*
- *Distribution System Satellite Data Collection*
- *Customer Choice Right Tree Right Place*
- *Fuel Reduction Partnerships*



Avista Transmission Corridor

Distribution Annual Risk Tree. Metrics indicate that trees are three times more likely to fall into distribution lines than grow into them (see Figure 5). And, in many cases, trees that fall into lines are located outside of prescribed rights-of-ways and are not subject to routine maintenance. Avista monitors tree related incidents for both trees that encroach into powerlines (grow-in) and those that fall into powerlines (fall-in). Avista's risk vegetation management efforts target dead, dying, diseased, or structurally defective trees on both the transmission and distribution systems.

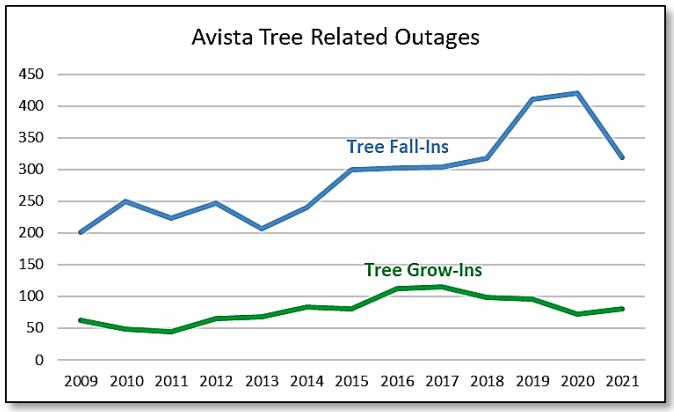


Figure 5. Tree Related Outages

Based on the 2020 Wildfire Plan recommendations, the risk tree program transitioned from a 5-year cycle program to an annual program. With the help of the LiDAR and satellite imagery and associated data results, we are confident we can be more effective by directing crews specifically to the highest priority areas for treatment. This new technology, in conjunction with our existing proven inspection techniques, will guide our vegetation management practices into the future and should result in reductions in these outages, which are one of the most common causes of spark events.

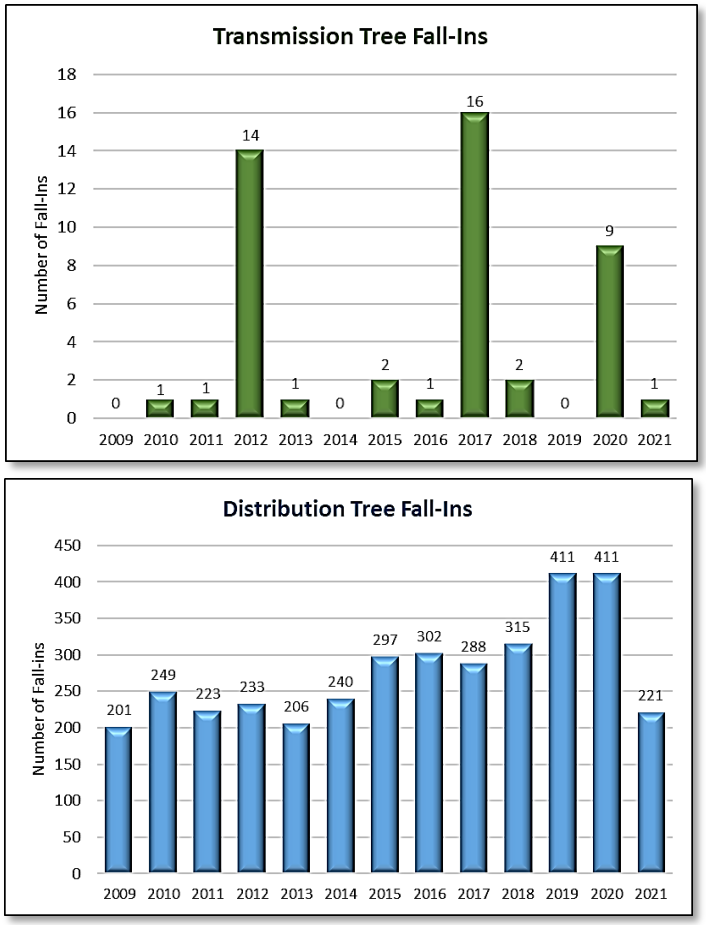


Figure 6. Transmission and Distribution Number of Tree Fall-in Events

Transmission LiDAR and Distribution Satellite Imaging. As part of the 2020 Wildfire Plan, Avista has begun using both LiDAR surveys and satellite imagery together with machine-learning data processing to identify both vegetation encroachment and hazard/risk trees. The use of remote sensing technologies such as LiDAR provides program managers with a system-wide snapshot rather than using traditional ground-based approaches. In essence, by using these technologies, all vegetation risks are known and quantifiable.

TRANSMISSION. Historically, Avista inspects transmission powerlines via ground and aerial patrols annually. As part of enhancing vegetation inspections related to wildfire risk, Avista added the additional layer of LiDAR data collection for the transmission grid.

LiDAR is a laser survey technique that is highly accurate in identifying tree health as well as tree height and distance from powerlines. It can clearly identify dead, dying, diseased or structurally defective trees both inside and outside our corridor rights-of-way and is very accurate in calculating fall-in risk and providing computer-aided precise location and identification of vegetation-based issues as they arise over time.

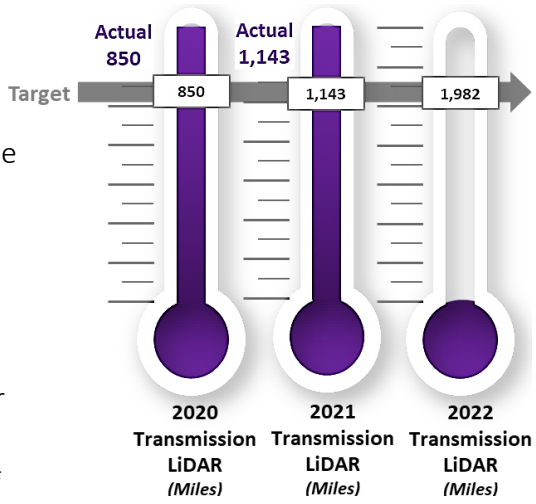
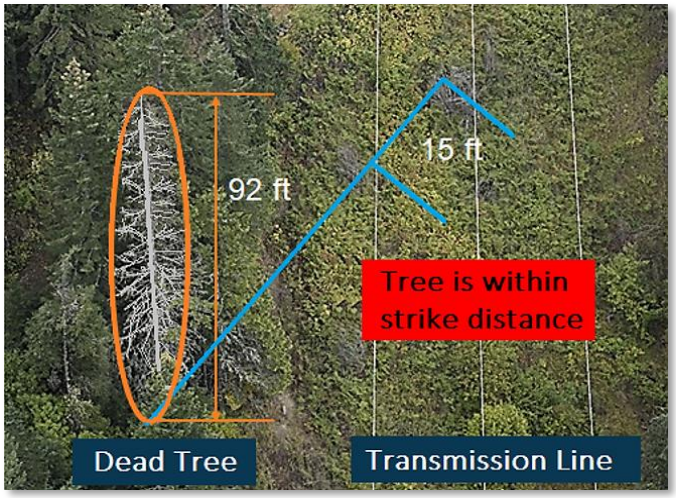


Figure 7. Transmission LiDAR Work

LiDAR data is generally collected via a fixed wing aircraft or helicopter due to wide and well-defined transmission corridors. The resulting survey-grade data yields sub-centimeter accuracy, and when combined with high resolution photography, provides vegetation planners with a robust assessment of both encroachment and risk tree hazards. Avista has contracted with GeoDigital[27] to perform Transmission LiDAR inspections of the entire transmission system routinely starting in 2022. In 2020, 850 miles of LiDAR data was collected (230 kV and specific 115 kV lines[28]) and in 2021, Avista collected LiDAR on 1,143 miles of remaining 115 kV transmission lines. Going forward the entire transmission system will be surveyed at least once a year.



GeoDigital LiDAR image showing a dead tree outside the right-of-way that is still within strike zone of the conductor.

DISTRIBUTION. For the Distribution system, Avista partnered with AiDASH,[29] a satellite imaging company. A satellite-based methodology aligns well with distribution topologies, allowing for collection over a broad area and collecting trunk and lateral distribution circuits both in urban and rural areas. This system collects imagery using successive overpasses and pairs this information with computer-based machine learning algorithms to assess the risk of both tree encroachment (grow-in) and hazard tree risks (fall-in).

[27] GeoDigital is one of the utility industry's leaders in analytical vegetation management. https://geodigital.com/about-geodigital/ and https://geodigital.com/geodigital-insight-transmission/
[28] LiDAR data was collected for WECC-identified lines, which are those lines interconnected with the Western U.S. grid.
[29] https://www.aidash.com/

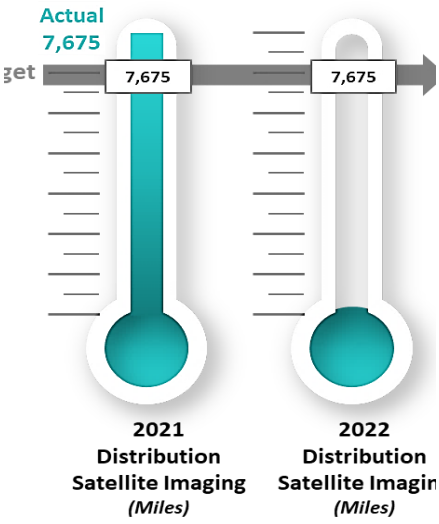


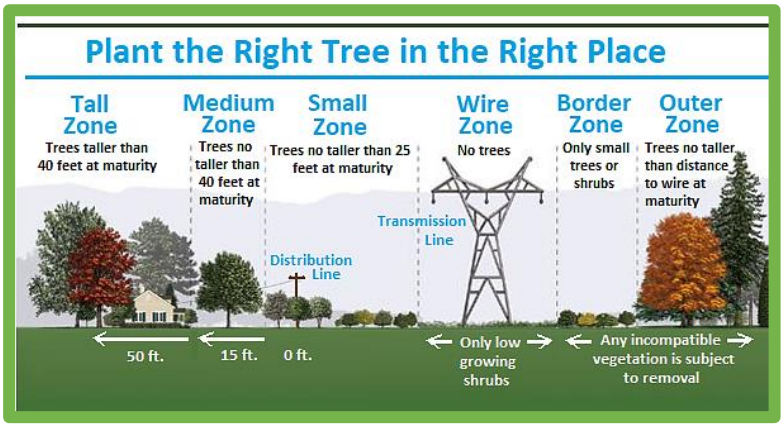
Figure 8. Distribution Satellite Work

Because satellite data and images are collected on a regular basis (e.g. spring and fall), the dataset indicates where vegetation risk exceeds both reliability and fire safety thresholds and provides valuable information regarding the location of problems. This approach takes vegetation management to the next level. Rather than relying upon human inspections, the data collection is automated, detailed, and aided by machine learning analytics.

AiDash Satellite Imagery

Fuel Reduction Partnerships. This program is geared toward reducing fuel loading near Avista transmission and distribution facilities and helps to strengthen working relationships with fire protection professionals. Avista is actively engaged with several land management agencies, including tribal governments, to assist with fuel reduction near Avista facilities. This work includes mechanical forest thinning, mitigating dead trees on or adjacent to Avista owned facilities and corridors, and removing brush. The State of Idaho has identified several Avista-served communities at significant risk of wildfire. Avista is working with the State of Idaho to plan and execute fuel reduction activities in these communities in an attempt to lower their risk. This work will serve as the model for other fuel reduction partnerships with Washington Department of Natural Resources, the Bureau of Land Management, the US Forest Service as well as the Nez Perce, Colville Federated, Spokane and Coeur d' Alene tribes.

Customer Choice Right Tree Right Place. Vegetation contacts with powerlines are a significant source of spark-ignition potential. In response, Avista is developing a new program called "Customer Choice - Right Tree Right Place." This program will identify customers in elevated fire threat areas where tall-growing trees are under or adjacent to powerlines. Over the next few months, we plan to pilot a study in which several of these specific customers will be contacted with an offer to replace trees that are likely to fall into or grow into our lines with a low growing variety at no cost to the customer. Customers will be connected with local arborists who can help them identify which trees are most at risk and to suggest a replacement variety that is unlikely to grow into



powerlines and create risk of outages or spark events. We see a real win-win here as we protect our customers from a potential hazard situation and also reduce the risk to the reliability of our system, as well as reducing the continuing need to trim trees that grow or fall into lines over time.

Situational Awareness

Strategies and systems designed to enable remote monitoring and control of transmission and distribution equipment provide not only direct control of critical infrastructure, but also allow system operators and planners to fully understand short term operating risks. For example, Avista's Fire Weather Dashboard combines the National Weather Service's 7-day forecast with Avista infrastructure data to render a circuit-by-circuit risk analytic value that helps determine protection and emergency operating levels.

Avista has deployed a summer operating strategy known as Dry Land Mode since the early 2000s to limit distribution circuit reclosing following forced outages. This helps reduce overall spark-ignition risk by lowering electrical fault energy levels. As part of the 2020 Wildfire Plan, Avista is embarking on a multi-year project to fully automate over 235 discrete devices. Prior to the 2022 fire season, over 100 of these devices will be fully automated, allowing system operators to dynamically alter protection settings to align with fire risk potential. It cannot be overstated how powerful this tool will be.

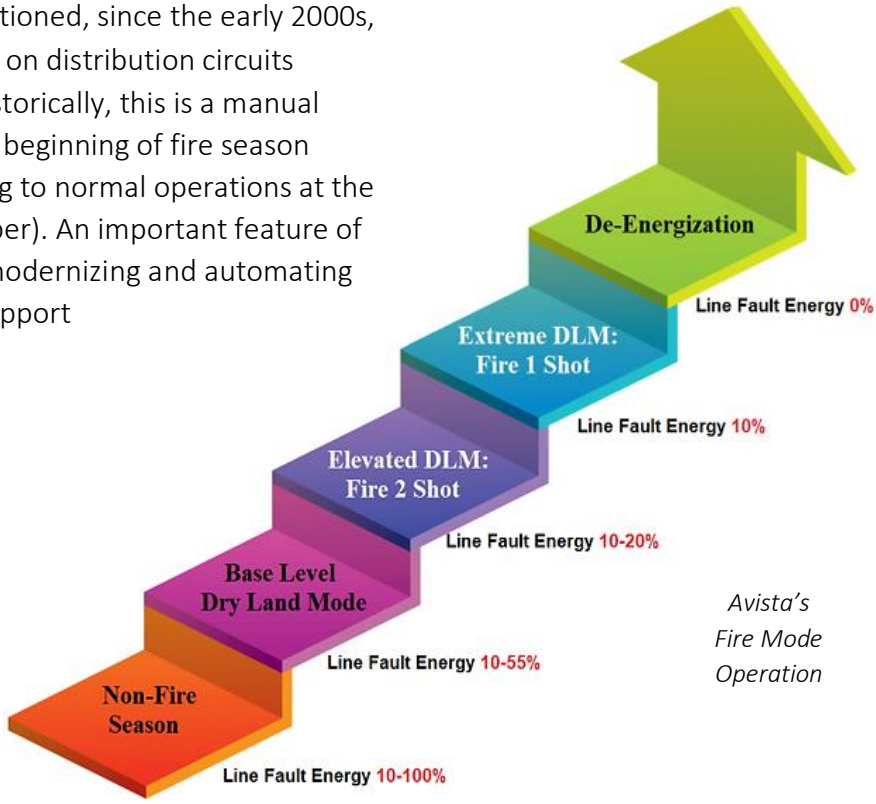
SITUATIONAL AWARENESS	*Actual*	*Expected*	*Projected*								*10-Yr. Total*
	2020	2021	2022	2023	2024	2025	2026	2027	2028	2029	Total
Capital											
Fire Weather Dashboard	$197,750	$175,000	$0	$0	$0	$0	$0	$0	$0	$0	$372,750
Dry Land Mode 100% Substation SCADA	$400	$500,000	$1,500,000	$1,500,000	$3,000,000	$4,500,000	$4,500,000	$4,500,000	$4,500,000	$4,500,000	$29,000,400
Automate Dry Land Mode / Midline Reclosers	$30,530	$1,000,000	$750,000	$650,000	$650,000	$650,000	$650,000	$650,000	$650,000	$650,000	$6,330,530
TOTAL CAPITAL	***$228,680***	***$1,675,000***	***$2,250,000***	***$2,150,000***	***$3,650,000***	***$5,150,000***	***$5,150,000***	***$5,150,000***	***$5,150,000***	***$5,150,000***	***$35,703,680***
O&M											
Fire Weather Dashboard	$0	$0	$150,000	$75,000	$75,000	$75,000	$75,000	$75,000	$75,000	$75,000	$675,000
TOTAL	***$228,680***	***$1,675,000***	***$2,400,000***	***$2,225,000***	***$3,725,000***	***$5,225,000***	***$5,225,000***	***$5,225,000***	***$5,225,000***	***$5,225,000***	***$36,378,680***

Table 7. Situational Awareness Programs Actual Expenditures and Budgets

Situational awareness encompasses four strategies:

- *Dry Land Mode Operations*
- *Fire Weather Dashboard*
- *Dry Land Mode Substation SCADA Installations*
- *Dry Land Mode Automation Devices*

Dry Land Mode (DLM). As mentioned, since the early 2000s, Avista has limited automatic reclosing on distribution circuits located in high threat fire districts. Historically, this is a manual process of initiating the system at the beginning of fire season (typically early July) and then returning to normal operations at the end of fire season (usually early October). An important feature of the Wildfire Resiliency Plan involves modernizing and automating this system so that circuit reclosers support higher modes of protection, also known as Fire Mode Operation. The ladder diagram illustrates this concept, with Base Level Dry Land Mode as the primary mode of operation during fire season. The elevated fire modes shown, Fire 2 Shot and Fire 1 Shot, significantly reduce fault energies and therefore the probability of combustion. However, use of these modes may expose customers to longer duration and wider-spread outages in the attempt to balance customer reliability with safety.



Avista's Fire Mode Operation

The Wildfire Plan recommends Dry land Mode with four levels of reclosing operations:

1) Non-Fire Season Mode –Normal operations where circuit breakers automatically reclose 2-3 times (or more) before locking out.
2) Base Level Dry Land Mode – If a circuit is set to this level, when it trips it waits a predetermined length of time then recloses to test the circuit. If it tests bad the second time it will stay off until manually inspected before being placed back in service.
3) Elevated Risk: Fire 2 Shot – When a circuit is placed at this level, when it trips off it will stay off if it tests bad. There is no time delay. This allows the circuit to close back in for temporary faults but de-energizes for permanent faults by tripping off the breaker.
4) Extreme Risk: Fire 1 Shot – Circuits considered in extreme danger are configured so if the circuit trips, it does not test or try to reclose. It stays off until it is inspected and released back into service.

For extreme weather events exceeding Fire One Shot, the Company will selectively implement de-energization on feeders or sections of feeders as a measure of last resort in coordination with our partners and first responders. This will only be done in a situation where there are no customer impacts or if no other mitigation actions are available, and when it is clear that the safety benefits exceed the cost of shutting off power. We have implemented de-energization at the request of first responders as a course of business throughout our history. Avista has historically selectively de-energized circuits based

on a spectrum of criteria, primarily impacts to customer service and safety, or as requested by fire commanders, but is a measure of last resort.

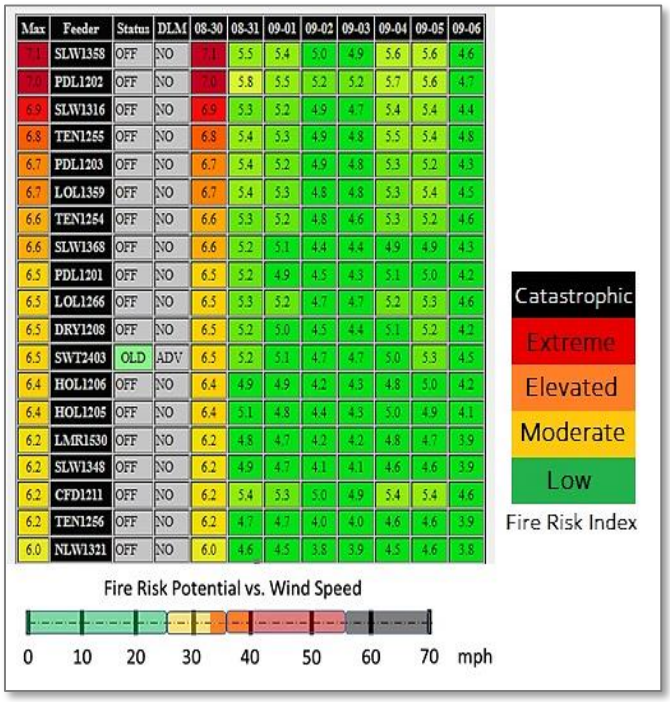
Avista is not currently planning on implementing a formalized public safety power shutoff (PSPS) such as those that have been used in California, although this concept is not off the table. When administering protection using a PSPS, circuits are preemptively removed from service based on calculated level of fire risk. Circuits can be out of service for several hours to several days depending upon conditions. *The major difference between Dry Land Mode Operations and PSPS is that Dry Land circuits are only removed from service when an actual fault is experienced on the line, while PSPS circuits are proactively disconnected based on an assessment of risk.*

Implementing a PSPS is complex and multi-dimensional process. As we have learned from our contemporaries, it also has widespread ripple effects on customers, placing especially heavy burdens on vulnerable households with medical devices, those lacking transportation, or customers facing food insecurity. The risk calculation of initiating a PSPS must also account for the fact that restoration of service can take time, extending customer outage duration, because the de-energized system must be physically inspected for damage before being turned back on. Avista learned from the heat-related outages of last summer that customers simply do not understand outages based on projected risk or circumstances they cannot directly see and experience (such as a snowstorm or high winds), making PSPS outages especially hard for customers to accept and tolerate. Thus, the Company believes that the trade-off between a perceived and a real threat must be carefully considered.

Fire Weather Dashboard. Avista has developed a computer-based fire risk-based monitoring program that combines data from the National Weather Service's 7-day forecast with infrastructure performance and vegetation/fuel data. Known as the Fire Weather Dashboard, this tool helps operators identify fire risk potential and is an integral part of Avista's defensive strategy to limit the number of spark-ignition events that can support fire combustion.

The Dashboard features high wind and fire risk alerts for each Avista operating district as well as a system overview. It allows operators to understand not only the overall risk, but the timing and specific nature of the risk. For example, the predominant wind pattern throughout the Avista service territory is from the southwest. It most situation, wind levels below 50 mph from the southwest pose low to moderate risk of tree related outages, as trees in the area are strengthened for the winds from that direction. However, that same wind blowing from the north will often generate hundreds of incidents and may impact thousands of customers. The wind event of Labor Day 2020 was such a "north wind" event, sparking 28 fires across the Inland Northwest and forcing power outages across Avista's system.

Output from the Fire Weather Dashboard is illustrated in the figure to the right. Note that each circuit (feeder) is identified as well as its weekly maximum fire risk, the operating status of the circuits (status) and whether the circuit is fully automated (DLM: ADV=automated, NO=manual operation). This system is an important tool in helping to determine when DLM Fire Modes should be implemented. It is also the primary communication tool used during the weekly Fire Planning Unit meetings as appropriate levels of protection are discussed.



Avista's Fire Weather Dashboard showing the risk factors by day for each feeder for late August 2021

Though many elements of Wildfire Resiliency are aimed at reducing outage events and possible fire starts, we realize that it is impractical to expect perfect reliability, especially during fire season wind events. By altering protection schemes on select circuits, Avista can achieve a better balance between reliability and fire safety objectives.

Substation SCADA. Fifteen Avista substations located in high threat fire districts lack communications equipment, and another thirty substations require hardware upgrades to support a fully automated Dry Land Mode system. The St. Maries Substation (St. Maries, Idaho) is one of these stations lacking modern control and monitoring systems. In 2021 this substation was updated with SCADA electronics. Starting in 2022, Avista plans to modernize 4-5 substations per year, with the goal of forty-five stations capable of remote monitoring and control by 2030.

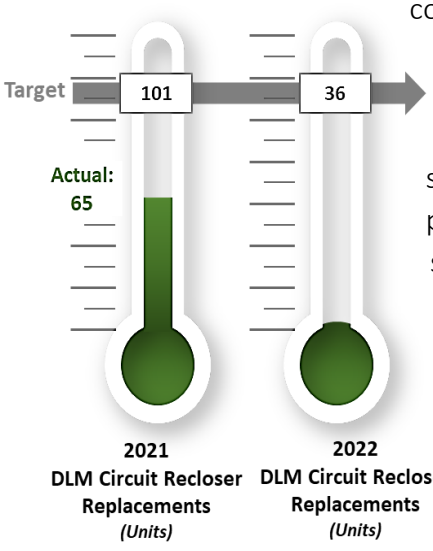
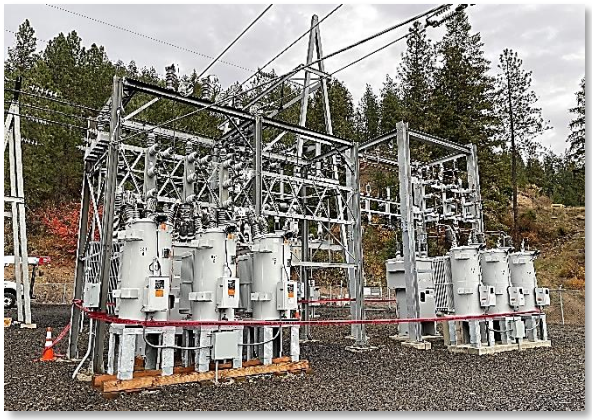


Figure 9. Circuit Recloser Software Upgrades Nov. 2021

Dry Land Mode Automation. Avista operates 240 distribution reclosers (both midline and substation) that require protection settings in order to be Dry Land Mode capable and able to aid in implementing wildfire protection measures.[30] The vast majority of these devices are located on circuits that serve rural areas in high threat fire districts. Many of these devices lack communication controls and must be switched or altered manually by physically accessing the

[30] These 240 devices were selected based on the downstream WUI tier zones that are served (Tiers 2 and 3 were mandated by the Program, while some Tier 1 were also included based on historical events).

device. 101 of the 240 circuit reclosers are modern units and will support automated Dry Land Mode but require software upgrades. To date, 65 of those units have been upgraded. All of these will be automated, tested, and commissioned by the start of the 2022 fire season.



Substation work being completed at the St. Maries Substation

There are also 129 substation breakers that serve downstream WUI 2 or 3 zones. This includes about 50 midline and substation breakers already deployed in elevated fire threat areas that must be upgraded with new dynamic protection settings (we call these "Fire Mode Ready" devices) to operate during fire season automatically and remotely. Remaining units both on the distribution grid (e.g. midline devices) and those located in substations require some level of hardware upgrades such as recloser replacement and/or upgrades to electronics up to and including major installations, such as SCADA monitoring systems. Upgrading these units is a significant project and is expected to run the term of the Wildfire Resiliency Plan.

Automating these devices allows operators to remotely reconfigure protection settings and implement the Fire 2 and Fire 1 shot modes. This represents the state of the art with respect to electric distribution operations to mitigate the risk of fire combustion.

Operations & Emergency Response

The Wildfire Plan encompasses both internal and external resources with a goal of reacting to wildfire risk in proactive manner along with the ability to rapidly respond to wildfire events. The costs to align current operating tactics with Wildfire Resiliency are marginal. However, adoption of Plan strategies is projected to significantly reduce operating risk and build solid working relationships with external partners including fire protection and emergency management.

EMERGENCY OPERATIONS & RESPONSE	Actual	Expected	Projected								10-Yr. Total
	2020	2021	2022	2023	2024	2025	2026	2027	2028	2029	Total
Capital											
Emergency Operation Plan (EOP)	$0	$0	$0	$0	$0	$0	$0	$0	$0	$0	$0
Fire Ignition Tracking/Metrics	$2,510	$0	$0	$0	$0	$0	$0	$0	$0	$0	$2,510
TOTAL CAPITAL	*$2,510*	*$0*	*$0*	*$0*	*$0*	*$0*	*$0*	*$0*	*$0*	*$0*	*$2,510*

Table 8. Operations & Emergency Response Programs Actual Expenditures and Budgets

The Emergency Operations & Response category includes several elements:

- *Weekly Fire Threat Assessment Meetings*
- *Formalized Wildfire Emergency Operating Plan & Procedures (EOP)*
- *Wildfire Performance Metrics*
- *Emergency First Responder Training*
- *Expedited Fire Response*
- *Fire Ignition Tracking System*


Snake River Complex Fire Damage

Weekly Fire Threat Assessment Meetings. During the 2021 fire season, Avista convened weekly fire planning meetings to assess weather, fire conditions, and to share information with both internal and external stakeholders. Approximately 75 people were invited to these calls including district managers, corporate communications, system and distribution operations, line operations staff, claims/legal, together with fire managers from the Washington Department of Natural Resources (WA DNR) and the Idaho Department of Lands (IDL). The meetings were highly interactive, with district managers reporting on current fires and potential impacts to infrastructure, state agencies reporting on fires they felt might impact Avista operations, and weather and risk assessments provided by Avista's Wildfire team. In 2022, Avista plans to formalize the process for escalating from Base Level Dry Land Mode (non-reclosing) to the higher levels of Fire Mode protection associated with Fire 2 and Fire 1 Shot modes. This represents a marked departure from a reliability-based model and will help managers and system operators shift towards a safety-first model. As noted, this is a vitally important element of Avista's wildfire plan. These weekly meetings will be the forum for discussing appropriate levels of protection.


Crossarm tracking fire damage

Formalized Wildfire Emergency Operating Planning and Procedures. In 2022 Avista will develop a formal, wildfire specific Emergency Operations Plan (EOP) similar to those that already exist for storm situations. When declaring a weather related EOP, Avista operations shift to emergency response with service restoration as the primary objective. Wildfire events differ markedly from storm events because of the inherent safety risks to both the public and first responders including Avista operating personnel. Safety precautions such as evacuations may be necessary. Access to downed powerlines may be restricted in active fire zones. Avista personnel must work closely with fire protection to support the primary goal of fire suppression. By establishing a specific Wildfire EOP, Avista will clearly establish workflow processes and unified command structures deployed during fire related EOP events. This includes defining key roles and responsibilities, identifying communications channels, and emergency operating procedures to be used during wildfire events.

In Washington and Idaho, responses to fires larger than 100 acres triggers a Fire Incident Command Structure (ICS). Avista remains committed to embedding Avista personnel with Fire ICS to serve as a primary point of contact.

Wildfire Performance Metrics. Avista tracks data related to fire-related performance such as number of acres impacted by fires together with data related to fire impact such as the number of transmission and distribution structures damaged during fires. Historically, Avista has tracked the number of distribution pole fires, equipment failures, and tree-related outages, but prior to the 2020 Wildfire Plan, did not have a systematic approach to quantify the effectiveness of wildfire programs. Avista is now tracking a range of metrics including grid hardening production, the automation of circuit recloser equipment, the number of steel poles installed, together with metrics related to vegetation management and the overall performance of the electric system.

WILDFIRE METRICS INCLUDE:

- Tree Fall-Ins
- Tree Grow-Ins
- Pole Fires
- Overhead Equipment Failures
- Spark Ignition Events
- Transmission Steel Pole Conversions
- Transmission Fire Resistant Pole Wraps Installed
- Miles of Distribution Grid Hardening
- Number of Dry Land Mode Automation Devices Installed
- Risk Tree Miles Patrolled
- Number of Risk Trees Identified/Mitigated
- Acres of Transmission Corridors Cleared
- Miles of LiDAR Imaging Completed
- Miles of Satellite Imaging Completed

It is important to note that some outcomes of the Wildfire program will not show up immediately. It takes time for long-term projects such as grid hardening and risk-based vegetation to reflect in outage data. With some measures it is difficult to judge the impact, as it is based upon how many events may have been avoided. Avista has placed a strong emphasis on data collection as a means of tracking the progress and success of these programs and will continue to refine the data collected and collection methods over time.

First Responder Training. Avista plans to conduct annual fire safety and electrical hazard training with fire agency partners across the service territory. When COVID restrictions are lifted enabling in-person training, Avista will conduct joint training sessions with fire protection personnel prior to fire season. Fire professionals will provide fire safety training to Avista first responders and, in turn, Avista will conduct electrical hazard training for fire personnel. It is important that Avista understand the safety precautions taken during an active fire situation. Likewise, it is important that fire personnel understand the hazards associated with utility infrastructure. This program is designed to promote the safety of everyone involved in a wildfire situation.

Expedited Fire Response. In 2020, a Memorandum of Understanding was executed with the Spokane County Fire Department which included the dispatch of fire patrol personnel to transmission-level outage locations during fire season. Avista System Operations initiates the request and provides an exact location of the incident. The MOU with Spokane County was renewed in 2021 and Avista plans to pursue similar agreements with other county-level fire agencies.

Fire Ignition Tracking System. Avista's Outage Management System (OMS) is used to track electric outages including causation information such as: tree fall-ins, car hit poles, wind, animal, underground cable, overhead equipment, pole fires, etc. Fire is listed as an outage category, but generally relates to structure fires and is not typically related to Avista equipment.[31] The OMS was designed to record actual events based upon cause, not impact, with the goal of repairing or replacing equipment that has or could lead to an outage. Currently we can use the OMS dataset to capture spark-ignition and fire events by searching the text strings of Dispatcher comments. Going forward we plan to develop on a more formalized way of capturing spark events from the dataset. This may require software or equipment upgrades. Note that the current outage management system is essentially frozen (no major changes) until it is replaced with a commercial off the shelf system which is expected to occur within the next five years.

[31] Structure fires often require Avista to respond and turn off the power at the meter to protect firefighters, thus "fire" may be noted in the comments.

Appendix A: Current and Future Program Summary

Infrastructure Grid Hardening			
Plan Element	Current State	Future State	Benefits
Transmission Fire Retardant (FR) Program	Fire resistant pole paint program, replaced 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 and ground surveys to identify structure defects (reliability based)	Additional aerial and ground inspections via LiDAR to identify defects (fire risk based)	Reduce transmission fire ignition events which, though less likely than distribution sourced fires, are generally larger
Transmission Steel Pole Replacement	Based on WUI model (20% system total)	Based on historic fire data	Reduce likelihood of damage to Avista transmission assets. 20% of Avista's transmission assets are located in elevated fire threat areas
Distribution Grid Hardening	Restricted to WUI Tier 2 and 3 of the 2019 WUI map	Transition to the 2022 WUI map starting in 2023.	Reduce the probability of distribution fire ignition in high fire threat districts.

Risk-Based Vegetation Management			
Plan Element	Current State	Future State	Benefits
Digital Data Collection	Human based ground and aerial inspections	Satellite inspections with computer-based analysis to identify vegetation encroachment and tree fall-in risks	Allows for scenario-planning of treatment options and serves as the QA tool to assess the efficacy of previous field work
Fuel Reduction Partnerships	No program	Partnering with state and tribal agencies to remove fuels near critical infrastructure	Strengthens relationships between Avista and fire first responders and reduces fire severity threats to infrastructure
100% Annual Risk Tree	Combined with routine maintenance (5-year cycle)	System-wide effort to annually identify and remove dead, dying, diseased or structurally defective trees	Reduce tree fall-ins, which are 3 times more likely to occur than grow-ins
Customer Choice Right Tree, Right Place	No program	Engage with customers in high fire risk areas to remove tall growing trees underneath powerlines	Reduces the risk of tree grow-ins and subsequent spark-ignition sources

Situational Awareness			
Plan Element	Current State	Future State	Benefits
Fire-Weather Risk Monitoring System (Dashboard)	Weather forecast data subject to individual interpretation (prior to 2020 fire season)	By combing weather forecast and fire threat condition data, operating personnel now have clear guidance relative to the likelihood and potential impact of fires	Promotes a more consistent and data-focused approach for decision makers
Additional Distribution Circuit Reclosers	Condition based replacements	Combined with the overall project to fully automate Avista DLM system	Supports Fire Mode operations that significantly reduce the risk of spark-ignition
Substation Supervisory Control & Data Acquisition (SCADA)	Condition based	Combined with the overall project to fully automate Avista DLM system	Supports Fire Mode operations that significantly reduce the risk of spark-ignition
Dry Land Operating Mode (DLM)	Seasonal implementation (single mode)	DLM mode based on fire risk level, a dynamic, risk-based system	Improves fire safety margins during periods of elevated fire risk

Emergency Operations and Response			
Plan Element	Current State	Future State	Benefits
Fire specific Emergency Operating Procedures	No formal wildfire policy	Avista Wildfire-specific EOP to delineate wildfires from other storm events.	Improved coordination with fire protection and other emergency first responders
Avista representative assigned to Fire Protection Incident command	Adhoc policy	A commitment to involve Avista personnel in 100% of Fire Incident Command meetings	Improved coordination with fire protection and other emergency first responders
Wildfire Performance Metrics	General outage related metrics	Develop fire-specific performance metrics and ensure that Plan objectives are being met	Supports the evolution of the Resiliency Plan to align with future operating and environmental conditions
Wildland Urban Interface (WUI) Map	WUI 2019 based on USDA Fuels Model (wildfire hazard potential)	WUI 2022 based on USDA housing unit impact dataset and Avista electric system performance data.	Provides a more direct and tractable WUI map
Emergency First Responder Training	No formal program	Annual fire safety training for 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	Spokane County pilot projects in 2020 and 2021	Expand expedited response to other jurisdictions	Suppress electric transmission line fires before they can spread

Appendix B: 2020 and 2022 Plan Changes Summary

ID # (2020 Plan)	2020 WF Resiliency Plan Element	2022 Plan Status	Notes
		System & Transmission (ST)	
ST-1	EOP and Fire ICS Representation	Split into distinct elements. Wildfire EOP and ICS Rep.	These should not have been combined items. The EOP element emerged after the 2020 Labor Day Storm. It was not part of the 2020 Plan.
ST-2	Fire Weather Dashboard	No change. Intact.	
ST-3	Engineering Review of Major Events	Removed	This is now an embedded work process for transmission engineering.
ST-4	Wildfire Compliance Trackng	Renamed Wildfire Metrics.	
ST-5	Digital Data Collection	Renamed Transmission LiDAR.	
ST-6	Wood Pole FR Mesh Protection	No change. Intact.	
ST-7	Fuel Reduction Partnerships	No change. Intact.	
ST-8	Emergency Responder Training	Renamed 1st Responder Wildfire Training.	
ST-9	Conforming Rights-of-Way	Removed	Analyis does not justify the cost of widening of transmission corridors to prevent tree fall-ins.
ST-10	Transmission Inspection Program	No change. Intact.	
ST-11	Expedited Fire Response	No change. Intact.	
ST-12	Transmission Grid Hardening	Renamed Transmission Steel Pole Conversion.	
		Fire Planning Unit	Added in 2021.
	12 Elements in 2021	*12 Elements in 2022*	
		Electric Distribution	
D-1	Fuse Coordination	Combined with Automated DLM.	There are several elements that support the Dry Land System. We'll combine them in the 2022 Plan.
D-2	Recloser Event Reporting	Combined with Automated DLM.	
D-3	Fire Ignition Tracking System	Combined with Wildfire Metrics.	
D-4	Veg Management in CPC designs	Removed	Embedded element in CPC work processes.
D-5	Fire Suppressent wetting agent	Removed	Unnecessary
D-6	Dry Land Mode 'effectiveness study'	Removed	Task Complete Dec 2020.
D-7	WUI layer in GIS	Renamed 2022 WUI 'refresh.'	
D-8	DLM initiation 'trigger'	Removed	Task Complete June 2019.
D-9	Arcos Wildfire Notification	Removed	Communication revised to email and added to Fire Planning Unit.
D-10	Distribution Annual Risk Tree	No Change. Intact	Coverage extends to 100% of system exempting WUI 0 - large urban areas.
D-11	Right Tree Right Place	No Change Intact	Name Change: Customer Choice Right Tree Right Place
D-12	Midline Recloser Automation	Combined with Automated DLM.	
D-13	Additional Midline Reclosers	Combined with Automated DLM.	
D-14	Digital Data Collection	Renamed Distribution Satellite Imagery (AiDash).	
D-15	WA Grid Hardening	Combined as Distribution Grid Hardening.	
D-16	ID Grid Hardening	Combined as Distribution Grid Hardening.	
	16 Elements in 2021	*6 Elements in 2022*	

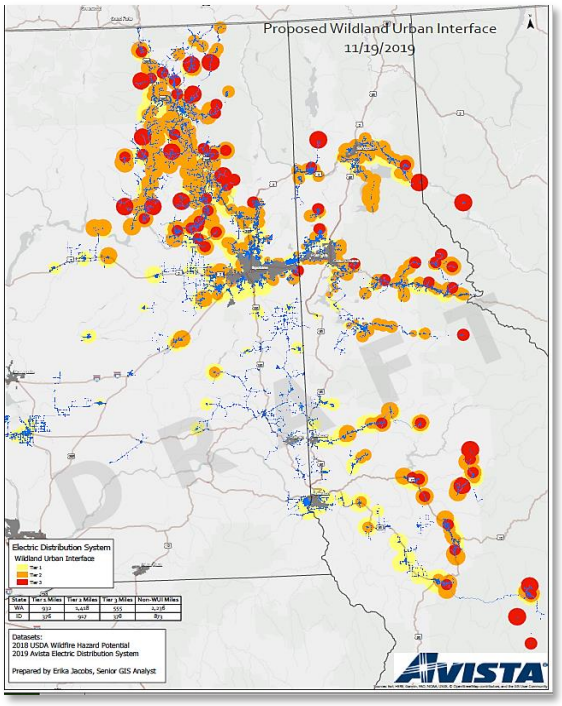
Appendix C: Wildland Urban Interface (WUI)

The interface area between forest lands and human development is referred to as Wildland Urban Interface (WUI). Homes and businesses located WUI zones are most at-risk from the impact of wildfires, often located in rural areas and lacking adequate 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.[32]
- Housing Density – Parcels smaller than 20 acres were included in the analysis, but highly-developed, incorporated urban areas were excluded. Urban areas do not meet the definition of Wildland Urban Interface because fuel canopies are interspersed with hard-scape non-burnable areas, and in most cases, professional fire protection is 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. Avista has delegated four primary risk tiers (see inset map): Low (0-not colored), Moderate (1-yellow), Elevated (2-orange), and Extreme (3-red). The 2020 Wildfire Plan declares the combination of WUI Risk Tiers 2 & 3 as "elevated fire threat areas." These areas comprise approximately 40% of Avista's electric distribution and 20% of transmission lines. Portions of the WUI map that are not highlighted are classified as Non-WUI areas and represent areas with low fuel concentrations, very low housing densities, or are large urban areas (> 10,000 population).



Avista WUI Map Area

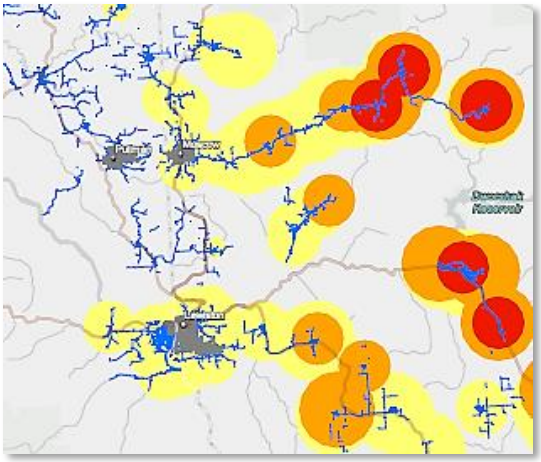
Avista used the USDA Forest Service Wildfire Hazard Potential Map (WHP)[33] to define initial WUI risk areas. On its own, the WHP is not an explicit map of wildfire threat or risk, but when it is paired with spatial data depicting highly valued resources such as structures or powerlines, it can approximate relative wildfire risk to those resources and assets. Incorporated urban areas exceeding 10,000 in population are considered non-WUI, as these areas have well established fire response facilities and non-burnable

[32] "Wildfire Hazard Potential for the United States," https://www.firelab.org/project/wildfire-hazard-potential

[33] Source: https://wildfirerisk.org/download/. Data is available as raster GIS data or as spreadsheets from the USDA Forest Service Fire Modeling Institute.

hardscape areas such as roads and parking lots to serve as fire containment zones, thus, fire spread potential is constrained in these areas. On the other end of the spectrum, the map considers fuels in an area that are subject to a high probability of experiencing extreme fire behavior under the right weather conditions, highlighting areas of increased concern where it may be difficult for local suppression resources to contain a wildfire and where it may have a significant impact on people.[34]

To create the initial WUI map, Avista overlayed the WHP onto its grid, dividing the system into ¼ square mile sections within a specified distance to our facilities, and began to identify fire potential. Elements of our service territory such as agricultural land, large bodies of water, undeveloped public lands, non-Avista service territory, and incorporated areas were excluded. Remaining areas were defined as low, moderate (yellow), high (orange), or very high (red) risk based on population density, forestry, vegetation, fuel levels, distance from facilities, and the WHP map. When this newly created layer was placed over our transmission grid, it became possible to determine the initial risk level for each pole in our system.



Avista WUI Map Area Showing Distribution Lines in Blue

To further refine our wildfire risk analysis, Avista is adopting a new approach to the Wildland Urban Risk Areas. The original WUI map, based upon the best information we had at that time, was focused more toward fire intensity than human impact. In order to add in this critical element, we brought in data from the USDA on Wildfire Risk to Communities[35] and the USDA and U.S. Forest Service Housing Unit Impact[36] which estimates the potential for damage to homes and associated impacts to people caused by a wildfire. These tools go beyond modeling the likelihood of fire occurring by incorporating the general consequences of fire. This additional information was overlayed over an Avista facilities map to more accurately represent the potential impacts of wildfires to areas in Avista's service territory.

Next, grid location is considered from a perspective of being burnable or not likely to burn. Areas considered unlikely to burn include urban areas with an abundance of blacktop or other fire breaks that create a low rate of spread. Finally, historic outage data and feeder health information is factored in to help identify potential equipment-related risk, then satellite analysis of vegetation is included. All of this helps to develop risk numbers for each section of the grid. It enables reviewing specific areas of the service territory, for example having the ability to look at a specific segment of a line versus looking at the entire length of the line, as characteristics can change across an area. With this new analysis, we can more accurately project dynamic wind-driven risk zones at a more granular level across our electric system.

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[34] One way this map is often used is to highlight places where vegetation treatments may be needed to reduce the intensity of future wildfires.

[35] "Wildfire Risk to Communities," https://www.fs.usda.gov/managing-land/fire/wildfirerisk and https://wildfirerisk.org/

[36] "Wildfire Risk to Communities Housing Unit Impact" https://data-usfs.hub.arcgis.com/datasets/ce8f901f10274eb5baea0314fa3c3e18/explore