

Exh. DRH-4

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BEFORE THE WASHINGTON UTILITIES AND TRANSPORTATION COMMISSION

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EXH. DRH-4

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REPRESENTING AVISTA CORPORATION



Wildfire Resiliency Plan



Avista Utilities Wildfire Resiliency Cost Forecast January 2020



January 2020

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This report details the 10-year cost forecast associated with Avista's 2020 Wildfire Resiliency Plan and is consistent with a risk analysis report published in September 2019: "**Wildfire Risk Analysis Summary, Proposed Actions, September 2019**". This report will focus on forecasted capital investments and operating expenses based on the recommendations from the Risk Analysis Summary. This report reflects a refinement in scope versus that of the Risk Analysis Summary and includes preliminary cost estimates. Several estimates are based on results of Avista's Subject-Matter-Expert Fire Workshops (June 2019), while others reflect parametric estimates based on subsequent efforts to develop the Wildland Urban Interface (WUI) map. Feasibility estimates generally reflect accuracy levels between 30 and 50%. Definitive cost estimates require final engineering design and contractual commitments for materials and labor.

PLAN LEVEL FORECAST

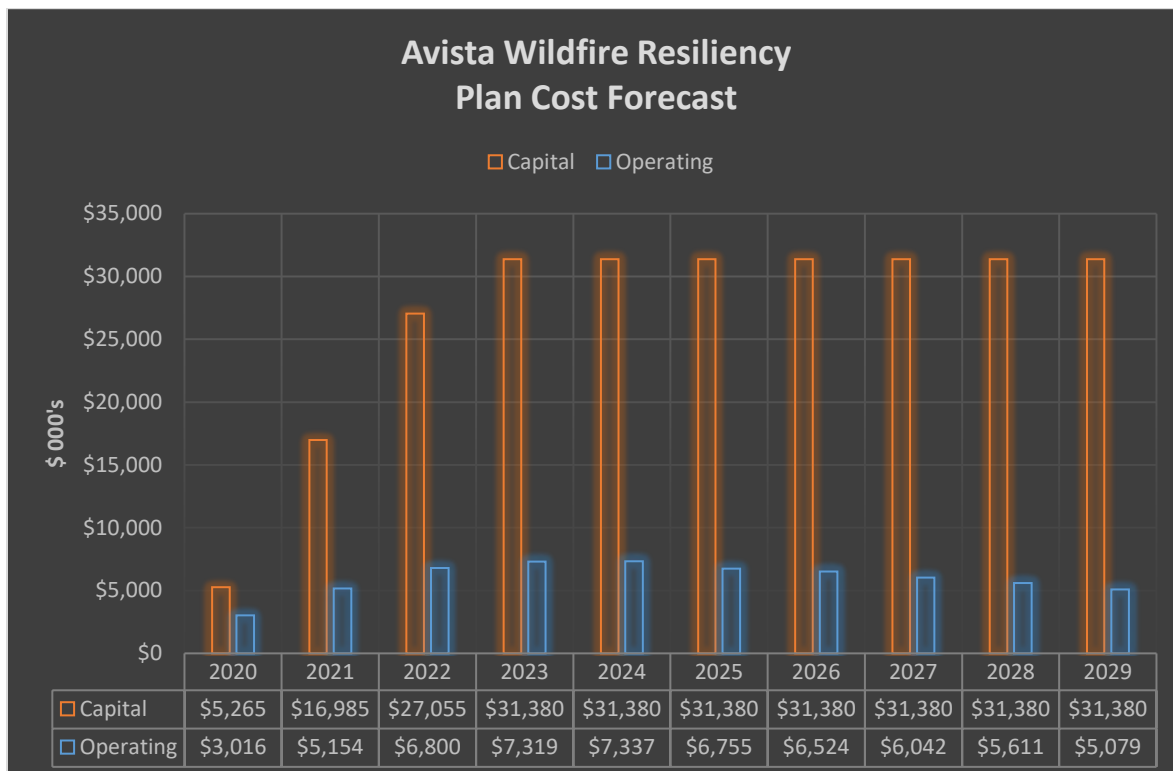
Consistent with the Risk Analysis Summary, this report is based on a 10-year planning horizon from 2020 to 2029, with activities grouped into four main categories:

1. **Enhanced Vegetation Management** – This includes actions in excess of Avista's current Vegetation Management program and reflects a focus on reducing fire ignition events. Plan elements include collecting vegetation data via digital high-resolution photography and Light Imaging, Detection, and Ranging (LIDAR), increasing the frequency of the Risk Tree treatments in fire prone areas, and conducting a public outreach campaign associated with 'right tree-right place' concepts.
2. **Situational Awareness** – This category includes extending Supervisory Control and Data Acquisition (SCADA) systems to a portion of Avista's thirty-three non-communication substations (dark stations). Using SCADA to monitor and control powerlines is a fundamental tenant of utility wildfire plans across the western U.S. and Canada. Avista also plans to develop a web-based 'fire-weather dashboard'; combining publicly available weather and fire threat information to inform operational readiness and enable enhancements to the Dry Land Mode (DLM) distribution protection scheme.

Avista Internal Work Product

3. **Operations “Toolkit” & Metrics** – Avista has a number of existing work processes and programs aimed at reducing the impact of wildfire. Enhancements to existing programs and the addition of other ‘operating’ elements are included in this group.
4. **Grid Hardening & Dry Land Mode** – Avista developed a non-reclosing distribution protection scheme back in the early 2000’s to mitigate fire ignitions. The protection scheme known internally as Dry Land Mode (DLM) will be updated to ensure alignment with program objectives. Additionally, infrastructure replacements or *grid hardening* will be implemented to reduce fire ignitions.

The total cost forecast of these efforts is depicted in the following graphs. The 10-year **capital cost forecast is \$268,965,000** with a corollary **operating expense cost of \$59,636,000¹**. *By far, the largest capital investment is associated with electric distribution grid hardening (\$193,200,000).*



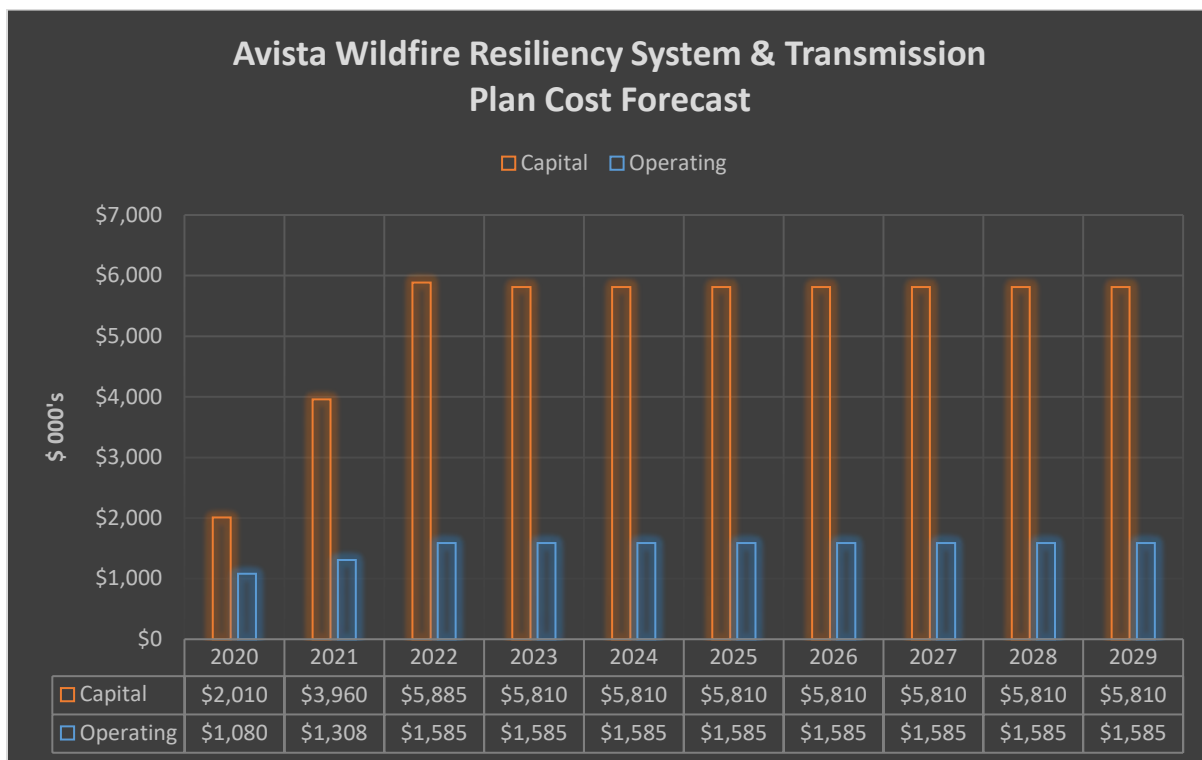
Significant operating expenses include enhancements to Avista’s vegetation management program including annual risk tree removals in fire prone areas. These additional measures account for \$48,600,000 of the 10-year operating expense forecast.

¹ All operating expenses provided in this report reflect incremental amounts above existing expense levels and are specific to the wildfire resiliency plan.

Avista Internal Work Product

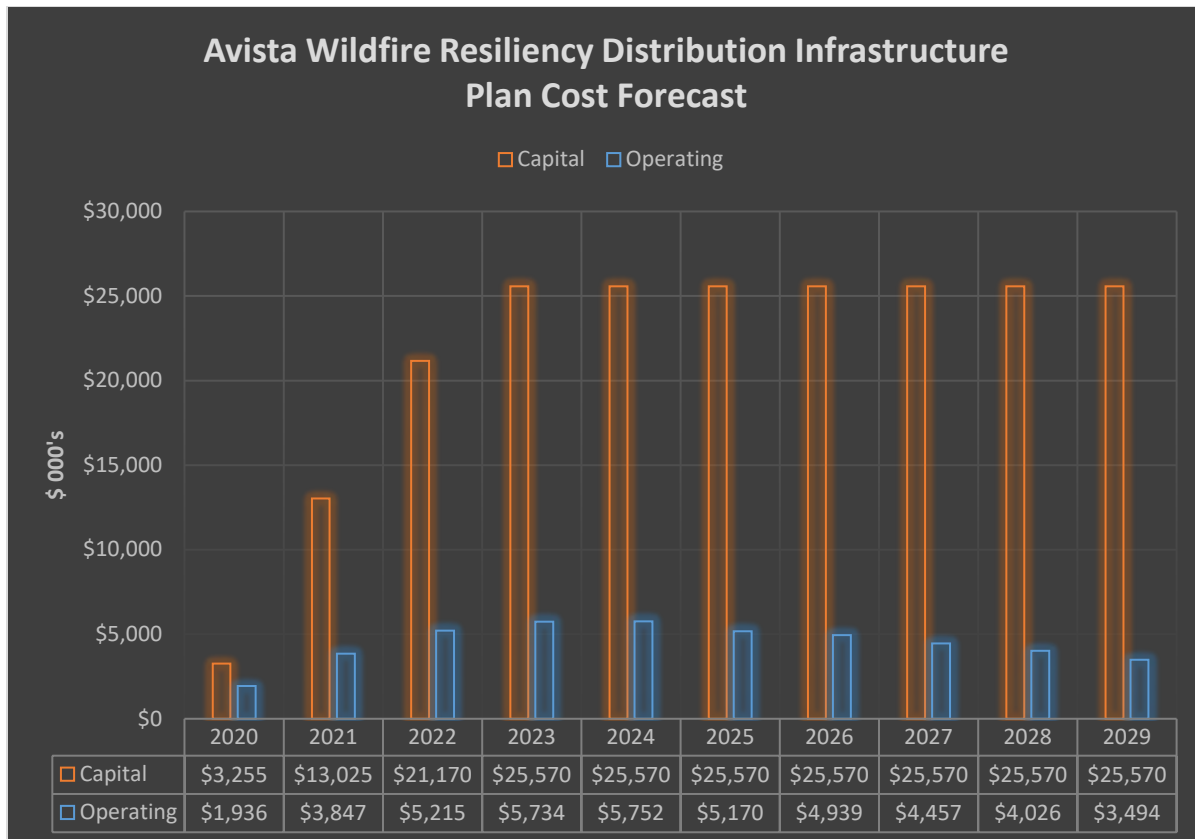
The following graphs reflect the 10-year cost forecasts of system and transmission level programs and those associated solely with electric distribution. System-wide elements include: personnel training, revisions to work processes, metrics tracking along with fire-protective pole wraps and widening transmission rights-of-way. As noted, the single largest investment element is the grid hardening of the electric distribution system.

Electric system outage history (2013-2018) indicates a **50:1 ratio** between **sustained distribution and transmission system outages**. Of particular note are the pole fires associated with the distribution system. From 2013 to 2018, there were over 90 pole fires on an annual basis. These fires generally follow periods of hot dry weather combined with a light rain which increases leakage current across insulators and wood cross-arms. Excessive leakage current produces pole fires. Also, the rate of vegetation contacts is higher on the distribution system yielding a **distribution to transmission vegetation contact ratio of 100:1**. Since the bulk of potential fire ignitions occur on distribution circuits, efforts to reduce vegetation contacts and equipment failures are aligned with those assets.



The 10-year cost forecast for capital investments and support systems on the transmission grid total \$52,525,000 with an operating expense of \$15,068,000.

Avista Internal Work Product



As noted, the largest capital spend program is the effort to ‘harden’ the distribution grid by replacing wood cross-arms, removing small copper wire, replacing obsolete insulators, and installing wildlife guards. Operating expenses reflect efforts to enhance vegetation management including conducting public outreach to replace tall growing trees such as maples and pines with lower growing species like plums and dogwoods. The accumulated 10-year cost forecast for distribution system capital is \$216,400,000 with an operating expense of \$44,569,000.

2020-2029 Avista Wildfire Resiliency Plan Cost Forecast

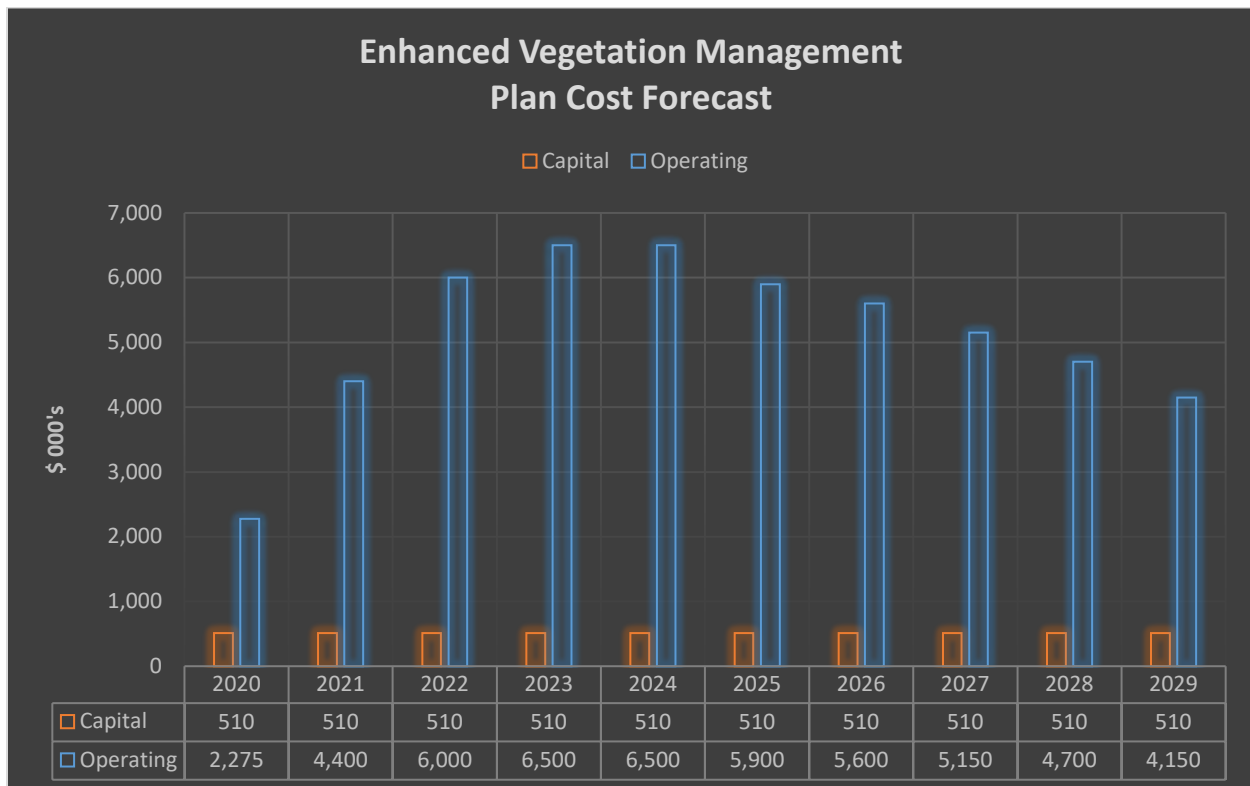
2020-2029	Capital Investment	Operating Expense
System & Transmission	\$52,525,000	\$15,068,000
Electric Distribution	\$216,400,000	\$44,569,000
Plan Total	\$268,965,000	\$59,636,000

1.0 ENHANCED VEGETATION MANAGEMENT

The single largest contributor to possible fire ignition events on Avista’s T&D system is electrical contact between energized powerlines and vegetation. Between 2013 and 2018, there were nearly 2,000 vegetation contacts to the electric distribution system. Though many of these contacts occur during winter storm events, nearly 40% of contacts occur during the summer months. Adapting and innovating Avista’s vegetation management system is a primary objective of the Wildfire Resiliency Plan. One element of the plan is to collect digital data for 100% of Avista’s transmission system (2,270 miles) and approximately 40% of the distribution system (3,040 miles).

Information in this section reflects findings from the “Wildfire Risk Analysis Summary, September 2019”. Individual plan elements are coded with an alphanumeric such as ST-2 or D-3. “ST” indicates System & Transmission and reflects elements such as the fire-weather dashboard and others specific to the transmission grid like protective FR mesh wraps for wood poles. “D” indicates elements specific to the electric distribution system such as midline recloser communications (D-12) where communication systems will be added to circuit reclosers.

The 10-year cost forecast for enhanced vegetation management includes a capital investment of \$5,100,000 and operating expenses of \$51,175,000. This is the largest operating expense category.



Avista Internal Work Product

Enhanced Vegetation Management		Capital 10-yr	Operating 10-yr
ST-5	Transmission Digital Data Collection	0	6,825
ST-7	Fuel Reduction Partners (DNR, IDL, USFS)	0	1,500
ST-9	Widen Transmission Rights-of-Way	5,000	0
D-4	Vegetation Management included in distribution designs	100	0
D-10	Distribution Annual Risk Tree in WUI areas	0	25,500
D-11	Public Outreach 'Right Tree-Right Place'	0	9,600
D-14	Distribution Digital Data Collection	0	7,750
	Vegetation Total	\$5,100	\$51,175

\$ shown in 000's

Enhanced Vegetation Management Plan Elements

ST-5 & D-14 Digital Data Collection – This includes aerial surveys and post flight processing of high resolution photography and laser imaging (LIDAR) to identify structure integrity issues (i.e. broken cross-arms, hot splices, code clearance violations, and unauthorized attachments) and vegetation encroachments including conductor clearance to the vegetation undergrowth and identification of risk/danger trees.

ST-7 Fuel Reduction Partners – Avista plans to partner with County Fire Districts and State agencies including the Department of Natural Resources (WA) and Idaho Department of Lands to reduce fuel loading near critical infrastructure sites such as major substations and transmission corridors.

ST-9 Transmission Rights-of-Way – Many of Avista's transmission easements do not specify width nor do they provide clear language to remove danger trees. Modernizing these transmission rights-of-way is a significant effort to reduce the risk of vegetation contact.

D-4 Vegetation Management embedded in design – This acknowledges the need to include vegetation clearing associated with both greenfield new construction and brownfield reconstruction efforts.

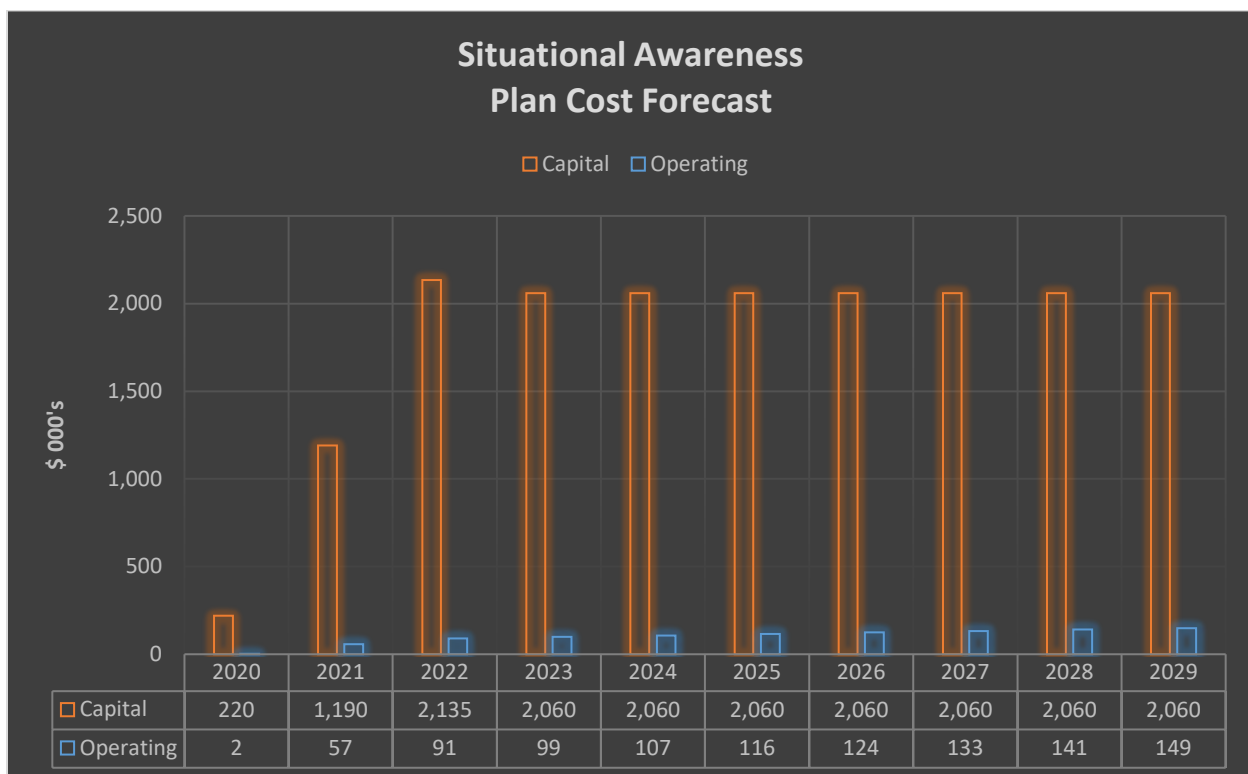
D-10 Annual Risk Tree – To conduct annual assessments and removal of risk trees associated with overhead distribution circuits.

D-11 Public Outreach "Right Tree-Right Place" – For many years Avista has encouraged property owners to plant low growing trees near powerlines. This effort would pair a public media campaign with field efforts to remove and replace trees.

2.0 SITUATIONAL AWARENESS

The ability to monitor and control transmission and distribution systems is a fundamental tenant to effective risk mitigation. Avista operates 165 substations. Thirty-three of those substations are not connected to transmission SCADA or the distribution management system (DMS). Adding SCADA and/or DMS capability aligns with the Dry Land Mode protection scheme and allows system operators to remotely configure substation reclosers. In addition, Avista plans to develop a fire-weather heads-up display that combines current weather forecasts with fire threat indices.

The 10-year cost forecast for situational awareness includes a capital investment of \$17,965,000 and operating expenses of \$1,019,000.



Situational Awareness		Capital 10-yr	Operating 10-yr
ST-2	Fire-Weather Dashboard	425	650
D-12	Midline Recloser Communications	540	272
D-15	100% Substation SCADA	17,000	97
		17,965	1,019

\$ shown in 000's

Situational Awareness Plan Elements

ST-2 Fire-Weather Dashboard – Develop a web-based display combining near term weather forecasts with prevailing fire threat conditions. This dashboard will be used to inform operational posture and manage the Dry Land Mode program.

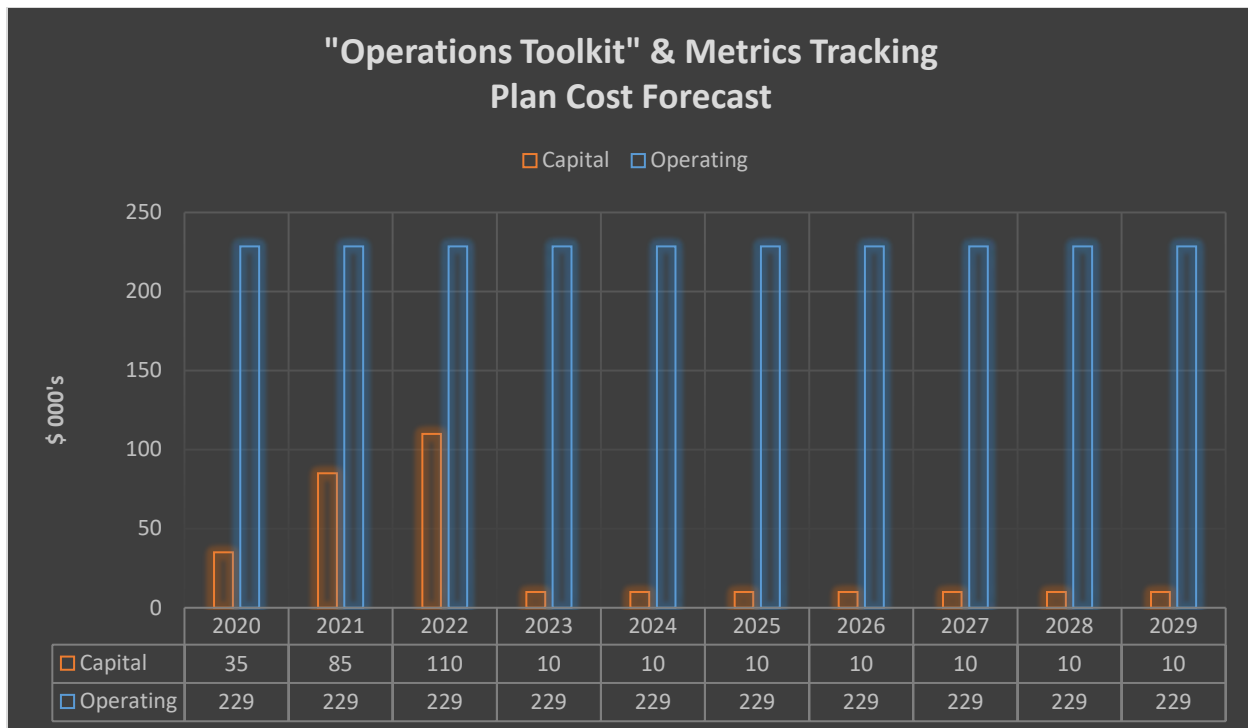
D-12 Midline Recloser Communications – Retrofit modern distribution midline reclosers with cellular modems to enable remote operation, configuration, and monitoring of distribution circuits in WUI Risk Tiers 2 and 3.

D-15 100% Substation SCADA – Add substation communication systems to non-com stations located in or near WUI Tier 2 and 3 areas.

3.0 “OPERATIONS TOOLKIT” & METRICS TRACKING

During the Wildfire Risk Workshops conducted in June of 2019, a number of opportunities were identified to elevate the Avista’s operational readiness during fire season. Avista has a long history of working within highly regulated compliance environments such as the Federal Department of Transportation for natural gas operations, the Federal Energy Regulatory Commission for the transmission system, and Environmental Protection Agency’s clean air and water requirements to name a few. The Wildfire Plan elements will also be held to compliance level oversight.

The 10-year cost forecast for the operations toolkit includes a capital investment of \$300,000 and operating expenses of \$2,285,000.



Avista Internal Work Product

"Operations Toolkit" & Metrics Tracking		Capital 10-yr	Operating 10-yr
ST-1	EOP & Fire ICS Representative	0	50
ST-3	Engineering Review Major Events	100	0
ST-4	Wildfire Compliance Tracking	0	150
ST-8	Emergency Responder Training	0	1,300
D-1	Fuse Coordination Study	0	200
D-2	Recloser Event Reporting	0	400
D-3	Fire Ignition Tracking System	200	100
D-5	Fire Suppression 'wetting' agent	0	50
D-7	WUI layer in GIS	0	30
D-9	Arcos Wildfire Notification	0	5
Ops Toolkit & Metrics Total		300	2,285

\$ shown in 000's

"Operations Toolkit" & Metrics Tracking Plan Elements

ST-1 EOP & Fire ICS Representative – Aligns Avista's Emergency Operating Plan (EOP) with the Wildfire Resiliency Plan to account for the labor costs of embedding Avista personnel in 100% of all County, State, and Federal Incident Command Structures (ICS).

ST-3 Engineering Review Major Events – Require a 24-48 hour stand-down period following major transmission events to allow for an engineered reconstruction plan.

ST-4 Wildfire Compliance Tracking – System level metric tracking of the Plan elements.

ST-8 Emergency Responder Training – Provide annual fire safety training for electric operating personnel as well as electric hazard safety training delivered to fire protection personnel.

D-1 Fuse Coordination Study – This is an annual effort to ensure proper coordination of distribution system fuses.

D-2 Recloser Event Reporting – To conduct engineering review of recloser events in WUI areas.

D-3 Fire Ignition Tracking System – Adapting Avista's Outage Management System (OMS) to capture fire ignition outcomes.

D-5 Fire Suppression 'wetting' agent – Use of chemical additives such as 'cold fire' to maintain the 'wetting' action of water.

D-7 WUI Layer in GIS – Annual maintenance of Avista's Wildland Urban Interface system.

D-9 Arcos Wildfire Notification – Provide annual dispatcher training on the use and implementation of the Arcos call-out system to provide real time fire updates to key personnel; including executive management.

4.0 GRID HARDENING AND “NEXT GEN” DRY LAND MODE

Since the early 2000’s, Avista has adapted the protection of distribution circuits in fire prone areas. Internally, this program to disable both instantaneous tripping and automatic reclosing is known as “Dry Land Mode”. Avista will conduct a holistic review of this program and will recommend program changes including adding midline reclosers.

In order to reduce ignition events and to effectively ‘harden’ the system against the impacts of fire, a number of programmatic measures are recommended to replace wood structures, remove small copper wire, add wildlife guards, and to protect wood poles with fire-retardant (FR) mesh wrap. This is by far the largest capital investment of the plan and represents alignment with other regional utilities including Northwestern, Idaho Power, Chelan PUD, Portland General Electric, and PacifiCorp.

The 10-year cost forecast for grid hardening and dry land mode includes a capital investment of \$245,600 and operating expenses of \$5,157,000.

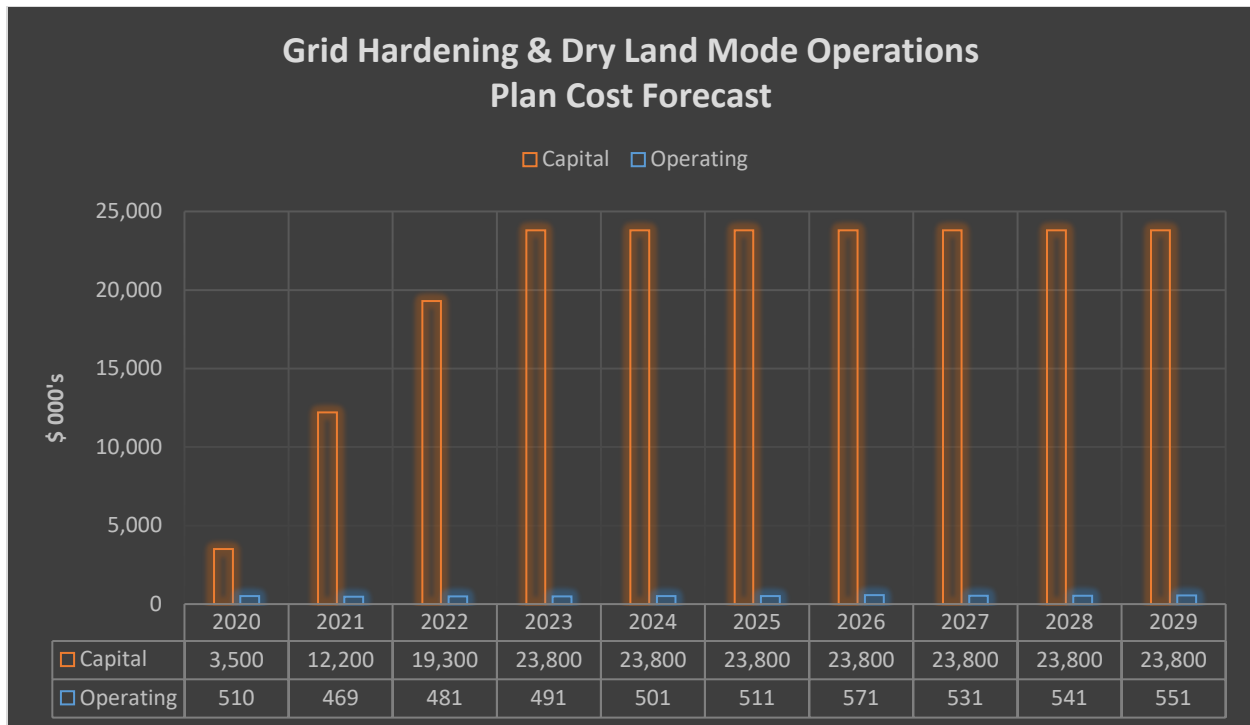


Efforts to Harden the distribution grid include the replacements of wood with steel poles. “High-Value Poles” in fire prone areas will be systematically replaced with steel to mitigate damage and outages during wildfire events.



Distribution midline reclosers will play an important role in Avista Next Generation Dry Land Mode program. The ability to quickly detect and de-energize circuits is paramount to reducing fire ignition events.

Avista Internal Work Product



Grid Hardening & DLM		Capital 10-yr	Operating 10-yr
ST-6	Wood Pole Fire Retardant Mesh Wrap	0	2,500
ST-10	Structure Integrity Line Patrols	3,000	0
ST-11	Expedited Fire Response	0	93
ST-12	Additional Transmission Patrols in WUI	0	2,000
ST-13	Transmission Grid Hardening	44,000	
D-6	Dry Land Mode 'Effectiveness' Study	0	100
D-8	Dry Land Mode 'Trigger'	0	20
D-13	Additional Midline Reclosers	5,400	444
D-16	WA Grid Hardening in WUI Tiers 2-3	120,000	0
D-17	ID Grid Hardening in WUI Tiers 2-3	73,200	0
	Grid Hardening & DLM Total	245,600	5,157

\$ shown in 000's

Grid Hardening and Dry Land Mode Plan Elements

ST-6 Wood Pole Fire Retardant Mesh Wrap – This is a program to add fire retardant mesh wraps on transmission poles subject to ground level fires (e.g. channeled scablands, agricultural areas, and dry grasslands.) *Avista is currently using fire retardant pole paint and is considering moving to a more permanent mesh wrap.*

ST-10 Structure Integrity Line Patrols – Provides additional funds for capital follow-up work to ensure that defects likely to produce ignition are treated prior to fire season.

ST-11 Expedited Fire Response – This is an agreement with fire protection agencies to patrol transmission fault events during fire season.

ST-12 Additional Patrols in WUI – An annual line inspection patrol specific to fire ignition and fire impact hazards.

ST-13 Transmission Grid Hardening – To convert existing transmission wood to steel Structures in WUI Tiers 2 & 3.

D-6 Dry Land Mode ‘Effectiveness Study’ – Review Avista’s summer operating mode including electric circuits in WUI Tier 2 & 3 areas.

D-8 Dry Land Mode ‘Trigger’ – Monitor US Forest Service Fire Threat Index to implement DLM. This is a GIS based system.

D-13 Additional Midline Reclosers – Enhance DLM to require the installation of several circuit reclosers and communications systems.

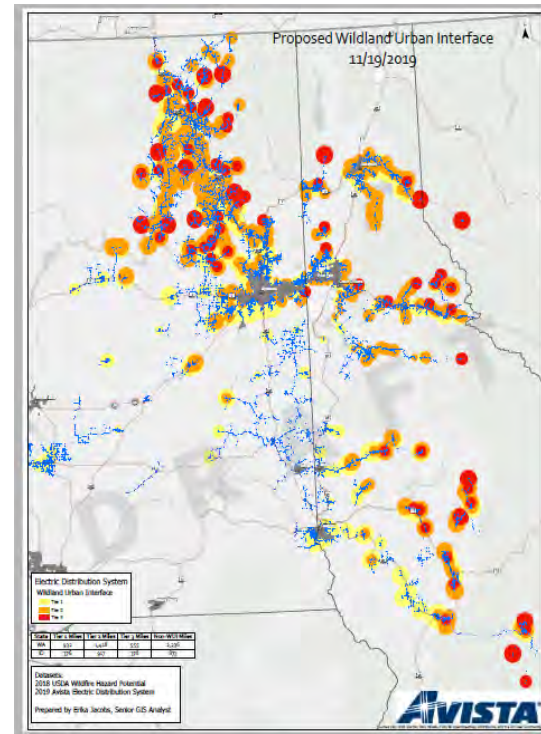
D-16 WA Grid Hardening in WUI Tier 2-3 – The Washington component of distribution grid hardening includes replacing wood cross-arms with fiberglass, replacing small copper conductor, installing select steel poles, and adding wildlife guards to fuses, arrestors, and transformer bushings.

D-17 ID Grid Hardening in WUI Tier 2-3 – The Idaho component of the above element.

ADDENDUM

Wildland Urban Interface

Assessing the risk of wildfire and aligning treatments to reduce that risk is the objective of Avista's Wildfire Resiliency Plan. The concept of Wildfire Urban Interface (WUI) has emerged as a widely adopted method for quantifying that risk. At Avista, we recognize that our T&D facilities are both vulnerable to the impact of fire (consequence of fire) and are a potential source of fire ignition (probability of fire). Avista's Plan is squarely focused on reducing both fire consequence and probability. Jake Jacobs, GIS Specialist, has developed a WUI map based on Avista's electric distribution system, housing density, and Wildfire Hazard Potential data as provided by the U.S. Department of Agriculture. As referenced in "Wildfire Risk Analysis Summary, September 2019" and in this report, the WUI risk map allows Avista to target treatments to reduce fire risk to our customers, the communities that we serve, and to safeguard our employees. The importance of aligning actions with risk cannot be overstated.



A larger version of the WUI map is reprinted on the following page. The WUI is divided into three tier levels:

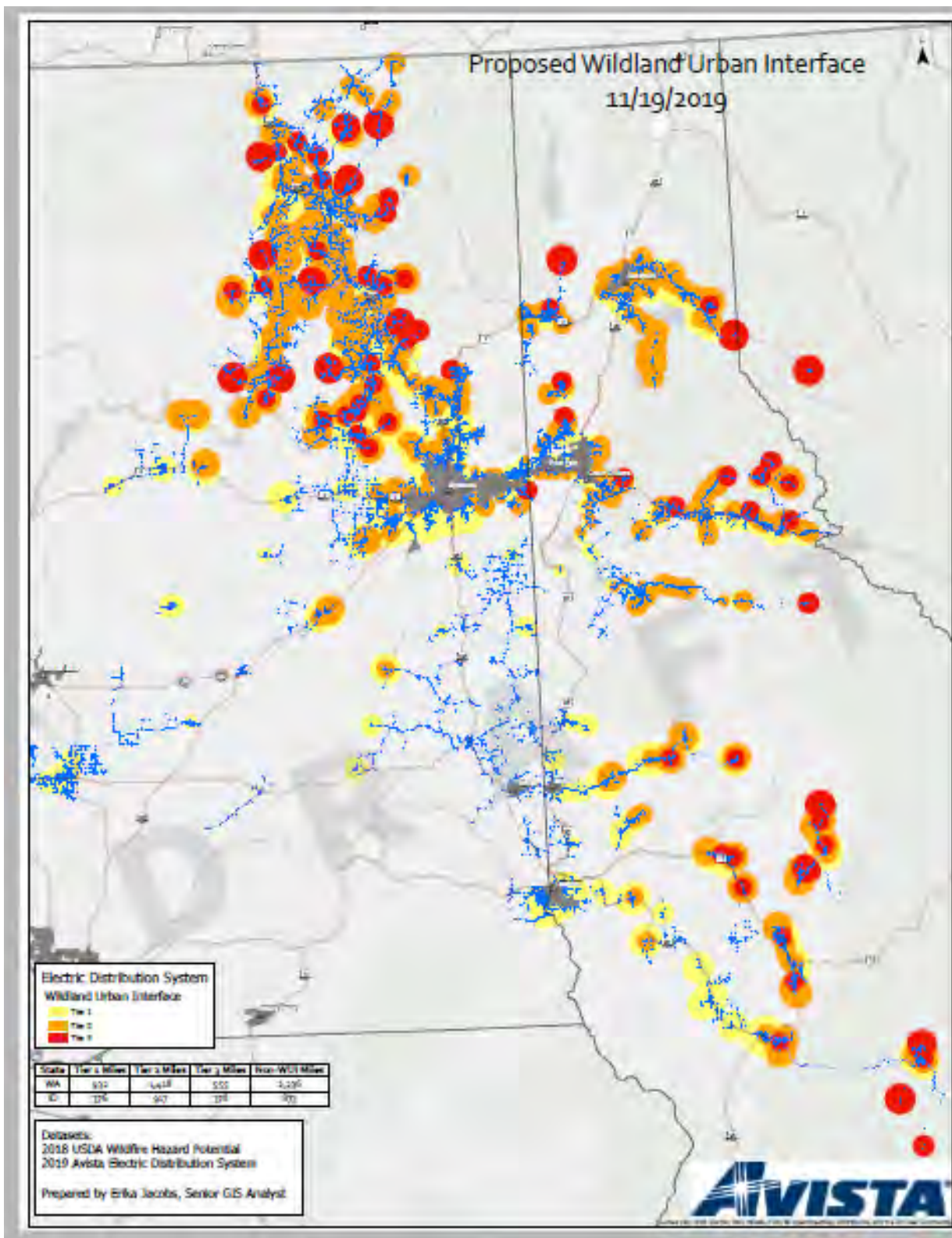
Tier 1 (Low) – Yellow Highlight – Geographic areas with <10% of Wildfire Hazard Potential (WHP) rated at moderate fuel levels or higher.

Tier 2 (Elevated) – Orange Highlight – Geographic areas with 10-50% of WHP rated at moderate fuel levels or higher.

Tier 3 (High) - Red Highlight – Geographic areas with 50-100% of WHP rated at moderate fuel levels or higher.

Areas not highlighted fall below the criteria for WUI either because they are heavily populated (cities) and have well developed fire defense mechanisms or they are so sparsely populated that the consequence of fire is low. Do not confuse the WUI map with fire probability. Most national forest lands fall outside of the WUI because human development is low or non-existent. The WUI map indicates where human development is most at-risk from the impact of wildfire.

Note that most of Avista's vegetation and system hardening efforts will be targeted in the WUI Tier 2 and 3 areas.

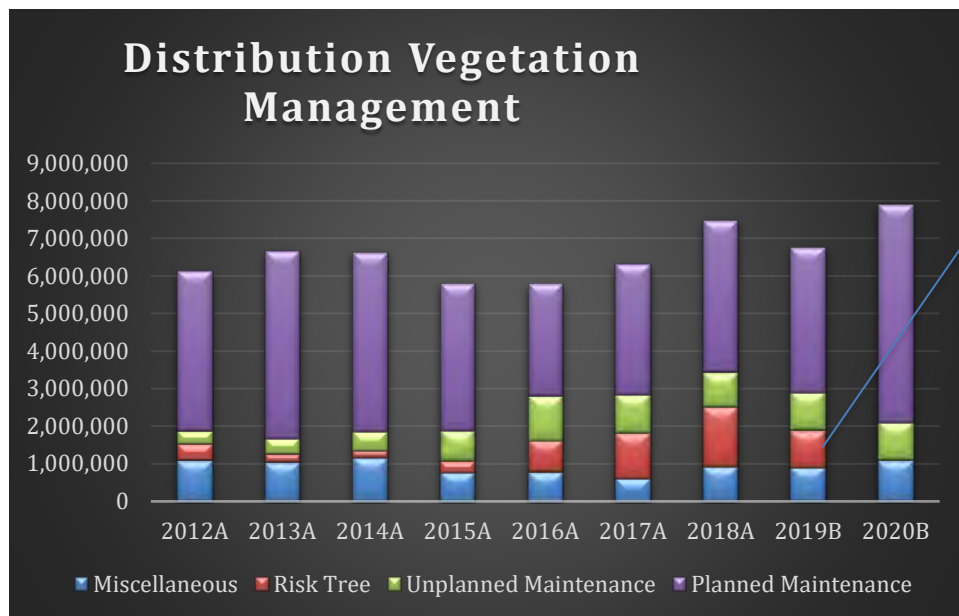


Enhanced Vegetation Management

Historically, utility vegetation management systems were focused at maintaining reliability service levels. However, over the past decade, utility trends are shifting towards a more risk-based approach with fire risk mitigation as a primary factor.

The following chart and table indicates actual spend in Avista’s distribution vegetation program. The program has three main elements:

1. Planned Maintenance – to systematically trim and remove vegetation growing underneath or directly adjacent to primary distribution circuits (13.2-34.5 kV). This program covered approximately 20% of the system per year resulting in a 5-year rotation cycle.
2. Unplanned Maintenance – Avista responds to customer requests for tree trimming including ‘internal’ customers. The upward trend of unplanned work presents a significant resource challenge and oftentimes erodes planned maintenance.
3. Risk Tree – in addition to proximity trimming, dead and dying trees within the strike distance of the line are slated for removal. This oftentimes requires property owner consent as most of these trees are located outside of established easement areas.



Risk Tree Shifts to Wildfire Resiliency Starting in 2020

2012-2018 – actual program spend indicated
 2019-2020 – budget forecast amounts

Avista Internal Work Product

Adding wildfire risk mitigation to the base vegetation program results in three actions:

1. Digital Data Collection – The industry is trending away from cadence based programs and towards risk based programs. Avista plans to collect LIDAR data in the elevated fire risk areas (WUI Tiers 2&3). This data will be used to design line clearance prescriptions, it will also serve as an audit of prior work.
2. Annual Risk Tree- By separating the risk tree activities from planned maintenance, Avista will prioritize risk tree removals on a risk-cost basis.
3. Right Tree-Right Pace – Avista plans to conduct a customer outreach program and encourage the removal of tall growing trees with more compatible species. Tree that mature at a crown height of 20-25 feet typically do not require trimming and do not pose a hazard for powerline operation or maintenance.

If one assumes a base vegetation spend of \$8M/year, adding fire resiliency to the base plan results in a cost forecast as shown below. This graph simply reflects the addition of wildfire efforts to Avista’s existing program with the exception of transitioning the risk tree element to the wildfire plan.

