STRATEGIC ASSET MANAGEMENT PLAN

For Transmission Category

This Strategic Asset Management Plan documents Transmission's current state and maturity in asset management organization, people, processes and systems. The SAMP recommends asset management improvement actions to be implemented from FY18 through FY22 across the full asset lifecycle to better create and deliver value for BPA's ratepayers and stakeholders, while also ensuring long term grid safety and reliability

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1.0 EXECUTIVE SUMMARY

Transmission's Strategic Asset Management Plan (SAMP) documents the current state and describes planned asset management improvements, maturity and competencies needed to effectively and efficiently manage the entire lifecycle of BPA assets that deliver electric transmission and telecommunication services. The SAMP aims to provide alignment between the agency strategy, Transmission Business Model, stakeholder requirements, organizational objectives and resulting asset management objectives to ensure assets are managed and measured in creating and delivering value to the region.

Transmission Services manages nearly $5 billion in depreciated assets for substations, transmission lines and communication infrastructure that is critical to the Northwest economy. Replacement cost is significantly higher. The system comprises about three-fourths of the Northwest region's high voltage transmission assets. This remarkable engine of the Northwest economy spans approximately 300,000 square miles and includes more than 15,000 circuit miles of transmission lines, 3,500 miles of fiber, approximately 300 substations and 732 telecommunication facilities. These assets deliver electric power, directly or indirectly, to a population of more than 12 million through four main product categories.

- Transmission service to regional utilities and merchant entities
- Generation and line & load interconnections
- Interregional transfers of capacity and energy
- Ancillary services, such as regulation and load following services

Transmission Services has moved the needle from its initial SAMP where many of the 39 IAM competencies initially received a score of 1 on the maturity scale (out of a possible 4). Over a two year period Transmission has matured its asset management competencies from an initial score of 1 to now ranging between 1.5 – 1.9. Continual cultural focus at all levels of the organization has allowed for growth in making asset lifecycle evaluations that result in the best value for the region; whereas historically *following precedence* may have yielded a different outcome. The roughly ~260,000 algorithms developed and codified into policy; is now being incorporated into decision making. This reflects an achievement worth taking special note of as it is a new capability to BPA.

Given BPA's imposed funding and labor constraints, Transmission will focus on integrated replacement and maintenance decision making with explicit risk consideration in order to achieve the desired asset management performance, cost, and risk mitigation over the next ten years. Replacement of aging asset classes will continue on a progressive pace, however, with the use of asset health and criticality, specific asset replacement decisions will be better informed. Additional options such as asset life extension, run- to-failure (when applicable) and maintenance strategies will be examined. Maintenance changes will occur, where identified, to free up resources for replacement and expansion work.

Transmission system expansion will be dominated by compliance and customer-driven interconnection requests to serve continuing growth in renewable generation and large loads, specifically data centers. Energy storage projects are on the horizon and may require system reinforcement when built. BPA and the region are increasingly looking to commercial and technical alternatives to meet dynamic system demands and therefore very large infrastructure builds will become less likely in the next decade.

2.0 ACKNOWLEDGEMENTS

2.1 Senior ownership

BPA has a proud history of electrifying the northwest and carries on the important mission of reliably and safely operating the grid to serve as an engine of economic development. From 2018 through 2020, Transmission Services will enable a record amount of interconnections to the grid for new renewable generation, transmission lines and loads. Wind generation projects will continue to be built and utility scale solar generation projects will number in the dozens. Data center loads will rival and perhaps exceed loads of the former aluminum industry during its heyday. While Transmission Services welcomes the revenue provided by these projects, the quantity and magnitude of customer interconnections will challenge the capacity of Transmission and Supply Chain to build solutions and deliver certainty. Implementing asset management in Transmission Services during this same timeframe will not eliminate the execution challenges of the customer projects but will enable better, risk-informed decisions in prioritizing the needed asset replacements and grid reinforcements identified by BPA's planners and engineers. As senior vice president, I am committed to Transmission periodic updates of the SAMP, development of Asset Plans, implementation of a risk assessment and evaluation methodology, and employing maintenance analytics and reliability engineering to make integrated maintenance/replacement decisions. These initial asset management competencies will enable Transmission to prioritize the highest value actions across the entire asset lifecycle to maintain reliability even during a period of intense interconnection activity.

Richard L. Shaheen

Senior Vice President of Transmission

2.2 Strategy Development Approach

2.2.1 Key Contributors

Towards the end of FY19, TPO led a series of SAMP workshops to better socialize the SAMP across Transmission. The intended approach was to ensure an expanded contributor population by engaging through collaborative dialogue. Through the combination of strategical and tactical perspectives the workshops were geared toward strengthening buy-in to continue to mature asset management competencies. The series of collaborative discussions included

- Strategic Directors
  - 4 IOMs, TF Senior, Reliability Centered Maintenance (RCM) SME, Finance representation
- Strategic Enablers
  - 28 Tier III managers across all Transmission organizations, representatives from Supply Chain, Risk, Environment

While there are key contributors and specified owners of key initiatives, programs and projects for the delivery of Transmission's strategy, every team member within Transmission plays a role, has responsibility and can add value to implement the prescribed activities and methodologies to balance asset performance, identify and manage risks and maximize Total Economic Value.

2.2.2 Key Activities

As mentioned in 2.2.1, the primary activity to prepare for the SAMP refresh was numerous workshops that engaged the Strategic Directors and Enablers. The following topics helped facilitate the collaborative dialogue:

- Agency Strategy & Transmission Business Model (TBM)
- Increasing pace of change across industry landscape (Josh Binus presentation)
- Internal and External Influencers
- SWOT analysis
- Paradigm busting
- Asset Management Program Plan alignment

3.0 STRATEGIC BUSINESS CONTEXT

3.1 Alignment of SAMP with Agency Strategic Plan

Bonneville's mission is to create and deliver best value for its customers and constituents. It is committed to cost-based rates by setting rates as low as possible while maintaining consistency with sound business principles and ensuring full recovery of all of its costs. BPA's vision to be an engine of the Pacific Northwest's economic prosperity and environmental sustainability is provided through high reliability, low rates, responsible environmental stewardship and regional accountability. The direction of the Agency's Strategic Plan has set forth goals which will sustain and further BPA's mission and vision.

To ensure alignment with the agency strategy Transmission developed the Transmission Business Model (TBM). The TBM developed value propositions and focus areas with corresponding outcomes to facilitate the delivery of the Strategic Plan

(Figure 3.1-2). Each of the TBM focus areas and outcomes tie to one or more of the four goals in order to fulfill the intent of the agency strategy. While resources are allocated to achieving the specified outcomes the *Infrastructure* and *Long-Term Viability* focus areas are key contributors to the efforts outlined in Transmission's current SAMP. One of the main reasons for this is that the corresponding outcomes help Transmission achieve an initial operating capability to administer an industry-leading asset management program.

Maturing Transmission's asset management competencies will enable the modernization of assets to help BPA maintain competitive advantage in the marketplace, enable industry change and deliver on public responsibilities; as well as strengthen financial health through the management of lifecycle costs and asset value. The Asset Management Strategies and Plans presented in this SAMP support the following Strategic Plan objectives:

Table 3.1-1, SAMP Alignment

Transmission Focus Areas	Supporting Strategy, Action or Process	Agency Strategic Plan Alignment
Infrastructure ➢ Advanced Situational Awareness ➢ Right-sized Investments ➢ Value and Risk-Based Asset Management	Develop asset strategies and plans that are informed by asset condition, criticality and risk: *On-going/continuous improvement (first level maturity achieved for asset condition in FY18* Manage lifecycle costs to inform investment decisions based on best value and perform alternatives analyses that also consider total lifecycle costs coupled with CHR and economic analysis: *New Initiative/Competency (one-off manual lifecycle cost analyses have been performed in FY19 using the risk spend efficiency assessments that integrate economic analysis and CHR to inform all decisions of the asset lifecycle. Transmission will continue to mature/automate in order to manage investments in a scalable/flexible manner – i.e. Portfolio Optimization, Facility Rebuilds, Discreet Asset Replacements, Maintenance & Sparing strategies)* Partner with Agency enterprise architect to align related processes and systems: *On-going (Supporting Asset Registry and Asset Hierarchy efforts)*	**Objective 1a**: Improve cost-management discipline **Objective 1b:** Build Financial Resiliency **Objective 2a:** Administer an industry leading asset management program that takes into consideration asset condition, criticality, health & risk (CHR) **Objective 2b:** Modernize federal power and transmission system operations and supporting technology **Objective 4a:** Address load service requests by using flexible, scalable and efficient solutions
Long-Term Viability ➢ Integrated & Efficient Processes ➢ Data-Driven Decision Making	Develop and Implement Criticality, Health, and Risk criteria to inform how much maintenance should be done on a given asset, when investment decision should be taken, prioritizing highest values assets for an investment decision that considers all risk dimensions: *On-going/Continuous (Development initiated in FY18).* Develop agency performance metrics that understands asset investments and impacts to agency objectives; including net-carbon as an example:	**Objective 1a**: Improve cost-management discipline **Objective 1b:** Build Financial Resiliency **Objective 2a:** Administer an industry leading asset management program **Objective 2b:**

Transmission Focus Areas	Supporting Strategy, Action or Process	Agency Strategic Plan Alignment
➢ Innovation & Continuous Improvement	*New (Following SAMP 1.0 audit from Woodhouse understanding and tying metrics to assets is a high level objective)*	Modernize federal power and transmission system operations and supporting technology **Objective 4a:** Address load service requests by using flexible, scalable and efficient solutions **Objective 4b:** Develop and Implement policies, pricing and procedures for regional planning that incentivize grid optimization

Figure 3.1-1 Transmission Business Model

3.2 Scope

Transmission's SAMP embraces a 10 year planning horizon which utilizes asset management principals to connect its business strategy to its investment outcomes. To assure the Pacific Northwest has a transmission system that is prepared to meet the task of integrating and transmitting power from federal and non-federal generating units; Transmission measures its asset management maturity to develop and implement plans that maximize the value derived from its assets and effectively prioritize investments.

BPA's transmission system is comprised of high voltage transmission lines & substations, communication sites, fiber optic cable, right-of-ways and control center assets. While all of these assets are taken into consideration in the SAMP, the specific activities and timeframe to implement will vary depending on the maturity and need of the asset categories. For instance some asset categories initial focus will be to integrate into the asset register so that it is not at a programmatic strategic disadvantage.

Furthermore, the SAMP takes into consideration that asset health is a top agency enterprise risk due to the criticality of transmission assets and its corresponding average asset age. This is vital in order to modernize assets. Many of BPA's transmission assets are near or beyond their effective economic lives. As a capital intensive entity, BPA's mission, vision, goals and strategic objectives are dependent on cost effective management of its assets. Creating and delivering value to the region and ratepayers is made possible only by maintaining high reliability and safety while managing costs to keep rates competitive. To maximize value, BPA must increasingly consider the full asset lifecycle performance and cost, and better integrate asset acquisition, maintenance and retirement decisions.

As Transmission is developing its asset management initial competency there are several capital projects currently in flight that are various stages of their lifecycle and therefore may have limited CHR/Lifecycle costing. These major capital projects include Vancouver Control Center (VCC), Boardman to Hemingway (B2H) and Grand Coulee switchyard. For various reasons including Energy Imbalance Market (EIM) or external pressures; Transmission may only exercise limited asset management future state capabilities including CHR/Lifecycle costing due to their hyper sensitive nature. Additionally, Transmission is working towards ensuring its asset register is complete and accurate. Therefore some programs such as Fiber and Control Center assets may also have limited CHR/Lifecycle costing in the interim as Transmission works towards updating its asset register. The remaining capital and maintenance work will continue on the path of best practice decision making for right sized investments.

3.3 Asset Description and Delivered Services

Transmission manages more than 15,000 circuit miles of high voltage transmission lines, approximately 300 substations, nearly 400 dedicated communication sites, approximately 3,500 miles of Fiber, approximately 195,600 acres of right of way and two control centers. Asset hierarchy and terminology is currently under development and will be referenced in the Asset Plan. See Table 3.3-1 for a summary of assets.

Table 3.3-1, List of Major Assets

Asset	Description
Alternating Current Substations (AC Subs)	Approximately 300 substations with more than 32,000 major equipment items including high value, critical items such as transformers, reactors and circuit breakers.
High Voltage DC / Flexible AC Transmission Systems (HVDC/FACTS)	Specialized conversion and control equipment located at Celilo Convertor Station, Maple Valley, Keeler and Rogue Static Var Compensation sites, and numerous series capacitor installations on the high voltage alternating current intertie transmission lines.
Control Centers	Two redundant and geographically distributed control centers monitoring and controlling the grid and data systems. Over 85 automation systems.
Power System Control (PSC) and System Telecomm	732 sites and ~ 11,000 pieces of equipment, 3,500 miles of fiber optic cable, all vital to BPA's ability to control and monitor the grid.

Asset	Description
System Protection and Control (SPC)	956 locations, approximately 28,000 major units of 33 equipment types, all critically important to protect the grid for reliability and safety.
Access Roads	11,860 miles of access roads with bridges, culverts and gates
Land Rights	Approximately 80,000 tracts of easement plus fee-owned properties
Wood Lines	Approximately 4,800 miles total in 336 separate transmission lines with 73,500 wood poles.
Steel Lines	10,300 circuit miles with 43,500 lattice steel and engineered steel pole transmission lines and all associated towers, hardware and components.

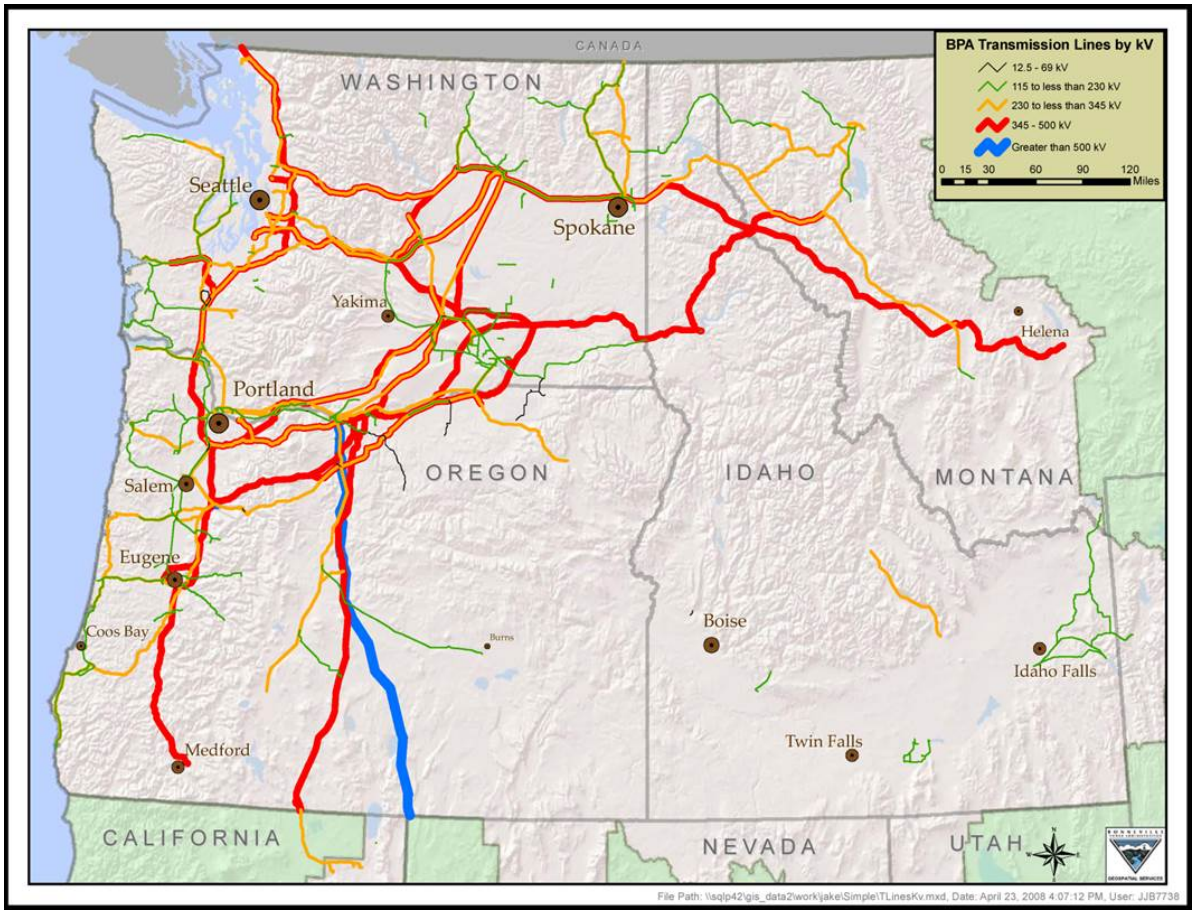


Figure 3.3-2, Asset Locations

In addition to the 15,000 miles of transmission lines and 300 plus substations, Transmission Services manages over 200,000 major unit assets, 732 telecommunication sites, and two control centers. Depreciated (book) value is approximately $5 billion dollars. Operation and Maintenance cost is approximately $180 million dollars per year.

Planning and asset management addresses customer and stakeholder requirements for upgrades and additions while also sustaining the existing transmission system. Plans of service are developed to ensure that the performance of the transmission network is maintained. These activities result in capital work plans.

The capital plan is a combination of main grid, upgrades & additions, area and customer service, projects funded in advance (by customers), capital replacement in the sustain programs, and operations and maintenance flexibility

programs. Transmission also coordinates with and enables portions of Facilities' SAMP and Asset Plan. Development plans and asset management plans are created for the various assets. These plans are integrated to develop an integrated investment plan. This ensures that opportunities are identified to minimize expenditures, for example:

- Asset renewals and maintenance at sites affected by augmentations are coordinated to minimize outages and rework;
- Maintenance is deferred or minimized for assets that are to be replaced by augmented assets;
- Renewal and development expenditure project contracts are bundled to achieve economies of scale.

Transmission assets deliver the following products and services:

- ***Ancillary Services and Control Area Services (ACS):***
  This product is needed with transmission service to maintain reliability within and among the balancing authority areas (BAA) affected by the transmission service. Under the pro forma tariff, the transmission provider is required to provide, and transmission customers are required to purchase, certain Ancillary Services. The transmission provider is also required to offer other Ancillary Services that the transmission customer must either purchase or self-supply through a customer's own resources or purchases from a third-party.
- ***Generator Interconnection/Integration (GI):***
  GI projects are customer requests to interconnect/integrate to the BPA system, resulting in potential network additions and/or interconnection facilities. A key objective of the Transmission Services product management strategy is to interconnect customer projects as efficiently as possible, ultimately meeting customer timelines. In doing so, BPA continues to fulfill its commitment to the region to provide an adequate, efficient, economical and reliable power supply.
- ***Network Transmission (NT):***
  NT Service is a transmission service product enabling the delivery of generation across BPA's transmission system to serve load. The NT Service product is intended for, and available only to, load serving entities requesting use of BPA's transmission system for delivery of generation to serve their loads.
- ***Point-to-Point (PTP):***
  Point to Point transmission is a transmission service that allows a customer to schedule energy from point A to point B. PTP is highly valuable because of its unique flexibility. It can be used to market power to third parties as well as to serve load. It can be resold, redirected to other firm or non-firm products, including different paths. It can also be used for dynamic transfers both on the network and on interties.

Refer to the Open Access Transmission Tariff (OATT) for additional information pertaining to Transmission products and services.

3.4 Demand Forecast for Services

Transmission service assets needed now and in the future include current and future sales of Transmission products. The majority of transmission sales are based on either Network loads or Point-to-Point reserved transmission demands. The large portion of sales come from rate segments that include Network, Intertie, and Ancillary Services, comprising over 90% of total transmission sales both now and in the long-term (5 years and 10 years out). As Transmission progresses towards the EIM the impacts to future demand service is not known at this time. There is potential that current products and services may behave differently in the future.

However, the current long range sales forecast is based on sales and revenues from the BP-20 Transmission Rate Case settlement, with the out-years adjusted for identified factors, particularly Network load and Network contract demand. Network transmission service includes products used to either serve load to customers, or move transmission from a Point-of-Receipt to Point-of-Delivery for load service and marketing usage. Network Integration (NT) sales serve load to customers and are based on metered customer loads at the peak hour of the Transmission load in the month. The load forecast is based on forecast developed by Agency Load Forecast, with an annual load growth applied to out-years. Point-to-Point service (PTP) moves energy over transmission paths in the Network based on reserved demand (firm and non-firm). Long-term service includes service for one year or more with the demand amount specified to move transmission from POR to POD over specified time duration. Short-term service includes service less than one year and is market driven by hydro and pricing conditions. In the out-year forecast, BP-20 rate case was adjusted for Network Conversion where an eligible customer can convert their existing PTP LT service to NT. Respectively the PTP LT reservations that expire become NT service; and as such the NT service increases on top of the inherent load growth with decreases for PTP LT.

Intertie sales (IS) likewise are based on demand and capacity. Long-term sales for IS include sales durations of one year or longer and are based on confirmed reserved capacities and deferrals. The long-term capacity on the Southern Intertie is almost fully subscribed from north-to-south with high rates of renewals (95%), so added sales are limited. Short-term IS sales include demand for near-term service with regional price spreads as the primary inputs for customer behavior.

Another sales category includes required Ancillary Services. As described in Section 3 of the OATT, customers that purchase Network and Intertie transmission are required to acquire Scheduling, Control, and Dispatch service (SCD). Other Ancillary Services include products that apply to certain customers only.

The Transmission Planning (TPP) organization then proposes (or identifies) transmission projects in its service territory over a ten-year interval and is refreshed annually to deliver the recommended alternatives for reinforcements to BPA's transmission system. The recommended alternatives are documented in the Transmission Plan and includes transmission needs identified from the annual reliability system assessment, transmission service requests, new generation and line & load interconnection requests. Acknowledging the many uncertainties that exist in the evolving energy industry, the Transmission Plan is a robust, yet flexible forecast of Transmission needs.

Within Section 12 of the Transmission Plan a narrative description is provided of the transmission needs identified through the transmission planning process. This includes the preferred alternative, an estimated cost, and estimated schedule for completion of the preferred alternative. Reinforcement projects for the transmission system are identified and described, along with proposed projects identified to meet the forecast requirements of BPA and other customers over the ten-year planning horizon. This section provides the proposed new facilities organized by type of project. The types of projects include the following:

- Projects required to provide load service and meet Planning Reliability Standards
- Projects to improve operational or maintenance flexibility
- Projects required to meet requests for transmission service
- Projects required to meet requests for Generator Interconnection/integration service
- Projects required to meet requests for Line and Load Interconnection service

Refer to the Transmission Plan for detailed information regarding required products and services, as well as, market factors that may affect delivery of service.

3.5 Strategy Duration

Transmission assets economic lives vary from ten to eighty years. The SAMP documents asset management strategic initiatives over a ten-year period. It provides a long-term view that takes into consideration organizational needs, external expectations, current state of existing assets, and the agency's asset management capabilities. While the SAMP is reviewed in two year cycles, Transmission intends to reassess whether a rapidly changing business environment requires updates to the SAMP for strategic direction on an annual basis. Additionally, the refresh is coordinated with the Integrated Program Review (IPR) cycle in order to support the IPR.

4.0 STAKEHOLDERS

4.1 Asset Owner and Operators

BPA owns and operates the transmission grid located in the Pacific Northwest. Transmission Services coordinates grid operations with Reliability Coordinator (RC West), the Reliability Coordinator for the western interconnection. The Army Corps of Engineers and Bureau of Reclamation own and operate the federal hydropower projects in the Columbia River basin with BPA markets the power produced by the facilities. Except for a very few instances of operation & maintenance by other utilities on BPA owned assets, BPA's Transmission System is owned, operated and maintained by Transmission Services. Operating under its OATT, BPA provides transmission service and enables generation and line and load interconnections to the grid.

4.2 Stakeholders and Expectations

BPA's ratepayers and stakeholders expect reliable service at the lowest possible transmission rates consistent with a sustainable business model. Internal to BPA, Finance and Risk expect prioritization of Transmission investments based on a net economic benefit ratio while Transmission Services manages programmatic and execution risks. To deliver on these requirements, Transmission must have effective methodologies for investment evaluation and decisions. Total Economic Cost modeling tools are currently undergoing an update to determine investment levels by asset type, and Transmission is investigating Reliability Engineering and Portfolio optimization methods and tools to improve decision making over the full asset lifecycle. To meet internal and external stakeholder expectations, Transmission must continue to implement improvements and achieve efficiencies. Transmission has the following strategic goals:

- Understand and deliver on external and internal customer expectations;
- Maintain safe and reliable grid operations and maintenance while reducing capital and expense costs;
- Increase utilization of lease finance to extend the availability of Treasury borrowing authority;
- Transform asset management in concert with Transmission's evolving business model to include new approaches that deliver greater value;
- Demonstrate line of sight between Transmission's asset strategies and program delivery; and
- Create sustainable organizational structures and personnel competencies.

Table 4.2-1, Stakeholders

Stakeholders	Expectations	Current Data Sources	Measures
Customers[1]	Control Costs	Long Term Rates Forecasting Tool, Focus 2028	Rate Forecast from Long Term Planning / Marketing
	Reliability	Reliability database, SCADA, OARS	SAIDI, SAIFI

Stakeholders	Expectations	Current Data Sources	Measures
	Transmission Service and Interconnection Availability	Transmission Service Request queue Interconnection queue	Transmission Service Requests granted vs. denied, queue waiting time. Request to Energization duration for new interconnections.
Government Agencies (USFS, USACE, FAA, USBOR, USFWS)	Communication	Public Comment Records, Forums including telephone meetings	Customer Satisfaction Surveys
	Compliance with Regulations	Public Comment Records, Agreements, Documented Policies	NEPA Permitting duration
	Joint Funding for Shared Investments	Agreements	Request to Signed Agreement duration for new interconnections.
FERC	Open Access to BPA's Transmission System Proper Asset Accounting	BPA's Open Access Transmission Tariff Plant Accounting Policy and Procedures	Transmission Service Request Mgmt. Interconnection Request Mgmt. Timely Unitization
Environmental Interests Parties	Compliance with Regulations	Industry regulations and standards (NEPA)	NEPA Permitting
	Minimized Impacts	Environmental Assessment Documents	Net Carbon Footprint, Visual Rendering
Fish and Wildlife Advocates	Transmission operations help support fish passage	Outage and Remedial Action Scheme records	Generating Unit forced outage rate, RAS availability
Commercial Energy Market Entrants	Enable distributed generation and energy storage	Interconnection queue	Request to Energization duration for new interconnections and/or metering and telemetering.
NERC/WECC Staff	Compliance with Regulations	Resolver	Internal/External Auditing, RSIPP Decision Documentation, Self-Reports
	Health and Safety	Safety database	Incident statistics
	Job Security and Satisfaction	Administrative database	Federal Employee survey results, turnover figures
	Training	Administrative database	Agreed professional development
Public	Safety	Industry regulations and standards	Safety Metrics (Lost Time Accident Rates, Days Away Restricted or Transferred, Total Case Incident Rate)
Public	Safety	Public safety management system	Non-conformance records
Tribal Parties	Communication	Public Comment Records, Forums including telephone meetings	Tribal Satisfaction Surveys
	Compliance with Regulations	Public Comment Records, Agreements, Documented Policies	Number of cultural resource disturbances

Stakeholders	Expectations	Current Data Sources	Measures
			Number of realty actions on Tribal land

Table 4.2-2, Customer Breakdown

Customer Breakdown[1]	Top Priorities
Preference Customers	Load service responsibilities - utility customer schedules are driven by interconnection customer schedules
	Responsiveness to utilities' end-use customers, their utility boards and political pressure
	Keep the lights on – provide reliable service to their customers
	Control costs
Independent Power Producers	Identify economical interconnections for their generation projects, primarily wind and solar
	Develop generation projects in a timeframe that meet their customer's needs
	Transmit generation to their customers
Investor Owned Utilities	Reliably serve customer loads at rates acceptable to Regulators
	Effectively and efficiently utilize existing BPA transmission rights to access regional low cost generation resources to deliver to IOU load
	Optimize IOU marketing transactions to increase IOU revenue to offset operational costs that impact IOU ratepayers and stockholders
BPA Power Services	Utilize the BPA grid to market the output of the 31 federal hydro generation plants and the Columbia Generation Station nuclear plant to power purchasers throughout the west. Keep transmission rates low to help Power Services remain competitive in the energy marketplace.

5.0 EXTERNAL AND INTERNAL INFLUENCES

Transmission's ability to sustain its assets is heavily influenced by customer demands for transmission service, generation interconnections, and line/load interconnections. Customer projects draw on the same resources required for internal projects and take priority due to aggressive need dates. The electric utility business in general is currently marked by uncertainty and volatility, resulting in response expectations that are difficult for Transmission to deliver. Beyond the demands of its regional customer base, Transmission is also impacted by trends in energy storage and load control. Limited human resources and contracting capability are the largest internal influences.

Table 5.0-1, External Influences

External Influences	Affects and Actions
Climate change	Load pattern changes due to temperature changes in SW and NW. Timing of precipitation (earlier freshet/ perhaps bimodal freshets) and therefore generation patterns for FCRPS in the Northwest will affect transmission bulk power flow. Increased wildfire risk may impact transmission lines and other assets in the field, and could impact public perception of BPA.
Changing generation mix	Changes to the generation mix in Pacific Northwest (and across WECC) may require future investments in transmission reinforcements to reliably serve loads.

External Influences	Affects and Actions
Electrical services and generation resources will become more distributed and less centralized	Non-traditional utility services and consumer load control coupled with distributed generation and energy storage will increase the volume and complexity of bi-directional energy flows. Generation and load decisions will increasingly be made by non-utility actors, increasing the difficulty of transmission planning and operations.
Flat regional loads may be the norm until transportation is electrified or populations significantly increase	Consumers will voluntarily adopt a range of increasingly cost-effective, load reducing technologies behind the meter (e.g. solar generation, energy efficiency, energy storage, energy management systems, etc.) Without increasing revenue, BPA must increase its efficiency and effectiveness in asset management to avoid significant rate increases.
Fast track customer interconnections for new generation and major load additions	Exemplified by new photovoltaic solar generation and data center loads, BPA's stakeholders demand ever-faster and cheaper interconnections to the grid. Transmission must find ways to study, plan and execute these interconnections in a much shorter timeframe without expanding its staff.
Rapid technology changes	Technological obsolescence will require Transmission to replace equipment and systems in shorter cycles, likely increasing the cost of its communication and control systems. The cost of energy storage (primarily batteries, inverters and controls) is steadily decreasing, leading to greater penetration in distribution systems and resulting in greater risk of stranded transmission assets.
NERC and WECC mandatory reliability standards	Demonstrating compliance increases Transmission's operating cost and continues to demand significant human resources.
Culturally conservative	Innovation and urgency are suppressed. Costs to implement innovation are higher than other transmission organizations.
Specialized material and engineering standards	Procurement and engineering costs are high. Industry standard materials and components are not always completely evaluated. BPA sets appropriately high standards for safety and reliability – the challenge is to determine if industry standard materials and components meet those standards and can provide solutions with better business value. Transmission must provide leadership and invest resources to make those determinations.

Table 5.0-2, Internal Influences

Internal Influences	Affects and Actions
Attraction and retention of high-quality talent will be challenged by an increasingly competitive, innovation-filled energy industry landscape	BPA's workforce has been and continues to be a top enterprise risk. With high retirement rates and other attrition, BPA must provide greater opportunities and competitive pay to keep and attract a qualified workforce. Greater innovation and use of best industry practices will not only help with retention but will also reduce project cost and duration.

Internal Influences	Affects and Actions
	Transmission's workforce is highly specialized, limiting opportunities to address workload peaks and adding cost to scoping and preliminary engineering activities. Subject matter expertise is needed and should be retained but BPA should also consider cross training and utilizing its talent more as generalists to increase engagement and reduce cost.
Modernization of Transmission operations will occupy significant resources (staff and budget) for much of the coming decade	Until formally addressed, the work of Transmission schedulers and dispatchers will continue to be hampered by the absence of a shared platform that provides accurate and reliable real-time system data regarding loads, generation, and transmission loadings and enables staff to conduct real-time contingency analyses. Agency efforts to generate revenue will require increased attention to the provision of accurate, risk-informed determinations of inventories that incorporate the consideration and prioritization of non-power policy objectives (e.g. reliability, environmental/fish concerns, renewables integration, etc.). The quest for improved operational efficiency and cost savings will continue to drive the demand for coordination, integration, and/or consolidation of many functions across Power and Transmission (e.g. modeling, forecasting, scheduling, dispatch, long-term outage planning and coordination).
Lack of integrated asset data repositories and systems	With approximately 40 systems containing asset information, Transmission is awash in data but largely lacking in clear information upon which to make good decisions. The inability to integrate information systems has reduced employee engagement, documented in the most recent Gallup survey.
Attention to disciplined cost containment	BPA is increasingly focused on cost containment and reducing rate pressures. Transmission has a role to play by identifying and implementing innovative, lower lifecycle cost alternatives to provide better business value to the region.

5.1 SWOT Analysis

Table 5.1-1: SWOT

Favorable	*Unfavorable*
Strengths (Internal)	***Weaknesses (Internal)***
• **Reliable Transmission Grid:** Long term history of a reliable system of uptime performance. • **Resiliency:** Cultural response to unplanned outages has a time proven commitment to rapid restoration for an event. • **Low Cost Sources of Capital:** BPA as a public sector utility is a nonprofit provider of transmission services and has access to lower costs of capital than IOU's or other transmission providers.	• **Risk Adverse Culture:** Culture does not reflect a workforce that is risk informed, in order to balance cost performance and risk. • **Roles & Responsibilities:** Lack of transparency around decision making authority creates inefficiencies in decision making therefore hindering throughput. • **Non-Optimized Resources:** Inability to prioritize and understand asset value hinders workforce efficiency and limits agility in decision making. Ultimately, this

• **Safety:** Agency-wide commitment to safety-centric culture; where public service is a daily driver for decision making. • **Executive Support:** Transmission Senior Leadership has embraced and pushed forward asset management as a key priority for Transmission. • **Asset Management Capability Development:** SAMP 1.0 Asset Management initiatives are beginning to be used to help inform decision making from a planning to operation perspective. • **Standardization:** Transmission has established a governance organization that develops maintenance and design standards. This enables best practices and the ability to execute contracted work that necessitates quality controls while maintaining reliability. • **Abundance of Data:** Transmission has access to an abundance of condition and performance data, utility wide (i.e. IEEE, EPRI), that allows Transmission lifecycle models to inform Asset Strategies and Plans. • **Continual improvement of Data:** Transmission has been in a 5 year ongoing effort to improve data quality where the best values are and will continue to do so. • **Environmental Sustainability:** Transmission has a growing non-wires program that brings alternatives analysis to meet Transmission service requirements that also reduces net carbon footprint.	impedes potential revenue growth and the ability to effectively manage risk. • **Quantifying Value:** Transmission is unable to quantify asset value or risk. Preventing maintenance/capital prioritization and optimization. This includes processes, standards, operational activities and planning activities. • **Agency Alignment:** Currently, operational business organizations and support organizations are not in alignment to prioritize and deliver on critical support functions (i.e. Fleet, HCM, Facilities, IT). • **Data Integration:** Data management practices are still being matured. Transmission has asset information systems that do not fully integrate with one another in a structured or enhanced fashion. Additionally, it does not have a data warehouse that integrates all the data for ease of use or analytical reporting capabilities. • **Rigid Financial Engine**: Current financial processes/policies are heavily influencing the type of work completed and its corresponding execution throughput. This limits the ability to identify the best value decisions or new asset strategies, such as run-to-failure for certain assets (i.e. relays). • **IAM Cultural Awareness:** Everyone has an impact to asset management and needs to be aware of their role • **Unified Maintenance & Capital:** Utilizing lifecycle costs to holistically evaluate projects and maintenance activities. This ensures finding a balance with project funding needs in order to finance the project are considering an optimized combination of maintenance and capital spending.
Opportunities (External)	***Threats (External)***
• **Risk Based Planning & Prioritization:** Transmission is on a path to setup an ongoing capability to understand asset Criticality, Health & Risk to inform investment decisions and prioritize investments across the entire lifecycle. • **Financial Effectiveness:** As part of the capital investment process, Transmission is working on inserting alternatives analysis as a requirement to deliver lowest lifecycle costs. This allows existing standards in place to be compared using business driven outcomes to retain economies of scale and maximizing asset life utilization. • **Reliability Engineering:** Is being revitalized as a core competency in engineering and planning that allows for new asset management tools (i.e.	• **Aging Infrastructure:** With a transmission system that is near end-of-life fosters an environment to increase risks such as outages, wildfires, technological obsolescence, etc. Furthermore, deferring replacements limits BPA's ability to control costs. • **Climate Change:** The growing concerns with climate change ranging from natural disasters to increased seasonal high temperatures spawns new high impact challenges from grid operations to investment planning with wildfire seasons being longer and more aggressive. • **Cost Control:** Over the past decade the focus has been on customer funded projects. As a result, BPA is facing the challenge of sustaining a system that is at end-of-life that requires significant ongoing

SALVO Decision Support Tool) to optimize individual assets.	replacements in order to maintain existing levels of reliability. Additionally, assets that directly impact revenue are also at end-of-life. It is critical to optimize the highest value work and controlling costs. This will be accomplished through continual emphasis on CHR to quantify the biggest risk mitigation per dollar. • **State/Federal Regulations and Mandates:** With growing societal concern on climate change, States are aggressively pursuing new policies to mandate environmental thresholds with renewables that ultimately impacts Transmission infrastructure. While this primarily impacts Generation it does have secondary impacts to Transmission. An example would be decommissioning coal generation with reactive power support.

6.0 ASSET MANAGEMENT CAPABILITIES AND SYSTEM

On the five point Institute of Asset Management maturity scale, Transmission's current asset management practices range from 1.2 to 1.8, on a scale of 0 to 4. The organization has identified its asset management needs and has demonstrated progress by committing to ongoing efforts that will continue to mature asset management capabilities.

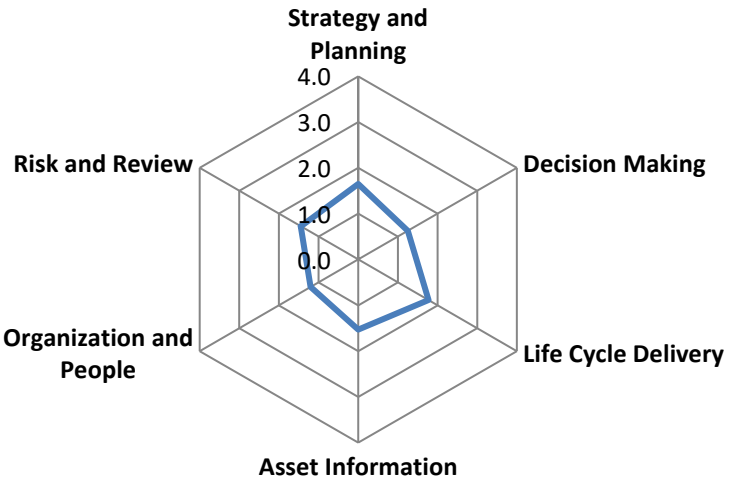


Figure 6.0-1, Asset Management Maturity Radar Chart

While asset management responsibility resides throughout Transmission Services, accountability is placed with the Vice President of Transmission Planning & Asset Management who also carries the title of BPA's Chief Engineer. Asset management delegation of authority flows through TP's Internal Operations Manager to the Strategy & Program Management (TPO) Manager, who also serves as Transmission's Asset Manager.

- Transmission's asset management responsibilities and systems are currently distributed across many workgroups, including the following: (Note: A lower case "x" following a two letter organizational code indicates that responsibility is distributed in one or more Tier 3 or Tier 4 sub-organizations). Planning organizations (TPP, TPM, TPC) – 60 hertz, communication and customer service engineers study grid and telecommunications performance and develop plan of service alternatives that meet load growth, reliability and customer needs
- Strategy, Asset and Program Management (TPO) – engineers with broad experience in asset specialties develop the near and long term asset strategies and work plans for system expansion and sustainment
- Technical Services (TEx) - engineers with deep knowledge of specific equipment parameters and performance
- Project Management and Design organizations (TEx) – Project Engineers and Project Management Professional certified Project Managers in a multitude of disciplines and specialties
- Field Services (TF) – Construction, Maintenance and Operations Personnel
- Information Technology / Operational Technology (TTx) – A new organization charged with Leadership and Governance of the Control Centers and Power System Control assets located throughout the system

Transmission's Asset Management Executive Council (TAMEC) is a strong supporter of asset management. The TAMEC reviews and approves Transmission capital funding recommendations prior to submittal to the Agency Capital Prioritization Review Team (ACPRT) and the Finance Committee (FC). Through a charter, the TAMEC has authorized the Portfolio Management Team (PfMT) to make the daily portfolio management decisions. The PfMT consists of the managers of Strategy, Asset and Program Management (TPO), Asset Management Oversight & Program Support (TPW) and Project Management (TEP).

In recognition of the importance and value of full lifecycle asset management, an Asset Management Lifecycle Governance Team (AMLGT) has formed; it is the governance body to ensure that the Asset Management Lifecycle phases work well together and that process dependencies and handoff points are properly designed. The AMLGT consists of the PfMT members plus delegates appointed by Transmissions Engineering, Operations and Field Services Vice Presidents.

Transmission recognizes there is great opportunity in effectiveness and cost savings through integrated replacement and maintenance decisions and yet there is currently no coordination between these functions except in very limited circumstances such as the transformer effective age calculated by Technical Services. Increased maintenance resources will be needed where replacement is deferred.

The separation of capital and expense budgeting is another weakness that drives suboptimal asset maintenance and replacement decisions. Transmission's greatest weaknesses hampering asset management improvements include:

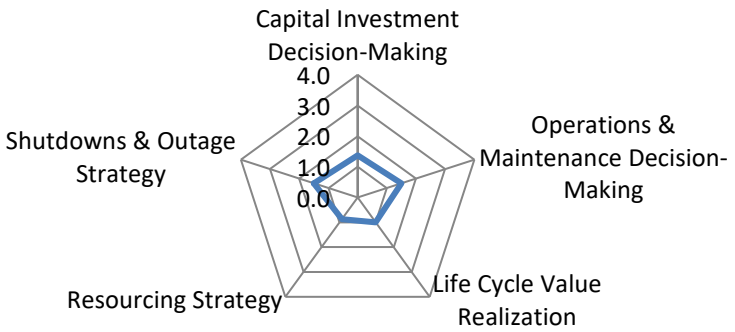
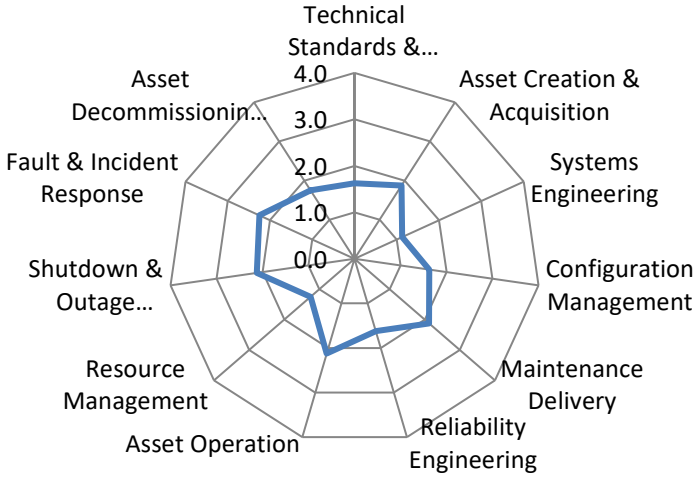
- Lack of knowledge in Institute of Asset Management principles and methods
- Inadequately defined roles and responsibilities
- Poor visibility of human resource capacity and loading
- Separation of Capex and Opex decision making
- Separation of asset replacement and maintenance practice decisions
- Undefined risk criteria and acceptable risk tolerance
- Lack of resources to perform statistical analysis

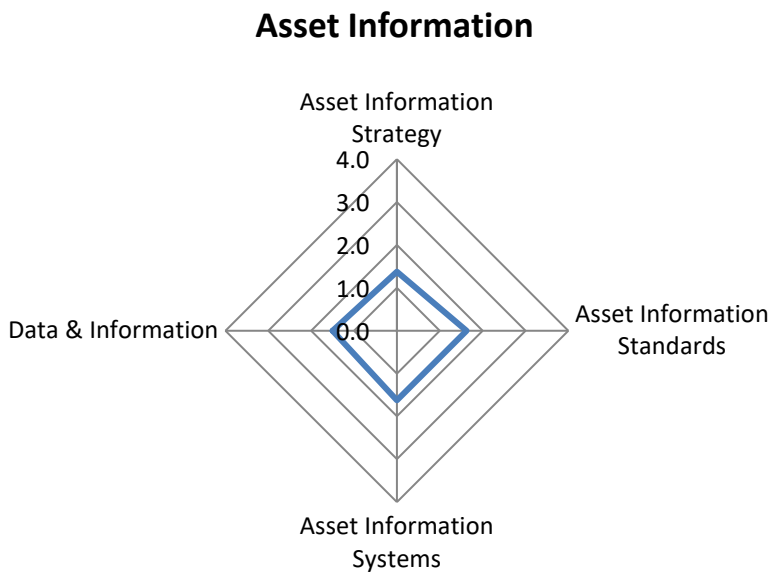
A large number of uncoordinated asset information systems

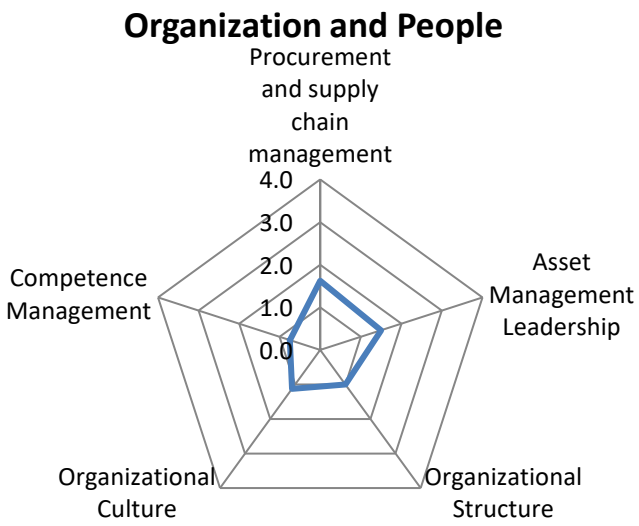
6.1 Current Maturity level

Table 6.1-1 Maturity Level

Subject Area	Maturity Level
Strategy & Planning	*Strengths*: Asset policies and the Asset Plan were implemented in FY18 providing clear line of sight to the agency strategic plan. Demand analysis is strong in the Transmission Field organization and is being established within the Engineering organization. *Weaknesses*: Resources and processes are not yet fully implemented to support compliance with the policy and execution of the plans. An external audit identified SAMPv1 did not have correlation between the enterprise performance objectives/metrics and the various departments & levers within the Transmission organization. Alignment between efforts existing in the Asset Management Program Plan (AMPP) and the SAMP/Asset Plan needs improvement. 
Decision Making	*Strengths*: Capital Investment Acquisition (CIA) process is in place and operational. *Weaknesses*: Lack of cultural acceptance of established CIA process and the prioritization process decision points can be unclear or seem complex. Information views and data needed for investment prioritization decisions/monitoring is currently inadequate. Competencies are not yet matured for *technical alternatives* functionality across the entire portfolio, currently alternatives analyses are one-off's with varying levels of effort. Inability to define how many people are needed to accomplish asset plan execution and clearly identify what will not be accomplished with current staffing levels.

Subject Area	Maturity Level
	Decision Making 
Life Cycle Delivery	*Strengths*: Financial obligations as a result of statute or regulations (i.e. A-123, NERC/WECC) are established with mature internal controls. Effective communication, corresponding to processes or assets impacted by financial obligations, is in place. TCIPI & RTCA are established processes to understand unplanned outages; overall BPA does a good job for shutdown and outage management. *Weaknesses*: The Policy & Governance organization (TEBP) provides platform to house and understand asset design and maintenance standards. Life cycle value optimization is not yet consistent or measured to policy level performance requirements for technical alternatives. Similar to capital delivery, real-time best value for maintenance is not consistent and largely dependent on asset type. BPA does not manage interactions between asset activities (FAC-008). Asset disposal is only considered in one-off alternative analyses and there are decommissioned lines that have not been removed or maintained. **Life Cycle Delivery** 

Subject Area	Maturity Level
Asset Information	*Strengths*: Asset Management Data (ADM) support organizations are well established and technically competent. ADM has established processes with a formalized charter to manage changes to the asset register. Data incorporated in ADM is being used to inform lifecycle and risk decisions with reasonable confidence. Ongoing data quality improvements across Transmission reinforces data driven decisions and mitigates gaps in a systemized manner. *Weaknesses*: Lack of clear enterprise IT strategy to minimize numerous systems that contribute to Transmission decision making, hinders ADM's execution abilities. Due to large volume of AM systems data collection is difficult to assemble. Due to the nuances of the systems and data types users may not obtain all of the necessary asset information. In incomplete asset register where missing assets where significant dollars in investments or risk exposure lack the continuity for decision making. Transmission will continue to study which assets belong in Cascade (Fiber, Strain Bus, Pedestals) and which ones do not warrant that level of management. Control centers are a good example where an integrated system approach is the better value decision not a Cascade solution. 
Organization & People	*Strengths*: Implementing and executing IAM training. *Weaknesses*: Asset management competencies and understanding is still new to BPA. Lack of defining asset management roles and responsibilities in performance plans slows the development of skills and competencies required to align with industry standards. Additionally, it allows for conflicting priorities that will lengthen the time it takes to understand and embrace IAM values and best practices.

Subject Area	Maturity Level
	
Risk & Review	*Strengths*: Transmission achieved initial health scores (IHS) across all assets in the asset register. Since the implementation of IHS, Transmission's first health policy has been published and codified to mature its health calculations for higher statistical confidence. *Weaknesses*: Risk tolerance in regards to asset performance is not well defined, therefore, risk mitigation plans and internal controls are not yet developed. Asset management governance is underdeveloped. Asset cost assessments is locally managed and not a cross-functional activity. 

6.2 Long Term Objectives

Objective 1: Risk based Planning & Prioritization

Under the agency strategic plan for 2a (Administer an industry leading asset management program) Transmission will continue to follow page 26 of the agency strategy; that understanding asset Criticality, Health & Risk (CHR) is the widely accepted best practice for planning and prioritizing investments including maintenance and capital. Transmission has made progress in following the SAMP 1.0 initiatives to realize this capability; standing up CHR as a cross-functional output for decision making tangibly improves all areas of the current state asset management maturity model. This is due to risk informed decisions occurring across the asset lifecycle and as such require underlying the ISO-31000 framework to be effective. Risk based planning is beyond prioritizing investments as it also addresses the risk mitigation alternatives that deliver the best risk spend efficiency (later described in chapter 9).

- Specific: Transmission will quantify asset criticality, health & risk.
- Measurable: Transmission will quantify risk through policy, system architecture, and established process an ISO-31000 calculation for 50% of its assets by EOY 2021.
- Achievable: Transmission has laid out a plan currently scalable to reflect a 3 year initial operating capability that has been socialized across all levels of the organization.
- Relevant: Institute of Asset Management recognizes that understanding cost, performance and risk are the fundamentals for effective business model and decision making. CHR is the adoption the IAM model and ISO-31000 framework which directly inserts itself in the SAMP & AP.
- Time bound: A pragmatic 3 year initial operating capability calls for an aggressive approach to execute on a paradigm shift of decision making. This creates the necessary sense of urgency to stand up risk quantification.

Objective 2: Financial Effectiveness

Transmission is applying best-practice industry standards to manage the lifecycle costs of federal assets. This is central to maintaining the long-term value and reliability of the power and transmission systems and is in direct alignment with the strategic plan goals 1 & 2 strengthening financial health and modernizing asset management/operations. Understanding how existing standards/process/policy influence the cost of delivering Transmission service and corresponding asset lifecycle costs makes visible the greatest opportunities for savings and shifting from a reliability driven outcome to a business driven outcome culture and operational environment.

- Specific: Transmission will begin collecting and quantifying asset lifecycle costs for decision making.
- Measurable: Transmission will have an understanding of 10% of its assets and their corresponding lifecycle costs by EOY 2021.
- Achievable: Recent one-off victories including risk/lifecycle decision influence the Shelton – Fairmont rebuild project and single vendor 500kv relay decision reflects the environment is ripe with focused understanding of specific asset lifecycle costs.
- Relevant: Creating a cost conscious culture that uses cost, performance and risk is described from the IAM anatomy as “help the organization on their asset management journey…adopt and improve on their asset management capabilities and deciding where to focus on for systems/process etc.”
- Time bound: Due to the degree of complexity of the asset management systems data integration and financial mapping to those systems a 2 year interval to calculate 10% of Transmissions asset lifecycle costs allows the highest probability for success. In addition this effort would begin to socialize the changing of standards (both design and maintenance) to highlight which assets have the highest lifecycle costs relative to industry benchmarking or classical projections of uncapped reliability focus.

6.3 Current Strategies and Initiatives

Initiative 1: Portfolio Delivery Model

Asset replacement continues to fall short by approximately 30% per year, while the backlog of assets needing replacements is increasing. Increasing execution throughput requires a systematic approach that addresses multiple constraint dimensions impacting the asset lifecycle. Currently Transmission is focusing on three areas within project execution striving to an ultimate goal of creating available and flexible resource capacity to meet the demand delivered from asset management lifecycle planning, system expansion planning, and customer system needs.

1. Develop a Secondary Capacity Model to augment the Primary Capacity Model (current model) that offers flexibility as demand fluctuates and as other capacity models expand and contract. The Secondary Capacity Model is currently under development and is targeting Q3/4 of FY20 for vendor/partner selection and on-boarding. The on-boarding process will include production of actual work products via selected pilot projects.
2. Develop an internal Demand Planning and Work Scheduling capability to enable centralized resource assignments and task tracking across the Transmission portfolio of projects. The aggregation of the information from the Work Scheduling service will produce information for strategic resource planning. This capability is being stood up in the Transmission Engineering organization and is targeted to complete staffing objectives and service delivery standards in FY20.
3. Maturing Transmission Standard Practices to improve, augment, or replace current processes, and stand up a governance structure and site for processing new and up to date policies and procedures. This initiative is targeted to establish a formal intake and Standards benchmarking for FY20.

The combination of these three efforts are expected to drive efficiencies in current processes and practices in the Portfolio Delivery Model while simultaneously seeking out additional resourcing options in order to deliver on the demands provided by Portfolio Planning. It is worth noting part 3 'Maturing Transmission Standard Practices' is a direct connection to financial effectiveness by driving towards business driven outcome standards to optimize delivery.

Initiative 2: Criticality, Health & Risk (CHR)

BPA has adopted industry leading asset management standards and begun building the capabilities to understand individual asset's criticality, health and risks. Defensible and proven methodologies and analytical methods will be developed, tested and adopted to inform prioritization of maintenance and capital investments. Transparent, objective CHR information and risk quantification will enable Transmission decision makers to optimize the utilization of financial and human resources to deliver best value for BPA and the region.

7.0 ASSET CRITICALITY

7.1 Criteria

The Institute of Asset Management describes criticality "*as a measure of the importance of an asset to the delivery of an organization's objectives, with the level of criticality being proportional to the degree the business objectives rely on the correct operation of the asset. Understanding the criticality of assets is important to enable the ranking of risks and prioritizing actions.*"

Transmission's recent Reliability Standards Implementation Planning Process's (RSIPP) Internal Controls Evaluation (part of the 2013-2017 strategy implementation) established that portfolio criticality has no organizational owner. A broad

perspective of system reliability is required to perform asset management with due consideration of extreme low probability events and cost.

Transmission is currently developing an operational model for criticality across all five value measures to determine an asset's criticality. Due to the size and complexity of Transmission's asset portfolio, a 5x7 risk matrix was adopted to adequately score transmission assets. Current efforts are in flight to develop logic sheets for each dimension. By the end of FY21, Transmission will have logic sheets for each dimension which will provide consistent scoring for Safety, Reliability, Financial, Environmental and Compliance. Figure 7.1-1 identifies the timeframe in which criticality is being developed & implemented, along with health and risk.

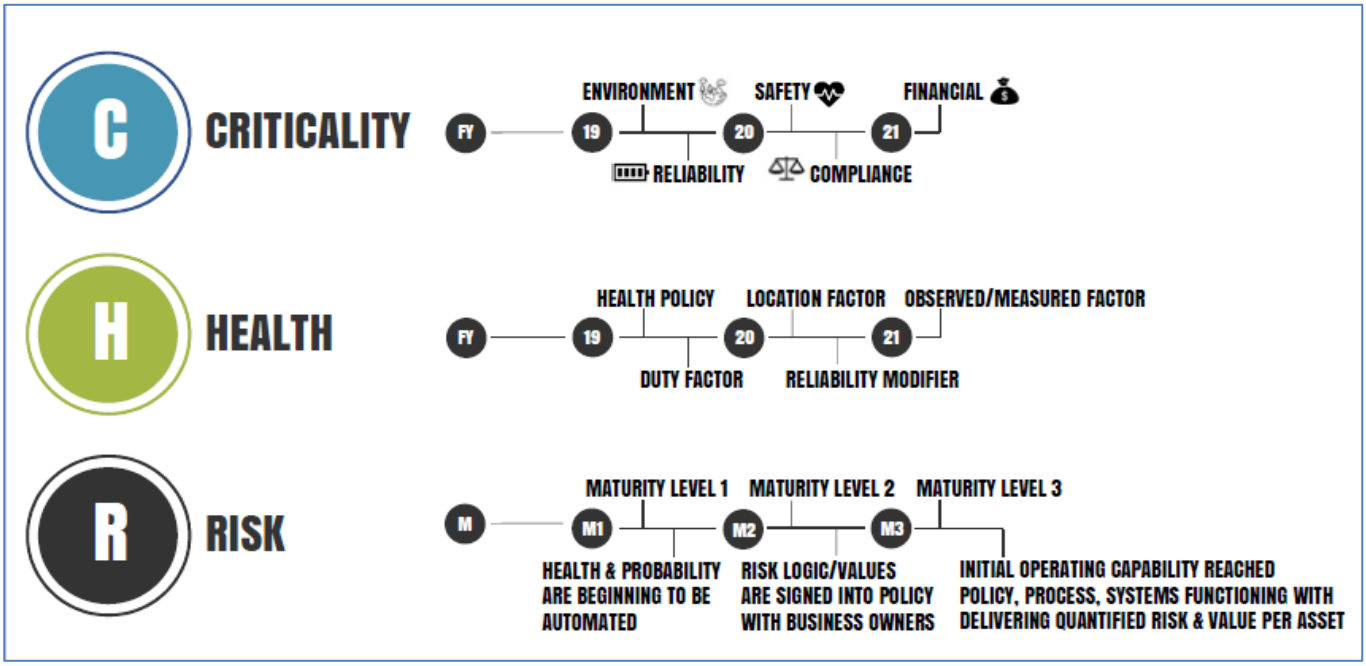


Figure 7.1-2 Criticality, Health & Risk (CHR) Roadmap

Assets included in flow gates cut across all Sustain programs; there is no differentiation at that macro level. Due to recent changes in the mandatory reliability standards, the use of flow gates as a proxy for criticality is no longer meaningful. Going forward, Transmission must perform the task of assessing risk and criticality without relying on past practices. The shift in practice will ensure transparency and one-to-one comparison across BPA's value measures: Safety, Reliability, Financial, Environmental and Compliance. The following figure provides the criteria for determining criticality based on these dimensions:

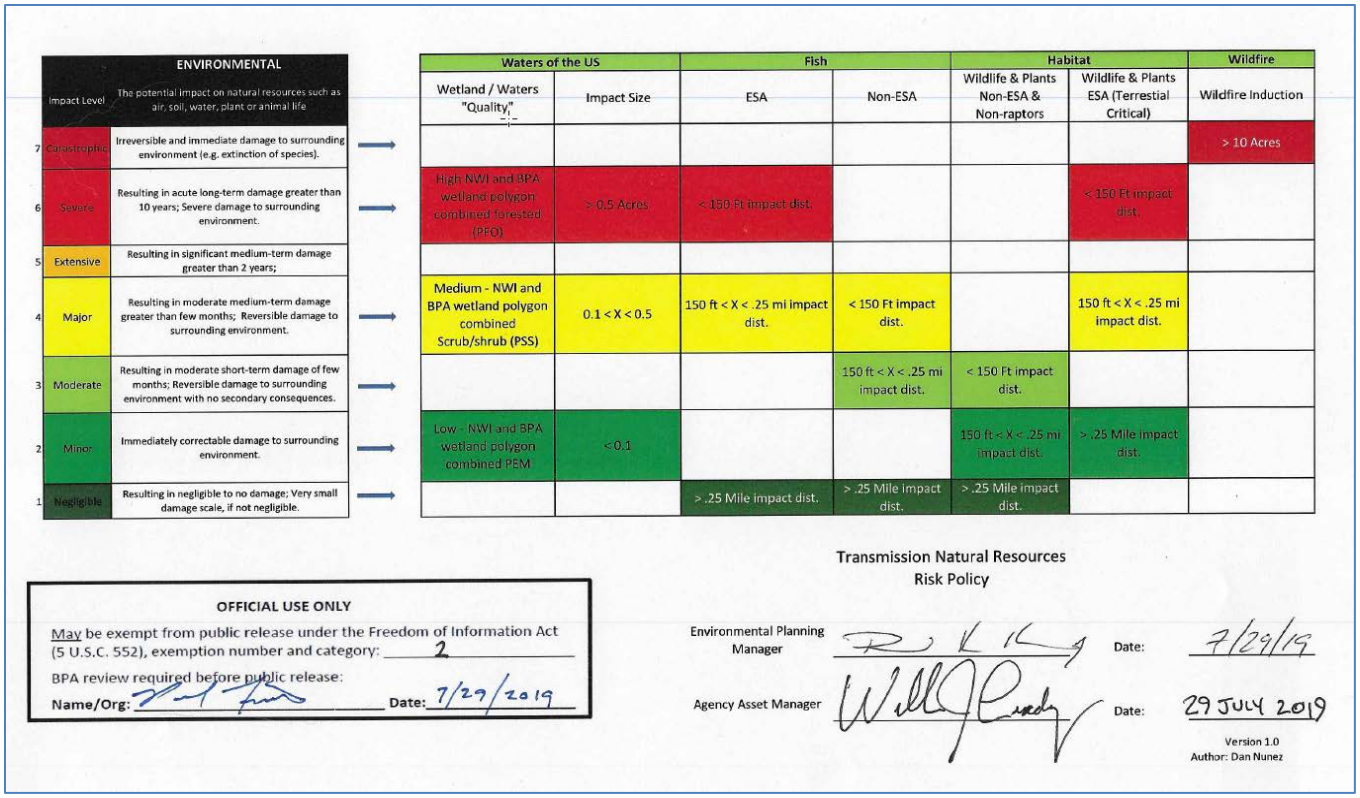
	SAFETY	RELIABILITY	FINANCIAL	ENVIRONMENTAL	COMPLIANCE
Impact Level	The potential impact of a risk even on a public or worker safety	The potential impact of a risk even on service or grid reliability	The potential risk event resulting in a financial costs to customers/rate payers measured in incremental dollar impact	The potential impact on natural resources such as air, soil, water, plant or animal life	The potential impact of noncompliance with federal, state, local, industrial, or operational standards or requirements
Catastrophic	Many Fatalities, Mass Serious Injury or Illness: Many fatalities of employees, public members or contractors; Mass serious injuries or illness resulting in hospitalization, disability or loss of work; Widespread illness caused typically caused by sustained exposure to agents.	Customer Hours Impact: Outage resulting in greater than 20 million total customer hours of interruption.	Impact > $3 billion in costs; consider costs to customers, shareholders and third parties.	Irreversible and immediate damage to surrounding environment (e.g. extinction of species).	NonCompliance Impact: Actions resulting in potential closure, split or sale of Company.
Severe	Few Fatalities, Serious Injuries or Illness; Permanent Disability: Few fatalities of employee, public member or contractor; Many serious injuries or illnesses resulting in hospitalization, disability or loss of work; Localized illness typically caused by acute or temporary exposure to agents.	Outage resulting in at least 2 million total customer hours of interruption.	Impact between $300 million and $3 billion in costs; consider costs to customers, shareholders, and third parties.	Resulting in acute longterm damage greater than 10 years;Severe damage to surrounding environment.	NonCompliance Impact: Regulator issued cease and desist orders; Regulators force the shut down of critical assets, and demand changes to operations/administration
Extensive	Serious Injuries or Illness; Permanent Disability: Serious injuries or illness to many employees, public members or contractors resulting in hospitalization, disability or loss of work.	Outage resulting in at least 200,000 total customer hours of interruption.	Impact between $30 million and $300 million in costs; consider costs to customers, shareholders, and third parties.	Resulting in significant mediumterm damage greater than 2 years;	NonCompliance Impact: Regulatory investigations and enforcement actions, lasting longer than a year; Violations that result in multiple large nonfinancial sanctions; Regulators force the removal and replacement of management positions.
Major	Serious Injuries or Illness; Permanent Disability: Serious injuries or illness to few employees, public members or contractors resulting in hospitalization, disability or loss of work; Several employees, member of the public or contractors sent requiring treatment beyond first aid.	Outage resulting in at least 20,000 total customer hours of interruption.	Impact between $3 million and $30 million in costs; consider costs to customers, shareholders, and third parties.	Resulting in moderate mediumterm damage greater than few months; Reversible damage to surrounding environment.	NonCompliance Impact: Significant new and updated regulations are enacted as a result of an event; Violations that result in adopting modest changes to operations/administration; Increased oversight from regulators.
Moderate	Minor Injuries or Illness: Minor injuries or illness to several employees, public members or contractors; Few employees, member of the public or contractors requiring treatment beyond first aid.	Outage resulting in at least 2,000 total customer hours of interruption.	Impact between $300k and $3 million in costs; consider costs from customers, shareholders, and third parties.	Resulting in moderate shortterm damage of few months; Reversible damage to surrounding environment with no secondary consequences.	NonCompliance Impact: Violations that result in minor changes to operations/administration; No additional oversight from regulators.
Minor	Minor Injuries or Illness: Minor injuries or illness to few employees, public members or contractors requiring first aid.	Outage resulting in at least 200 total customer hours of interruption.	Impact between $30k and $300k in costs; consider costs to customers, shareholders, and third parties.	Immediately correctable damage to surrounding environment.	NonCompliance Impact: Selfreported or regulator identified violations.
Negligible	No injury or illness.	Outage resulting in less than 200 total customer hours of interruption.	Impact of less than $30k in costs; consider costs to customers, shareholders, and third parties.	Resulting in negligible to no damage; Very small damage scale, if not negligible.	NonCompliance Impact: No compliance impact up to an administrative impact.

Figure 7.1-1 Impact/Consequence Scale

7.2 Usage of Criticality Model

During FY19, criticality logic sheets for Environmental and Reliability were developed. Figure 7.2-1 illustrates the logic sheet developed by Environmental SMEs for Natural Resources which will be used to score an asset's Environmental criticality. The logic sheets are signed by the Senior Manager of the corresponding criticality owner's organization and BPA's Agency Asset Manager. The criteria will then be codified into Transmission's risk policy to ensure transparency and consistency.

In the first quarter of fiscal year 2020 Transmission along with the Environmental Protection Organization (ECT) used the Natural resources logic sheet to score associated criticality for more than 300 substations. Additionally, the Transmission GIS team developed a map layer that visually displays the boundaries of the criticality scores for Natural Resources. Quantifying scores based off of the logic sheets for Reliability has been an ongoing effort and will be completed by the end of the second quarter in FY20; this includes updating the asset register with the quantified criticality scores. The effort to determine substation and line criticality has been a collaborative effort between Transmission Planning, Operations & Field Services.



ENVIRONMENTAL		
Impact Level	The potential impact on natural resources such as air, soil, water, plant or animal life	
7 Catastrophic	Irreversible and immediate damage to surrounding environment (e.g. extinction of species).	
6 Severe	Resulting in acute long-term damage greater than 10 years; Severe damage to surrounding environment.	
5 Extensive	Resulting in significant medium-term damage greater than 2 years;	
4 Major	Resulting in moderate medium-term damage greater than few months; Reversible damage to surrounding environment.	
3 Moderate	Resulting in moderate short-term damage of few months; Reversible damage to surrounding environment with no secondary consequences.	
2 Minor	Immediately correctable damage to surrounding environment.	
1 Negligible	Resulting in negligible to no damage; Very small damage scale, if not negligible.	

Waters of the US		Fish		Habitat		Wildfire
Wetland / Waters "Quality"	Impact Size	ESA	Non-ESA	Wildlife & Plants Non-ESA & Non-raptors	Wildlife & Plants ESA (Terrestial Critical)	Wildfire Induction
						> 10 Acres
High NWI and BPA wetland polygon combined forested (PEO)	> 0.5 Acres	< 150 Ft impact dist.			< 150 Ft impact dist.	
Medium - NWI and BPA wetland polygon combined Scrub/shrub (PSS)	0.1 < X < 0.5	150 ft < X < .25 mi impact dist.	< 150 Ft impact dist.		150 ft < X < .25 mi impact dist.	
			150 ft < X < .25 mi impact dist.	< 150 Ft impact dist.		
Low - NWI and BPA wetland polygon combined PEM	<0.1			150 ft < X < .25 mi impact dist.	> .25 Mile impact dist.	
		> .25 Mile impact dist.	> .25 Mile impact dist.	> .25 Mile impact dist.		

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BPA review required before public release:

Name/Org: _____ Date: 7/29/2019

Transmission Natural Resources Risk Policy

Environmental Planning Manager _____ Date: 7/29/19

Agency Asset Manager _____ Date: 29 JULY 2019

Version 1.0
Author: Dan Nunez

Figure 7.2-1 Environmental Logic Sheet (Natural Resources)

The logic sheets will be used to score the substations and transmission lines. There will be a logic sheet defined for each one of the value measures.

8.0 CURRENT STATE

8.1 Historical Costs

Over the past five years program execution has been underperforming for high priority assets. As determined by the TEC models, which propose relative program investment levels to reduce total economic costs, Transmission is also underinvesting in system replacements (Sustain).

Transmission's FY18-19 sustain program was authorized for a total spend of $400 million (direct costs). The actual spend for FY18-19 was $293 million for the two-year period. This was a significant shortfall largely due to displacement by customer driven work (PFIA), Transmission's human resource constrained environment, and lack of agility to advanced other projects funded within the portfolio due to internal processes, as demonstrated by the workforce study. Since 2015, Transmission's five-year average rate of sustain execution is $173.4M.

Transmission's overall capital program proposals from the previous IPR totals $363M in FY20 and $355M in FY21, including a $200M annual sustain budget (all $ figures are direct cost). However, even the current budgets are likely well in excess of the expected performance given Transmission's human resource and outage constraints.

Table 8.1-1 Historical Spend by Program – Direct Costs

Program	Historical Spend (in thousands) w/ Current Rate Case						
Capital Expand (CapEx)	2015	2016	2017	2018	2019	2020	2021
Main Grid	$94,317	$20,365	$11,135	$14,906	$5,588	$17,000	$21,000
Area & Customer Service	$68,867	$79,252	$29,688	$35,307	$56,222	$46,000	$69,000
Upgrades & Additions	$193,203	$99,959	$29,326	$21,383	$22,807	$47,000	$37,000
PFIA	$986	$2,427	$5,197	$32,907	$57,201	$53,000	$35,000
Total Capital Expand	***$357,373***	***$202,003***	***$75,346***	***$104,503***	***$141,818***	***$163,000***	***$162,000***
Capital Sustain							
Steel Lines	$7,842	$10,144	$13,793	$15,259	$13,242	$15,000	$18,700
Wood Lines	$54,897	$36,550	$46,459	$27,445	$26,893	$15,000	$18,700
PSC/System Telecomm	$30,437	$31,309	$32,054	$23,412	$18,854	$23,000	$28,500
SPC	$23,079	$25,995	$17,341	$14,143	$12,125	$15,000	$18,700
SUBS AC	$33,864	$48,606	$62,117	$50,785	$38,968	$35,000	$43,700
SUBS DC	$81	$79	$433	$5,415	$8,804	$10,000	$12,500
Other*	$52,445	$26,518	$28,325	$23,224	$20,665	$20,300	$25,400
Total Capital Sustain	***$202,644***	***$179,202***	***$200,521***	***$159,681***	***$139,551***	***$133,300***	***$166,200***
Total Capital	**$560,017**	**$381,205**	**$275,867**	**$264,184**	**$281,369**	**$296,000**	**$328,200**
Expense (OpEx)							
Asset Management Program (O&M)	$262,897	$251,944	$263,833	$273,010	$283,047	$262,974	$268,795
Total Expense	**$262,897**	**$251,944**	**$263,833**	**$273,010**	**$283,047**	**$262,974**	**$268,795**

**Other: Access Roads, CC System Infrastructure, Land Rights, TEAP Tools, Line Ratings, Misc. Replacement Projects*

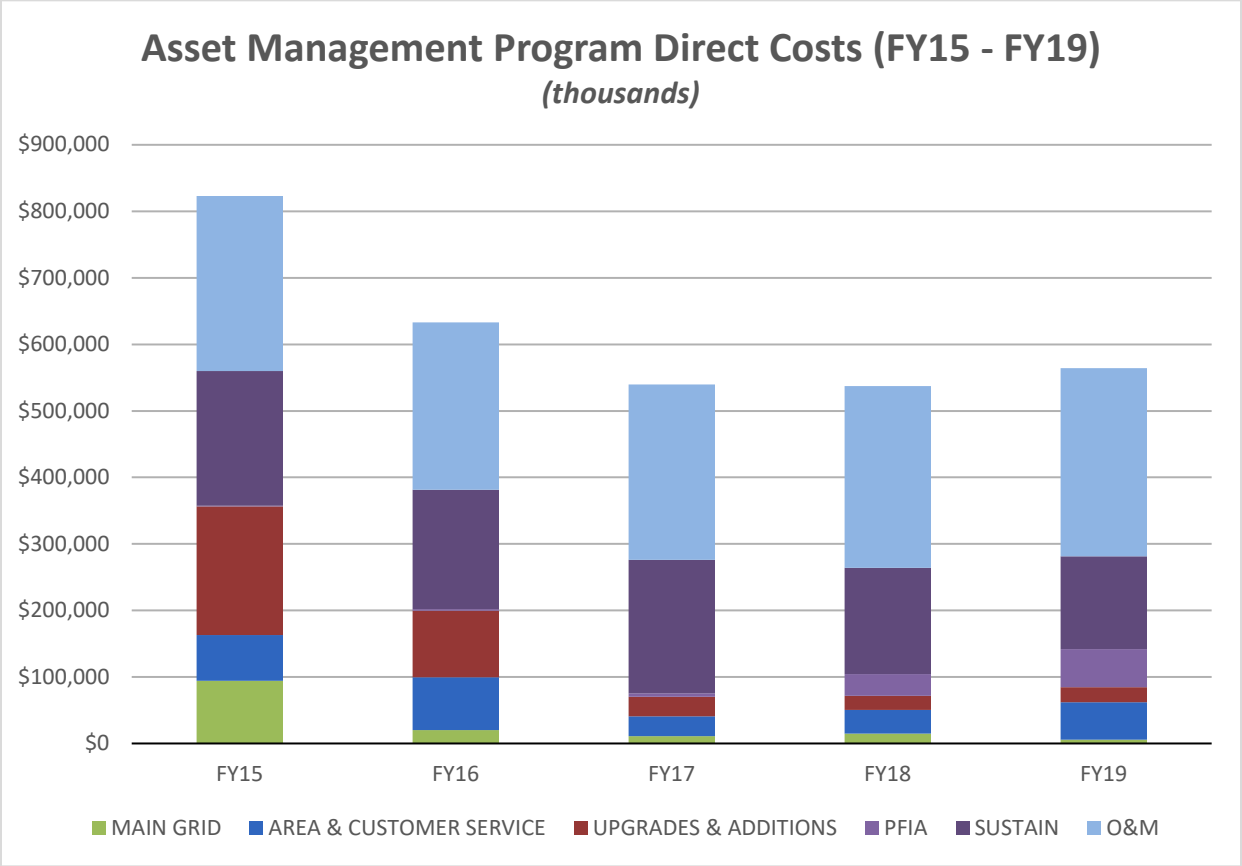


Figure 8.1-1 Historical Expenditures (CAP/EXP)

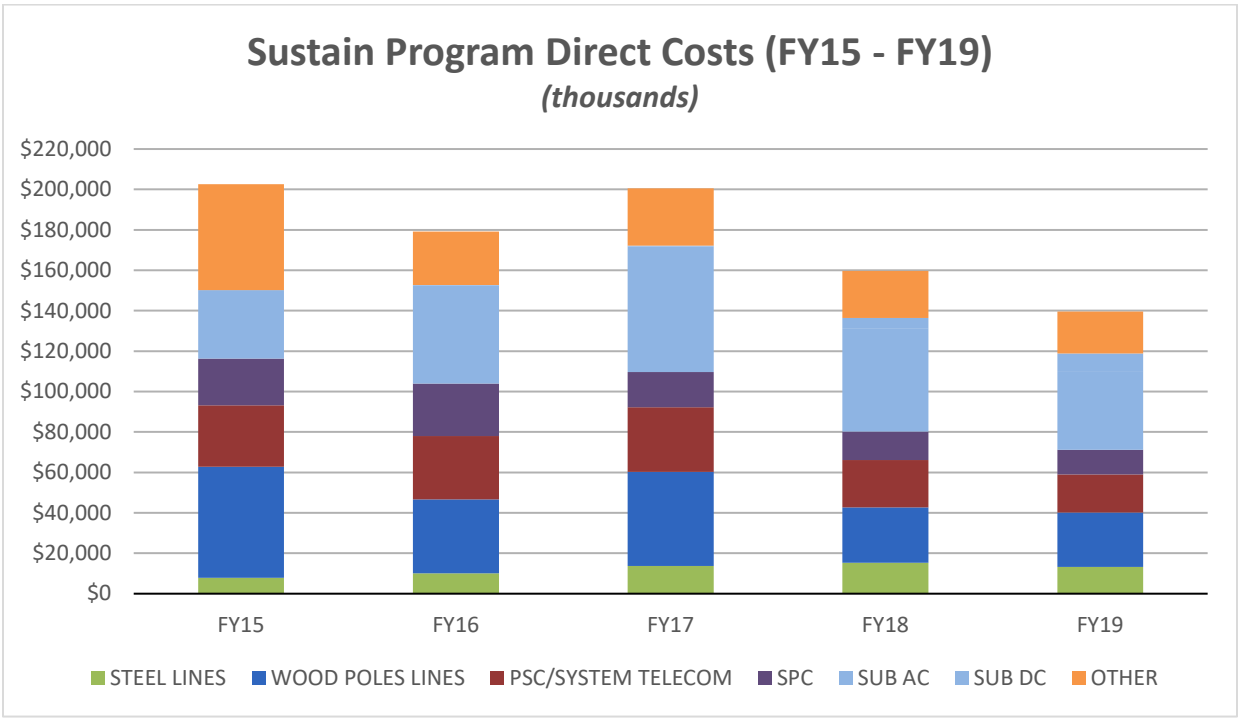


Figure 8.1-2 Sustain Program Historical Actuals

The Transmission Services maintenance program is funded through the Integrated Program Review (IPR) process and is included as a direct cost in BPA's Transmission revenue requirement. The maintenance program has been focused on system reliability and regulatory requirements. To meet these business drivers, BPA primarily performs maintenance on a time interval basis applied uniformly to like assets across the system. While this provides for uniformity in management and compliance reporting, it is less than optimum in terms of managing reliability risk and cost.

The maintenance program costs are a combination of three primary components.

1) Transmission Field Services crews and support staff that perform the operations and maintenance.
2) The Transmission Engineering Technical Services organization is responsible for assessing and prescribing the maintenance plan. They also provide the technical support needed by the Transmission Field Services organization.
3) The equipment and materials needed to support the maintenance activities performed on the Transmission System.

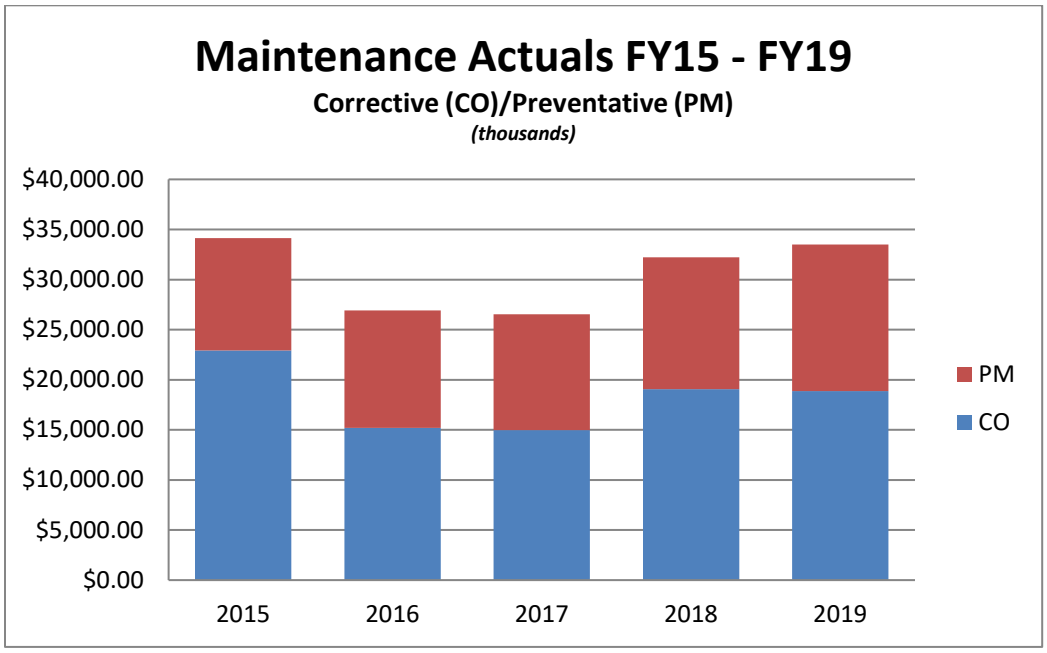


Figure 8.1-3 Corrective & Preventative Maintenance Historical Actuals (Expense)

8.2 Asset Condition and Trends

When Transmission published its first SAMP in 2018, it did not have a uniformed methodology for assessing asset condition. During the first quarter of FY19 Transmission published its first Health Policy that sets out a common methodology for assessing the health of BPA's Transmission assets by quantifying the overall process for assessing condition-based health. It specifies the parameters, values and conditions to be used. This information enables long-term planning in replacement and maintenance activities to obtain asset management maturity in alignment with the Institute of Asset Management (IAM) framework, allowing optimized life-cycle decisions and risk to be quantified.

Preceding the publication of the Health Policy a significant amount of work took place in order for Transmission to develop its first iteration of health criteria that was then coded into Cascade to automate more than 240K calculations for an initial health score. The initial health score was implemented into Cascade at the end of FY18. Establishing additional health logic criteria for assets (if applicable to the asset), has continued on throughout FY19 and is ongoing in order to mature the score from an initial health score to a current health score that incorporates observed and measured conditions from the field personnel.

Figure 8.2-1 is a snap shot of Transmission's health scores for assets within the substation and steel structures & wood poles for line assets. The health scores range between one and ten. Assets with a health score closer to one indicates the assets are in good condition, whereas, assets nearing a score of ten may have a higher likelihood of failing. As this is a new methodology, *with ongoing implementation efforts*, that has set out to apply a universal architecture across the entire portfolio the figure below serves as a baseline for asset health and identifying asset condition trends in the future under the new methodology. Some assets such as *fiber, strain-bus, and pedestals* do not reside in structured asset information systems, this creates challenges in assessing asset condition due to the lack of structured data.

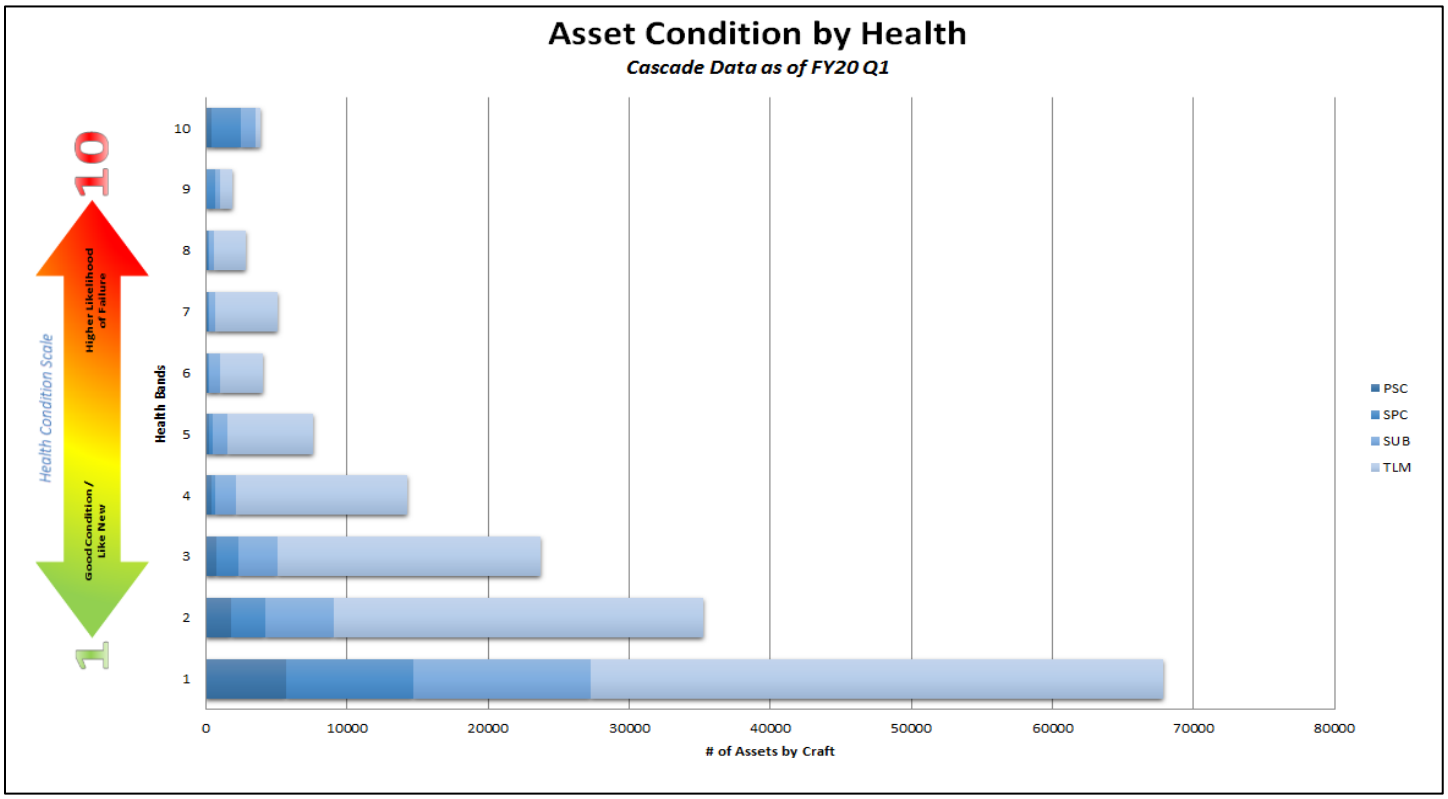


Figure 8.2-1, Asset Condition by Health Band

Within the major asset programs figure 8.2-2 displays that approximately 74-82% of assets on the system have a health score equal to or below three. The health architecture factors in age, location factors, utilization factors, reliability factors and observed & measured conditions. The level of health maturity will be determined by the specific asset types. In some instances the quality of data or availability of data is not ready for the health calculation but will drive configuration changes to begin collecting information and/or identify additional training/communication needs with the key creators of the data (i.e. Field Services personnel). The methodology that was adopted allows for the continuous improvement and maturity of asset health. Some assets such as Fiber do not currently reside within the Transmission asset register and therefore do not have the CHR functionality applied. Efforts are inflight to systematically bring these

individual databases and data sources into a structured asset information system in order to perform the same risked-based planning and prioritization.

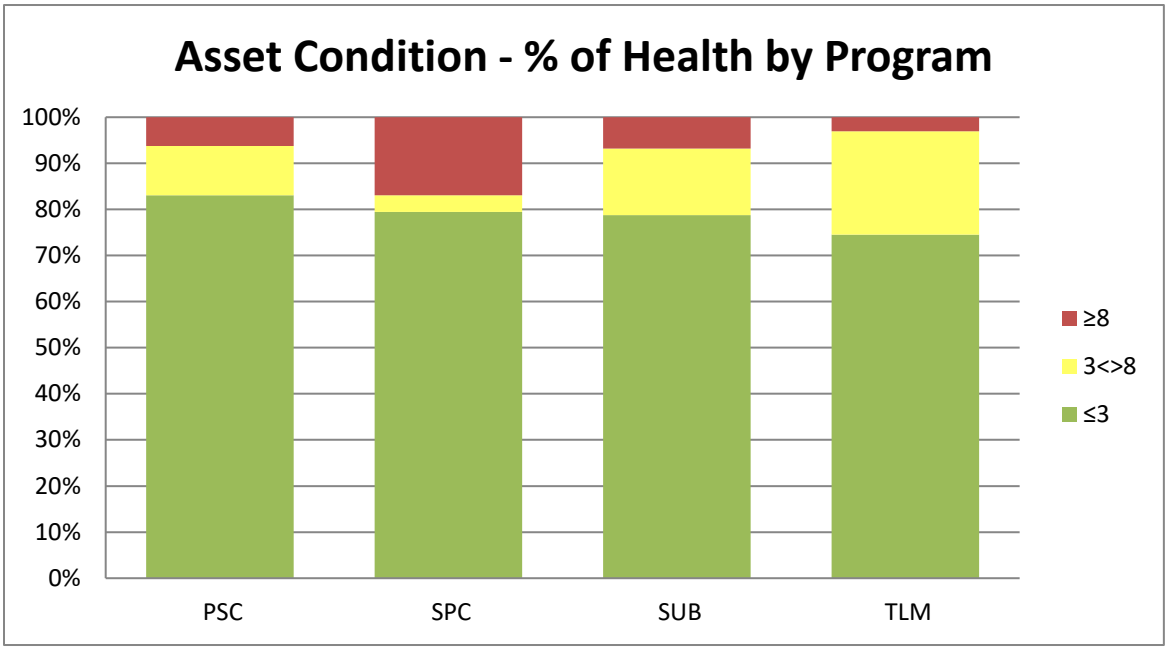
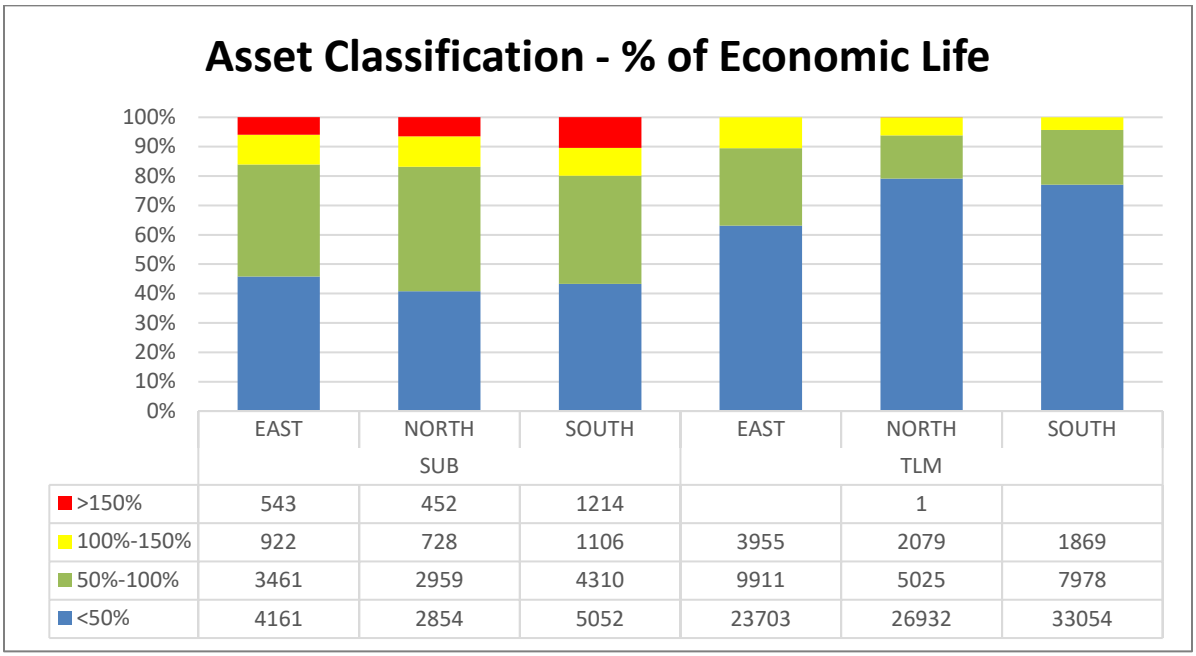


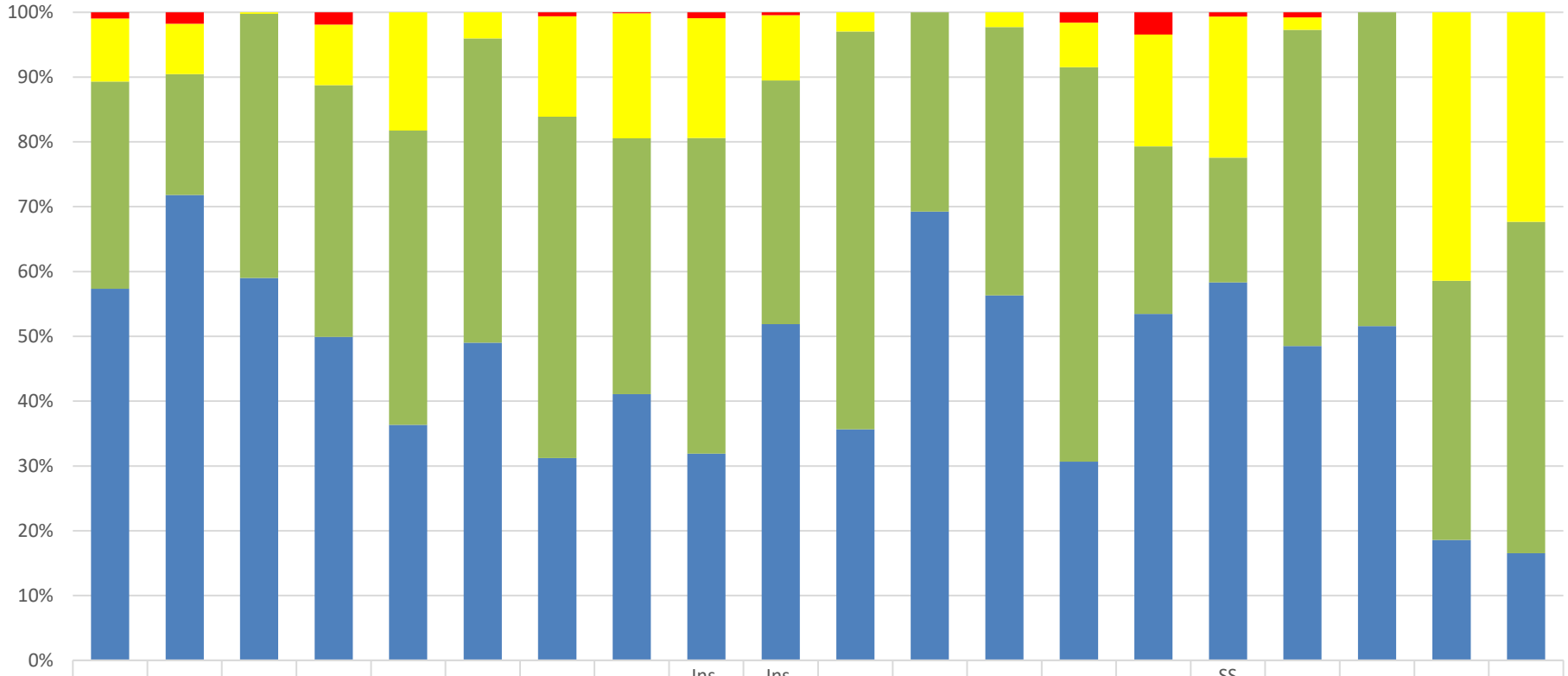
Figure 8.2-2, Asset Condition % of Health

While the TEC models are Transmission's primary means to propose funding levels for Sustain programs today, it is limited in its ability to couple asset condition data and risk across all valued dimensions. Age and outage costs are significant inputs for the TEC models. For major unit assets approximately 46%-77% (varies by region and program) are at less than 50% of their economic life (see figures 8.2-3, -4, and -5).



	SUB			TLM		
	EAST	NORTH	SOUTH	EAST	NORTH	SOUTH
>150%	543	452	1214		1	
100%-150%	922	728	1106	3955	2079	1869
50%-100%	3461	2959	4310	9911	5025	7978
<50%	4161	2854	5052	23703	26932	33054

Figure 8.2-3, Current Asset Age by Classification



	Arresters	Battery /Charger	Circuit Breaker 500kv	Circuit Breaker Other	Diconnect 500kv	Diconnect 69-345kv	Disconnect < 69kv	Fuse	Ins. Transformer < 69kv	Ins. Transformer > 69kv	Reactor 500kv	Reactor Other	Series Cap	Shunt Cap	SS Egs	SS Transfer Switch	SS Transformer	Transformer	Transformer - Auto	Transformer - Other
>150%	38	14		31			10	3	21	21				16	2	1	8			
100%-150%	394	62	1	155	164	176	246	385	423	470	3		2	70	10	34	19		58	84
50%-100%	1294	149	172	643	409	2062	838	787	1114	1758	62	4	36	617	15	30	490	61	56	133
<50%	2319	573	249	826	327	2153	497	819	730	2426	36	9	49	311	31	91	487	65	26	43

Figure 8.2-4, Current Asset Age by Asset Type

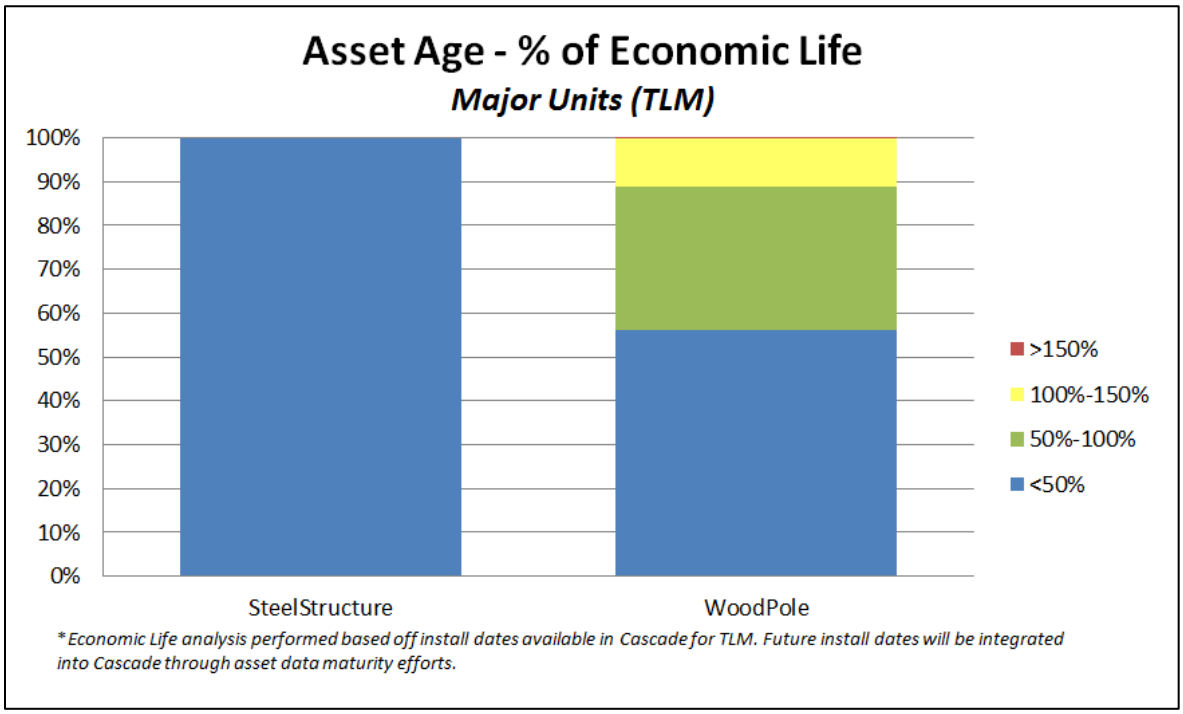


Figure 8.2-5, Current Asset Age by Asset Type

As Transmission has invested in modernizing its assets and maturing asset management decision making, spending has been more efficiently allocated to practices that enhance system reliability. A key trend that is used to manage completed work is the year-over-year change to the preventative maintenance backlog and the amount of crew time needed to complete the associated work. The chart below shows the year-over-year change in the backlog by craft. TLM is on a separate scheduling and tracking system as a result of regulatory requirements, it is not included in measurement of the maintenance backlog.

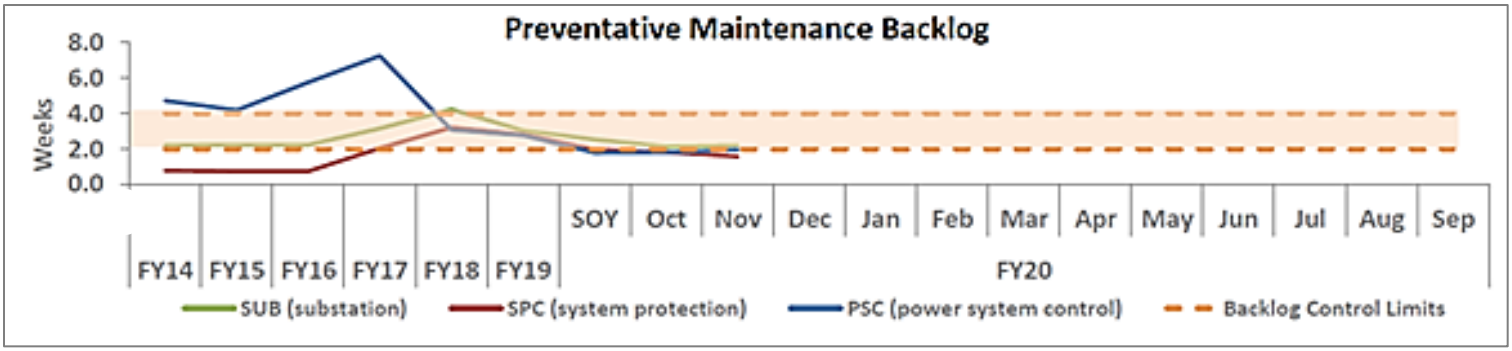


Figure 8.2-6, Preventative Maintenance Backlog by Craft

For non-TLM assets the current state process to measure backlog is defined using the following reference titled "Maintenance Planning, Coordination and Scheduling" where an acceptable level of backlog is two to four weeks. Maintenance is prioritized for highest value work based on in the best information available today. As CHR is developed and implemented, Transmission expects new information as a result of the effort to inform best value decisions for maintenance strategies and corresponding backlogs.

8.3 Asset Performance

Asset health performance does exist for some assets but the granularity varies by asset type. The alternating current Substation (Subs AC) program has the most granular level of performance data. However, for other assets (including Subs AC), data exists in approximately 40 systems. Depending on the source system Transmission has limited usable information. While standing up CHR as a cross-functional output for decision making, the agency is working towards best practices for the management of asset information. By improving asset information governance, stewardship, and system architecture, along with the initial operating capability for CHR, the corresponding outputs will be used in asset analytics.

Currently, Transmission is unable to demonstrate an *asset performance metric* in a historical format that is in line with strategic goal #2: *Modernize Assets*. With that said, Transmission has developed the following asset performance metrics including: asset health, asset reliability score, asset turnover ratio, % remaining life as key measures for understanding asset performance from an individual asset to a system of networked assets.

Table 8.3-1 Historical Asset Performance Summary

Strategic Goal	Objective	Measure	Assets	2018	2019-YTD
Modernize assets	Transmission Reliability Coefficient	System Reliability Score (min = 0, max = 1)	Portfolio	.7+/-.22	0.99

The preceding table is the 2018 Transmission System Reliability Score. Important nuances to take away are assets not currently in Cascade do not have a health score allowing Transmission to calculate its reliability coefficient. Fiber would be an example of an under represented asset in terms of asset performance metrics. Additionally, Transmission asset health maturity is still underway; working to connect the observed/measured field data to gain higher confidence levels in understanding asset health. Today only limited assets have that level of robust algorithm structure to quantify health/probability of failure.

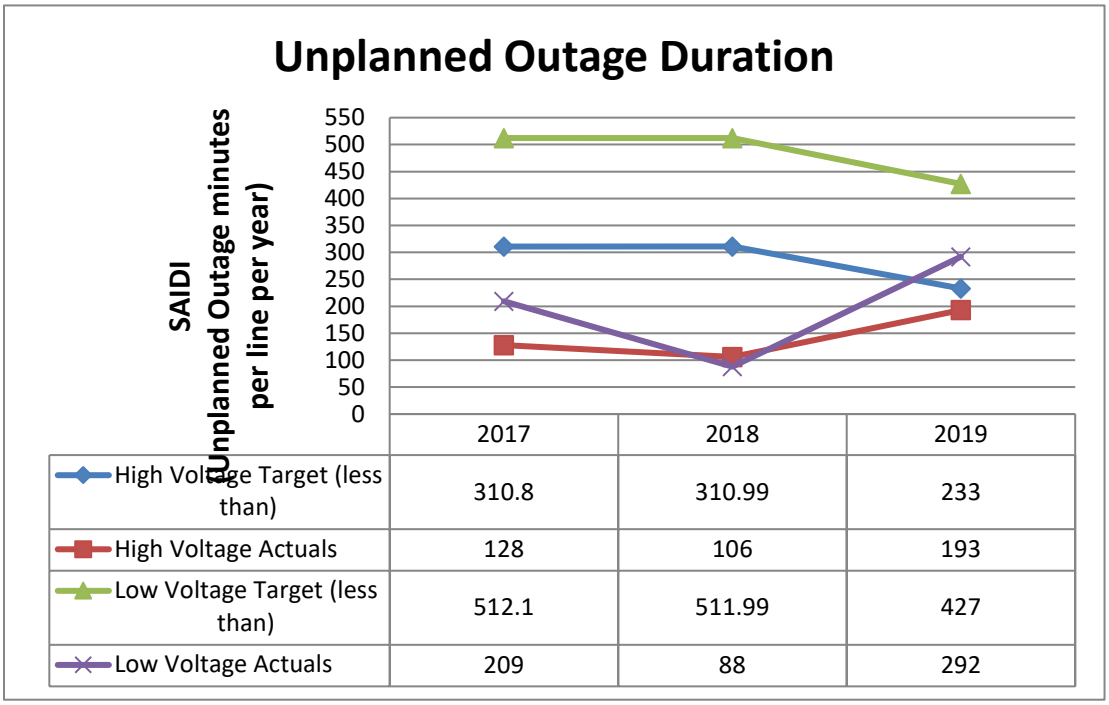
Transmission Services establishes and updates performance standards on an annual basis and reports trends through informal dashboards distributed to all personnel and formal reports prepared for executive leadership. Transmission currently tracks safety and outage metrics which can be found in the Transmission Quarterly Report. Transmission needs to improve its ability to benchmark within the industry. In the Risk Prioritization Pilot Transmission benchmarked its internal risk capability for assets and was determined to be 1-2 standard deviations below best practice. The following is a summary of the measures tracked:

- Safety: Transmission tracks Recordable Injuries and reports on cause, Incident Frequency Rate (IFR) and Days Away, Restrictions, and Transfers (DART)

	2017	2018	2019
Injury Frequency Rate (IFR)	1.8	1.9	1.4
Lost-Time Frequency Rate (DART)	0.8	0.5	0.5

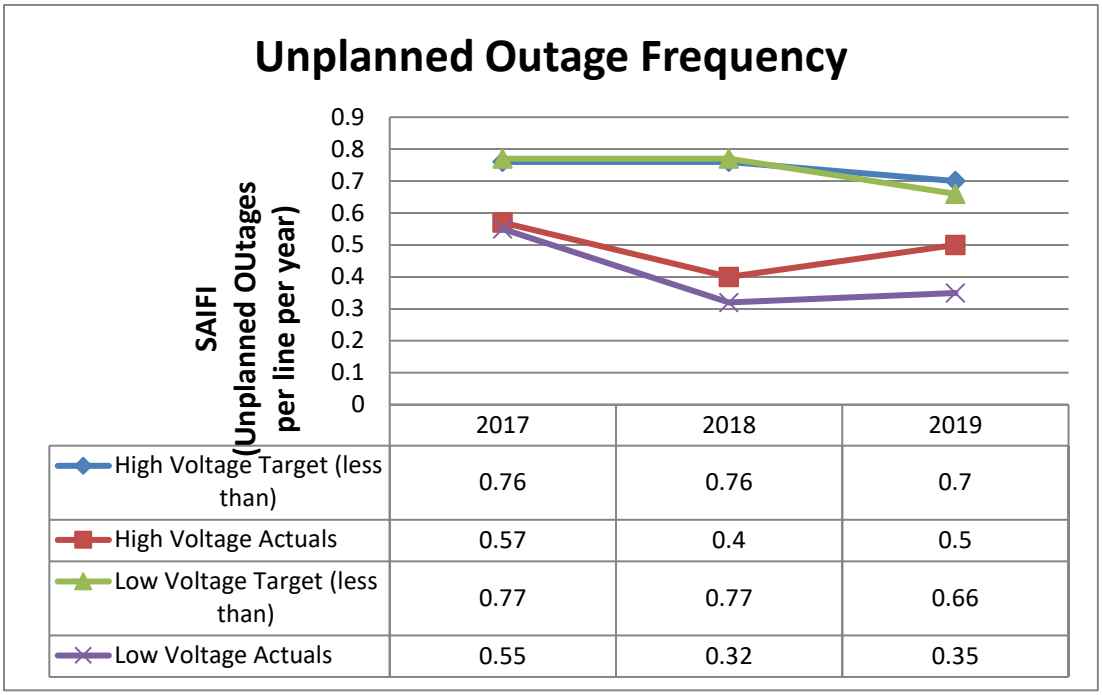
- Financials: Rate Case revenues and expenses are compared to start of year, FY to date and end of year forecast

- Reliability: Counts of unplanned outages by week and cumulative to date are trended against previous performance and pre-defined warning limits
  - System Automatic Interruption Duration Index (SAIDI)



	2017	2018	2019
High Voltage Target (less than)	310.8	310.99	233
High Voltage Actuals	128	106	193
Low Voltage Target (less than)	512.1	511.99	427
Low Voltage Actuals	209	88	292

  - System Automatic Interruption Frequency Index (SAIFI)



- Asset Investments: Transmission System Infrastructure key performance indicator (KPI) tracks and projects capital spending on a single fiscal year basis
- Asset Replacements: Both Transmission System Infrastructure KPI and the programmatic Sustain business case tracks asset replacements in each sustain program.

- Compliance:
  - Regulatory (FERC, NERC, WECC)
  - Legal/financial (A-123)
  - Partnerships and New Technology
  - Technology Innovation projects
  - Commercial and other generation dispatch and load management arrangements

8.4 Performance and Practices Benchmarking

Top US and Canadian utility companies participate in benchmarking programs and research on topics relevant to today's business operations and customer service needs. Industry benchmarking programs provided by 3rd party vendors are available and with participation can provide many benefits. The primary reasons for participating are to assess performance and track progress relative to your peers, highlight best practices and learn from others, and support regulatory/stakeholder requirements.

Transmission Services establishes and updates performance standards on an annual basis and reports trends through informal dashboards distributed to all personnel and formal reports prepared for executive leadership. Transmission Service does not currently participate in an annual benchmarking study with peer utilities and therefore, data on these metrics to compare with peers is very limited.

Transmission currently tracks safety and outage metrics which can be found in the Transmission Quarterly Report. Transmission needs to improve its ability to benchmark within the industry. Most of the benchmarking is ad hoc and specific to an improvement initiative. For example, in the Risk Prioritization Pilot Transmission benchmarked its internal risk capability for assets and was determined to be 1-2 standard deviations below industry best practice.

The following is a summary of the performance measures currently tracked:

- Cost: Capital (sustain and expand) and expense, compared to start of year, FY to date and end of year forecast
- Safety: Recordable Injuries and reports on cause, Incident Frequency Rate (IFR) and Days Away, Restrictions, and Transfers (DART)
- Reliability: SAIDI and SAIFI. Counts of unplanned outages by week and cumulative to date are trended against previous performance and pre-defined warning limits.
- Practices: Work tracking and reporting (Cascade)

Since we lack industry peer data, it is difficult for Transmission Services to know how we compare with peers on these measures. Participating in a Transmission benchmarking study with other utilities could yield identification of new performance metrics, investigation and comparison into work volume, drivers of work – emerging and innovative practices and provide comparative data with peer utilities that Transmission currently does not have. Transmission Services needs to improve benchmarking standards and participate in studies that provide access to other Transmission Utility data for comparative purposes and to guide improvement initiatives.

9.0 RISK ASSESSMENT

BPA Policies 130-5 and 231-1 describe the office of Compliance, Audit and Risk Management charter, in which BPA follows an ISO-31000 risk methodology for risk management, and provides guidance on BPA's Enterprise Risk Management policies. ISO 55000 for Asset Management contains risk management guidance that complements ISO 31000. BPA's adoption of international standards for asset management and risk assessment is the central core, enabling efficient business decisions for the right asset activities at the right time to deliver optimal value. Transmission has begun adopting best practice on methodologies which include expand/sustain & maintenance activities; with the goal of embedding risk assessment as an integral component in the culture, philosophy, business practices and processes. This is an ongoing long term effort. Complete culture change in similar government organizations typically requires a decade.

BPA's Transmission system includes many assets significantly older than its peers, and a key focus for BPA is to effectively manage the associated asset risks due to poor condition in order to achieve asset lifecycle cost and reliability performance objectives. With regard to asset condition and risk, Transmission will set service-based targets for assets to balance the risk of asset failure and the associated reliability impacts with the replacement cost.

Transmission is also pursuing strategies to:

- Expand the use of condition based risk management across key asset categories
- Continue to develop and implement processes for capturing, registering, assessing and tracking asset related risks and internal control treatments aimed at providing reasonable assurance of risk mitigation to better match customer/service requirements.
- Make risk informed investment and prioritization decisions across the asset lifecycle.

BPA asset management identified the following dimensions of risks: Safety, Financial, Compliance, and Environmental & Reliability.

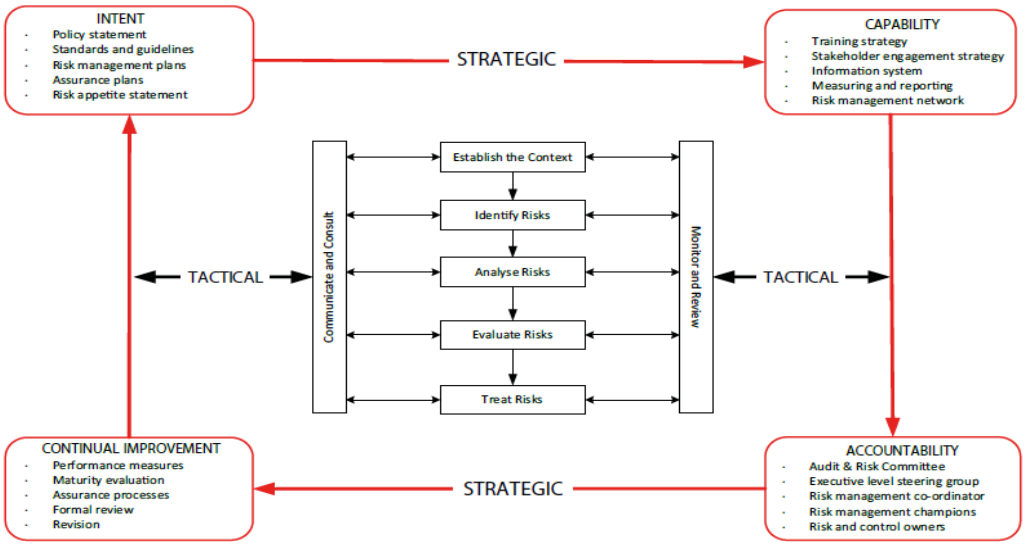


Figure 9.0-1: Based on the ISO-31000 Risk Framework

BPA is actively pursuing a risk assessment to its largest and highest priority assets; Transformers, Circuit Breakers, Line circuits, Reactors, Fiber and Disconnects. These assets were selected by Asset Managers to be the most sensitive for applying quantitative risk assessments to identify the asset condition/health risk scores.

The risk methodology capability is being built up with process, policy, data, and data systems to formalize a Transmission Asset and Risk register. The goal of the methodology is to identify and reduce the likelihood or impact of failures to minimize disruption to customers and maintain reliability.

Scoring these assets against the following likelihood and impact criteria matrix which have been developed by Southern Cal Edison as an established asset risk assessment; using the following equation:

$$RS = TEF * C_p * 10^{CI}$$

RS = Risk Score of a risk statement

TEF = Triggered Event Frequency – Number of times a risk event occurs per year

C_p = Conditional Probability that an outcome occurs given the risk event has occurred

CI = Consequence/Impact – Expected severity of impact for risk statement

Table 9.0-1: Heat Map Likelihood and Impact Matrix

(Illustrative Only – Future State Transmission Portfolio Heat Map per each risk dimension)

Frequency Description	Frequency /Year	Frequency Level
Once Every > 10 / year	F => 10	Common
Once 1-10 / year	F = 1-10	Regular
Once Every 1-3/ Years	F = 1- 0.3	Frequent
Once Every 3-10 /Years	F = 0.3 - 0.1	Occasional
Once Every 10-30/Years	F = 0.1 - 0.033	Infrequent
Once Every 30-100 /Years	F = 0.033- 0.01	Rare
Once Every 100+ /Years	F = < 0.01	Remote

Impact	Negligible	Mino	Moderate	Major	Extensive	Severe	Catastrophic
					345kV T.B. McNary 500kV T. B. Sickler	McNary-Ross No.1 Circuit	
					345kV C.B	115kV T.B. Yaak	
				500kV T. B Santiam		115kV C.B Yaak	

BPA will continue to implement this risk methodology across Transmission and expand it to all programs in conjunction with building it into the asset register. Since the publication of the initial SAMP in 2018, Transmission has performed one-off risk assessments and lifecycle analysis for sensitive or high priority investments as requested by Transmission leadership. As CHR is developed and implemented in the asset register these one-off requests are manually performed in the interim. Until the logic for all the various elements is defined some of the assumptions are based on external data (safety statistics, senses data, etc.) and therefore will have varying levels of confidence in the assessment. Each of the completed risk assessments and/or lifecycle analysis includes an executive summary that clarifies the assumptions and associated level of confidence.

The risk based planning methodology allows Transmission to make flexible and scalable adjustments in real time and incorporate maintenance activities into the risk register in real time. Maintenance is incorporated into the risk assessment in both the TEF and Cost risk spend efficiency terms, to allow BPA to select the highest return on investment based on the risk reduction per mitigation effort.

The risk spend efficiency (RSE) represents the risk reduction of a mitigation per $1,000 cost; this is used to derive holistic asset lifecycle decisions on maintenance and replacement activities.

$RSE_{pv} = MRR_{pv} / \$1k$

Maximize RSE to obtain most effective mitigation solution for that asset type; either minimizing the TEF or the CP.

Ad hoc risk assessment (interim):

Shelton - Fairmont No.1 is an example of one of the ad hoc risk assessments performed while CHR is being implemented systematically (Figure 9.0-4). Figures 9.0-2 and 9.0-3 illustrate the output of the risk assessment performed for the Shelton-Fairmont line. This assessment was based off of the health logic determined by Transmission engineering subject matter experts (SME), which was coupled with the environmental and system reliability criticality logic that was developed by Environmental and Operation SMEs. Quantifying the risk associated with Environmental and Reliability impacts allowed for Transmission to make an informed decision that resulted in a change from the original investment decision of spot maintenance to scheduled maintenance with the intention of rebuilding the line.

	Location Factor	Cascade Current Health Score	Health Score Adjusted w/ Location Modifier
Shelton-Fairmont No 1	1.35	8.15	10

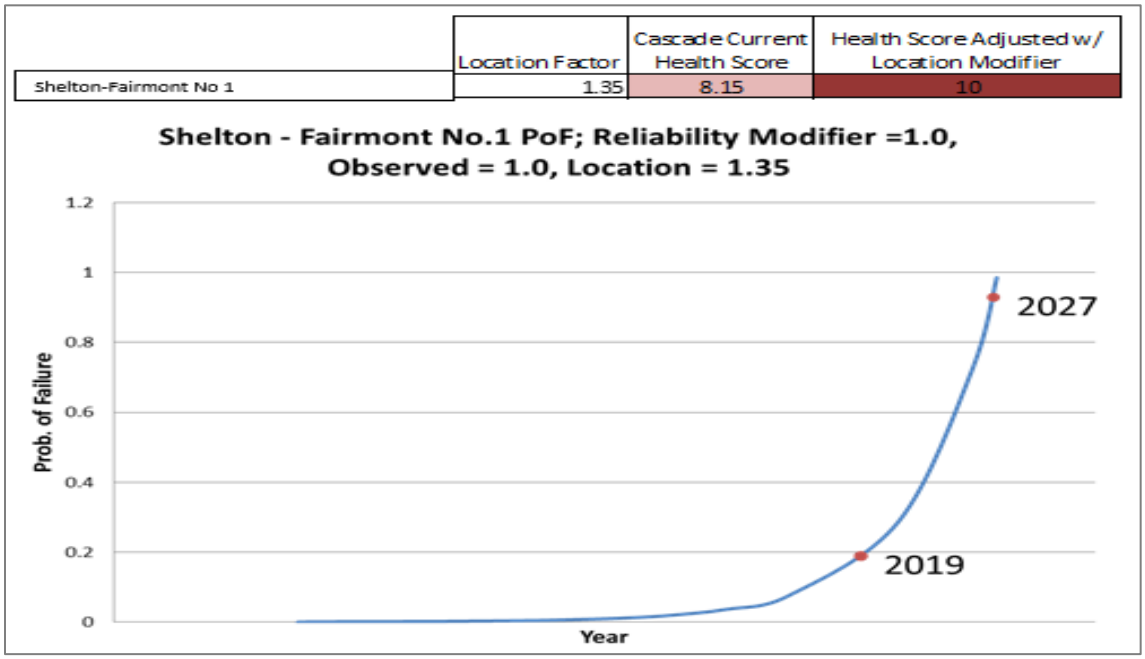


Figure 9.0-2 PoF for Shelton – Fairmont Line

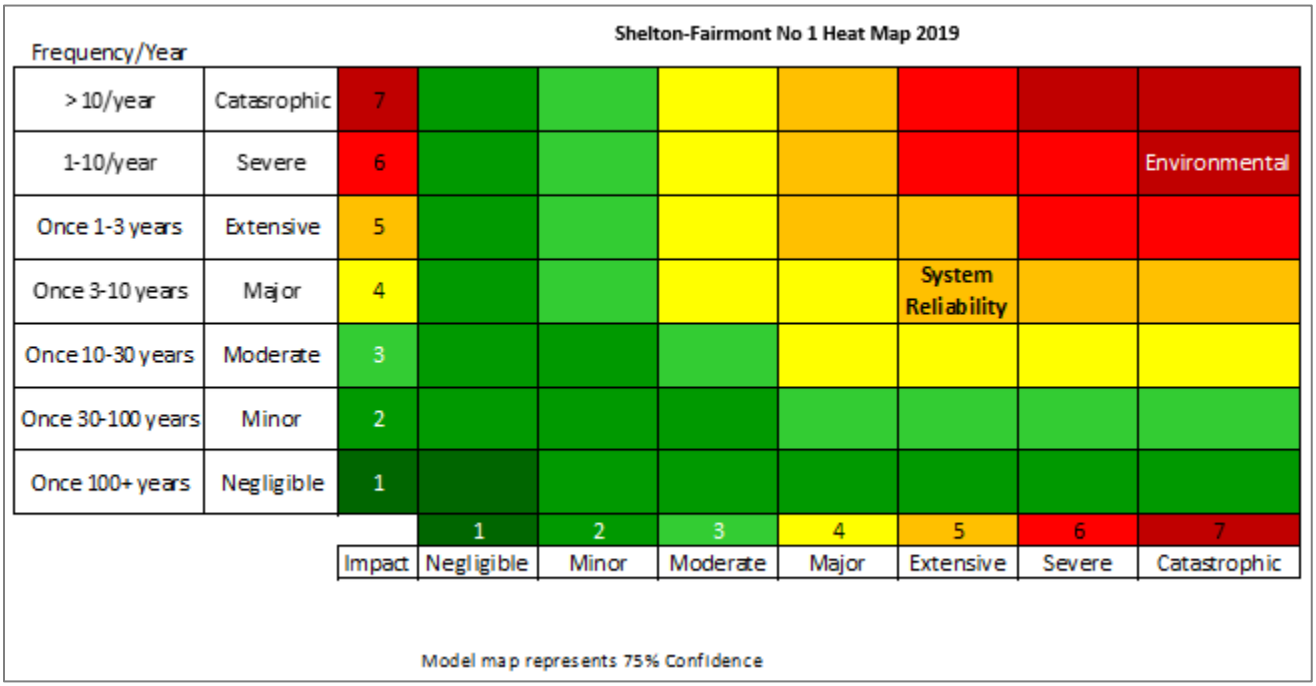


Figure 9.0-3 Shelton – Fairmont Heat Map for Environmental and Reliability Risk

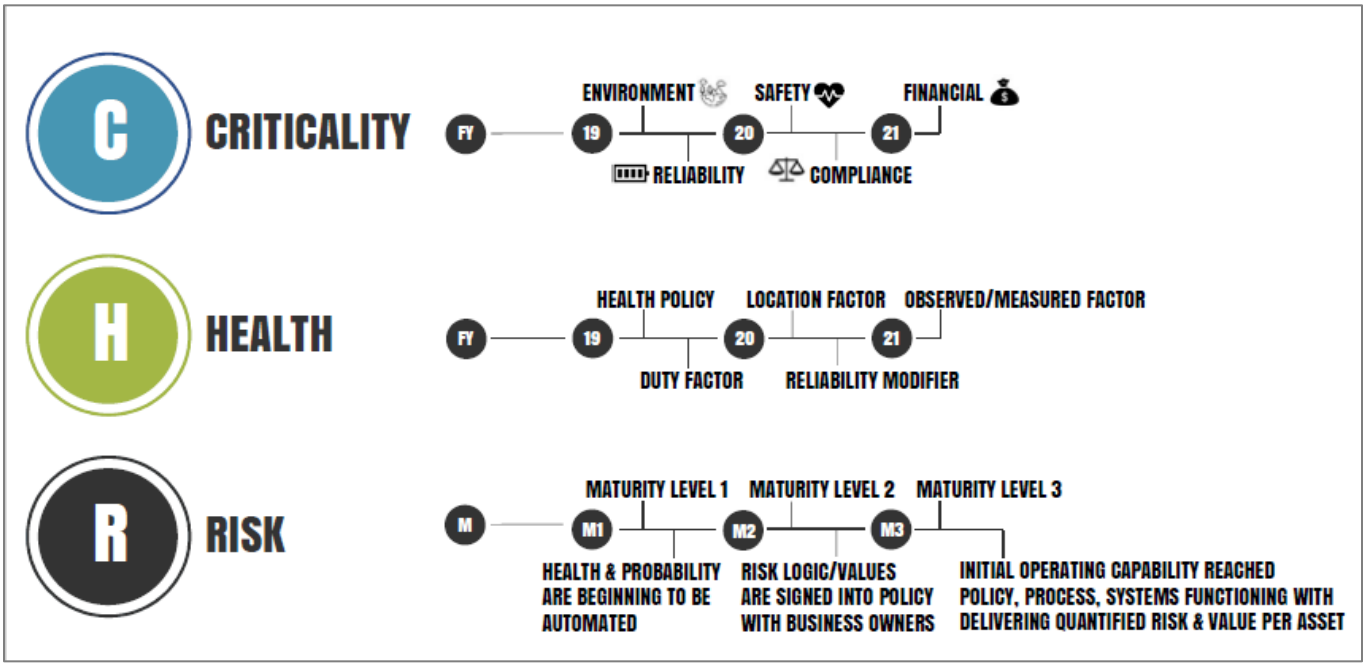


Figure 9.0-4 Criticality, Health & Risk (CHR) Roadmap

10.0 STRATEGY AND FUTURE STATE

Transmission's initial SAMP was unable to characterize investment levels calibrated to each risk dimension in order to layout plans that optimized and prioritized value across the system. In that vein multiple efforts were setup to develop Transmission's risk based planning capability (CHR/Financial Effectiveness/SALVO) to increase its effectiveness for decision making. Within the two years following the publication of the initial SAMP, Transmission has made tremendous strides in capital/maintenance and operational decision making. Examples of enhanced informed decisions included parameters i.e. lifecycle costs, performance metrics and risk analysis that were studied to inform an investment decision. These included projects such as:

- BPA Wildfire Assessment
- Longview 2021 Cascadia vs. Load Shedding
- 500kV Line Relays (Dual vs. Single Vendor)
- Shelton – Fairmont No. 1 Line Rebuild
- Snowcat Modifications

As these capabilities mature, Transmission continues to leverage the Total Economic Cost models to provide a reasonable level of programmatic funding levels in the interim. The dollar focused lens is the lower end of the maturity as risk and value eventually will dictate priority where asset management becomes focused on the assets; rather than solely how much is spent. Ultimately cost will be coupled with risk/value and market forces including inflation that will influence those delivery systems to some extent.

Figure 10.0-1 represents asset management maturation and indicates how investments will be made in the future through the use of the following systems:

1. CHR (Criticality, Health & Risk)
2. TPOT (Transmission Portfolio Optimization Tool)
3. TEC (Total Economic Cost models)
4. SALVO (Strategic Assets Lifecycle Value Optimization)

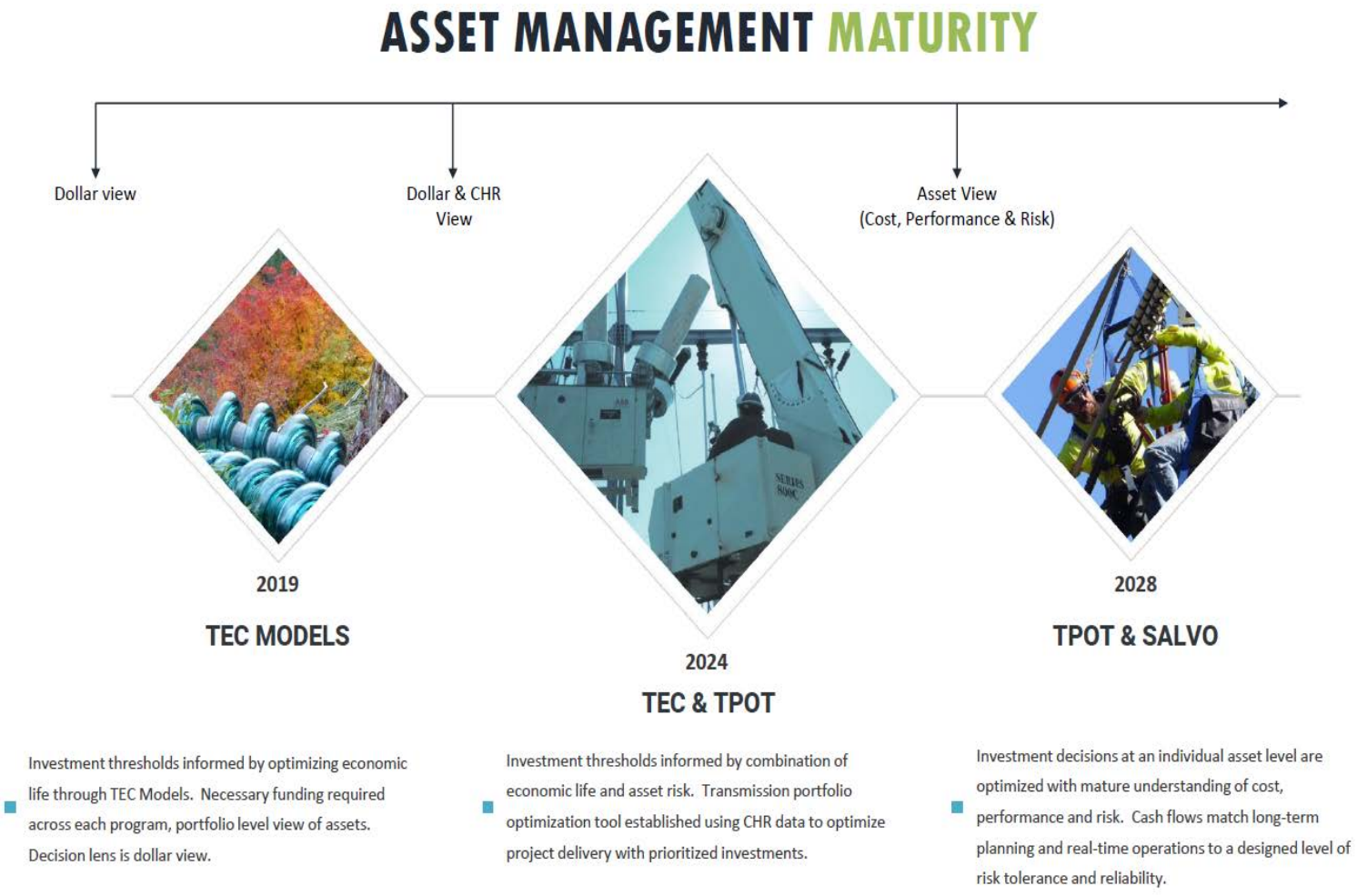


Figure 10.0-1 Asset Management Investment Maturation

10.1 Future State Asset Performance

Ultimately Transmission's future asset performance will be a designed level of reliability performance, where risk based planning reflects the products and services Transmission services provides. Today Transmission has put forward a suggested signal for reliability strength as a function of SAIFI & Asset Health ƒ(SAIFI, Health). Table 10.1-1 shows the calculated performance metric from 2018 to 2019 as a network of system performance. Transmission is not currently able to project what the future boundary thresholds are until greater correlation relationships and data integration allow for more granular calculated metrics.

Table 10.1-1 Future Asset Performance Objectives

Objective	This Year	Year +1	+2	+3	+4	+5	+6	+7	+8	+9	+10
Reliability Strength	6.38	5.12	TBD	TBD	TBD	TBD	TBD	TBD	TBD	TBD	TBD

10.2 Strategy

10.2.1 Sustainment Strategy

Over the past few years, Transmission Services has been maturing its asset management program with a goal of sustaining its existing assets to meet reliability and availability targets at optimal lifecycle costs. Long-term asset strategies and asset plans for capital replacements and maintenance have been developed for:

- Alternating and direct current substations
- Control centers
- Power system control/telecommunications
- System protection and control
- Rights-of-way
- Wood lines
- Steel lines

Sustainment planning is asset driven and takes into account the condition of the assets and the demands placed on them. Each of the program strategies contains a representation of asset health and risk of failure to the system along with a strategy for mitigating any associated risks. The strategies provide the direction for addressing the most critical assets first while a corresponding plan has been developed to implement risks mitigation, slow down or eliminate capital replacement backlogs, and reach optimal lifecycle management.

AC Substations

A long-term strategic approach proactively maintains assets and evaluates them based on evolving reliability centered maintenance principles. Assets will be replaced based on their effective life cycle. Strategic drivers for asset replacement are based on technical obsolescence, limited long-term vendor support, spare parts availability and cost, decreasing equipment operating margins and skilled workforce shortages. The strategy is focused on four key areas for all major equipment groups: *Performance monitoring/data analysis, O&M approaches, equipment standardization, appropriate sparing strategies that are equipment and location specific.* Assets are targeted for replacement based on asset condition assessments, system upgrades (capability/capacity), and asset risk (failure and consequence).

Control centers

The strategies to improve control center asset performance are focused on addressing critical asset risks first, as well as, high risk asset issues before they reach critical stage. Including, migrating OpenVMS-technology systems; such as migrating major control systems to a Windows platform to improve manageability and maintain sufficient software vendor support. Ensuring that critical systems meet their established availability targets by taking appropriate maintenance, support and replacement actions. Conducting annual asset risk assessments; and developing a two-to-three-year rolling resource plan with sourcing strategies to support sufficiently maintaining and replacing risk assets.

Power System Control

The strategy is aimed at aggressively reducing the risks of asset failure with an analytic statistical replacement strategy as well as large backlogs resulting from years of underinvestment; addressing interoperability issues by designing and conducting a comprehensive, integrated testing program. PSC and telecommunication equipment is upgraded and replaced to enable the agency to deliver on its strategic initiatives, including possible regional imbalance market formation, greater use of dynamic transfer capacity and demand response resources, and changes in scheduling. Replacement plans are integrated with system protection and control and associated control center assets.

Rights-of-Way

Vegetation management

Implement an integrated vegetative management approach – a system of managing plant communities whereby managers set objectives, identify compatible and incompatible vegetation, consider action thresholds and evaluate, select and implement the most appropriate control methods to achieve set objectives. The choice of control methods should be based on the environmental impact and anticipated effectiveness along with site characteristics, security, economics, current land use and other factors. Assure the highest level of regulatory compliance by adopting the integrated vegetative management approach, which is considered an industry best practice.

Access roads

Implement a systematic long-term method for upgrading and maintaining BPA access to and through rights-of-way corridors. This allows a corridor approach for planning work in support of the wood pole and steel line sustain programs. It also considers bundling projects to allow greater implementation through the owner's engineer contract. Ensure that safe access in compliance with environmental regulations is provided throughout the entire transmission system.

Land rights

Develop a long-term plan to meet program objectives/targets, including reducing backlogs and supporting asset plans for access roads, vegetation and poles/lines. This strategy prioritizes the needs for rights (alternative routes, risk of complaints/litigation/trespass violations, criticality of the line, tribal renewals) in a comprehensive view.

System Protection and Control

Replace specific populations of equipment groups that are at highest risk of failure or technological obsolescence. Targeting these replacements will mitigate the risks associated with the documented poor health of aged equipment, the lack of manufacturer support for older equipment, the increased corrective maintenance on aged asset population and the challenge of retaining the skill set necessary to work on older equipment models.

Steel Lines

The strategy includes a proactive plan to replace vital overhead system components nearing end-of-life. It sets standard metrics for collecting and retaining asset condition data with enough granularity to identify condition trends, target and pace replacement efforts, manage components over time and better predict remaining service life. It standardizes the process for sampling and testing retired components. It develops a long-term strategy for evaluating and mitigating a continuously aging asset. It incorporates standardized components and technology innovations into replacement efforts.

Wood Lines

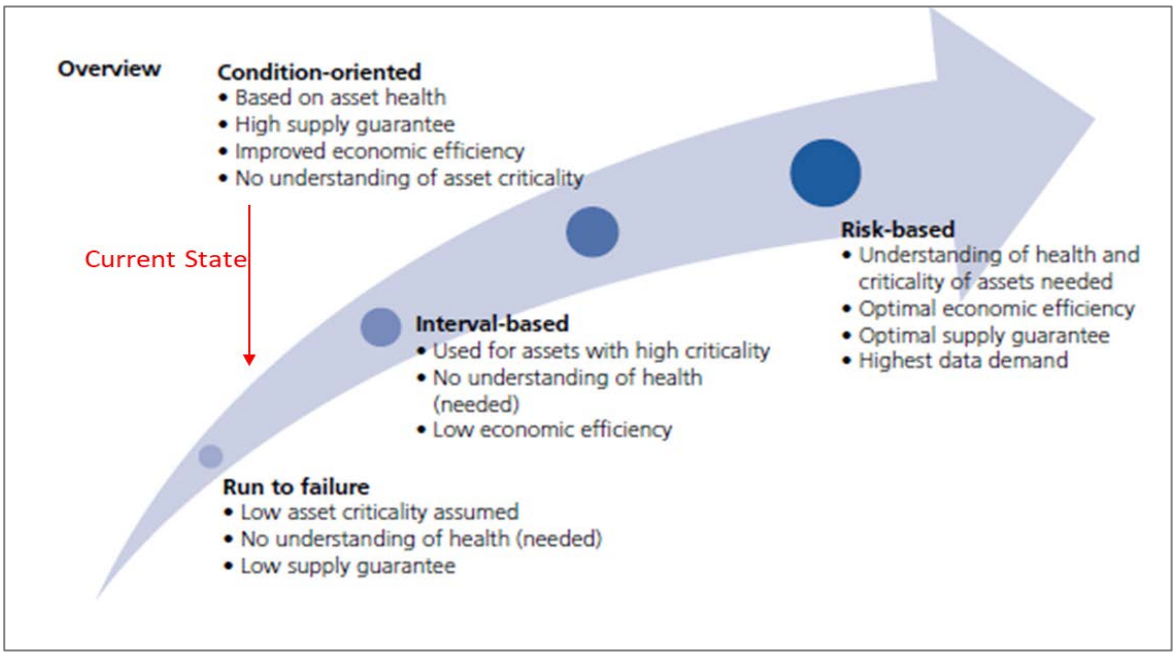
The strategy focuses on shifting from individual components of the line, such as wood poles, to an asset life cycle strategy that combines life extension replacement of all of the aged components on the structure and systematic replacement of aged, poorly performing wood pole lines. It implements projects on a three-year program schedule to allow adequate time for gaining road rights, acquiring land and materials, and performing NEPA activities. It retires old de-energized lines to mitigate safety and liability risks and reduce maintenance responsibility.

As asset management is matured through the use of CHR, financial effectiveness, and the Salvo decision support tool, the various programs' methodologies for assessing asset health and risk will all follow the same architecture so that assets and programs can be discussed comparatively through a systematic approach using industry best practices.

Operations & Maintenance Strategy

Transmission continues to align its replacement and maintenance work streams by utilizing processes and analytics to converge an integrated best value strategy at all levels of the organization. Independent of resource constraints, some investment activities that would mitigate risk and realize significant value for Transmission as a result of pursuing the activity, is halted or postponed due to the required financial treatment of the activity. Sometimes this is a result of it being an unanticipated expenditure or the available budget has already been consumed and/or committed. It is important to ensure financial mechanisms such as IPR align to business strategies that incorporate cost, performance, and risk for all Transmission assets. In that vein moving towards probabilistic/risk-based maintenance requires initial competencies (i.e. CHR/SALVO) to be at an initial operating capability. Thus the strategy remains unchanged from status quo other than continue working on asset segmentation/criticality scoring/survival analysis to create bands of asset classes that can have a different maintenance interval/specification and ultimate strategy. The image below shows where Transmission wants to go for maintenance using the initiatives in flight today; ultimately moving towards a risk-based maintenance strategy.

Current state is limited to interval-based maintenance; with correctives which are initiated by internal standards and guides to drive a maintenance action.



10.2.2 Growth (Expand) Strategy

BPA's transmission expansion program includes investments to add capacity and flexibility, increase operational output, improve reliability and meet load growth while maintaining safety. The expansion program includes investments to interconnect generation, meet customer service requests and relieve transmission congestion. Projects range from minor upgrades and substation additions to major transmission line additions. Included are projects that are tariff driven or customer requested and that may be funded in part or wholly by customers or a third party.
Expand investments are divided into four groups:

- **Main grid,** consisting of 500-kilovolt (kV) transmission and substation facilities as well as some 345-kV and a few 230-kV facilities.
- **Area and customer service**, consisting of facilities, typically 230 kV and below, that function primarily to serve customer loads at their request.
- **Interregional paths**, consisting of 500 kV and some lower voltage lines and facilities that interconnect with transmission providers and generating resources outside the Pacific Northwest.
- **Upgrades and additions,** consisting of upgrades to substations, line capacity, hardware, software and other electrical equipment. This includes the multi-year project to modernize and upgrade the Celilo Converter Station and the Pacific Direct Current Intertie north of the California-Oregon border.

Transmission Services also funds capital investments in information technology, environmental work, nonelectric facilities, fleet, and security enhancements in support of the transmission program. These investments are addressed through separate asset strategies for these asset types due to the unique drivers behind the investments.

10.2.3 Strategy for Managing Technological Change and Resiliency

Technological Obsolescence

Transmission Services is faced with the challenge of rapidly evolving technology in several different programs such as system telecommunications, system protection and control, and control centers. BPA has generally lagged behind the industry and is starting to feel the effects of this delay. Maintaining system and equipment operability with multiple older vintages of equipment has increased the inventory of equipment needed for spare parts and creates additional instances of equipment failure and system miss-operations. Costs for maintenance and inventory are up substantially as a result. In addition, while some equipment may still be in fair or good condition, the lack of vendor support and replacement parts makes repairs very expensive and increases the potential for outages of unacceptable duration.

In addition, there are many new technologies that would provide Transmission Services with flexibility on the system for performing replacements and O&M activities without requiring an outage. Transmission Services is focused on identifying and implementing technologies that would reduce the number and the duration time of outages for maintenance, repair and replacement. While Transmission Services has begun initial efforts to partner with Electric Power Research Institute (EPRI) to develop a technology research and development roadmap, this effort is just beginning to reach a functional level.

Resiliency

Resiliency which is quoted by NERC/FERC (Docket AD18-7-000) as the "infrastructure resilience is the ability to reduce the magnitude and/or duration of disruptive events. The effectiveness of a resilient infrastructure or enterprise depends upon its ability to anticipate, absorb, adapt to, and/or rapidly recover from a potentially disruptive event." This puts a time based function on reliability where maintaining existing asset performance levels has been the traditional thought, that a designed level of response time to an event is adding resiliency to the system and region. This would be intended to be a designed program that grows as it matures and definitions are codified by NERC/FERC regulatory standards with guidance on reasonable levels of reliability/resiliency.

Regional district managers coordinated this effort with a clear direction and guidance that resiliency can grow in time with both build projects and logistical investments; these initial improvements are real-time use cases primarily from the Transmission Line Maintenance staff. All 13 district managers identified specific access road sections that add multiple benefits to the region including resiliency, revenue protection, wildfire risk mitigation and wildfire emergency responder safety. Of the 13 districts each one provided three specific sections of right of way that will be prioritized using CHR to be reinforced or rebuilt to provide Transmissions first pass at resiliency. The specific projects of these road improvements will be provided in Transmissions asset plan.

These projects will go into the normal capital acquisition phase for Transmission for estimating/scoping purposes as well as share a critical parallel to preventative efforts in the Transmission Wildfire Mitigation Plan coming in Q2 FY20.

10.3 Planned Future Investments/Spend Levels

Table 10.3-1 is a summary of Transmission's capital budgets, as well as expense budgets within the asset management program. Since the Vancouver Control Center (VCC) is not yet approved, conservative capital budget estimates are included in the *Upgrades & Additions* line item for expand and multiple line items for sustain. The VCC costs are approximately $5M in FY20 and $15M in FY21. Expected execution underperformance in other programs due to human resource limitations will likely enable Transmission to fund the first two years (FY20/21) of VCC development without

requesting additional authorization. Beginning in FY25, additional funding will need to be approved for Transmission expand and sustain costs associated with VCC. The corresponding capital estimates are $148.6M in FY25, $144M in FY26, and $70M in FY27.

Scoping and design dollars are included in the FY20 and FY21 numbers for upgrading the Ross Complex electrical station service in order to sufficiently serve the proposed new VCC. The construction dollars associated with the station service project are included in FY22 and FY23 as placeholders. BPA's financial participation in Midway-Ashe is included, assuming $8M spend in each of the following fiscal years: FY20, FY21 and FY22. The proposed Grand Coulee 230kV switchyard modernization effort is included starting in FY21's budget but significant investment beyond the 230kV current limiting reactor is not expected to occur until FY22 or later. Transmission's share of investment in Grid Mod projects such as the federal generation high-side metering additions are also included.

At this time BPA's financial participation in the proposed Boardman to Hemingway (B2H) transmission line is not included. Although studies and negotiations continue, BPA has not committed to funding it's portion of the costs involved in building the nearly 300 mile long 500kV transmission line; nor has BPA agreed to, either, asset or capacity swaps with other transmission owners and providers.

If Transmission must adjust budgets to accommodate VCC and/or B2H, or any other large project, other program budgets and execution rates would be affected and updates/tradeoffs would be reflected in future investment planning. Irrespective of budgets, if VCC is approved, Transmission will substantially defer other projects and programs as required to focus limited human resources on VCC.

O&M expense costs have not yet been finalized prior to the completion of the SAMP refresh. Tentatively, expense costs are expected to be held flat in FY22 and FY23, and then increased incrementally at the rate of inflation. The costs listed in table 10.3-1 are estimates which will be finalized during IPR, and updated in the next iteration of the SAMP.

Table 10.3-1 Future Expenditures (thousands)

Program	Rate Case (Fiscal Year)		Future (Fiscal Year)							
Capital Expand (CapEx)	2022	2023	2024	2025	2026	2027	2028	2029	2030	2031
Main Grid	$10,000	$5,000	$10,000	$12,000	$8,000	$7,000	$10,000	$10,000	$10,225	$10,450
PFIA	$45,000	$50,000	$40,000	$30,000	$30,000	$30,000	$30,000	$30,000	$30,675	$31,350
Area & Customer Service	$40,000	$60,000	$50,000	$40,000	$40,000	$40,000	$40,000	$40,000	$40,900	$41,800
Upgrades & Additions	$50,000	$50,000	$50,000	$64,000	$66,000	$55,000	$44,000	$44,000	$44,990	$45,980
Total Capital Expand	***$145,000***	***$165,000***	***$150,000***	***$146,000***	***$144,000***	***$132,000***	***$124,000***	***$124,000***	***$126,790***	***$129,580***
Capital Sustain										
Steel Lines	$24,000	$24,000	$49,000	$51,000	$39,000	$32,000	$28,000	$28,000	$28,630	$29,260
Wood Lines	$33,000	$33,000	$58,000	$60,000	$47,000	$39,000	$35,000	$35,000	$35,788	$36,575
PSC/System Telecomm	$53,000	$53,000	$57,000	$57,000	$54,000	$53,000	$52,000	$52,000	$53,170	$54,340
SPC	$21,000	$21,000	$25,000	$26,000	$24,000	$22,000	$22,000	$22,000	$22,495	$22,990
SUBS AC	$44,000	$44,000	$49,000	$49,000	$47,000	$54,000	$53,000	$53,000	$54,193	$55,385
SUBS DC	$3,000	$3,000	$3,000	$3,000	$2,000	$3,000	$3,000	$3,000	$3,068	$3,135
Other*	$34,000	$34,000	$34,000	$172,600	$171,000	$87,000	$27,000	$27,000	$27,608	$28,215
Total Capital Sustain	***$212,000***	***$212,000***	***$275,000***	***$418,600***	***$384,000***	***$290,000***	***$220,000***	***$220,000***	***$224,952***	***$229,900***
Total Capital	**$357,000**	**$377,000**	**$425,000**	**$564,600**	**$528,000**	**$422,000**	**$344,000**	**$344,000**	**$351,742**	**$359,480**
Expense (OpEx)										
Asset Management Program (O&M)**	$265,884	$265,884	$272,399	$278,773	$285,073	$291,487	$298,147	$304,930	$311,791	$318,650
Total Expense	**$265,884**	**$265,884**	**$272,399**	**$278,773**	**$285,073**	**$291,487**	**$298,147**	**$304,930**	**$311,791**	**$318,650**

**Other: Access Roads, CC System Infrastructure, Land Rights, TEAP Tools, Line Ratings, Misc. Replacement Projects*

***Tentatively, expense costs are expected to be held flat in FY22 and FY23, and then increased incrementally at the rate of inflation for FY24-FY31. The costs listed in table 10.3-1 are estimates which will be finalized during IPR, and updated in the next iteration of the SAMP.*

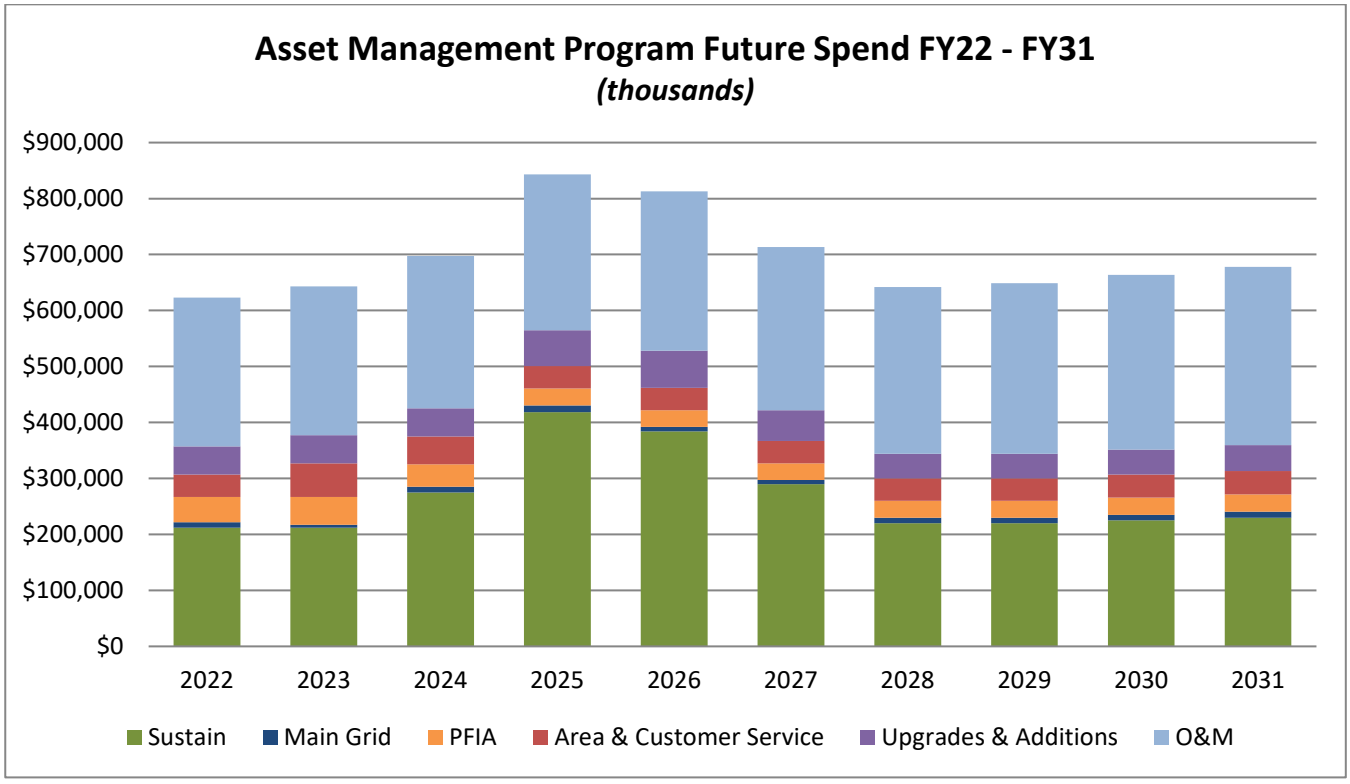


Figure 10.3-2 Future Spend (Capital & Expense)

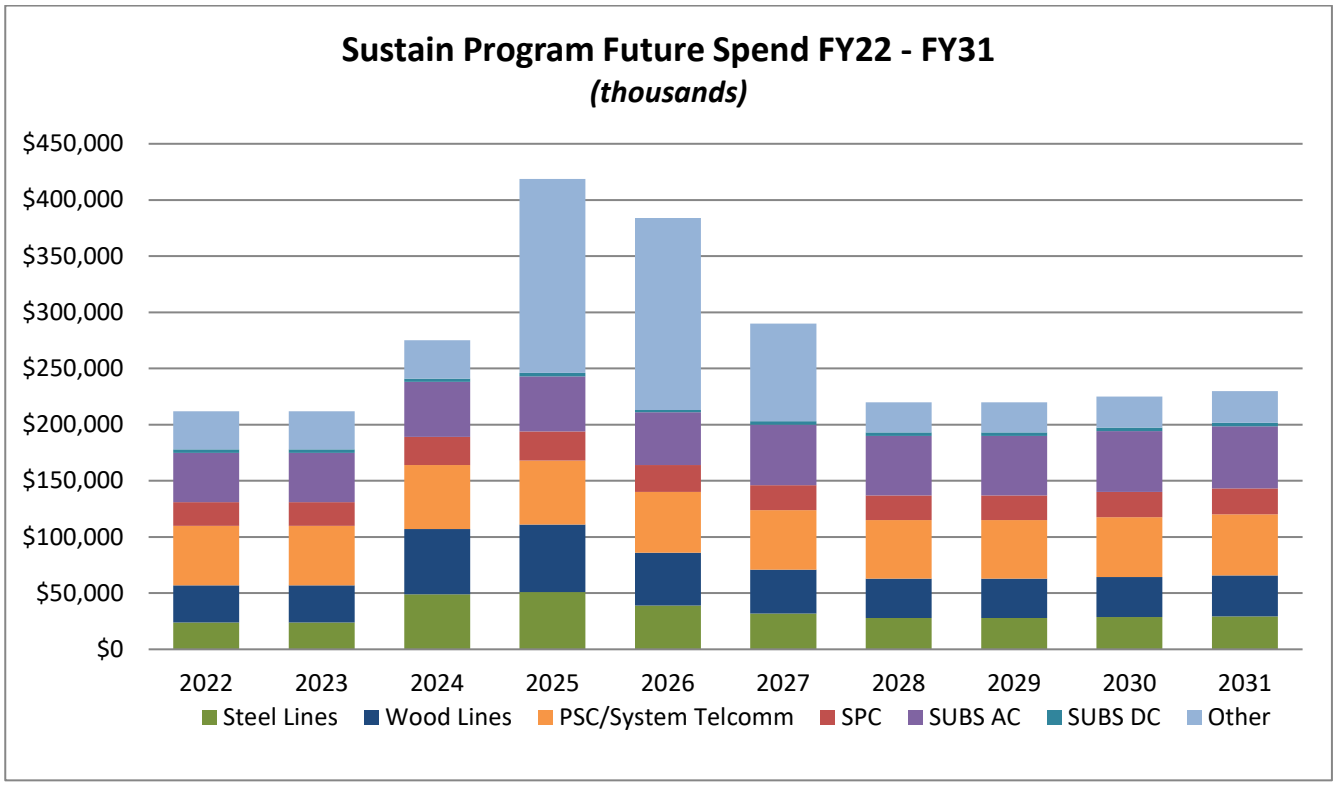


Figure 10.3-3 Sustain Program Future Spend

10.4 Implementation Risks

Transmission has identified the following implementation risks for executing on the SAMP/AP, from the following perspectives: investment strategies and maturity initiatives.

Table 10.4-1, Implementation Risks

Risk	Impact	Mitigation Plan
Cultural resistance to paradigm shift	"Pocket veto" and passive aggressive undermining can delay or halt maturity growth	Top down support and communication plan that demonstrates "what's in it for me" and executive commitment to enforce change to deliver value
Executive alignment on environmental and public perception	Continued risk adverseness on any potential NEPA deviation regardless of impact to project schedule and cost	Discovery and shared business practices with other utilities both private and Federal to educate senior leadership on a defensible approach to environmental execution practices
Constrained execution resources	Delayed and deferred projects degrade reliability and customer satisfaction	Organizational changes and redeployment and in some cases re-training employees is a long term proposition, in addition to an increase in managed services contracts such as engineer/procure/construct. Secondary capacity initiative and Re-engineering work and processes is another alternative but the Agency would need to direct employees to accept more calculated risk in processes and methods.
Premature redirection (aka chasing the next shiny object)	Redeployment of resources prior to reaching mature, steady state business implementation of improvement initiatives prevents realization of potential value and discourages employees.	Executives must continually educate/communicate with the workforce to direct the level of effort and resources required, and stay the course to successful completion to realize dividends in years to come. Repeated demonstration of this level of commitment is required before BPA's culture can change. Executive-led, enterprise wide communication strategy should include projected and realized efficiencies, repeated often with transparent expectations of staying the course.

10.5 Asset Condition and Trends

Future projections of average asset age in time is not yet understood due to the volatility of capital replacement pacing and understanding maintenance refurbishment and how that influences the effective age and health in the future. Premature projects of average asset condition in time has the potential for unsubstantiated focus on the lowest sensitivity indicator for understanding asset performance (age). Transmission continues to refine asset health to a maturity where observed and measured condition will be understood and projected into futuristic probabilistic risk profiles that has direct ties back to the asset register and maintenance management system to track how those maintenance refurbishments influence the health.

The operations and maintenance strategy described in 10.2 will remain unchanged in the next 2 year IPR cycle where status quo criteria for prioritization of maintenance and accumulation of net backlog rate will be the only indicators of

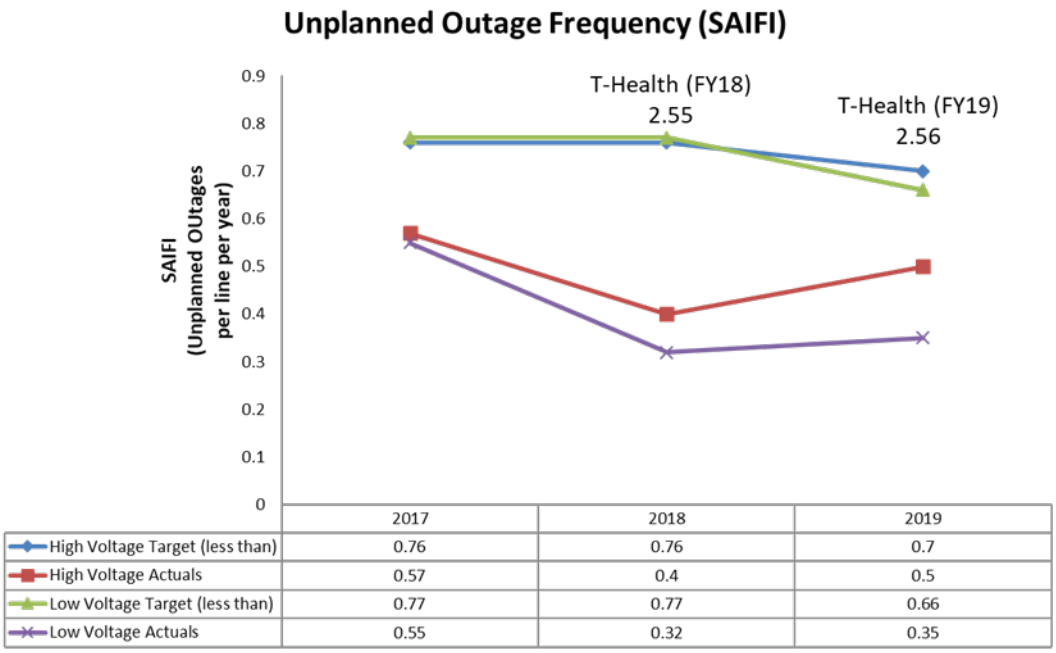
the future. As previously mentioned the strategy for handling the backlog accumulation is continual prioritization using the CHR data as it stacks in information and operational visibility. Transmission has identified focus on the maintenance optimization using the Strategic Asset Lifecycle Value Optimization (SALVO) methodology in FY 23/24 where the asset criticality and health can be converted into the required inputs for any applicable decision support tool for maintenance intervals and sparing.

An example of CHR informing maintenance today is on concrete circuit breaker pedestals; understanding what options exist that are best value for refurbishment instead of wholesale replacement as is current practice.

10.6 Performance and Risk Impact

As stated in Section 9, Transmission does not yet have the ability to baseline or project the current system performance or roll up of individual asset performance or risk score. By the end of the second quarter in FY20 Reliability Criticality will have its initial scoring complete for all substations to allow the use of asset health & reliability/stability data to understand a risk impact for current state asset condition. The scoring for that process follows the ISO-31000 framework with defined criteria that will be codified in policy with senior management officials owning the criteria elements that define risk. Transmission is exploring portfolio correlation based metrics tying in system reliability and asset health. An example may look like understanding SAIDI/SAIFI and Transmission Portfolio Health Score as investment actions take place or do not take place to influence the score and its potential impact to unplanned outages and their duration.

Figure 10.6-1 Unplanned Outages and Transmission Portfolio Health Correlation



	2017	2018	2019
High Voltage Target (less than)	0.76	0.76	0.7
High Voltage Actuals	0.57	0.4	0.5
Low Voltage Target (less than)	0.77	0.77	0.66
Low Voltage Actuals	0.55	0.32	0.35

11.0 Addressing Barriers to Achieving Optimal Performance

Transmission is aggressively moving asset management maturity into the next evolution of critical thinking, efficient processes, and risk-based decision making that derives value. The steps to further strategic goal #2 into an industry leading asset management program that uses ISO 55000/31000/9000/etc., as the guiding frameworks for policy, process, systems and culture, is being taken with a holistic lift across all Transmission business lines.

Internal Barrier:

Internally, the single root cause barrier hindering Transmission's ability to realize this goal is the impedance of significant enterprise level initiatives/projects/workload with cross functional resource impacts accompanied with rapid turnover. For example the rapid timelines and finite resource pool for Grid Modernization, EIM, Resiliency, Wildfire mitigation and balancing investments for aging infrastructure; means that standing up industry leading asset management capabilities is competing against other priorities utilizing the same resource pool. This boils down to ensuring agency alignment for priorities and workforce education to mature complex competencies in an environment. Aligning priorities in a methodical, transparent, well-documented and socialized manner fosters an environment that does not allow for cutting corners or altering scope in order to declare victory.

Strategy for addressing internal barrier:

Rigorous communication plan, across all levels, on a regular cadence that demonstrates the wins of asset management. These wins have been used in a decision in order to determine a better value outcome that varies from historical practice. An example, is the Dual vs. Single vendor relay decision where CHR and lifecycle costing was used to determine a single vendor line relay had the best risk spend efficiency for BPA and will ultimately allow for better financial savings ($5-$8 million per year into perpetuity). Furthermore it helps Transmission field craftsman/engineers in their day-to-day operations. As the entire workforce continues to be educated on what is happening, the organization will be able to collectively identify asset management victories that are truly working level/operational victories, such as the Dual vs. Single vendor example. This collective awareness will continue the momentum of adopting asset management maturation and BPA's chosen strategy.

To further support the chosen strategy, the development of policy where all reference material and reasons that are chosen and their varied level of evidence (data, SME determination etc.) are documented into the policies. This starts to bring continuity and transparency on how things are being done with governance to drive employee workflows and practices into a systemic learned behavior.

External Barrier:

The implication of uncertain changes occurring across the electric power industry landscape challenge Transmission Services to adopt strategic actions with a planning horizon that will challenge status quo paradigms.

Strategy for addressing external barrier:

- Continue to integrate alternative analysis thinking for investments.
- Develop an ADF to evaluate alternative solutions.
- Identify and collaborate with other BPA groups and personnel working to solve the same challenge.
- Continue collaborative efforts with our customers/stakeholders

12.0 DEFINITIONS

Financial Terms:

Indirect Costs: Any costs incurred for common objectives that cannot be directly charged to any single point of cost application. Indirect costs as a class have the character of `joint' or `common' costs and, as a group, are usually referred to as `burden' or as `overhead'. Indirect costs are often allocated to various categories of work in proportion to the benefit to each category.

Investment Classifications:

Compliance: Must be an executive order/directive requiring the specific investment must be made and that the project as proposed includes only the minimum required to comply with the directive. For example Cyber Security, Highway Relocations, BiOp

Replacements: In kind replacement of equipment and components. For example, wood poles, transformers, batteries, existing buildings, breakers, reactors, and conductor.

Upgrades/Additions: Replacement of existing assets that provide addition capacity and/or capability. Examples include breakers, transformers, lines, etc. that after replacement have higher ratings to transfer power. Replacement of applications that provide new capability

Expansion: Adding new assets to the system that did not exist before providing new capability. Examples include: new IT applications, new buildings, and new units at existing power generation sites, new line and substations.

ISO 55000:

Management System: Set of interrelated or interacting elements of an organization to establish policies and objectives and processes to achieve those objectives

- A management system can address a single discipline or several disciplines.
- The system elements include the organization's structure, roles and responsibilities, planning, operation, etc.
- The scope of a management system may include the whole of the organization, specific and identified functions of the organization, specific and identified sections of the organization, or one or more functions across a group of organizations.

Asset Management System: Management system for asset management whose function is to establish the asset management policy and asset management objectives

- The asset management system is a subset of asset management.

Asset management plan: Documented information that specifies the activities, resources, and timescales required for an individual asset or a grouping of assets, to achieve the organization's asset management objectives

- The grouping of assets may be by asset type, asset class, asset system or asset portfolio
- An asset management plan is derived from the strategic asset management plan

- An asset management plan may be contained in, or may be a subsidiary plan of, the strategic asset management plan.