2021 Electric Integrated Resource Plan

Appendix G – Transmission 10-year plan (2020) and 2019-2020 Avista System Assessment

2020 Avista System Plan

Prepared By: System Planning

SADDLE MOUNTAIN STATION UNDER CONSTRUCTION

Version	Version Date	Action	Prepared By	Reviewed By
A	Nov 19, 2020	Draft posted for stakeholder review	John Gross	Damon Fisher
0	Dec 18, 2020	Finalized following stakeholder review	John Gross	David Thompson

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I SYSTEM PLANNING OVERVIEW

Avista's System Planning department's core responsibilities include the development of a system plan for system reinforcements to meet transmission system needs for load growth, adequate transfer capability, requests for generation interconnections, line and load interconnections, and long-term firm transmission service.

The development of the system plan follows a two-year process with four phases. Stakeholders have opportunities to participate in the development of the system plan by collaborating with System Planning and providing comments.

- Phase 1 includes establishing the assumptions and models for use in the technical studies, developing and finalizing a Study Plan, and specifying the public policy mandates planners will adopt as objectives in the current study cycle.
- Phase 2 includes performing necessary technical studies and development of the Planning Assessment. The results of the technical studies are documented in the Planning Assessment, including conceptual solutions to mitigate performance issues.
- Phase 3 includes providing the Avista System Plan report to stakeholders. The Avista System Plan will include documentation of the electrical infrastructure plan with preferred solution options. The resulting project list will include additional information regarding projects and system modifications developed through means other than the technical studies.[1]
- Phase 4 comprises the majority of year two in the two-year process and includes refining the preferred plan of service. Conceptual projects identified in Phase 2 which have not been fully developed in Phase 3 will be addressed in Phase 4.

[1] Such other means may include, for example, generation interconnection or transmission service request study processes under the OATT, or joint study team processes within the region.

Figure 1 provides a visual representation of the four phases throughout the two-year process.

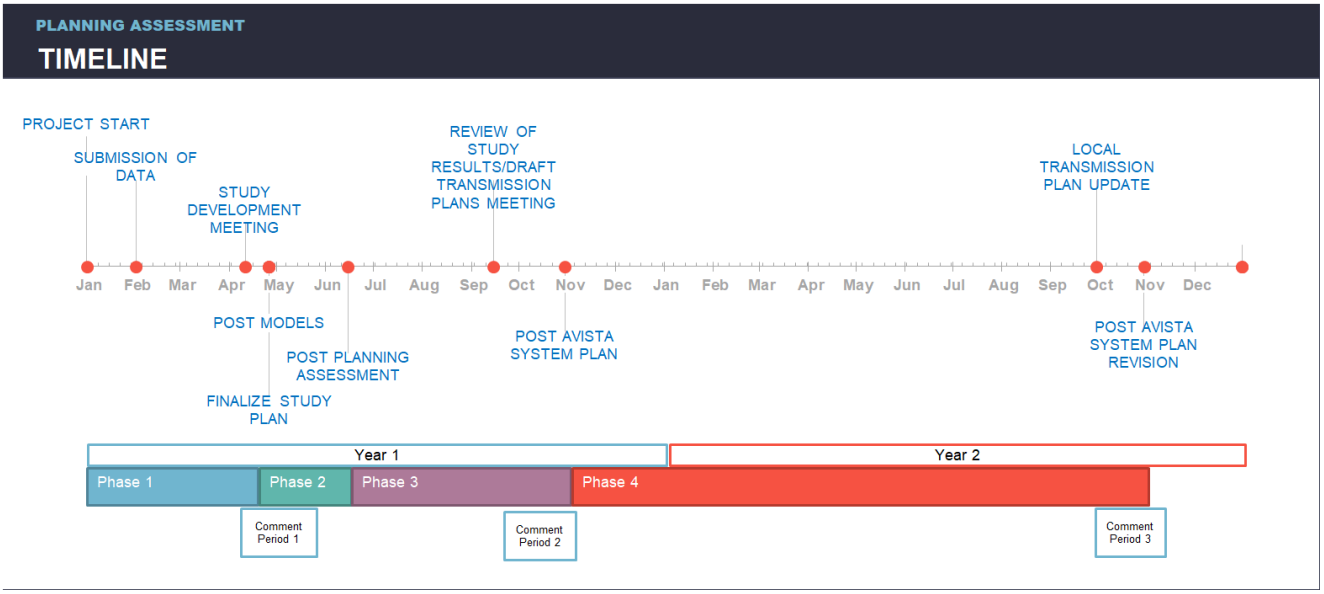

FIGURE 1: AVISTA PLANNING ASSESSMENT TIMELINE

II SYSTEM PROJECT LIST

Initiative	#	Project Name	Driver	Scope	Targeted Date of Operation	Status	Included in Transmission Model
Big Bend System Reinforcement	-	Bruce Siding Station	Performance & Capacity	Scope not complete. New distribution station along Othello SS – Warden #2 115kV transmission line. Station may be an interconnection point for new transmission line used to integrate proposed renewable generation.	N/A	Conceptual Not Scoped	
	32	Davenport Station Rebuild	Asset Condition	Rebuild existing distribution station at nearby greenfield site. Initial construction will include single 20MVA transformer with three feeders.	Q3 2022	Budgeted	
	37	Little Falls Station Rebuild	Asset Condition	Scope not complete. Rebuild existing station in place.	Q4 2023	Budgeted Not Scoped	
	117	Sprague Station Rebuild	Asset Condition	Scope not complete. Rebuild existing distribution station.	N/A	Conceptual Not Scoped	
	-	Benton – Othello 115kV Transmission Line Rebuild	Mandatory & Compliance	Reconductor Avista's 26-mile section of the Benton – Othello Switching Station 115kV transmission line with 795 ACSS with a minimum thermal capacity of 205MVA at 40°C.	Completed Q2 2020	Complete	YES
	-	Chelan Stratford 115kV Transmission Line Rebuild	Performance & Capacity	Scope not complete. Reconductor entire 35.1 miles of Chelan – Stratford 115kV transmission line and 1.2 miles of 115kV line from Headwork tap to Coulee City with 795 ACSS, with a minimum thermal capacity of 205MVA at 40°C.	N/A	Conceptual Not Scoped	
	122	Devils Gap – Lind 115kV Transmission Line Rebuild	Asset Condition	Transmission line minor rebuild to address age and condition of assets.		Construction	
Cabinet Gorge GSU Isolation	82	Cabinet Gorge GSU Protection Upgrade	Performance & Capacity	Install circuit breakers on high side of GSU.	Q4 2024	Budgeted	
Coeur d'Alene System Reinforcement	-	Canfield Station	Performance & Capacity	Scope not complete. New distribution station.	N/A	Conceptual Not Scoped	
	5	Dalton Station Rebuild	Performance & Capacity	Rebuild existing distribution station to two 30MVA transformers, six feeders, and looped-through transmission with circuit breakers.	Q3 2020	Complete	

Initiative	#	Project Name	Driver	Scope	Targeted Date of Operation	Status	Included in Transmission Model
	-	Pleasant View Station	Performance & Capacity	Scope not complete. Rebuild existing station.	N/A	Conceptual Not Scoped	
	105	Rathdrum Distribution Expansion	Performance & Capacity	Scope not complete. Increase existing distribution capacity.	N/A	Conceptual Not Scoped	
	80	Huetter Station Expansion	Performance & Capacity	Scope not complete. Rebuild existing distribution station to two 30MVA transformers, six feeders, and looped-through transmission with circuit breakers.	Q4 2023	Budgeted Not Scoped	
	-	Coeur d'Alene – Pine Creek 115kV Transmission Line Rebuild	Mandatory & Compliance	Reconductor Coeur d'Alene - Pine Creek 115kV transmission line with 1272 ACSR conductor and operate normally open switch as closed.	Completed Q4 2019	Complete	YES Open
	46	Poleline (Prairie) Station Rebuild	Performance & Capacity	Scope not complete. Construct new distribution station to replace Avista facilities at existing Prairie Station. New station to include two 30MVA transformers, six feeders, and looped-through transmission with circuit breakers.	Q4 2023	Budgeted Not Scoped	
	-	Magic Corner	Performance & Capacity	Convert the Ramsey – Rathdrum #3 and Boulder – Post Falls 115kV transmission lines into Boulder – Rathdrum and Post Falls – Ramsey 115kV transmission lines by swapping jumpers on the "magic corner" pole where the transmission lines intersect. Changing the transmission lines will allow the Coeur d'Alene – Pine Creek 115kV transmission line to be operated normally closed.	Q2 2021		NO
East Coeur d'Alene Lake System Reinforcement	12	Carlin Bay Station	Performance & Capacity	Construct new distribution station to include single 20MVA transformer and three feeders. Transmission integration to include constructing a new radial transmission line from O'Gara Station to Carlin Bay and rebuilding the existing O'Gara Station to a switching station. New microwave communication paths will be established to O'Gara Station.	Q1 2025	Budgeted	
	89	Saint Maries Station Expansion	Performance & Capacity	Construct a fourth distribution feeder at the existing Saint Maries Station. SCADA and communication infrastructure will be added.	Q1 2022	Budgeted	

Initiative	#	Project Name	Driver	Scope	Targeted Date of Operation	Status	Included in Transmission Model
	128	Benewah – Pine Creek 230kV Transmission Line Rebuild	Asset Condition	Scope not complete. Design 2025 Rebuild transmission line.	N/A	Conceptual Not Scoped	
Idaho/Lewis County System Reinforcement	34	Grangeville Station Rebuild	Asset Condition	Rebuild existing station to include a main bus with transmission lines terminated at circuit breakers. New distribution facilities to include a 13.2kV and a 34.5kV transformer.	N/A	Conceptual	
	36	Kooskia Station Rebuild	Asset Condition	Scope not complete. Rebuild existing distribution station. Initial construction will include single 20MVA transformer with two feeders.	Q4 2025	Budgeted Not Scoped	
Kettle Falls Stability	96	Kettle Falls Protection System Upgrade	Mandatory & Compliance	Upgrade existing protection schemes on the Addy – Kettle Falls and Colville – Kettle Falls 115kV transmission lines. New relays at Kettle Falls Station and a new communication path from Kettle Falls to Mount Monumental are required.	2022	Budgeted	NO
Lewiston/Clarkston System Reinforcement	64	Hatwai – Lolo #2 230kV Transmission Line	Mandatory & Compliance	Scope not complete. Construct new 230kV transmission line from Hatwai to Lolo, new transmission line terminal at Lolo Station and request interconnection at BPA's Hatwai Station.	2025	Budgeted Not Scoped	
	6	LOID Station	Customer Requested	Scope not complete. New distribution station in the Lewiston Orchards area.	Q4 2025	Budgeted Not Scoped	
	108	Wheatland Station	Performance & Capacity	Scope not complete. New distribution station in the Lewiston area.	N/A	Conceptual Not Scoped	
	109	Tenth & Stewart Station Expansion	Performance & Capacity	Scope not complete. Rebuild and expand existing distribution station.	N/A	Conceptual Not Scoped	
	42	Bryden Canyon Station	Asset Condition	Scope not complete. New distribution station to replace existing distribution facilities at South Lewiston Station.	Q1 2023	Budgeted Not Scoped	
	42	South Lewiston Station Rebuild	Asset Condition	Scope not complete. Rebuild existing station including relocating distribution facilities to Bryden Canyon Station and constructing a switching station with circuit breaker terminated transmission lines.	Q1 2023	Budgeted Not Scoped	NO

Initiative	#	Project Name	Driver	Scope	Targeted Date of Operation	Status	Included in Transmission Model
	79	Dry Gulch Station Upgrade	Customer Requested	Upgrade of facilities for the replacement of PacifiCorp's 69kV transformer with the 69kV transmission line to be operated normally open.	2020	Complete	NO
	62	Lolo Transformer Replacement	Mandatory & Compliance	Replace Lolo #1 230/115kV transformer with 250MVA rated transformer. Replace Lolo #2 230/115kV transformer with 250MVA rated transformer. 115kV circuit breakers, bus work and other capacity-limiting elements will be replaced. Circuit switchers at Lolo and Sweetwater stations will be replaced.	Q3 2023 Q3 2024	Budgeted	NO
	41	Pound Lane Station Rebuild	Asset Condition	Scope not complete. Rebuild existing distribution station.	N/A	Conceptual Not Scoped	
	124	Lolo – Oxbow 230kV Transmission Line Rebuild	Asset Condition	Rebuild transmission line.	Q2 2021 for first phase 2025 for completion	Budgeted	
Metro Station Rebuild	125	Downtown Transmission Cable Replacement	Asset Condition	Replace existing Metro – Post Street and Post Street – Third & Hatch 115kV transmission line cables with 1500 kcmil XLPE.	Q1 2021	Construction	NO
	38	Metro Station Rebuild	Asset Condition	Rebuild existing substation at new location. 115kV bus to be a 6-position ring: 2 – 30MVA xfmrs, 2 – 115kV UG lines from PST, 2 – 115kV OH lines; switchgear on the 13kV side, both Network and Distribution feeders	Q1 2024	Budgeted	YES
North Spokane System Reinforcement	81	Beacon – Francis & Cedar – Waikiki Reconfiguration	Performance & Capacity	Scope not complete. Request new interconnection to Bell Station and loop existing Beacon – Francis & Cedar 115kV transmission line into Bell Station. Waikiki Station can then be served normally by the Bell – Francis & Cedar line.	N/A	Conceptual Not Scoped	
	129	Mead – Colbert – Milan 115kV Transmission Line	Performance & Capacity	Scope not complete. Construct a new 115kV transmission line starting from north Spokane to pick up Mead, Colbert, and Milan stations.	N/A	Budgeted Not Scoped	
	50	Florida & Dalke Station	Performance & Capacity	Scope not complete. New distribution station on the Beacon – Bell	Q4 2025	Budgeted Not Scoped	

Initiative	#	Project Name	Driver	Scope	Targeted Date of Operation	Status	Included in Transmission Model
				#1 115kV transmission line in the Hillyard area.			
	15	Hawthorne Station	Performance & Capacity	Scope not complete. New switching station with distribution facilities located in north Spokane near Bell Station. 115kV interconnection will be along the Beacon – Francis & Cedar corridor and can be a starting point for new transmission line toward Mead Station.	Q4 2025	Budgeted Not Scoped	
	98	Midway Station	Performance & Capacity	Scope not complete. New distribution station located north of Spokane along the Bell – Addy 115kV transmission line.	Q1 2023	Budgeted Not Scoped	
	106	Waikiki Station Expansion	Performance & Capacity	Scope not complete. Increase existing distribution capacity at Waikiki Station.	N/A	Conceptual Not Scoped	
	111	Lyons & Standard Station Expansion	Performance & Capacity	Scope not complete. Increase existing distribution capacity at Lyons & Standard Station.	N/A	Conceptual Not Scoped	
	40	Northwest Station Rebuild	Asset Condition	Scope not complete. Rebuild existing Northwest Station.	Q4 2024	Budgeted Not Scoped	
Palouse System Reinforcement	2	Center Street Station	Performance & Capacity	Scope not complete. New distribution station located in the Pullman area.	2025	Budgeted Not Scoped	
	47	Stateline Station	Performance & Capacity	Scope not complete. New distribution station located between Pullman and Moscow.	Q1 2024	Budgeted Not Scoped	
		Tamarack Station	Performance & Capacity	Scope not complete. New distribution station located in the Moscow area.	N/A	Conceptual Not Scoped	
	112	Moscow City Station Rebuild	Asset Condition	Scope not complete. Rebuild existing Moscow City Station.	N/A	Conceptual Not Scoped	
		North Moscow Station Expansion	Performance & Capacity	Scope not complete. Increase distribution capacity at the existing North Moscow Station.	N/A	Conceptual Not Scoped	
	77	Palouse Area Transformation	Mandatory & Compliance	Scope not complete. Install new 230/115kV transformer at Shawnee Substation with low- and high-side breakers	N/A	Conceptual Not Scoped	

Initiative	#	Project Name	Driver	Scope	Targeted Date of Operation	Status	Included in Transmission Model
				Install breaker at high-side of Shawnee 230/115kV No. 1 XFMR			
	114	Potlach Station Rebuild	Asset Condition	Scope not complete. Rebuild existing Potlatch Station.	N/A	Conceptual Not Scoped	
Rattlesnake Flat I Wind Integration	99	Neilson Station	Customer Requested	Build new 115kV Switching Station for Saddle Mtn POI. Initial configuration 3-terminal ring; final 6-terminal breaker and a half.	Q3 2020	Complete	YES
	99	Lind – Warden 115kV Transmission Line Rebuild	Customer Requested	Upgrade existing Lind – Warden 115kV transmission line to 314MVA capacity including upgrades to terminal equipment at each station. New conductor is 795 ACSS.	Q4 2019	Complete	YES
	99	Lind – Washtucna 115kV Transmission Line Rebuild	Customer Requested	Upgrade existing Lind – Washtucna 115kV transmission line between Lind and the new Nielson Station to 314MVA capacity including upgrades to terminal equipment at Lind Station. New conductor is 795 ACSS.	Q4 2019	Complete	YES
Saddle Mountain	75	Saddle Mountain Station	Mandatory & Compliance	Construct a 3-position 230kV DBDB arrangement with space for two future positions at the line crossing of the Walla Walla – Wanapum 230kV and Benton – Othello 115kV Lines Construct a 4-position 115kV breaker and a half arrangement with space for four future positions Install 1-230/115kV transformer rated at 250MVA.	Q4 2020	Construction	YES
	75	Othello SS – Warden #1 115kV Transmission Line Upgrade	Mandatory & Compliance	Reconstruct Othello SS – Warden #1 115kV transmission line to minimum 205MVA including upgrades to terminal equipment at both stations.	Q1 2019	Complete	YES
	75	Othello SS – Warden #2 115kV Transmission Line Upgrade	Mandatory & Compliance	Reconstruct Othello SS – Warden #2 115kV transmission line to minimum 205MVA including upgrades to terminal equipment at all stations.	Q4 2021	Construction	YES
	75	Othello – Saddle Mountain 115kV Transmission Line	Mandatory & Compliance	Construct 11 miles of 115kV line with a minimum summer rating of 205MVA from Saddle Mountain Station to the new Othello City station with a N/O tap to existing S. Othello Station.	Q4 2021	Construction	NO

Initiative	#	Project Name	Driver	Scope	Targeted Date of Operation	Status	Included in Transmission Model
	75	Othello Station Rebuild	Mandatory & Compliance	Reconstruct Othello Station to a 3-position breaker and a half with 2 – 30MVA transformers at new property.	Q3 2022	Construction	NO
Sandpoint System Reinforcement	56	Bronx Station Rebuild	Performance & Capacity	Scope not complete. Reconstruct existing Bronx Station to include distribution facilities.	2025	Budgeted Not Scoped	
	74	Sandpoint Transmission Addition	Mandatory & Compliance	Scope not complete. Build a new 37-mile line from Rathdrum to Sandpoint with a conductor capable of providing a minimum of 205MVA capacity. Add three circuit breakers at Sandpoint Substation. Add a position and circuit breaker at Rathdrum Substation.	N/A	Conceptual Not Scoped	
	-	Cabinet – Bronx – Sand Creek 115kV Transmission Line Upgrade	Mandatory & Compliance	Upgrade the Bronx – Cabinet and Bronx – Sand Creek 115kV transmission lines to 205MVA capacity including terminal equipment at all stations.	2017	Complete	YES
	70	Cabinet – Noxon 230kV Transmission Line Rebuild	Performance & Capacity	Reconductor entire 18.51 miles of line to 1590 ACSS.	N/A	Conceptual Not Scoped	
Silver Valley System Reinforcement	90	Mission Station Expansion	Performance & Capacity	Scope not complete. Increase distribution capacity at the existing North Moscow Station.	N/A	Conceptual Not Scoped	
	29	Big Creek Station Rebuild	Asset Condition	Scope not complete. Rebuild existing Big Creek Station.	2025	Budgeted Not Scoped	
	126	Noxon – Pine Creek 230kV Transmission Line Rebuild	Asset Condition	Scope not complete. Reconductor 42.87 miles of 43.51 miles of line to 1590 ACSS. Existing line is partially constructed as double circuit transmission line.	2025	Budgeted Not Scoped	
South Spokane System Reinforcement	67	Ninth & Central 230kV Expansion	Mandatory & Compliance	Scope not complete. Build new Ninth and Central 230kV Double Bus Double Breaker substation to include 1-230/115kV (250MVA) transformer associated with two Circuit Breakers. Loop Beacon – Bell No.4 or No.5 230kV Line to reconfigure to Bell – Ninth and Central 230kV Line Build new 230kV line section from Beacon to Ninth and Central alongside existing 115kV	N/A	Conceptual Not Scoped	

Initiative	#	Project Name	Driver	Scope	Targeted Date of Operation	Status	Included in Transmission Model
				line (Either Beacon – Ninth and Central No. 1 or No. 2 115kV Line is adequate.			
	54	Downtown West Station	Performance & Capacity	Scope not complete. New distribution station located on the Metro – Sunset 115kV transmission line.	2025	Budgeted Not Scoped	
	55	East Central New Substation	Performance & Capacity	Scope not complete. New distribution station located on the Ninth & Central – Third & Hatch 115kV transmission line.	2024	Budgeted Not Scoped	
	44	Southeast Station Expansion	Performance & Capacity	Replace 20MVA XFMR#2 with 30MVA and add sixth feeder (Complete). Upgrade 115kV loop-through with capacity for 314MVA.	Transmission Q4 2021	Construction	YES
	110	College & Walnut Station Rebuild	Asset Condition	Scope not complete. Rebuild existing College & Walnut Station.	N/A	Conceptual Not Scoped	
	60	Ninth & Central – Sunset 115kV Transmission Line Upgrade	Performance & Capacity	Replace the 795 AAC and ACSR conductor on the Ninth & Central – Sunset 115kV transmission line with 795 ACSS with E3X coating to match the rest of the line.	Q3 2023	Budgeted	NO
	93	Beacon – Ross Park 115kV Transmission Line Rebuild	Mandatory & Compliance	Rebuild existing Beacon – Ross Park 115kV transmission line. No capacity increase.	2021	Budgeted	
Spokane Valley Transmission Reinforcement	59	Irvin Station	Mandatory & Compliance	Construct the Irvin Station terminating the Beacon – Boulder #1 and #2, Irvin – IEP, and Irvin – Opportunity 115kV transmission lines as a breaker and a half configuration	Q1 2022 Partialy Complete	Construction	YES
	49	Irvin Distribution	Performance & Capacity	Scope not complete. Add distribution facilities to Irvin Station.	N/A	Conceptual Not Scoped	
	30	Chester Station Rebuild	Asset Condition	Scope not complete. Rebuild existing Chester Station.	N/A	Conceptual Not Scoped	
	57	Barker Station Expansion	Performance & Capacity	Scope not complete. Increase capacity at existing Barker Station.	N/A	Conceptual Not Scoped	
	123	Beacon – Boulder #1 115kV Transmission Line Rebuild	Asset Condition	Rebuild the existing Beacon – Boulder #1 115kV transmission line from Irvin to SIP.	2022	Budgeted	NO
	59	Beacon – Boulder #2 115kV Transmission Line Rebuild	Mandatory & Compliance	Rebuild the existing Beacon – Boulder #2 115kV transmission line from Beacon to Millwood to 795 ACSS conductor.	N/A	Deferred	NO
	43	Valley Station Rebuild	Asset Condition	Scope not complete. Rebuild existing Valley Station.	Q4 2024	Budgeted Not Scoped	

Initiative	#	Project Name	Driver	Scope	Targeted Date of Operation	Status	Included in Transmission Model
Stevens/Ferry County System Reinforcement	-	Addy – Devils Gap 115kV Transmission Line Upgrade	Asset Condition	Reconductor 5.19 miles (rebuild between Ford and Long Lake Tap) of limiting conductor which consist of 266.8 ACSR and 397.5 ACSR conductor resulting in a capacity limitation of 71.5MVA at 40°C, to be rebuilt to a capacity of 150MVA at 40°C (likely 240MVA)	Q1 2019	Complete	YES
	91	Long Lake Station Rebuild	Asset Condition	Scope not complete. Relocation of existing GSU transformer from within Long Lake HED to an outside station. Existing 115kV station is located in the powerhouse and will be relocated to an adjacent outdoor site.	N/A	Conceptual Not Scoped	
	101	Long Lake Station Expansion	Performance & Capacity	Scope not complete. Increase capacity of the distribution facilities at the Long Lake distribution station.	N/A	Conceptual Not Scoped	
	8	Addy – Gifford 115kV Transmission Line Rebuild	Asset Condition	Scope not complete. Reconstruct portions of the radial Addy – Gifford 115kV transmission line.	2026	Budgeted Not Scoped	
Sunset Station Rebuild	26	Sunset Station Rebuild	Mandatory & Compliance	Rebuild the existing Sunset Station as breaker and a half configuration.	Q2 2022	Construction	
West Plains System Reinforcement	53	Flint Road Station	Performance & Capacity	Scope not complete. New distribution station located north of Spokane along the Airway Heights - Sunset 115kV transmission line.	Q3 2022	Budgeted Not Scoped	
	104	Four Lakes Capacitor	Performance & Capacity	Scope not complete. Install capacitors at the existing Four Lakes Station.	N/A	Conceptual Not Scoped	
	100	Melville Station	Performance & Capacity	Scope not complete. New switching station near existing tap to Four Lakes Station off the South Fairchild Tap 115kV transmission line. Construct new transmission line from Airway Heights to Melville including passing through Russel Road and Craig Road distribution stations. Requires new transmission line terminal at existing Airway Heights Station.	Q1 2025	Budgeted Not Scoped	
	-	Russel Road	Performance & Capacity	Scope not complete. New distribution station located south of	N/A	Conceptual Not Scoped	

Initiative	#	Project Name	Driver	Scope	Targeted Date of Operation	Status	Included in Transmission Model
				Airway Heights along the new Airway Heights - Melville 115kV transmission line.			
	131	Garden Springs 115kV Station	Performance & Capacity	Construct new 115kV portion of Garden Springs Station at the existing Garden Springs switching location. New station will terminate Airway Heights – Sunset and Sunset – Westside 115kV transmission lines including the South Fairchild Tap.	Q4 2024	Budgeted	
	131	Garden Springs 230kV Station	Performance & Capacity	Construct new 230kV portion of Garden Springs Station including two 250MVA nominal 230/115kV transformers. Construct new 230kV transmission line from Garden Springs to a new switching station at interconnection point on the BPA Bell – Coulee #5 230kV transmission line.	N/A	Budgeted	
Westside Station Rebuild	58	Westside Station Rebuild	Mandatory & Compliance	Replace the existing Westside #2 230/115kV transformer and construct necessary bus work and breaker positions. Reconstruct 230 and 115kV buses to double bus double breaker 3000/2000 Amp standard. Phase 4: Complete bus work to double bus, double breaker on both the 230kV and 115kV buses	XFMR and 230 2x2 Q1 2021 Q3 2024 for complete rebuild	Construction	YES

III MAJOR SYSTEM PROJECTS

The following list is a subset of the project list provided in Section II. The subset of projects was selected based on their relative impact to the system performance and the project scope has been substantially determined. A general problem statement and summary of project scope is provided. Detailed project reports may be available and could have more recent information.

1 COEUR D'ALENE SYSTEM REINFORCEMENT

The Coeur d'Alene and Post Falls areas in northern Idaho have seen high load growth rates which are expected to continue. Area distribution stations are becoming heavy loaded with equipment operating above 80% of their applicable facility ratings in peak summer scenarios. The local transmission system is served by two 230/115kV autotransformers and a single 115kV transmission line. An additional transmission line can connect to the area but has been historically operated normally open. The autotransformers along with the 115kV transmission lines feeding Coeur d'Alene load may overload for multiple contingency events during moderate to heavy loading during all seasons.

The Coeur d'Alene System Reinforcement initiative includes several projects intended to increase distribution system capacity. Rebuilds and expansion of existing stations at Pleasant View, Rathdrum, Huetter and Prairie will provide increased transformation capacity and additional feeders to serve the area. The Magic Corner project, which changes the Boulder – Post Falls and Ramsey – Rathdrum 115kV transmission lines into the Boulder – Rathdrum and Post Falls – Rathdrum 115kV transmission lines, will allow the Coeur d'Alene – Pine Creek 115kV transmission line to be operated normally closed. Operating the transmission line normally closed provides an additional transmission source into the area.

1 Modify "Magic Corner" pole located at Poleline and Chase to convert the Boulder – Post Falls and Ramsey – Rathdrum #3 115 kV transmission lines into the Boulder – Rathdrum and Post Falls – Ramsey 115 kV transmission line.

2 Operate switch A429 at Blue Creek on the Coeur d'Alene – Pine Creek 115 kV Transmission Line normally closed. Not shown on drawing.

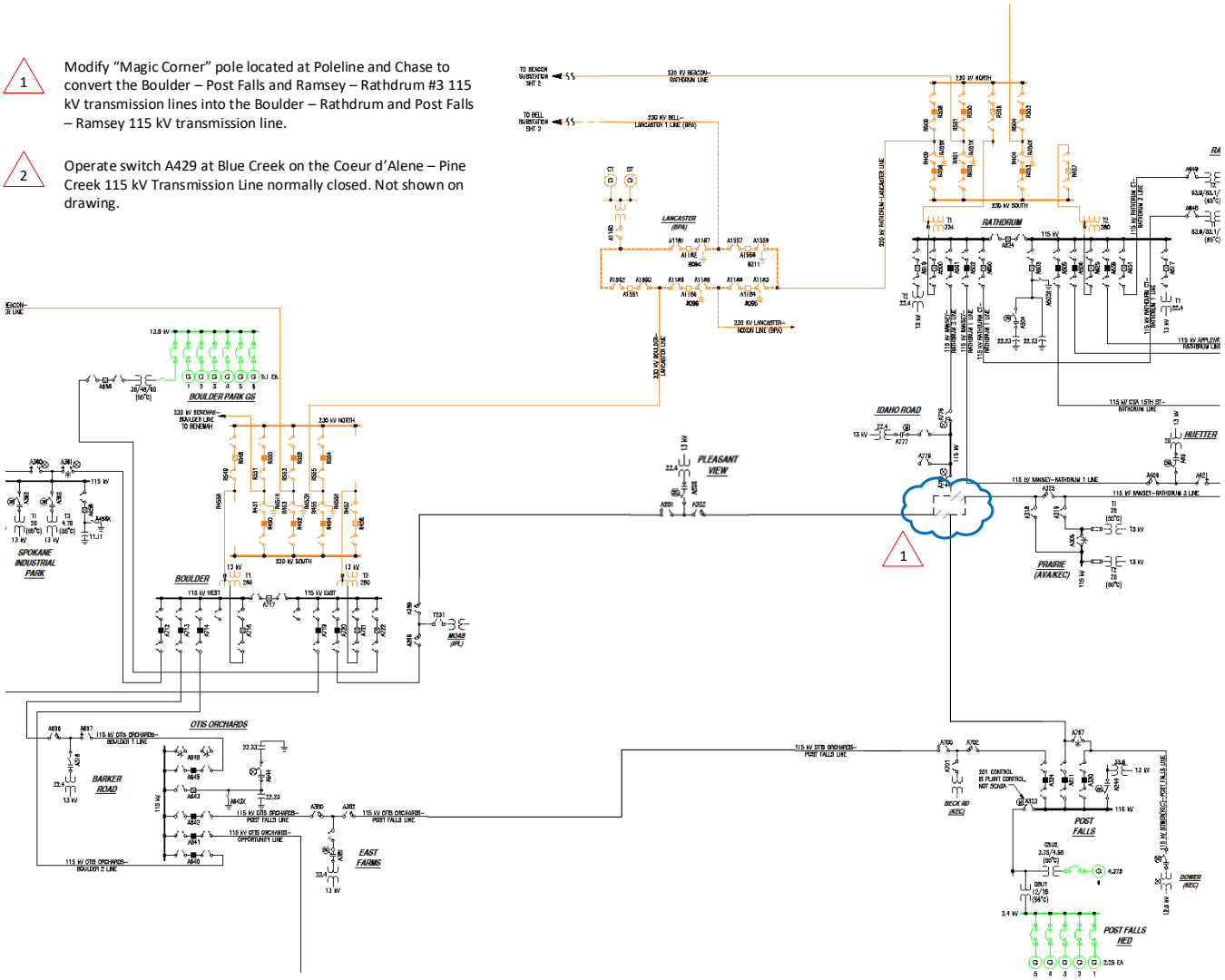

FIGURE 2: MAGIC CORNER PROJECT DIAGRAM

2 METRO STATION REBUILD

Metro Station, located in downtown Spokane, is one of two stations serving the downtown distribution network. Much of the major equipment in this station is now unsupported by the manufacturer. Legacy oil tanks beneath the site pose an environmental problem and limit modifications to upgrade the existing station. Underground transmission cables to this site in need replacement. Transformer and switchgear spares are unavailable or difficult to install in an outage scenario. Various other condition issues, such as the 115kV breakers, insulators, and panel house, also exist at this site.

The Metro Station Rebuild project is a full rebuild of the station on a green field site. In addition to the existing Metro – Sunset and Metro – Post Street lines, the Post Street – Third & Hatch line will now be terminated in the Metro station to provide additional transmission configurations to support the network load served out of Metro station and to provide additional redundancy and resiliency options throughout the Spokane urban area.

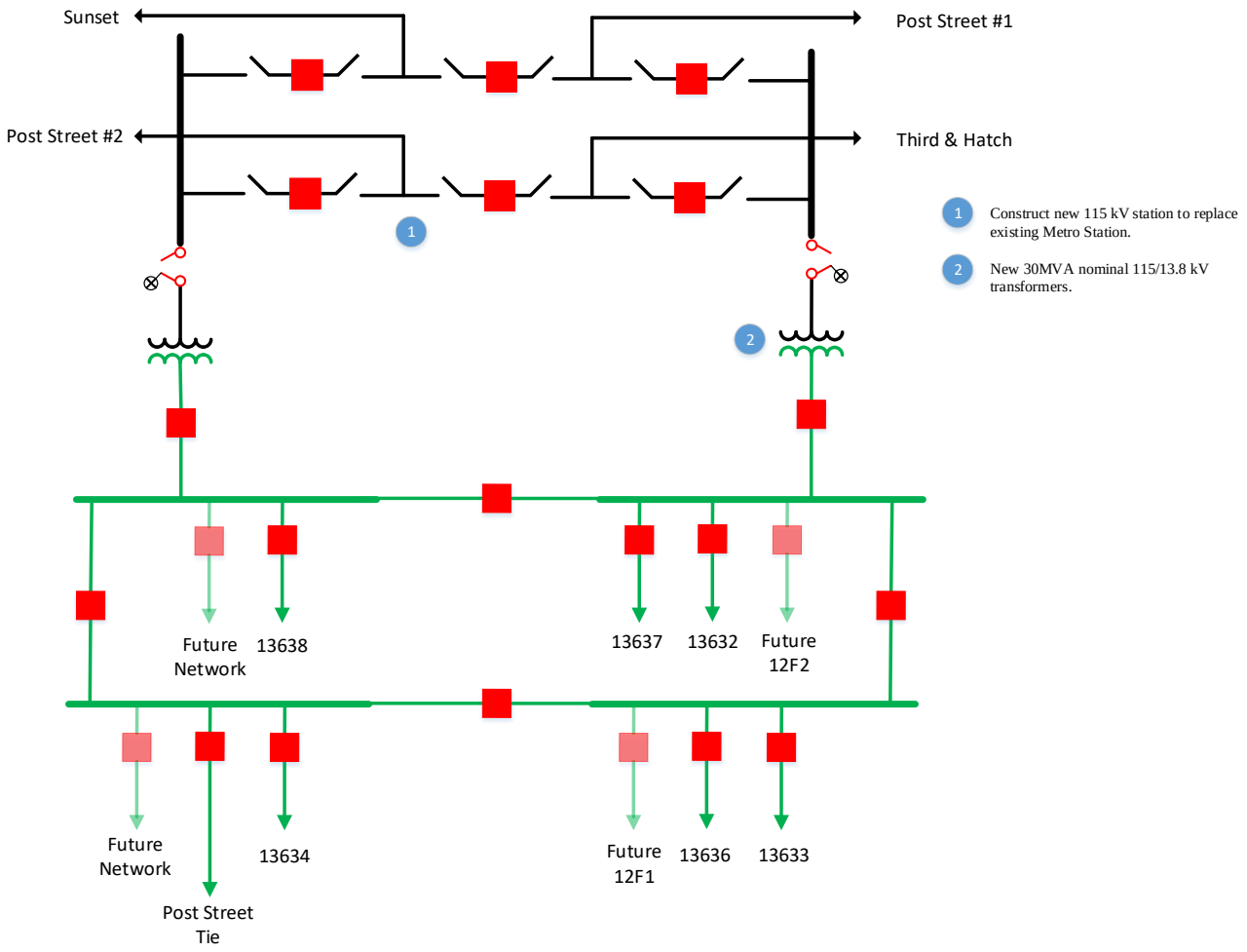

FIGURE 3: METRO STATION REBUILD PROJECT DIAGRAM

3 SUNSET STATION REBUILD

The existing circuit breakers at the Sunset Station do not have sufficient short circuit interrupting capability for close-in faults on the connected transmission lines. The available fault current increases with the necessary transmission system expansion to address other system deficiencies (i.e. Westside transformer replacement).

The Sunset Station Rebuild project is a complete station rebuild on adjacent property to the existing station. The 115kV station configuration will be a breaker and a half. The distribution portion of the station will include two 30 MVA transformers, six feeders, and auxiliary feeder positions on each bus.

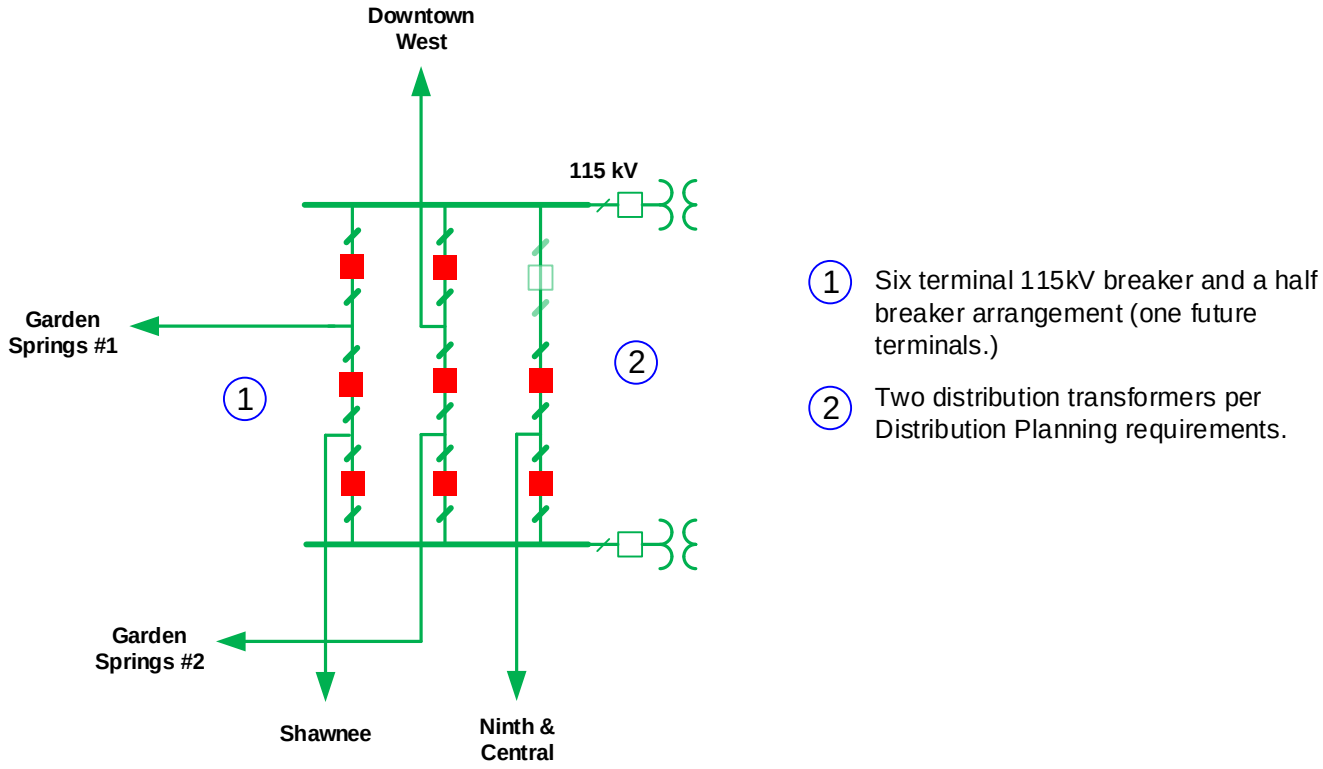

FIGURE 4: SUNSET STATION REBUILD PROJECT DIAGRAM

4 WEST PLAINS SYSTEM REINFORCEMENT

The West Plains and Sunset area (up to 245MW) is served by four 115kV transmission lines, which may overload for multiple contingency events during summer loading. Existing mitigation projects (Garden Springs – Sunset 115kV Transmission Line rebuild and the Ninth & Central – Sunset 115kV Transmission Line rebuild) help reduce the amount of overloading, but do not correct known contingency issues.

The West Plains System Reinforcement initiative includes the construction of a new 230kV transmission source into the area. A new transmission line is proposed to connect the Bell – Coulee corridor to a new Garden Springs Station. The Garden Springs Station will include two 250MVA nominal 230/115kV transformers and intersect the Sunset – Westside and Airway Heights – Sunset 115kV transmission lines. Additional reinforcements in the area to support distribution system expansion and interconnect new distribution stations includes a new 115kV transmission line from Airway Heights Station to a new Melville Station which intersects the South Fairchild 115kV transmission line Tap near Hallett & White Station. New distribution stations at Flint Road and Russel Road will increase transformation capacity and provide additional feeders to serve the increased distribution system demands.

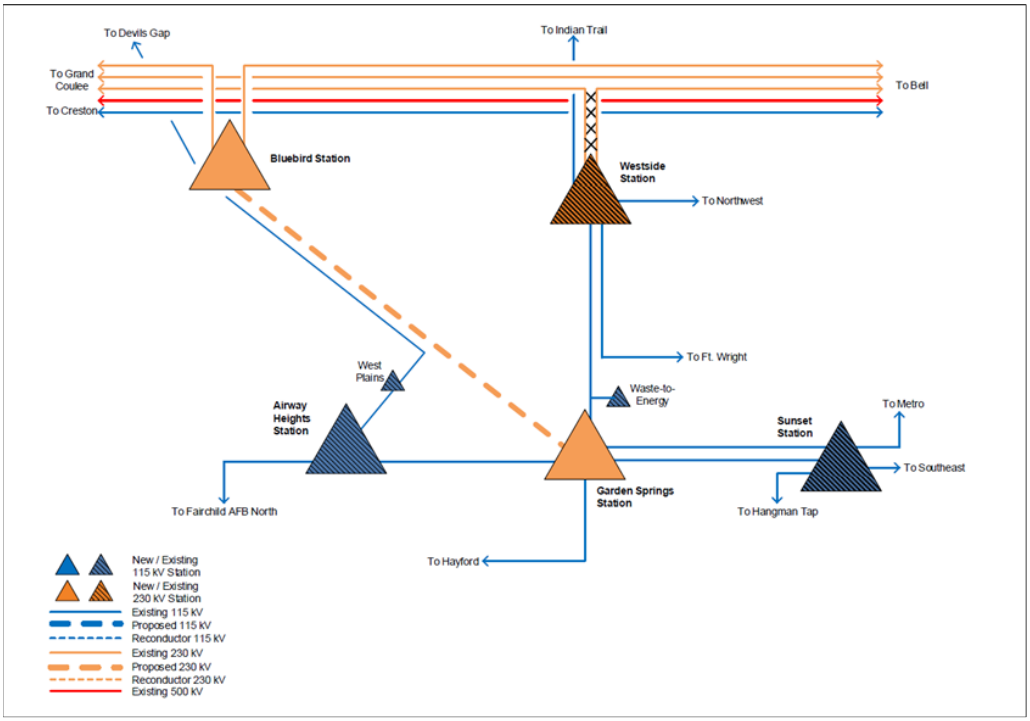

FIGURE 5: GARDEN SPRINGS STATION PROJECT DIAGRAM

5 WESTSIDE STATION REBUILD

Outages causing loss of 230/115kV transformers at the BPA Bell or Avista Beacon Station, or outages causing increased impedance from the Bell and/or Beacon Stations to the area's distribution stations cause the Westside #1 and #2 230/115kV transformers to exceed their applicable facility ratings. The Westside Station Rebuild project is a complete station rebuild which includes the replacement of the existing Westside #1 and #2 230/115kV transformers with 250MVA nominal capacity transformers. Both the 230kV and 115kV configuration will be double bus, double breaker.

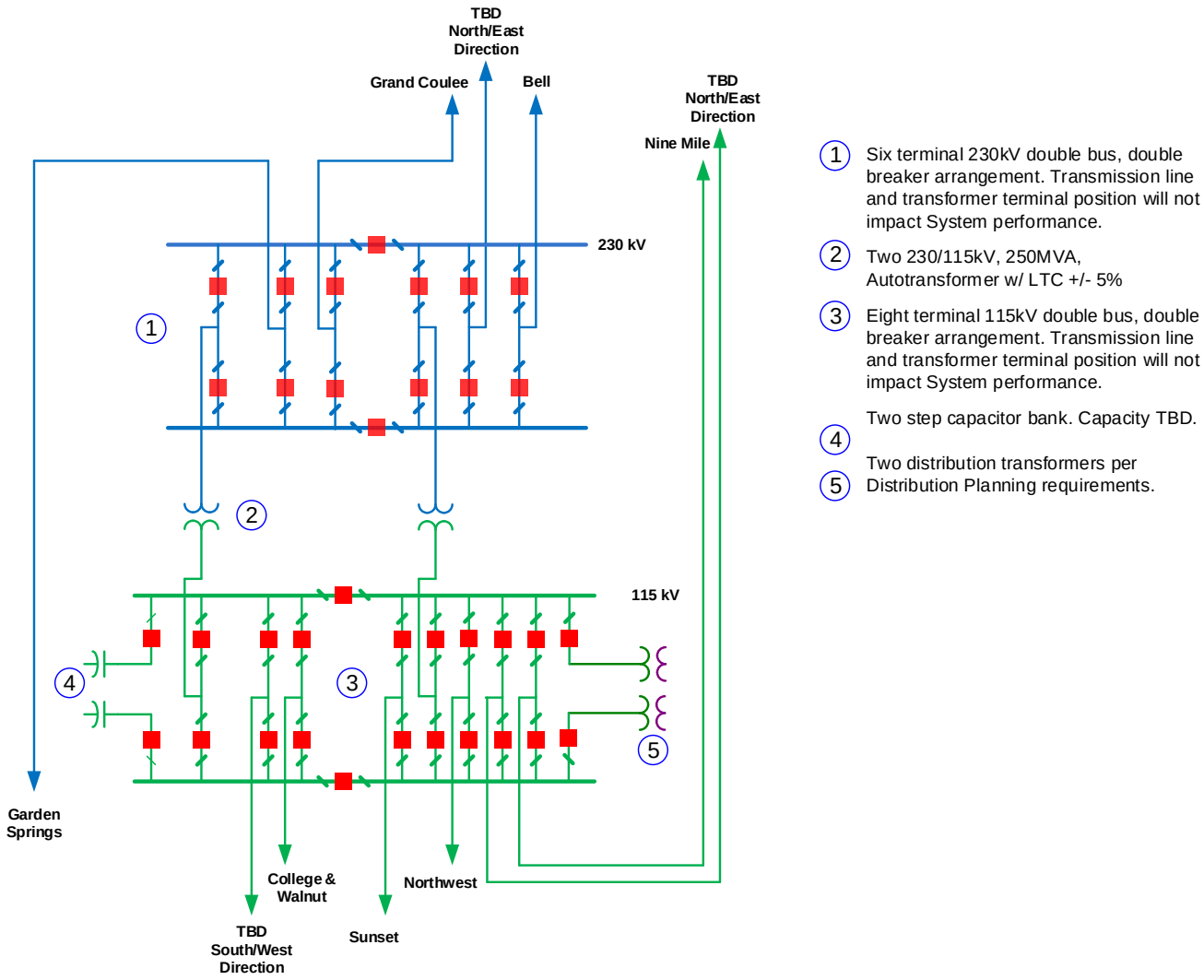

FIGURE 6: WESTSIDE STATION REBUILD PROJECT DIAGRAM

2019-2020 Avista System Assessment

Electrical System Planning Assessment

NEILSON SWITCHING STATION – RATTLESNAKE FLAT WIND INTEGRATION

Version History

Version	Date	Action	Prepared By	Reviewed By
0	11/15/19	Draft posted for stakeholder review	Spratt	Gross
1	12/20/19	Final	Team	Gross
1.1	1/9/20	De minimis	Spacek	Gross
2	12/18/20	2020 Update, confirmed 2019 results	Gross	Spacek

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2020 Update

Version 2 of the 2019-2020 Planning Assessment is unchanged from Version 1 published in 2019. A companion document has been created, 2020 Avista System Plan, which provides an updated project list with targeted date of operation for each project. The updated project list is also used as an update to the Attachment K Local Planning Report and proposed Single System Projects developed during year one of the biennial process.

Steady state, short circuit, and stability studies performed during 2019 (less than five calendar years old) have been determined to be still relevant as no material changes have occurred to the System represented by the studies.

A comparison of the modeled scenarios used in the 2019 studies to recent WECC approved base cases was performed using PowerWorld Simulator's Difference Case tool. No material changes to the model, neither new, removed, nor modified equipment, were discovered. Projects constructed during 2020 had been modeled and studied in the 2019 studies. The 2020 summer peak (2141 MW) did not exceed the peak summer load of 2319 MW studied in the 2019 studies. The 2019/2020 winter peak (2113 MW) did not exceed the peak winter load of 2444 MW studied in the 2019 studies.

I EXECUTIVE SUMMARY

Avista completed a comprehensive study to examine the electrical system's reliability under normal operating conditions along with prescribed planning events that include single and multiple outage conditions, commonly referred to as N-1-1. The results of this current study are compared to the benchmark of earlier studies to characterize the system's operational changes over time. Mitigation plans are provided in response to identified functional or operational issues.

Avista's System Planning process is designed to be transparent, open, and understandable, treating all customer classes on an equal and comparable basis. The study plan methodology develops operable solutions for conditions or states that negatively impact system reliability, adequacy, or security. The proposed solutions may include wired and non-wired options that either prevent or resolve the reliability concerns.

The impact of operational contingencies, generally defined as the unexpected failure or outage of an electrical system component, are evaluated by Avista through analysis of seasonal load and generation variations through a multi-year study. Of the contingencies evaluated, none resulted in Instability Cascading or Uncontrolled Separation conditions, confirming there are no Interconnection Reliability Operating Limits that would adversely impact the reliable operation of the Bulk Electric System.

Key findings from these studies include:

- No thermal criteria issues were identified under normal operational conditions regardless of season.
- Minor voltage exceedance issues were identified on the 115kV transmission system when evaluated under light load conditions.
- Heavy summer load conditions continue to drive the most significant system stressors, especially for transmission line and transformer capacities, most of which can be mitigated by upgrades or operational considerations.
- Transformers generally reach capacity limits prior to local transmission line segments.
- Available feeder capacity has been reduced in areas demonstrating load growth requiring several new or upgraded distribution stations.
- A new Corrective Action Plan has been identified to address transient stability issues identified in the Kettle Falls region.
- Three Corrective Action Plans continue to be promoted, specifically:
    - South Spokane system reinforcement
    - Spokane Valley transmission reinforcement
    - Sunset Station rebuild

With respect to projected load growth, thermal-related issues are expected to appear while voltages levels will be reduced, especially on the 115kV system. In addition, utility-scale generation projects may also introduce significant system challenges.

Future planning scenarios will be impacted by proposed generation interconnections and their inherent uncertainty. As with any other system device, interconnection projects will require appropriate mitigation through either the interconnection or transmission service processes to ensure that the existing transmission system performance is not negatively impacted.

II INTRODUCTION

The 2019-2020 Avista System Assessment (Planning Assessment) is a deliverable from Phase 2 of a two-year process as defined in Avista's Open Access Transmission Tariff (OATT) Attachment K. The Planning Assessment identifies the Transmission System facility additions required to reliably interconnect forecasted generation resources, serve the forecasted loads of Avista's Network Customers and Native Load Customers, and meet all other Transmission Service and non-OATT transmission service requirements, including rollover rights, over a ten-year planning horizon. The Planning Assessment process is open to all Interested Stakeholders, including, but not limited to, Transmission Customers, Interconnection Customers, and state authorities. The Western Electric Coordinating Council (WECC) facilitates interconnection wide planning and development of wide-area planning proposals.

The two-year planning process desired timeline is illustrated in Figure 1. The completion of Phase 2 includes providing the documented results of performing necessary technical studies. The state of the existing and future system is provided. Where the technical studies identified performance issues, conceptual projects have been proposed. Projects identified from previously posted planning assessments are listed as committed projects.

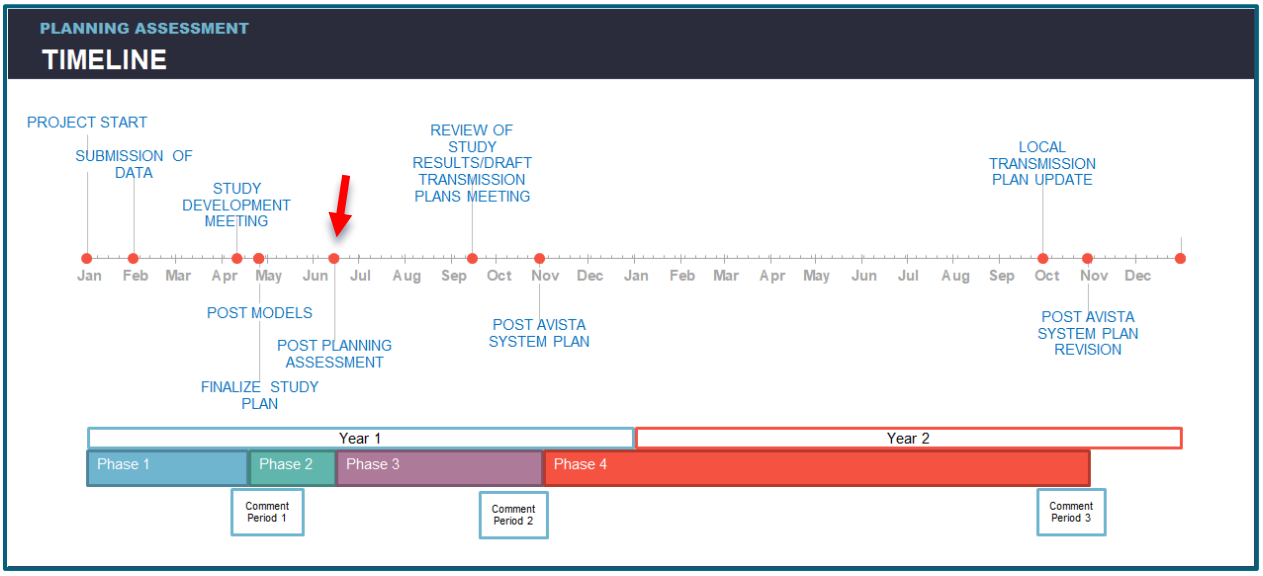


FIGURE 1: PLANNING ASSESSMENT TIMELINE.

Phase 3 of the process will follow the completion of the Planning Assessment. Phase 3 includes providing the Avista System Plan report to stakeholders. The Avista System Plan will include documentation of the electrical infrastructure plan with preferred solution options. The

resulting project list will include additional information regarding projects and system modifications developed through means other than the technical studies[1].

[1] Such other means may include, for example, generation interconnection or transmission service request study processes under the OATT, or joint study team processes under NorthernGrid.

III TECHNICAL STUDY OVERVIEW

The Avista System Planning Assessment 2019 Study Plan outlines the process, assumptions and technical studies used in the development of the Planning Assessment. The following is a summary of the assumptions and technical studies performed. The complete Study Plan is provided in Appendix I.

1 ASSUMPTIONS

1.1 System Representation

Computer simulation models are developed to represent the electric transmission and distribution system.

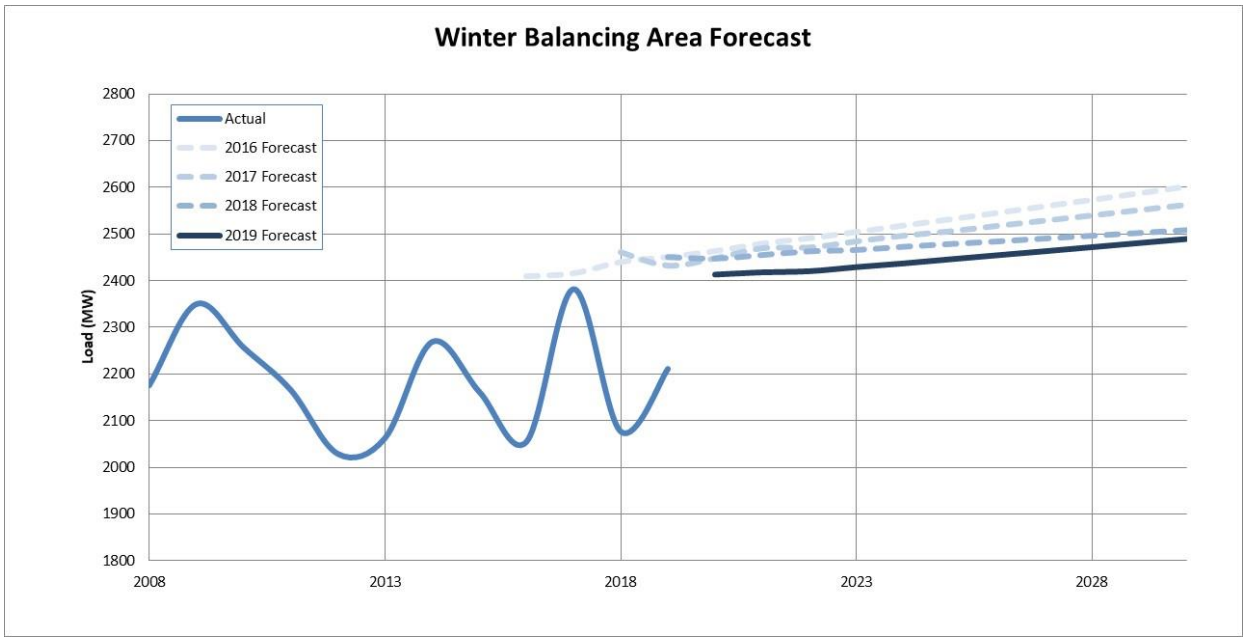
The transmission system models (Planning Cases or base cases) represent Avista's Transmission Planner and Planning Coordinator areas as well as the regional Transmission System. The Planning Case development process outlined in the internal document TP-SPP-04 – Data Preparation for Steady State and Dynamic Studies outlines the use of WECC approved base cases and the modification of steady state and dynamic data as required to represent existing facilities for the desired scenario. The resulting Planning Cases represent a normal system condition (P0). All established pre-contingency operating procedures are represented. Manual application of each operating procedure is followed in the process of developing each Planning Case.

Technical studies performed for the distribution system did not use detailed system models. When distribution system models are used they are created by extracting data from several internal Avista sources.

All technical studies are performed assuming no projects are constructed within the planning horizon. After establishing a list of system deficiencies, new planned facilities and changes to existing facilities are represented to evaluate the impact to the deficiencies. Only potential generation projects in Avista's queue of generation interconnection requests that have executed an Interconnection Agreement are modeled, along with corresponding upgrades, in the models for technical studies.

1.2 Load Growth

Avista's Balancing Authority Area (BAA) load peaked around 2,379MW in the winter of 2017 and 2,239MW in the summer of 2018. Figure 2 shows the BAA load historical seasonal peaks from 2008-2019 and the forecasted seasonal peaks for 2020-2030. The power factor of typical loads at a station vary from 0.95 in the summer to unity in the winter. During light load conditions, some loads may have leading power factor.



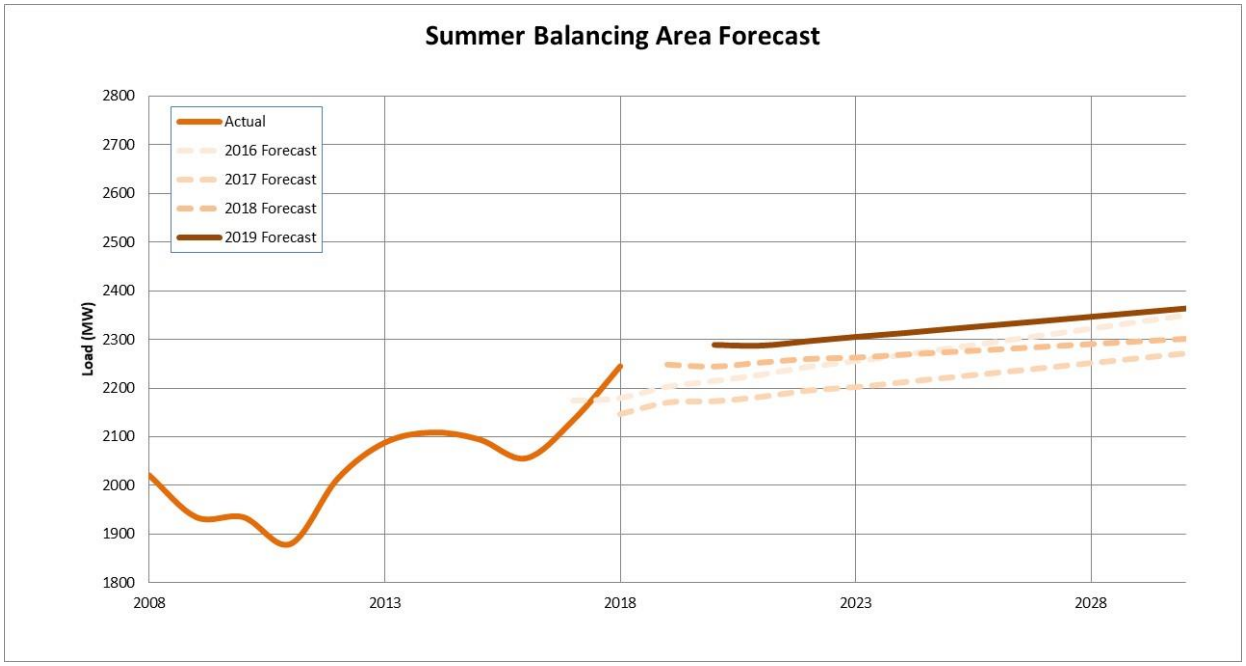


FIGURE 2: ACTUAL AND FORECASTED PEAK BALANCING AUTHORITY AREA LOAD.

1.3 Performance Criteria

The criteria used in evaluating the performance of the Transmission System are the current NERC Reliability Standards, WECC regional criterion and internal Avista policies, including the following. A summary of the Transmission System performance criteria is provided in the Study Plan.

- TPL-001-WECC-CRT-3 – Transmission System Planning Performance
- TPL-001-4 – Transmission System Planning Performance Requirements
- FAC-010 – System Operating Limit Methodology for the Planning Horizon
- TP-SPP-01 – Avista Bulk Power System Planning Standards

Distribution system performance criteria is under development.

2 TECHNICAL STUDIES

The technical studies performed as part of the Planning Assessment includes the following:

- Steady state contingency analysis
- Spare equipment analysis
- Short circuit analysis
- Stability contingency analysis
- Voltage stability analysis
- Distribution capacity analysis

3 POINT OF CONTACT

A Point of Contact for questions regarding this Planning Assessment and the projects described within it has been designated. Please contact the party named below with any questions:

System Planning Department
PO Box 3727, MSC-16
Spokane, WA 99220
TransmissionPlanning@avistacorp.com

IV PROJECT AND ISSUE LIST

1 SUMMARY

The following section provides a list of Single System Projects. Single System Projects are defined as projects necessary to ensure the reliability of the System and to otherwise meet the needs of long-term firm transmission service and native load obligations in accordance with Avista's planning standards. Justification for each project listed can include condition based asset management, necessary to meet performance requirements, customer growth, and others. A summary of the Single System Projects is provided in Table 1. The cost estimate and schedule of each project is subject to change.

The listed Single System Projects justified as necessary to meet performance requirements categorized as Corrective Action Plans are also noted in Table 1. Corrective Action Plans address how performance requirements will be met where the technical studies have indicated an inability of the System to meet the performance requirements of TPL-001. Corrective Action Plans are specific projects developed to meet the criteria defined by NERC (TPL-001-4 R2.7.3).

All Single System Projects are subject to change or modification as necessary to accommodate changes in load, generation, or other unforeseen system conditions.

TABLE 1: AVISTA TEN YEAR PROJECT LIST SUMMARY

Proposed Initiative	Existing Business Case	#	Project Name	Issue Mitigated	Date of Operation
Big Bend System Reinforcement	SDSC	47	Bruce Siding 115-13kV Sub	Distribution Capacity	
	SDSR	11	Davenport 115-13kV Sub	Age, condition and SCADA	2021
		30	Little Falls 115kV	Age and condition	2022
		86	Sprague 115kV Substation - Minor Rebuild	Age and condition	
	TCC	6	Benton-Othello 115kV Line	Sand Dunes 115kV bus outage	2020
		50	Chelan-Stratford 115kV Line	To be determined	
	TMR-AC	53	Devils Gap-Lind 115kV Line	Age and condition	
Cabinet Gorge GSU Isolation	PS	17	Cabinet Gorge 230kV Switchyard	Unnecessary bus clearing	2021
Coeur d'Alene System Reinforcement	SDSC	48	Canfield 115-13kV Sub	Distribution Capacity	
		7	Dalton 115-13kV Sub - Add 30MVA XFM	Distribution Capacity	2020
		75	Pleasantview 115-13kV	Distribution Capacity	
		81	Rathdrum Distribution	Distribution Capacity	
	SDSR	22	Huetter 115-13kV Sub - Expand Sub	Distribution Capacity	
		82	Rathdrum 230/115kV Station	Contingency	2024
	TCC	1	Coeur d'Alene-Pine Creek 115kV Line	Contingency and capacity	2019

Proposed Initiative	Existing Business Case	#	Project Name	Issue Mitigated	Date of Operation
East Coeur d'Alene Lake System Reinforcement	SDSC	27	Carlin Bay 115kV Sub	Distribution Capacity	2023
		10	St. Maries 115-24kV	Distribution capacity and reliability	
	SDSR	27	O'Gara 115kV Switching Station	Distribution Capacity	2023
	TMR-AC	45	Benewah-Pine Creek 230kV	Age and condition	
	TNC	27	Carlin Bay-O'Gara 115kV Line	Distribution Capacity	2023
Idaho/Lewis County System Reinforcement	SDSR	60	Grangeville 115-13-34.5kV	Age and condition	2023
		65	Kooskia 115/13kV	Age and condition	2023
Kettle Falls Stability		**91**	**Addy - Kettle Falls Protection Scheme[2]**	**Kettle Falls OOS**	
Lewiston/Clarkston System Reinforcement	PS	61	Hatwai-Lolo #2 230kV Line	Contingency and capacity	2024
	SDSC	28	Lewiston Orchards Irrigation District 115-13kV Sub	Customer requested	2021
		90	Wheatland 115-13V Sub	Distribution Capacity	
	SDSR	36	Tenth & Stewart 115-13kV	Distribution Capacity	
		19	Bryden Canyon 115kV Sub (Replace Equip)	Load service and reliability	2022
		56	Dry Gulch	Customer requested	2020
		21	Lolo 230kV Station	Age, condition and capacity	2023
		78	Pound Lane 115-13kV	Age and condition	
	TMR-AC	66	Lolo-Oxbow 230kV Line	Age and condition	2025
Metro Station Rebuild	SDSR	20	Metro 115-13V Sub	Age and condition	2023
	TMR-AC	5	Metro-Post Street 115kV Line	Age and condition	2020
		76	Post Street-Third & Hatch 115kV Line	Age and condition	2021
North Spokane System Reinforcement	PS	42	Beacon-Bell-F&C-Waikiki Reconfiguration	Contingency and capacity	
		69	Mead-Colbert-Milan 115kV Line	Contingency and capacity	
	SDSC	33	Florida & Dalke 115-13kV Sub	Distribution Capacity	2024
		23	Hawthorne 115kV Sub	Contingency and capacity	2024
		26	Midway 115/13kV Sub	Distribution Capacity	2023
		88	Waikiki - Add Capacity	Distribution Capacity	2021
		89	Waikiki-Mead 115/13kV Sub	Distribution Capacity	2023
	SDSR	67	Lyons & Standard 115-13kV	Distribution Capacity	
		35	Northwest 115-13kV Sub	Age and condition	2021
	TNC	33	Transmission to Serve Hillyard Sub	Distribution capacity	
		23	Transmission to Serve Hawthorne Sub	Distribution capacity	
		62	Indian Trail-Waikiki 115kV Line	Contingency and capacity	
		69	Mead-Colbert-Milan 115kV Line	Contingency and capacity	2024

[2] Corrective Action Plan

Proposed Initiative	Existing Business Case	#	Project Name	Issue Mitigated	Date of Operation
Palouse System Reinforcement	SDSC	49	Center Street 115-13V Sub	Distribution Capacity	2023
		29	M/P State Line 115-13V Sub	Distribution Capacity	
		87	Tamarack 115/13kV Sub	Distribution Capacity	
	SDSR	71	Moscow City 115kV Sub	Age and condition	
		72	N. Moscow 115kV Station: Add Transformer	Distribution Capacity	
		74	Palouse Transformation: Add Auto at Moscow or Shawnee	Contingency	
		77	Potlatch 115/13kV	Age and condition	
Protection System Upgrade for PRC-002	PS	79	PRC-002 Protection System Upgrade	Compliance	2022
Rattlesnake Flat Wind Farm	PS	2	Rattlesnake Flat 115kV Wind Farm Project	Customer requested	2020
Saddle Mountain Integration	PS	9	Saddle Mountain 230/115kV Sub (Phase 1)	Contingency and capacity	2020
		13	Saddle Mountain 230/115kV Sub (Phase 2)	Contingency and capacity	2021
Sandpoint System Reinforcement	SDSR	32	Bronx 115/21kV Substation	Distribution Capacity	2024
	TCC	83	RAT-SPI or ALB-SPI 115kV Line	Contingency	2024
Silver Valley System Reinforcement	SDSC	70	Mission 115kV Sub	Age and condition	
	SDSR	46	Big Creek 115kV Sub	Age and condition	
	TMR-AC	73	Noxon-Pine Creek 230kV	Age and condition	2022
South Spokane System Reinforcement	PS	42	Beacon 230kV Sub	Contingency and capacity	
		85	**Spokane West of Beacon - New 230kV Transformation[3]**	**Contingency and capacity**	**2025**
	SDSC	54	Downtown East 115-13kV Sub	Distribution Capacity	
		55	Downtown West 115-13kV Sub	Distribution Capacity	2023
		4	Southeast 115-13kV	Distribution Capacity	2019
	SDSR	52	College & Walnut 115kV Sub	Age and condition	
		84	Ross Park 115kV Sub	Age and condition	
	TCC	39	9CE-Sunset 115kV Line	Contingency and capacity	2023
		44	Beacon-Ross Park 115kV Line	Age and condition	2020
Spokane Valley Transmission Reinforcement	SDSC	63	Irvin 115/13kV Sub	Distribution Capacity	2021
	SDSR	41	Barker 115/13kV Substation	Distribution Capacity	
		51	Chester 115-13kV Sub	Age and condition	
	SVTR	14	BEA-BLD #2 115 - Upgrade 314MVA (TLD4)	Line section outage issues, motor starting support at IEP and reliability	2021

[3] Corrective Action Plan

Proposed Initiative	Existing Business Case	#	Project Name	Issue Mitigated	Date of Operation
		12	**Irvin 115kV Switching Station[4]**	**Contingency and capacity**	**2021**
	TCC	43	Beacon-Boulder #1 115kV Line	Contingency and capacity	2021
Stevens/Ferry County System Reinforcement	SDSC	37	49 Degrees North 115kV Sub	Distribution Capacity	
		34	Valley 115kV Sub	Age and condition	2022
	TCC	40	Addy-Devils Gap 115kV Line	Contingency and capacity	2020
Sunset Station Rebuild	**SDSR**	**15**	**Sunset 115kV Sub[5]**	**Age, condition and reliability**	**2021**
West Plains System Reinforcement	PS	58	Garden Springs 115/13kV Substation	Contingency and capacity	2023
		59	Garden Springs 230kV Substation	Contingency and capacity	
	SDSC	16	Flint Road 115/13kV Sub	Distribution Capacity	2022
		18	Four Lakes - Add Cap Bank	P6 low voltage	
		68	McFarlane 115/13kV Sub	Distribution Capacity	
	TBD	31	Melville Switching Station	Customer requested, contingency	
Westside Station Rebuild	PS	8	Westside 230/115kV Sub (Phase 1-4)	Contingency and capacity	2022

[4] Corrective Action Plan
[5] Corrective Action Plan

2 IDENTIFIED SYSTEM PROJECTS

Following is a summary of identified system issues, mitigations considered and recommendations.

2.1 Big Bend System Reinforcement

The Davenport, Little Falls and Sprague stations in the Big Bend area have been identified as a concern due to age and condition. Additionally, the age and condition of the Devil's Gap – Lind 115kV Transmission Line has been identified as a concern due to age and condition.

The Chelan – Stratford 115kV Transmission Line has demonstrated overload conditions due to local hydro generation during contingencies scenarios. The transmission line segments overloaded are 0.38 miles of 19#8 CW and 33.89 miles of 250 CU conductor with a rating of 78.3 MVA at 40°C.

Mitigation considered

The condition of identified stations and transmission lines due to age and condition should be analyzed to determine the scope of rebuilding the assets or target specific equipment replacement.

Recommendations

- Rebuild Davenport, Little Falls, and Sprague stations.
- Minor rebuild of Devils Gap – Lind 115kV Transmission Line.
- Utilize operating procedure to reduce local hydro generation for contingencies impacting Chelan – Stratford 115kV Transmission Line.

2.2 Cabinet Gorge GSU Isolation

The design to integrate the Cabinet Gorge hydro facility into the 230kV Western Montana Hydro transmission system did not include 230kV breakers to isolate the generation from the transmission system. This resulted in one zone of protection encapsulating both the Generator Step-Up (GSU) transformers and the 230kV bus. The deficiency with this design is that it is not selective enough and drops all 230kV lines, the Cabinet 230/115kV autotransformer and all Cabinet Gorge generation for issues with the either GSU.

Studies have identified the following contingency issue:

- Loss of a single Cabinet Gorge GSU (P1.3) results in the loss of up to 240MW of generation, two 230kV lines, and a 230/115kV autotransformer.

Mitigation considered

- Full rebuild of Cabinet Substation.
- Modify the existing Cabinet Substation with the addition of high-side GSU circuit breakers.

- Building a new switching station west of the existing Cabinet Substation to incorporate breakers and loop in the Lancaster – Noxon 230kV Transmission Line.

Recommendations

- A reliability upgrade to Cabinet substation consisting of a new 230kV breaker for each GSU, relocating two termination towers and adding new 230kV bus. Upgrades will require updates to GSU and bus relay protection.

2.3 Coeur d'Alene System Reinforcement

The Coeur d'Alene area is served by two 230/115kV autotransformers and a single 115kV transmission line. The Coeur d'Alene area is connected by one additional 115kV transmission line that has historically been operated normally open. The autotransformers along with the 115kV transmission lines feeding Coeur d'Alene load may overload for multiple contingency events during moderate to heavy loading during all seasons.

Studies have identified the following contingency issues:

- Loss of the Rathdrum 115kV east bus (P2.2) or a breaker failure on the Rathdrum 115kV east bus (P2.3) may result in an overload of a 115kV transmission line.
- Loss of the Pine Street – Rathdrum 115kV Transmission Line followed by the loss of a 230/115kV autotransformer (P6) may result in an overloaded 230/115kV autotransformer.
- Loss of a Rathdrum 230/115kV autotransformer followed by the loss of a 230/115kV autotransformer (P6) may result in voltage collapse in the Coeur d'Alene area. This results in the loss of up to 140MW of generation and 275MW of load.
- A Rathdrum 115kV bus tie breaker failure during any season results in the loss of up to 140MW of generation and 275MW of load in the Coeur d'Alene area.

Load growth in the Coeur d'Alene area has contributed to heavy loaded distribution facilities. The following stations have feeders which have exceeded 80% of their applicable facility ratings: Appleway, Dalton, Huetter, Post Falls, Prairie and Idaho Road. Anticipated load growth will increase the feeder loading and reduce necessary operational capacity.

The Prairie Station in the Coeur d'Alene area has been identified as a concern due to age and condition.

Mitigation considered

Transmission system contingency issue mitigation alternatives include the following:

- Operate the Coeur d'Alene – Pine Creek 115kV Transmission Line normally closed and revert back to the original 115kV transmission line configuration between Coeur d'Alene and Spokane Valley.
    - Requires upgrading the transmission lines connecting Coeur d'Alene and Spokane Valley.

- Operate the Coeur d'Alene – Pine Creek 115kV Transmission Line normally closed and build a new switching station near the crossing of Chase Road and Poleline Avenue.
- Build a new 230/115kV substation between Boulder Substation and Rathdrum Substation and integrate the existing 115kV transmission lines into this new substation.
- Build a new 230/115kV substation southeast of Coeur d'Alene with a 230kV tie to Pine Creek and integrate the existing 115kV transmission lines into the new substation.

Upgrade existing distribution stations with additional feeder capacity including: Dalton, Pleasantview, Rathdrum, Huetter, and Prairie.

The condition of identified stations due to age and condition should be analyzed to determine the scope of rebuilding the assets or target specific equipment replacement.

Recommendations

- The transmission system contingency mitigation project's specific scope and impact will be evaluated by the responsible parties within Avista to assist in the development of a coordinated business and implementation plan that will be presented to the Engineering Roundtable (ERT) for approval, prioritization, and deployment.
- Rebuild Pleasantview and Prairie stations.

2.4 East Coeur d'Alene Lake System Reinforcement

Forecasted load growth along the east side of Coeur d'Alene Lake is expected to cause the total load to exceed the capability of the existing 13.2 kV distribution system in the area. Feeder protection coordination and voltage regulation are not able to meet necessary performance requirements. Cold load pickup will cause protection devices to function during moderate to heavy loading levels.

Feeder loading from the St. Maries Station are near capacity. Recent growth in the area including a large industrial customer with 2300 horsepower of motor load will further increase equipment loading and reduce operational flexibility to maintain and back up feeders. The lack of Supervisory Control and Data Acquisition (SCADA) at St. Maries Station creates safety concerns and does not allow necessary situational awareness of the equipment status.

The Benewah – Pine Creek 230kV Transmission Line has been identified as a concern due to age and condition.

Mitigation considered

- Construct new Carlin Bay Station with a 13 mile radial 115kV transmission line to a rebuilt O'Gara Station.
- Convert area distribution system to 25kV.
- Upgrade St. Maries Station with fourth feeder and addition of SCADA.
- Rebuild the Benewah – Pine Creek 230kV Transmission Line

Recommendations

- Construct new Carlin Bay Station with a 13 mile radial 115kV transmission line to a rebuilt O'Gara Station.
- Upgrade St. Maries Station with fourth feeder and addition of SCADA.

2.5 Idaho/Lewis County System Reinforcement

The Grangeville and Kooskia stations in the Idaho/Lewis county area have been identified as a concern due to age and condition.

Mitigation considered

The condition of identified stations due to age and condition should be analyzed to determine the scope of rebuilding the assets or target specific equipment replacement.

Recommendations

- Rebuild Grangeville and Kooskia stations

2.6 Kettle Falls Stability

Implementation of a high speed, communication aided tripping scheme on the Addy – Kettle Falls 115kV Transmission Line is necessary to improve stability performance of the Kettle Falls generation facility. Stability contingency analysis indicates an inability of the System to meet the performance requirements in requirement R4.1.1 of TPL-001-4.

Studies have identified the following contingency issue:

- The Kettle Falls generator can become unstable if a time delayed three phase fault occurs on the Addy – Kettle Falls 115kV Transmission Line near Addy.

Mitigation considered

- This is a vetted project. Refer to past studies for mitigation options.

Recommendations

- The identified contingency issues will require a Corrective Action Plan.
- Modification of the Addy – Kettle Falls 115kV Transmission Line Protection System to include a communication aided protection scheme. A new communication path is required between Addy and Kettle Falls stations. Upgrades and setting changes to relays at BPA's Addy Substation and Avista's Kettle Falls Substation are also required to implement Avista's standard communication aided protection schemes.

2.7 Lewiston/Clarkston System Reinforcement

The existing 230kV system and underlying 115kV lines in the Lewiston/Clarkston area may overload during summer loading and high transfers south on the Idaho – Northwest (Path 14) cut plane for multiple contingency events. Planned or forced 230kV outages in the Lewiston/Clarkston area require a radial configuration of the 115kV system, arming RAS and/or reducing transfers on the Idaho – Northwest or West of Hatwai cut planes.

Studies have identified the following contingency issues:

- Loss of Dry Creek – North Lewiston 230kV Transmission Line followed by the loss of a 230kV transmission line (P6) may result in an overload of multiple 115kV transmission lines.
- Loss of Hatwai – Lolo 230kV Transmission Line followed by the loss of a 230/115kV autotransformer or any of two 230kV transmission lines (P6) may result in an overload of multiple 115kV transmission lines.
- Loss of the North Lewiston 230/115 #1 Transformer followed by the loss of a 230kV transmission line (P6) may result in an overloaded 115kV transmission line.

Load growth in the Lewiston/Clarkston area has contributed to heavy loaded distribution facilities. The following stations have feeders which have exceeded 80% of their applicable facility ratings: Lolo, Critchfield, and Tenth & Stewart. Anticipated load growth will increase the feeder loading and reduce necessary operational capacity.

The South Lewiston, Lolo and Pound Lane stations in the Lewiston/Clarkston area have been identified as a concern due to age and condition. Additionally, the age and condition of the Lolo – Oxbow 230kV Transmission Line has been identified as a concern due to age and condition.

Mitigation considered

Transmission system contingency issue mitigation alternatives include the following:

- Rebuild the overloaded 115kV transmission lines that were identified in the study.
- Rebuild South Lewiston substation into a switching station and close all three lines into the new station.
    - Reduces contingency overloads, but does not correct overload issues.
- Build a new second Hatwai – Lolo 230kV transmission line to either connect into Lolo Substation or bypass the Lolo Substation and connect directly to Oxbow Substation. This may require a new transmission line terminal at Lolo Station and a request for interconnection at BPA's Hatwai Station.

Rebuild existing distribution stations with additional feeder capacity.

The condition of identified stations due to age and condition should be analyzed to determine the scope of rebuilding the assets or target specific equipment replacement.

Recommendations

- The transmission system contingency mitigation project's specific scope and impact will be evaluated by the responsible parties within Avista to assist in the development of a coordinated business and implementation plan that will be presented to the Engineering Roundtable (ERT) for approval, prioritization, and deployment.

- Rebuild Tenth & Stewart and Pound Lane stations and targeted equipment replacement at Lolo Station.
- Construct new Bryden Canyon and Wheatland stations.
- Rebuild portions of the Lolo – Oxbow 230kV Transmission Line and evaluate priorities of other 230kV transmission line rebuilds.

2.8 Metro Station Rebuild

Metro Station dates to the mid-1970s. Switchgear is the worst condition on the system. Much of the major equipment in this station is now unsupported by the manufacturer. Legacy oil tanks beneath the site pose an environmental problem and limit modifications to upgrade the existing station. Underground transmission cables to this site are in need of replacement. Transformer/switchgear spares are unavailable/difficult to install in an outage scenario. Various other condition issues, such as the 115kV breakers, insulators, and panel house, also exist at this site.

Additionally, the age and condition of the Metro – Post Street and Post Street – Third & Hatch 115kV transmission lines has been identified as a concern due to age and condition.

Mitigation considered

- Rebuild Metro Station by replacing existing equipment with new.
- Rebuild Metro Station with new equipment in an improved configuration.
- Construct a new station on a new site to replace the existing Metro Station.
- Replace existing transmission cable on the Metro – Post Street and Post Street – Third & Hatch 115kV transmission lines.

Recommendations

- Construct a new station on a new site to replace the existing Metro Station.
- Replace existing transmission cable on the Metro – Post Street and Post Street – Third & Hatch 115kV transmission lines.

2.9 North Spokane System Reinforcement

Avista's Beacon and BPA's Bell substations are connected by two 115kV lines, either of which may overload for multiple contingency events during moderate to heavy loading during all seasons. Note that the additional autotransformer capacity, which is planned for the South Spokane area, will increase the overloads identified in these results.

Studies have identified the following contingency issues:

- A Beacon 115kV bus tie breaker fault (P2.4) may result in an overload of multiple 115kV transmission lines.
- Loss of the Beacon – Bell 115kV Transmission Line followed by the loss a 230/115kV autotransformer (P6) may result in an overload of multiple 115kV transmission lines.

- Loss of the Beacon – Northeast 115kV Transmission Line followed by the loss a 230/115kV autotransformer (P6) may result in an overloaded 115kV transmission line.
- Loss of the Bell 230/115kV #6 Transformer followed by the loss of any of two 115kV transmission lines (P6) may result in an overloaded 115kV transmission line.
- Loss of the Bell – Northeast 115kV Transmission Line followed by the loss a 230/115kV autotransformer (P6) may result in an overloaded 115kV transmission line.
- Loss of the Francis & Cedar – Ross Park 115kV Transmission Line followed by the loss of a 115kV transmission line (P6) may result in an overloaded 115kV transmission line.

Load growth in the North Spokane area has contributed to heavy loaded distribution facilities. The following stations have feeders which have exceeded 80% of their applicable facility ratings: Colbert, Francis & Cedar, Waikiki and Mead. Anticipated load growth will increase the feeder loading and reduce necessary operational capacity.

The Northwest Station in the North Spokane area has been identified as a concern due to age and condition.

Mitigation considered

Transmission system contingency issue mitigation alternatives include the following:

- Rebuild the overloaded 115kV transmission lines that were identified in the study.
    - This requires the rebuild of the Beacon – Bell, Beacon – Northeast, Bell – Northeast, and Beacon – Francis & Cedar 115kV transmission lines.
- Add Remedial Action Scheme (RAS) to drop load in the BPA area.
    - Solution only solves BPA related issues, but does not correct remaining Avista related transmission line loading issues.
- Build a new 115kV transmission line from Indian Trail substation to Waikiki substation and add breaker positions to both stations.
    - Does not correct all identified 115kV transmission line overloads.
- Loop the Beacon – Francis & Cedar 115kV transmission line into Bell.

Rebuild existing distribution stations with additional feeder capacity and construct new distribution stations.

The condition of identified stations due to age and condition should be analyzed to determine the scope of rebuilding the assets or target specific equipment replacement.

Recommendations

- The transmission system contingency mitigation project's specific scope and impact will be evaluated by the responsible parties within Avista to assist in the development of a coordinated business and implementation plan that will be presented to the Engineering Roundtable (ERT) for approval, prioritization, and deployment.

- Rebuild Northwest Station.
- Construct new Florida & Dalke, Hawthorne and Midway stations.
- Construct new 115kV infrastructure to the north of Spokane to interconnect Avista distribution stations into Avista's transmission system.

2.10 Palouse System Reinforcement

The Palouse area is served by two 230/115kV autotransformers and a single 115kV line. The Palouse is connected by four additional 115kV transmission lines that have historically been operated normally open. These autotransformers along with the 115kV transmission lines feeding Palouse load may overload for multiple contingency events during moderate to heavy loading (all seasons).

Studies have identified the following contingency issues:

- Loss of a Palouse area 230/115kV autotransformer followed by the loss of a 230/115kV autotransformer (P6) may result in voltage collapse in the Palouse area. This results in the loss of up to 186MW of load.
- Loss of the Moscow – South Pullman 115kV Transmission Line followed by the loss a 230/115kV autotransformer (P6) may result in an overloaded 115kV transmission line.
- Loss of the Moscow – Terre View 115kV Transmission Line followed by the loss a 230/115kV autotransformer (P6) may result in an overloaded 115kV transmission line.

Load growth in the Palouse area has contributed to heavy loaded distribution facilities. The following stations have feeders which have exceeded 80% of their applicable facility ratings: Turner. Anticipated load growth will increase the feeder loading and reduce necessary operational capacity.

The Moscow City and Potlatch stations in the Palouse area have been identified as a concern due to age and condition.

Mitigation considered

Transmission system contingency issue mitigation alternatives include the following:

- Add a new position at Moscow and extend the Moscow City – North Lewiston 115kV Transmission Line into Moscow 230 Station. Operate with Moscow City normally fed from this line, with the auto-throwover to the Moscow – South Pullman 115kV Transmission Line.
- Add a second 230/115kV autotransformer at Moscow or Shawnee stations.
- Build a new 230/115kV station east of Pullman and integrate the existing 115kV transmission lines into the new station.

Construct new and rebuild existing distribution stations with additional feeder capacity.

The condition of identified stations due to age and condition should be analyzed to determine the scope of rebuilding the assets or target specific equipment replacement.

Recommendations

- The transmission system contingency mitigation project's specific scope and impact will be evaluated by the responsible parties within Avista to assist in the development of a coordinated business and implementation plan that will be presented to the Engineering Roundtable (ERT) for approval, prioritization, and deployment.
- Construct new Center Street, State Line and Tamarack stations.
- Rebuild Moscow City and Potlatch stations.

2.11 Protection System Upgrade for PRC-002

NERC reliability standard PRC-002-2 defines the disturbance monitoring and reporting requirements to have adequate data available to facilitate analysis of Bulk Electric System (BES) Disturbances. The methodology of Attachment A of the NERC standard was performed to identify the affected buses within the Avista BES. The Protection Systems must be capable of recording electrical quantities for each BES Elements it owns connected to the BES buses identified.

The present Protection Systems are either electromechanical or first generation relays not capable of meeting the NERC PRC-002-2 standard requirements of fault recording. Implementation is a phased approach with 50% compliant within four years and fully compliant within six years of the July 1, 2016 effective date. There is a total of 49 affected terminals.

Mitigation considered

Upgrade the existing Protection Systems on various 230kV and 115kV terminals to Fault Recording (FR) capability per PRC-002 requirements at Beacon, Boulder, Rathdrum, Cabinet Gorge, North Lewiston, Lolo, Pine Creek, Shawnee and Westside.

Recommendations

- Complete Protection System Upgrades for PRC-002 Business Case.

2.12 Rattlesnake Flat Wind Farm

An Interconnection Customer (Project #49) has requested interconnection of a new Wind Power Plant (WPP) generation facility located southeast of Lind, Washington. The customer has chosen an interconnection to Avista's Lind - Washtucna 115kV Transmission Line, approximately 4.5 miles south of the Lind Station, requiring a new 115kV Neilson Station at the Point of Interconnection (POI) with a 115kV line position dedicated for the Interconnection Customer. Project #49 will have an aggregate nameplate capacity of 144MW and will consist of seventy-two (72), Vestas V110, 2.0MW Wind Turbine Generators (WTG).

Mitigation considered

- Rebuild Lind Station to accept the generator lead line with the POI at Lind Station.

- Construct new Neilson Station as the POI and rebuild the transmission line from Neilson to Lind.

Recommendations

- Construct network upgrades and direct assigned facilities according to Project #49 Facilities Study.

2.13 Saddle Mountain Integration

In the fall of 2013, Grant employees contacted Avista System Planning about performance issues within Grant's system that are exacerbated by Avista's load in the Othello area. The issue was escalated to ColumbiaGrid through the Regional Planning process. It was identified through this process and Avista System Planning that the system performance analysis indeed indicates an inability of the System to meet the performance requirements P1, P2 and P6 categories in Table 1 of NERC TPL-001-4 in current heavy summer scenarios, and P6 categories in heavy winter scenarios.

Studies have identified the following contingency issues:

- Loss of the Benton – Othello SS 115kV line followed by the loss of the Sand Dunes – Warden 115kV line during summer loading may overload the Larson – Sand Dunes – Warden 115kV line (up to 116%).
- Loss of the Larson – Sand Dunes – Warden 115kV line, followed by load restoration (Wheeler to Basset Jct. 115kV line section outage shows worst performance), followed by the loss of the Sand Dunes – Warden 115kV line during spring and summer loading will overload the Benton – Othello SS 115kV line and result in voltage collapse in the Othello area (drops up to 168MW).

Mitigation considered

- Construct Saddle Mountain Station, one new 115kV transmission line from Saddle Mountain to Othello City, and a new Othello City Station.
- Build new 115kV transmission line into the area from the Stratford area.
- Close normally open points to the east of the area.

Recommendations

- Complete Saddle Mountain Project (Phase 1 and Phase 2).

2.14 Sandpoint System Reinforcement

Load growth around Sandpoint is expected to cause the total load to exceed the capability of the existing 20.8 kV distribution system in the area. The existing Sandpoint Station distribution transformers are unique to Avista's system. Mobile transformers cannot be used to replace a failed transformer at this site. Continued load growth increases the risk of reliability serving customers in the area with potential equipment failure.

Previous transmission system studies have shown P6 contingency performance issues when two of the three transmission lines into the Sandpoint area are out of service. The issues observed were primarily low voltages during heavy winter loading. BPA has also documented in their 2019 System Assessment Summary Report observed performance issues in the area.

Mitigation considered

Rebuild the Bronx Station to provide distribution service to the area.

Construct new 115kV transmission line from Rathdrum or Albeni Falls towards Sandpoint.

Recommendations

- Rebuild the Bronx Station to provide distribution service to the area.
- Perform a detailed project analysis to determine risks and mitigations to low voltages in the area.

2.15 Silver Valley System Reinforcement

The Mission and Big Creek stations in the Silver Valley area have been identified as a concern due to age and condition. The feeder served by Mission Station has protection selectivity concern due to the feeder trunk extending two distinctly different directions.

The age and condition of the Noxon – Pine Creek 230kV Transmission Line has been identified as a concern due to age and condition.

Mitigation considered

The condition of identified stations and transmission lines due to age and condition should be analyzed to determine the scope of rebuilding the assets or target specific equipment replacement.

Recommendations

- Rebuild Big Creek station.
- Upgrade Mission Station with a second feeder position.
- Minor rebuild of Noxon – Pine Creek 230kV Transmission Line.

2.16 South Spokane System Reinforcement

The Spokane area is served by five 230/115kV autotransformers. These autotransformers along with the 115kV transmission lines feeding Spokane load may overload for multiple contingency events during moderate to heavy loading (all seasons). Existing mitigation projects (Ford – Devils Gap 115kV Transmission Line section rebuild, Irvin Switching Station, capacity at Westside) help reduce the amount of overloading, but do not correct known contingency issues. Steady state contingency analysis indicates an inability of the System to meet the performance requirements in requirement R3.1 of TPL-001-4 for the Beacon 115kV tie breaker failure.

Studies have identified the following contingency issues:

- A Beacon 230kV or 115kV bus tie breaker fault (P2.4) may result in an overloaded 230/115kV autotransformer and multiple 115kV transmission lines.
- A Ninth & Central 115kV bus tie breaker fault (P2.4) may result in an overloaded 115kV transmission line.
- Loss of an Addy – Bell 115kV Transmission Line section followed by the loss of any of three 230/115kV autotransformers (P6) may result in an overloaded 230/115 transformer and multiple 115kV transmission lines.
- Loss of any of three 230/115kV autotransformers followed by the loss of a remaining 230/115kV autotransformer (P6) may result in an overloaded 230/115kV autotransformer and multiple 115kV transmission lines.
- Loss of either Beacon – Ninth & Central 115kV transmission line followed by the loss of any of three 115kV transmission lines (P6) may result in an overload of multiple 115kV transmission lines.
- Loss of the Bell – Westside 230kV Transmission Line followed by the loss of any of three 230/115kV autotransformers (P6) may result in an overloaded 230/115 transformer.
- Loss of the College & Walnut – Westside 115kV Transmission Line followed by the loss of any of two 115kV transmission lines (P6) may result in an overload of multiple 115kV transmission lines.

The College & Walnut and Ross Park stations in the Spokane area have been identified as a concern due to age and condition.

The Beacon – Ross Park 115kV Transmission Line has been identified as a concern due to age and condition.

Mitigation considered

Transmission system contingency issue mitigation alternatives include the following:

- Increase the capacity of the Bell #6 230/115kV Transformer.
    - Does not correct remaining Spokane area 230/115kV transformer loading issues or resolve 115kV line loading issues feeding the West Plains area.
- Rebuild Beacon to a more reliable breaker arrangement or add a series breaker to both the bus tie breakers.
    - Does not correct remaining Spokane area 230/115kV autotransformer loading issues or resolve 115kV transmission line loading issues feeding the West Plains area.
- Rebuild the overloaded 115kV transmission lines
    - Does not correct Spokane area 230/115kV autotransformer loading issues.
- Loop the Beacon – Francis & Cedar 115kV Transmission Line into Bell Station.

    - Does not correct Spokane area 230/115kV autotransformer loading issues.
- Build a new 115kV transmission line from Westside Station to the West Plains area or to the Spokane downtown area.
    - Does not correct Spokane 230/115kV autotransformer loading issues.
- Add a new 230/115kV transformation at Ninth & Central Station and associated 230kV transmission lines.

The condition of identified stations and transmission lines due to age and condition should be analyzed to determine the scope of rebuilding the assets or target specific equipment replacement.

Recommendations

- The identified contingency issues will require a Corrective Action Plan.
- The transmission system contingency mitigation project's specific scope and impact will be evaluated by the responsible parties within Avista to assist in the development of a coordinated business and implementation plan that will be presented to the Engineering Roundtable (ERT) for approval, prioritization, and deployment.
- Construct new Downtown East and Downtown West stations.
- Rebuild College & Walnut and targeted equipment replacement at Ross Park stations.
- Rebuild the Beacon – Ross Park 115kV Transmission Line.

2.17 Spokane Valley Transmission Reinforcement

The Spokane Valley Transmission Reinforcement project improves transmission system performance by networking the 115kV transmission lines in the area together at Irvin and Opportunity stations. This reinforcement was necessitated by area load growth along with motor starting voltage issues resulting from the integration of two 25MW synchronous motors at Inland Empire Paper in 2007. Steady state contingency analysis indicates an inability of the System to meet the performance requirement in TPL-001-4 R3.1 for the Boulder 115kV tie breaker failure.

Studies have identified the following contingency issues:

- Loss of a Liberty Lake – Otis Orchards 115kV Transmission Line section or a Nelson – Ninth & Central 115kV Transmission Line section (P2.1) can load the remaining transmission line to its thermal limit. This has resulted in transferring all load growth to adjacent transmission facilities.
- A Boulder 115kV bus tie breaker fault (P2.4) may result in an overloaded 115kV transmission line above 125% of rating.
- Loss of the Beacon – Ross Park 115kV Transmission Line followed by the loss of any of two 115kV transmission lines (P6) may result in an overloaded 115kV transmission line.

- Loss of the College & Walnut – Westside 115kV Transmission Line followed by the loss of any of two 115kV transmission lines (P6) may result in an overload of multiple 115kV transmission lines.
- Loss of the Opportunity – Otis Orchards 115kV Transmission Line followed by the loss of any of two 115kV transmission lines (P6) may result in an overloaded 115kV transmission line.

Mitigation considered

- This is a vetted project. Refer to past studies for mitigation options.

Recommendations

- The identified contingency issues will require a Corrective Action Plan.
- Complete Spokane Valley Transmission Reinforcement Business Case including installation of the Irvin Station.
- Increase distribution capacity at Barker Station and add distribution facilities to Irvin Station.
- Rebuild Chester Station.

2.18 Stevens/Ferry County System Reinforcement

The Valley Station in the Stevens/Ferry county area has been identified as a concern due to age and condition.

The 49 Degrees North Ski Resort has an expansion plan which will exceed the capacity of the existing distribution system. The existing distribution is being reinforced to accommodate the planned expansion, but there is limited additional capacity.

Mitigation considered

The condition of identified stations due to age and condition should be analyzed to determine the scope of rebuilding the assets or target specific equipment replacement.

Construct a new 49 Degrees North distribution station to serve additional load growth.

Expand Chewelah Station with a new transformer and dedicated feeder.

Recommendations

- Rebuild Valley Station.
- Construct a new 49 Degrees North distribution station when customer request is received.

2.19 Sunset Station Rebuild

The existing circuit breakers at the station do not have sufficient short circuit interrupting capability to interrupt close in faults on the connected transmission lines. The available fault current increases with the necessary transmission system expansion to address other system

deficiencies (i.e. Westside transformer replacement). Short circuit analysis indicates an inability of the System to meet the performance requirements in requirement R2.8 of TPL-001-4.

Mitigation considered

Analysis of potential reconfiguration of the station concluded the station should be rebuilt with five transmission line terminals to match the existing station. The analysis reviewed potential reconfigurations with the objective of minimizing the station size. All configurations considered did not provide desired transmission system performance or reliability.

Recommendations

- The identified issues will require a Corrective Action Plan.
- The Sunset Station has been identified for a complete rebuild.

2.20 West Plains System Reinforcement

The West Plains and Sunset area (up to 245MW) is served by (4) 115kV transmission lines, which may overload for multiple contingency events during summer loading. Existing mitigation projects (Garden Springs – Sunset 115kV Transmission Line rebuild and the Ninth & Central – Sunset 115kV Transmission Line rebuild) help reduce the amount of overloading, but do not correct known contingency issues.

Studies have identified the following contingency issues:

- Loss of the Ninth & Central – Sunset 115kV Transmission Line followed by the loss of any of four 115kV transmission lines (P6) may result in an overload of multiple 115kV transmission lines.
- Loss of the Sunset – Westside 115kV Transmission Line followed by the loss of any of six 115kV transmission lines (P6) may result in an overload of multiple 115kV transmission lines.

Load growth in the West Plains area has contributed to heavy loaded distribution facilities. The following stations have feeders which have exceeded 80% of their applicable facility ratings: Airway Heights. Anticipated load growth will increase the feeder loading and reduce necessary operational capacity.

Mitigation considered

Transmission system contingency issue mitigation alternatives include the following:

- Rebuild the overloaded 115kV transmission lines that were identified in the study.
    - This requires the rebuild of the College & Walnut – Westside, Francis & Cedar – Northwest, Ninth & Central – Third & Hatch, Post Street – Third & Hatch, Ross Park – Third & Hatch and Sunset – Westside 115kV transmission lines.
- Build a new seven mile 115kV transmission line from Westside Station to the West Plains area.

- Add a new 230/115 transformation at Garden Springs and associated 230kV lines.

Construction of new distribution stations and related 115kV transmission line integration will support the anticipated load growth.

Recommendations

- The transmission system contingency mitigation project's specific scope and impact was evaluated by the responsible parties within Avista to assist in the development of a coordinated business and implementation plan that was presented to the Engineering Roundtable (ERT), approved and prioritized for deployment.
- Construct new Flint Road, McFarlane, and Melville stations with transmission line integration according to the West Plains Reinforcement Plan.

2.21 Westside Station Rebuild

Westside Substation was the last remaining Spokane area substation with 125 MVA rated autotransformers. In past studies, the Westside autotransformers would overload for multiple contingency events during moderate to heavy loading in all seasons. The Westside autotransformers are being upgraded to two 250 MVA rated units. Planned reliability improvements to both the 115kV and 230kV bus arrangements are also in this scope, which were required due to increased fault duty from the larger transformers.

Refer to previous studies for identified contingency issues that nucleated the Westside autotransformer upgrade.

The Westside Station is currently being rebuilt, with completion planned for fall of 2022. The construction sequence has resulted in the following temporary contingency issues:

- Loss of the Westside 115kV southwest bus (P2.2) or a breaker failure on the Westside 115kV southwest bus (P2.3) may result in an overload of multiple 115kV transmission lines.

Mitigation considered

- This is a vetted project, refer to past studies for mitigation options.

Recommendations

- Complete the installation of the second 250 MVA autotransformer.
- Complete the 230kV Double Breaker Double Bus arrangement.
- Complete the 115kV Double Breaker Double Bus arrangement.

3 COMPLETED PROJECTS

Project Name	Project Scope	Targeted Date of Operation
Sandcreek-Bronx-Cabinet Rebuild	Reconductor Bronx to Sand Creek with 795 ACSS	Completed in 2017
Noxon Rapids 230kV Breaker Replacement	Replace 6 limiting circuit breakers with 40kA fault current interrupting capability and operate at a steady state voltage of 253 kV	Completed in 2018
Westside Transformer Replacement	Auto#1 was replaced and placed into service	Completed in 2018
Addy – Devil's Gap 115kV Transmission Line	Reconductor 5.19 miles (rebuild between Ford and Long Lake Tap) of limiting conductor which consist of 266.8 ACSR and 397.5 ACSR conductor resulting in a capacity limitation of 71.5 MVA at 40°C, to be rebuilt to a capacity of 150 MVA at 40°C (likely 240MVA)	Completed in Jan. 2019 (Data included in 2019 Master Case)
Saddle Mountain Integration	Othello SS – Warden No.1 115kV Transmission Line upgraded to minimum 240 MVA @ 40°C.	Completed in Feb. 2019 (Data included in 2019 Master Case)
Othello – Warden#2 Partial Rebuild (Saddle Mountain) ** included in 2020 studies	Replace 2.8 Miles of conductor w/ 795 ACSS 200°C from OSS to OTH City.	Completed in March 2019 (Data included in 2019 Master Case)
Lee & Reynolds Rebuild	Substation rebuild. Install 2 – 30 MVA transformers and 6 feeders	Completed in May 2019
Hallett & White Rebuild	Substation rebuild. Install 2 – 30 MVA transformers and 6 feeders	Completed in June 2019
North Lewiston Reactors	Install two 50 MVAr shunt reactors to the existing 230kV bus at North Lewiston Station	Completed in July 2019 (Data included in 2019 Master Case)
Ford Substation Rebuild	Rebuild station with 10 MVA transformer. Tapped off of ADD-DGP line	Completed in December 2019
Boulder Substation	Install 1 – 30 MVA transformer for load support	Completed in October 2019
Priest River	Feeder bay rebuild, expanded to two feeders	Completed in October 2018

TABLE 2 COMPLETED PROJECTS

V TECHNICAL ANALYSIS RESULTS

1 STEADY STATE CONTINGENCY ANALYSIS

The state of the current system study examined system normal and outage simulations on all seasons of the 2020 base cases to determine the present 'state of the system' as it exists today. The existing system configuration was modeled in 2020 Heavy and Light Summer, 2020-21 Heavy and Light Winter, 2020 Spring (high generation, low load) and 2020 high east to west transfer (Montana-Northwest Path 8 and West of Hatwai Path 6 near limits).

Included in the 2020 cases were completed projects and select projects under construction. Significant system reinforcements or system changes since 2018 are as follows:

- Ninth and Central distribution load moved onto the 115kV bus.
- Westside 230/115 auto-transformers increased to 250 MVA.
- Coeur d'Alene – Pine Creek 115kV line increased capacity to 240 MVA.
- Adams-Neilson Solar (20 MVA) interconnected at Lind Substation.
- Cabinet – Bronx – Sand Creek 115kV line increased capacity to 143 MVA.
- Addy – Devils Gap 115kV line increased capacity to 120 MVA.
- Lind – Warden 115kV line increased capacity to 262 MVA.
- Othello SS – Warden #1 115kV line increased capacity to 262 MVA.
- Othello SS – Warden #2 115kV line increased capacity to 123 MVA.
- North Lewiston Reactors – two steps of 50 MVAr each.
- Benton – Othello SS 115kV line increased capacity to 138 MVA

Known outages of generation or transmission facilities with a duration of at least six months were also included in the 2020 cases as follows:

- Lancaster – Noxon 230kV line derated to 255 MVA by BPA beginning in 2017.

Study results show several previously known issues are now resolved, and few new problems have been observed in the current studies. None of the contingencies evaluated resulted in Instability, Cascading, Uncontrolled Separation or IROLs. Study results are summarized as follows.

1.1 Thermal Issues

P0 – No system elements show thermal overload under system normal conditions.

P1.1-P1.4 – No system elements show thermal overload under N-1 conditions, such as the loss of a generator, transmission circuit, transformer or shunt device.

P2.1 – No system elements show thermal overload with the opening of a line section without a fault during peak loading.

- Loss of the Liberty Lake – Otis Orchards 115kV line section during summer loading may load the Ninth & Central – Opportunity 115kV line (up to 98%).

- Loss of the Nelson – Ninth & Central 115kV line section during summer loading may load the Opportunity – Otis Orchards 115kV line (up to 98%).
- Planned mitigation is to complete the Spokane Valley Transmission Reinforcement (fall of 2021).

P2.2 – Several system elements can become thermally overloaded resulting from a bus section fault during peak loading.

- Loss of the Lolo 115kV bus during summer loading may overload the Clearwater – North Lewiston 115kV line (up to 96%, 116% if either Clearwater generator is offline)
    - The Clearwater – North Lewiston 115kV line is protected by thermal relays and will automatically drop load (157MW of load, 48MW of generation) when overloaded per SOP 03.
- Loss of the Hot Springs 230kV bus during high Montana to Northwest (Path 8) transfers may overload the Lancaster – Rathdrum 230kV line (up to 107%).
    - Known issue with BPA's Lancaster – Rathdrum 230kV line derate. BPA will mitigate in real time until the line derate is corrected (fall of 2021).
- Loss of the Rathdrum 115kV east bus during summer loading may overload the Rathdrum 230/115 transformer #1 (up to 103%) and overload the Ramsey – Rathdrum #1 115kV line (up to 109%).
    - Existing mitigation is transfer Coeur d'Alene area load to Pine Creek.
    - Refer to Coeur d'Alene System Reinforcement.
- Loss of the Westside 115kV southwest bus during summer loading may overload the Ross Park – Third & Hatch 115kV line (up to 114%), the Francis & Cedar – Northwest 115kV line (up to 105%), and the Post Street – Third & Hatch 115kV line (up to 111%).
    - Existing mitigation is to shed load (up to 60MW) in the South Spokane area until Westside rebuild is complete.
    - Planned mitigation is to complete the Westside Station Rebuild (fall of 2022).
- Loss of the Larson 115kV bus during spring and summer loading may overload the Chelan - Stratford 115kV line (up to 112%).
    - Existing mitigation is to move open point on the Devils Gap – Stratford 115kV line to Devils Gap.

P2.3 – Several system elements can become thermally overloaded resulting from an internal breaker fault (non-bus tie breaker) during peak loading:

- A breaker failure on the Lolo 115kV bus (5 CB's & 1 CS) during summer loading may overload the Clearwater – North Lewiston 115kV line (up to 96%, 116% if either Clearwater generator is offline).

  - The Clearwater – North Lewiston 115kV line is protected by thermal relays and will automatically drop load (157MW of load, 48MW of generation) when overloaded per SOP 03.

- A breaker failure on the Hot Springs 230kV bus (6 CB's) during high east to west transfers may overload the Lancaster – Rathdrum 230kV line (up to 106%).
  - Known issue with BPA's Lancaster – Rathdrum 230kV line derate. BPA will mitigate in real time until derate is corrected (fall of 2021).
- A breaker failure on the Rathdrum 115kV east bus (7 CB's) during summer loading may overload the Ramsey – Rathdrum #1 115kV line (up to 101%) and load the Rathdrum 230/115 transformer #1 to near rating.
  - Existing mitigation is transfer Coeur d'Alene area load to Pine Creek.
  - Refer to Coeur d'Alene System Reinforcement.
- A breaker failure on the Westside 115kV southwest bus (3 CB's) during summer loading may overload the Ross Park – Third & Hatch 115kV line (up to 114%), the Francis & Cedar – Northwest 115kV line (up to 105%), and the Post Street – Third & Hatch 115kV line (up to 111%).
  - Existing mitigation is to shed load (up to 60MW) in the South Spokane area.
  - Planned mitigation is to complete the Westside Station Rebuild (fall of 2022).
- A breaker failure on the Larson 115kV bus (9 CB's) during spring and summer loading may overload the Chelan - Stratford 115kV line (up to 112%).
  - Existing mitigation is to move open point on the Devils Gap – Stratford 115kV line to Devils Gap.

P2.4 – Several system elements can become thermally overloaded resulting from an internal breaker fault on a bus tie breaker during peak loading:

- A Beacon 230kV bus tie breaker failure during summer loading may overload the Bell 230/115 transformer #6 (up to 100%), the Bell – Northeast 115kV line (up to 114%), and the Francis & Cedar – Northwest 115kV line (up to 105%).
  - Existing mitigation is to shed load (up to 40MW) in the North Spokane area.
  - Refer to South Spokane Transmission Reinforcement.
- A Beacon 115kV bus tie breaker failure during summer loading may overload the Opportunity – Otis Orchards 115kV line (up to 122%), the Francis & Cedar – Northwest 115kV line (up to 121%), the Northwest – Westside 115kV line (up to 116%), and the College & Walnut – Westside 115kV line (up to 102%).
  - Existing mitigation is to shed load (up to 90MW) in the South Spokane area.
  - Refer to South Spokane Transmission Reinforcement.
- A Boulder 115kV bus tie breaker failure during summer loading may overload the Ninth & Central – Opportunity 115kV line (up to 147%).

  - Existing mitigation is to shed load (up to 56MW) east of Otis Orchards.
  - Planned mitigation is to complete the Spokane Valley Transmission Reinforcement (fall of 2021).
- A Ninth & Central 115kV bus tie breaker failure during summer loading may overload the Ross Park – Third & Hatch 115kV line (up to 95%, 100% with W2E offline).
  - Existing mitigation is to shed load (up to 10MW) in the South Spokane area.
  - Refer to South Spokane Transmission Reinforcement.

P3 – Several system elements can become thermally overloaded resulting from the loss of a generator; followed by system adjustments; followed by a subsequent loss of an additional transmission circuit, transformer or shunt device.

- Loss of Clearwater unit #3 or #4 followed by the loss of either Clearwater 115/34 transformer during any seasonal loading may overload the remaining Clearwater 115/34 transformer (up to 113%).
  - Existing mitigation is to reduce facility load.
- Loss of Clearwater generator unit #3 or #4 followed by the loss of Hatwai – Lolo 230kV line during summer loading may overload the Clearwater – North Lewiston 115kV line (up to 107%).
  - The Clearwater – North Lewiston 115kV line is protected by thermal relays and will automatically drop load when overloaded per SOP 03.

P4 and P5 – No further results beyond those identified in P2.2 thru P2.4

P6 – Several system elements can become thermally overloaded resulting from an N-1-1 contingency event. This is described as the loss of a transmission circuit, transformer or shunt device; followed by system adjustments; followed by a subsequent loss of an additional transmission circuit, transformer or shunt device.

- Loss of the Addy – Bell 115kV line, followed by load restoration (Addy to Loon Lake 115kV line section outage shows worst performance), followed by:
  - The loss of either Beacon 230/115 transformer during summer loading may overload the Bell 230/115 transformer #6 (up to 105%).
    - Existing mitigation is for BPA to operate within their short term rating.
  - The loss of Bell 230/115 transformer #6 during summer loading may overload the Beacon – Bell 115kV line (up to 113%) and Beacon – Northeast 115kV line (up to 102%).
    - Existing mitigation is to transfer Waikiki to Beacon - Francis & Cedar 115kV line.
    - Refer to North Spokane Transmission Reinforcement.
- Loss of the Airway Heights – Devils Gap 115kV line, followed by load restoration (Devils Gap – West Plains 115kV line section outage shows worst performance), followed by:

  - The loss of Nine Mile – Westside 115kV line during light spring loading may overload the Addy – Devils Gap 115kV line (up to 107%).
    - Existing mitigation is to limit generation at Nine Mile to 8MW per SOP 20
    - Planned mitigation is to complete the Addy – Devils Gap 115kV line section rebuild by correcting bottleneck at Devils Gap (spring of 2020).

- Loss of the either Beacon 230/115 transformer followed by:
  - The loss of the remaining Beacon 230/115 transformer during summer loading may overload the Bell 230/115 transformer #6 (up to 126%), the Beacon – Northeast 115kV line (up to 104%), and the Francis & Cedar – Northwest 115kV line (up to 100%).
    - Existing mitigation is for BPA to operate within their short term rating and for Avista to shed load (up to 33MW) at Waikiki or bring up Northeast CT
    - Refer to West Plains System Reinforcement and South Spokane Transmission Reinforcement.
  - The loss of Bell 230/115 transformer #6 during summer loading may overload the remaining Beacon 230/115 transformer (up to 119%).
    - Existing mitigation is for BPA and Avista to shed load (up to 80MW) in the north Spokane area
    - Refer to West Plains System Reinforcement and South Spokane Transmission Reinforcement.
- Loss of the either Beacon – Bell 230kV line followed by:
  - The loss of the remaining Beacon - Bell 230kV line during summer loading may overload the Bell 230/115 transformer #6 (up to 118%).
    - Existing mitigation is for BPA to operate within their short term rating.
- Loss of the Beacon – Bell 115kV line, followed by:
  - The loss of Bell 230/115 transformer #6 during summer loading may overload the Beacon – Northeast 115kV line (up to 126%) and the Bell – Northeast 115kV line (up to 102%).
    - Existing mitigation is to transfer Waikiki to Francis & Cedar.
    - Refer to North Spokane System Reinforcement.
- Loss of the either Beacon – Ninth & Central 115kV line followed by:
  - The loss of the remaining Ninth & Central 115kV line during summer loading may overload the Ross Park – Third & Hatch 115kV line (up to 123%).
    - Existing mitigation is to shed load (up to 70MW) in the South Spokane area.

        - Refer to West Plains System Reinforcement and South Spokane Transmission Reinforcement.
    - The loss of the Beacon – Ross Park 115kV line during summer loading may overload the remaining Beacon – Francis & Cedar 115kV line (up to 106%).
        - Existing mitigation is to open Ninth & Central – Opportunity 115kV line at Ninth & Central
        - Refer to West Plains System Reinforcement and South Spokane Transmission Reinforcement.
    - The loss of the Ross Park – Third & Hatch 115kV line during summer loading may overload the remaining Beacon – Francis & Cedar 115kV line (up to 102%).
        - Existing mitigation is to open Ninth & Central – Opportunity 115kV line at Ninth & Central
        - Refer to West Plains System Reinforcement and South Spokane Transmission Reinforcement.
- Loss of the Beacon – Northeast 115kV line, followed by:
    - The loss of Bell 230/115 transformer #6 during summer loading may overload the Beacon – Bell 115kV line (up to 162%).
        - BPA has to radialize their load at Bell pre-contingency
        - Refer to North Spokane System Reinforcement.
- Loss of the Beacon – Ross Park 115kV line followed by:
    - The loss of the either Beacon – Ninth & Central 115kV line during summer loading may overload the remaining Beacon – Ninth & Central 115kV line (up to 107%).
        - Existing mitigation is to open Ninth & Central – Opportunity 115kV line at Ninth & Central.
        - Planned mitigation is to complete the Spokane Valley Transmission Reinforcement (fall of 2021).
- Loss of the Bell 230/115 transformer #6 followed by:
    - The loss of the either Beacon 230/115 transformer during summer loading may overload the remaining Beacon 230/115 transformer (up to 118%).
        - Existing mitigation is to shed load (up to 80MW) in the north Spokane area
        - Refer to West Plains System Reinforcement and South Spokane Transmission Reinforcement.
    - The loss of the Beacon – Northeast 115kV line during summer loading may overload the Beacon – Bell 115kV line (up to 162%).
        - BPA and Avista shed load (up to 80MW) in the north Spokane area.

        - Refer to North Spokane System Reinforcement.
    - The loss of the Beacon – Bell 115kV line during summer loading may overload the Beacon – Northeast 115kV line (up to 126%).
        - Planning mitigation is to transfer Waikiki to Francis & Cedar.
        - Refer to North Spokane System Reinforcement.
- Loss of the Bell – Northeast 115kV line, followed by load restoration (Waikiki will auto-transfer to the Beacon – Francis & Cedar 115kV line), followed by:
    - The loss of Bell 230/115 transformer #6 during summer loading may overload the Beacon – Bell 115kV line (up to 105%).
        - BPA has to radialize their load at Bell pre-contingency
        - Refer to North Spokane System Reinforcement.
- Loss of the Bell – Westside 230kV line followed by:
    - The loss of either Beacon 230/115 transformer during summer loading may overload the Bell 230/115 transformer #6 (up to 107%) and the remaining Beacon 230/115 transformer (up to 106%).
        - Existing mitigation is for BPA to operate within their short term rating on Bell 230/115 transformer #6 and for Avista to shed load (up to 50MW) at Waikiki.
        - Refer to West Plains System Reinforcement and South Spokane Transmission Reinforcement.
- Loss of the Benewah – Boulder 230kV line followed by:
    - Loss of the Dworshak – Hatwai 500 during high east to west transfers may overload the Benewah – Pine Creek 230kV line (up to 126%).
        - Existing mitigation is to limit WMH to 1450MW and reduce Avista's share of MT-NW by 200MW per SOP 28.
- Loss of the Benewah – Pine Creek 230kV line followed by:
    - Loss of the Cabinet – Rathdrum 230 line during high east to west transfers may overload the Lancaster - Noxon 230kV line (up to 134%).
        - Existing mitigation is to limit WMH to 1350MW and reduce Avista's share of MT-NW by 200MW per SOP 28.
- Loss of the Benton – Othello SS 115kV line, followed by load restoration (Benton to South Othello 115kV line section outage shows worst performance), followed by:
    - The loss of the Sand Dunes – Warden 115kV line during summer loading may overload the Larson – Sand Dunes – Warden 115kV line (up to 116%).
        - Existing mitigation is to open the Larson – Sand Dunes – Warden 115kV line at Warden per SOP 21.

        - Planned mitigation is to complete the Saddle Mountain project Phase I and II (fall of 2022).

- Loss of the Cabinet - Noxon 230kV line followed by:
    - Loss of the Noxon – Pine Creek 230kV line during high WMH and east to west transfers may overload the Lancaster - Noxon 230kV line (up to 145%).
        - Existing mitigation is to arm RAS, limit Cabinet Gorge to 200MW, limit WMH to 1200MW and reduce Avista's share of MT-NW by 200MW per SOP 28.
- Loss of the College & Walnut – Westside 115kV line, followed by load restoration (Fort Wright – Westside 115kV line section outage shows worst performance), followed by:
    - The loss of the Ninth & Central – Third & Hatch 115kV line during summer loading may overload the Ross Park – Third & Hatch 115kV line (up to 105%).
        - Existing mitigation is to shed load (up to 10MW) at Fort Wright.
        - Refer to West Plains System Reinforcement and South Spokane Transmission Reinforcement.
    - The loss of the either Beacon – Ninth & Central 115kV line during summer loading may overload the remaining Beacon – Ninth & Central 115kV line (up to 101%).
        - Existing mitigation is to open Ninth & Central – Opportunity 115kV line at Ninth & Central
        - Planned mitigation is to complete the Spokane Valley Transmission Reinforcement (fall of 2021).
- Loss of the Devils Gap - Stratford 115kV line, followed by load restoration (Stratford – Wilson Creek 115kV line section outage shows worst performance), followed by:
    - The loss of the Larson - Stratford 115kV line during summer loading may overload the Chelan - Stratford 115kV line (up to 107%).
        - Existing mitigation is to open the Chelan - Stratford 115kV line at Stratford per SOP 21.
- Loss of the Dry Creek – North Lewiston 230kV line followed by:
    - Loss of the Hatwai - Lolo 230kV line during summer loading and high ID-NW transfers may overload the Clearwater – North Lewiston 115kV line (up to 167%), Dry Creek – North Lewiston 115kV line (up to 121%), and North Lewiston 230/115 transformer #1 (up to 138%).
        - Existing mitigation is to arm Lolo-Oxbow Back Trip, open Lolo – Pound Lane 115kV line at Lolo, open Lolo – Nez Perce 115kV line at Nez Perce, Open Dry Creek – North Lewiston 115kV line at North Lewiston, and open Dry Gulch 69 kV tie.

        - Refer to Lewiston/Clarkston System Reinforcement.
- Loss of the Francis & Cedar – Ross Park 115kV line, followed by load restoration (Lions & Standard – Ross Park 115kV line section outage shows worst performance), followed by:
    - The loss of the Northwest - Westside 115kV line during summer loading may overload the Beacon – Francis & Cedar 115kV line (up to 109%).
        - Existing mitigation is to open the Beacon – Francis & Cedar 115kV line at Francis & Cedar.
        - Refer to North Spokane System Reinforcement.
- Loss of the Larson – Stratford 115kV line, followed by:
    - The loss of the Devils Gap - Stratford 115kV line during spring and summer loading may overload the Chelan - Stratford 115kV line (up to 107%).
        - Existing mitigation is to limit generation at Main Canal and Summer Falls to a total of 90MW per SOP 21.
- Loss of the Larson – Sand Dunes – Warden 115kV line, followed by load restoration (Wheeler to Basset Junction 115kV line section outage shows worst performance), followed by:
    - The loss of the Sand Dunes – Warden 115kV line during spring and summer loading will overload the Benton – Othello SS 115kV line and result in voltage collapse in the Othello area (drops up to 168MW).
        - Existing mitigation is to open the Benton – Othello SS 115kV line at Othello SS per SOP 21.
        - Planned mitigation is to complete the Saddle Mountain project Phase I and II (fall of 2022). This still results in low voltage on GCPD's system.
- Loss of the Hatwai – Lolo 230kV line followed by:
    - Loss of the Dry Creek – Lolo 230kV line during summer loading and high ID-NW transfers may overload the Clearwater – North Lewiston 115kV line (up to 197%) and Dry Creek – Pound Lane 115kV line (up to 119%) or the;
    - Loss of the Dry Creek – North Lewiston 230kV line during summer loading and high ID-NW transfers may overload the Clearwater – North Lewiston 115kV line (up to 167%), Dry Creek – North Lewiston 115kV line (up to 121%), and North Lewiston 230/115 transformer #1 (up to 138%) or the;
    - Loss of the North Lewiston 230/115 transformer during summer loading and high ID-NW transfers may overload the Dry Creek – North Lewiston 230kV line (up to 116%).
        - Arm Lolo-Oxbow Back Trip, open Lolo – Pound Lane 115kV line at Lolo, open Lolo – Nez Perce 115kV line at Nez Perce, Open Dry Creek – North

Lewiston 115kV line at North Lewiston, and open Dry Gulch 69 kV tie per SOP 33.

- This leaves Clearwater – North Lewiston 115kV line in service, but ready to trip via thermal relays for a subsequent outage.

- Refer to Lewiston/Clarkston System Reinforcement.

- Loss of the Moscow 230/115 transformer followed by:
  - The loss of the Shawnee 230/115 transformer during any season will overload the Moscow – Orofino 115kV line and result in voltage collapse in the Moscow/Pullman area (drops up to 186MW).
    - Existing mitigation is to open the Moscow – Orofino 115kV line at Moscow. No current System Operating Procedure.
    - Can only recover load in the Moscow area (from Orofino & North Lewiston), which leaves up to 70MW offline until autotransformer issue is corrected,
    - Refer to Palouse System Reinforcement.
- Loss of the Moscow – South Pullman 115kV line, followed by load restoration (Moscow – North Moscow 115kV line section outage shows worst performance), followed by:
  - The loss of the Shawnee 230/115 transformer during summer loading may overload the Moscow – Terre View 115kV line (up to 110%).
    - Existing mitigation is to transfer Moscow City load to North Lewiston.
    - Refer to Palouse System Reinforcement.
- Loss of the Moscow – Terre View 115kV line, followed by load restoration (Moscow – North Moscow 115kV line section outage shows worst performance), followed by:
  - The loss of the Shawnee 230/115 transformer during summer loading may overload the Moscow – South Pullman 115kV line (up to 107%).
    - Existing mitigation is to transfer Moscow City load to North Lewiston.
    - Refer to Palouse System Reinforcement.
- Loss of the North Lewiston 230/115 transformer followed by:
  - Loss of the Hatwai - Lolo 230kV line during summer loading and high ID-NW transfers may overload the Dry Creek – North Lewiston 115kV line (up to 98%),
    - Arm Lolo-Oxbow Back Trip per SOP 33.
    - Refer to Lewiston/Clarkston System Reinforcement.
- Loss of the Nine Mile – Westside 115kV line, followed by load restoration (Indian Trail – Westside 115kV line section outage shows worst performance), followed by:
  - The loss of Airway Heights – Devils Gap 115kV line during light spring loading may overload the Addy – Devils Gap 115kV line (up to 107%).

        - Existing mitigation is to limit generation at Nine Mile to 8MW per SOP 20
        - Planned mitigation is to complete the Addy – Devils Gap 115kV line section rebuild by correcting bottleneck at Devils Gap (spring of 2020).

- Loss of the Ninth & Central – Sunset 115kV line, followed by load restoration (Glenrose – Ninth & Central 115kV line section outage shows worst performance), followed by:
    - The loss of the Beacon – Ross Park 115kV line during summer loading may overload the Ninth & Central – Third & Hatch 115kV line (up to 91%, 95% with W2E offline, increases to 100% after Irvin is complete).
        - Refer to West Plains System Reinforcement and South Spokane Transmission Reinforcement.
    - The loss of the Metro – Post Street 115kV line during summer loading may overload the Sunset – Westside 115kV line (up to 106%, 105% with W2E offline, increases to 109% after Irvin is complete).
        - Planned mitigation is to complete the Metro Substation rebuild and associated projects (spring of 2024).
    - The loss of the Metro – Sunset 115kV line during summer loading may overload the Sunset - Westside 115kV line (up to 96%, 96% with W2E offline, increases to 99% after Irvin is complete).
        - Refer to West Plains System Reinforcement.
    - The loss of the Ninth & Central – Third & Hatch 115kV line during summer loading may overload the Ross Park – Third & Hatch 115kV line (up to 98%, 103% with W2E offline, increases to 108% after Irvin is complete).
        - Refer to West Plains System Reinforcement.
- Loss of the Noxon – Pine Creek 230kV line followed by:
    - Loss of the Cabinet - Rathdrum 230kV line during high WMH and east to west transfers may overload the Lancaster - Noxon 230kV line (up to 121%).
        - Existing mitigation is to arm RAS, limit WMH to 1350MW and reduce Avista's share of MT-NW by 200MW per SOP 28.
- Loss of the Opportunity – Otis Orchards 115kV line, followed by load restoration (Liberty Lake – Otis Orchards line section outage shows worst performance), followed by:
    - The loss of the either Beacon 230/115 transformer during summer loading may overload the remaining Beacon 230/115 transformer (up to 98%).
        - Refer to West Plains System Reinforcement and South Spokane Transmission Reinforcement.
    - The loss of the either Ninth & Central 115kV line during summer loading may overload the remaining Ninth & Central 115kV line (up to 108%).
        - Existing mitigation is to shed load (up to 20MW) in the South Spokane area.

        - Planned mitigation is to complete the Spokane Valley Transmission Reinforcement (fall of 2021).

- Loss of the Othello SS – Warden #2 115kV line, followed by load restoration (Lee & Reynolds - Warden 115kV line section outage shows worst performance), followed by:
    - The loss of the Othello SS – Warden #1 115kV line during spring and summer loading may overload the Benton – Othello SS 115kV line (up to 125%).
        - Existing mitigation is to open the Benton – Othello SS 115kV line at Othello SS per SOP 21.
        - Planned mitigation is to complete the Benton – Othello SS project (spring of 2020).
- Loss of the Pine Street – Rathdrum 115kV line, followed by load restoration (Old Town – Pine Street 115kV line section outage shows worst performance), followed by:
    - The loss of the Rathdrum 230/115 transformer #2 during summer loading may overload the remaining Rathdrum 230/115 transformer #1 (up to 117%, 96% with CDA-PIN 115 closed).
        - Existing mitigation is to operate Coeur d'Alene – Pine Creek 115kV closed through per SOP 36.
        - Refer to Coeur d'Alene System Reinforcement.
- Loss of either Rathdrum 230/115 transformer followed by:
    - The loss of the remaining Rathdrum 230/115 transformer during any season will overload the Pine Street – Rathdrum 115kV line and result in voltage collapse in the Coeur d'Alene area (drops up to 275MW).
        - Existing mitigation is to open the Pine Street – Rathdrum 115kV line at Rathdrum per SOP 36. Note that closing though on the Coeur d'Alene – Pine Creek 115kV does not mitigate for the loss of both Rathdrum 230/115 transformers, due to Pine Street – Rathdrum 115kV line overload (up to 127%).
        - Refer to Coeur d'Alene System Reinforcement.
- Loss of the Sand Dunes – Warden 115kV line, followed by:
    - The loss of the Larson – Sand Dunes – Warden 115kV line 115kV line during summer loading may overload the Benton – Othello SS 115kV line (up to 212%).
        - Existing mitigation is to open the Larson – Sand Dunes – Warden 115kV line at Warden per SOP 21.
        - Planned mitigation is to complete the Benton – Othello SS project (spring of 2020).
- Loss of the Sunset – Westside 115kV line, followed by load restoration (Garden Springs – Waste to Energy 115kV line section outage shows worst performance), followed by:

- The loss of the Airway Heights – Devils Gap 115kV line during summer loading may overload the College & Walnut – Westside 115kV line (up to 102%).
  - Existing mitigation is to shed load (up to 10MW) at Fort Wright.
  - Refer to West Plains System Reinforcement.
- The loss of the College & Walnut – Westside 115kV line during summer loading may overload the Francis & Cedar – Northwest 115kV line (up to 102%), the Post Street – Third & Hatch 115kV line (up to 103%), and the Ross Park – Third & Hatch 115kV line (up to 110%).
  - Existing mitigation is to shed load (up to 50MW) in the South Spokane area.
  - Refer to West Plains System Reinforcement and South Spokane Transmission Reinforcement.
- The loss of the Francis & Cedar – Northwest 115kV line during summer loading may overload the College & Walnut – Westside 115kV line (up to 111%).
  - Existing mitigation is to shed load (up to 40MW) in the South Spokane area.
  - Refer to West Plains System Reinforcement and South Spokane Transmission Reinforcement.
- The loss of the Metro – Post Street 115kV line during summer loading may overload the Ninth & Central – Sunset 115kV line (up to 114%).
  - Existing mitigation is to shed load (up to 20MW) in the South Spokane area.
  - Planned mitigation is to complete the Metro Substation rebuild and associated projects (spring of 2024).
- The loss of the Metro – Sunset 115kV line during summer loading may overload the Ninth & Central – Sunset 115kV line (up to 102%).
  - Existing mitigation is to shed load (up to 10MW) in the South Spokane area.
  - Planned mitigation is to complete the Ninth & Central – Sunset 115kV line rebuild (Southeast Substation bottleneck) (spring of 2020).
- The loss of the Northwest – Westside 115kV line during summer loading may overload the College & Walnut – Westside 115kV line (up to 119%).
  - Existing mitigation is to shed load (up to 80MW) in the South Spokane area.
  - Refer to West Plains System Reinforcement and South Spokane Transmission Reinforcement.

- The loss of the Post Street – Third & Hatch 115kV line during summer loading may overload the College & Walnut – Westside 115kV line (up to 109%).
  - Existing mitigation is to shed load (up to 30MW) in the South Spokane area.
  - Refer to West Plains System Reinforcement.
- The loss of the Ross Park – Third & Hatch 115kV line during summer loading may overload the College & Walnut – Westside 115kV line (up to 103%).
  - Existing mitigation is to shed load (up to 10MW) at Fort Wright.
  - Refer to West Plains System Reinforcement and South Spokane Transmission Reinforcement.

- Loss of the Sunset – Westside 115kV line, followed by gen/load restoration (Waste to Energy – Westside 115kV line section outage shows worst performance), followed by:
  - The loss of the College & Walnut – Westside 115kV line during summer loading may overload the Ross Park – Third & Hatch 115kV line (up to 104%).
    - Existing mitigation is to shed load (up to 20MW) in the South Spokane area.
    - Refer to West Plains System Reinforcement and South Spokane Transmission Reinforcement.
  - The loss of the Francis & Cedar – Northwest 115kV line during summer loading may overload the College & Walnut – Westside 115kV line (up to 104%).
    - Existing mitigation is to shed load (up to 20MW) in the South Spokane area.
    - Refer to West Plains System Reinforcement and South Spokane Transmission Reinforcement.
  - The loss of the Metro – Post Street 115kV line during summer loading may overload the Ninth & Central – Sunset 115kV line (up to 102%).
    - Existing mitigation is to shed load (up to 10MW) in the South Spokane area.
    - Planned mitigation is to complete the Ninth & Central – Sunset 115kV line rebuild (Southeast Substation bottleneck) (spring of 2020).
  - The loss of the Northwest – Westside 115kV line during summer loading may overload the College & Walnut – Westside 115kV line (up to 112%).
    - Existing mitigation is to shed load (up to 50MW) in the South Spokane area.
    - Refer to West Plains System Reinforcement and South Spokane Transmission Reinforcement.

- The loss of the Post Street – Third & Hatch 115kV line during summer loading may overload the College & Walnut – Westside 115kV line (up to 102%).
  - Existing mitigation is to shed load (up to 10MW) in the South Spokane area.
  - Refer to West Plains System Reinforcement.
- The loss of the Ross Park – Third & Hatch 115kV line during summer loading may overload the College & Walnut – Westside 115kV line (up to 97%).

P7 – No system elements show thermal overload resulting from an N-2 contingency event. This is described as the loss of any two adjacent circuits on common structure (vertical or horizontal) and excludes circuits of (1) mile.

1.2 Voltage Issues

P0 – No voltage issues were identified under system normal conditions.

- Minor high voltage is observed under system normal and off-peak loading conditions in the Big Bend area.
  - Issue remains under observation.
- Minor low voltage has been observed under system normal conditions in PacifiCorp's 69 kV system.
  - PacifiCorp planned mitigation is to upgrade the Dry Gulch 115/69 kV transformer from 20 MVA to a 50 MVA transformer with voltage regulation (LTC).

P1.1-P1.4 – No voltage issues were identified under N-1 conditions, such as the loss of a generator, transmission circuit, transformer or shunt device.

P2.1 – Several voltage issues were identified with the opening of a line section w/o a fault during peak loading:

- Loss of the Roxboro – Warden 115kV line section requires transferring area load to Devils Gap and/or Shawnee, may result in low voltage at Roxboro (0.93pu).
  - Existing mitigation is to shed load at Roxboro (up to 20MW) per SOP 21.
- Loss of the Stratford – Wilson Creek 115kV line section requires transferring area load to Devils Gap, which may result in a high voltage step change (0.06pu) when inserting each 13.4 MVAr step at Othello.
  - Step change in voltage results in up to 40MW of irrigation load loss.
  - Planned mitigation is to investigate reducing cap bank step size.
- Loss of the Garden Springs – Hayford 115kV line section requires transferring area load to Airway Heights, which may result in low voltage at Cheney (0.95pu).
  - Existing mitigation is to transfer Cheney and Four Lakes to the Sunset – Shawnee 115kV line per SOP 12.

P2.2 – Several voltage issues were identified resulting from a bus section fault during peak loading:

- Loss of the Sand Dunes 115kV bus during summer loading may result in low voltage at Ritzville (0.95pu) and Othello City (0.95pu).
    - Existing mitigation is to transfer load at Ritzville to Devils Gap

P2.4 – Several voltage issues were identified resulting from an internal breaker fault on a bus tie breaker during peak loading:

- A Boulder 115kV bus tie breaker failure during summer loading may result in voltage collapse in the Spokane Valley.
    - Shed load east of Otis Orchards

P3 – No further results beyond those identified in P1 and P2.1

P4 & P5 – No further results beyond those identified in P2.2 thru P2.4

P6 – No voltage issues were identified resulting from an N-1-1 contingency event that were not captured in the previous thermal results section. This is described as the loss of a transmission circuit, transformer or shunt device; followed by system adjustments; followed by a subsequent loss of an additional transmission circuit, transformer or shunt device.

P7 – No voltage issues were identified resulting from an N-2 contingency event. This is described as the loss of any two adjacent circuits on common structure (vertical or horizontal) and excludes circuits of (1) mile.

1.3 Radial and Consequential Load Loss Issues

The present steady state contingency analysis methods allows for observation of consequential load loss for each studied contingency. Improved study methods are desired to capture both the amount of consequential load loss and the inability to restore service to customers. The following list identifies transmission system contingencies resulting in undesired consequential load loss. The list is not comprehensive of all radial transmission system elements and will be improved in subsequent studies.

- P1.1 – Loss of the Addy - Gifford 115kV line during any season results in an outage to Gifford (9MW)
    - Addy has a main/aux bus arrangement for substation related outages at Addy
- P1.1 – Loss of the Lind – Washtucna 115kV line during any season results in an outage to Delight and Washtucna (total of 3MW)
    - The Lind bypass switch provides service for substation related outages at Lind
- P1.1 – Loss of the Orofino – Weippe 115kV line during any season results in an outage to Weippe (4MW)
    - The Orofino bypass switch A196 provides service for substation related outages at Orofino

- P1.3 – Loss of the Benewah 230/115 transformer #1 (drops 20MW load), followed by load restoration (transfer Setters load to Ninth & Central and close the Benewah – Pine Creek 115kV line) did not result in load loss after load was restored from alternate sources.
- P1.3 – A trip of either Cabinet Gorge GSU A or B (P1.3) during any season will drop all units at Cabinet Gorge (up to 260MW) and clears the Cabinet 230kV bus due to the lack of a high side GSU breaker. This outage severs the (2) primary station service feeds at Cabinet Gorge Hydro, it open ends the Cabinet – Noxon 230kV line, the Cabinet – Rathdrum 230kV line and the Cabinet 230/115kV autotransformer, it results in a reduction in WMH to 1100MW and cuts MT-NW by 200MW.
    - Refer to Cabinet Gorge GSU Isolation.
- P2.4 – A Rathdrum 115kV bus tie breaker failure during any season drops load in the Coeur d'Alene area (drops up to 275MW).
- P7 / P6 – A forced outage of Beacon – Rathdrum 230kV line and Lancaster – Rathdrum 230kV line (common structure), followed by:
    - The loss of the Cabinet – Rathdrum 230kV line during any season will overload the Pine Street – Rathdrum 115kV line and result in voltage collapse in the Coeur d'Alene area (drops up to 275MW).
        - Open the Pine Street – Rathdrum 115kV line at Rathdrum per SOP 36
        - Refer to Coeur d'Alene System Reinforcement.

2 VOLTAGE STABILITY ANALYSIS

No QV or PV issues were identified during this assessment.

3 STABILITY CONTINGENCY ANALYSIS

The following transient stability issues were identified during this assessment.

3.1 Kettle Falls Generator Out of Step

The Kettle Falls generator can become unstable if a time delayed three phase fault occurs on the Addy – Kettle Falls 115kV Transmission Line near Addy. Studies indicate that speeding up the Zone 2 clearing (time delay of 9 cycles, 13 cycles total clearing) is not sufficient to correct this out of step issue.

The stability issue was addressed with the installation of an out of step relay (78) at Kettle Falls. The transient stability results are shown below and indicate that the local system returns to a stable state once the generators are tripped offline.

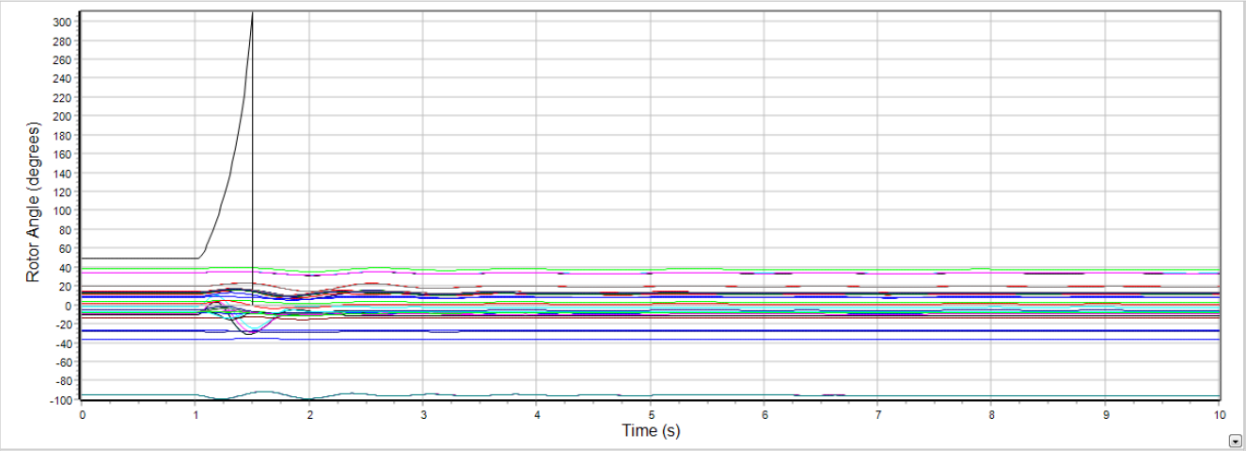


FIGURE 3: KETTLE FALLS GENERATION OOS.

Implementing a high speed communication aided tripping scheme on the Addy – Kettle Falls 115kV Transmission Line to improve stability performance of the Kettle Falls generation is necessary.

3.2 Nine Mile Generators Out of Step

All Nine Mile Hydro generators can become unstable if a time delayed three phase fault occurs on the Nine Mile – Westside 115kV Transmission Line near Westside. Studies indicate that speeding up the Zone 2 clearing (time delay of 9 cycles, 13 cycles total clearing) is not sufficient to correct this out of step issue.

Units #3 and #4 at Nine Mile Hydro have recently been rebuilt, resulting in up to 28MW of total facility generation. These units were commissioned with an out of step relay (78), but units #1 and #2 do not have this protection. The transient stability results are shown below and indicate that the local system returns to a stable state once units #1 and #2 are tripped offline.

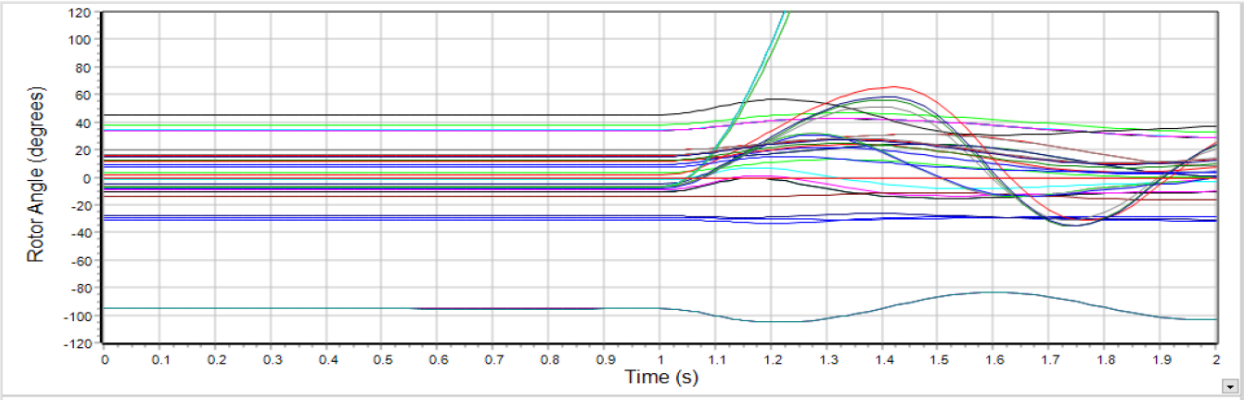


FIGURE 4: NINE MILE GENERATION OOS.

This issue is corrected after the Nine Mile - Westside 115kV Transmission Line is moved to the new Westside Southeast 115kV bus and the planned communication aided tripping is integrated.

3.3 Coeur d'Alene Area Voltage Recovery

During moderate to heavy loading, the Coeur d'Alene area has slow voltage recovery for a fault on the double circuit Boulder – Rathdrum and Lancaster – Rathdrum 230kV transmission lines (P7 contingency). The slow voltage recovery does not meet the WR1.1.4 Part 2 performance criteria as shown in Figure 5. Previous technical studies did not demonstrate the same performance. The implementation of stalled motor modeling in the composite load model contributes to the slow voltage recovery. Further detailed analysis is necessary to determine the accuracy of the simulation and potential modeling improvements. The implementation of the Coeur d'Alene System Reinforcement Project will address the voltage dip performance by improving the strength of the local transmission system.

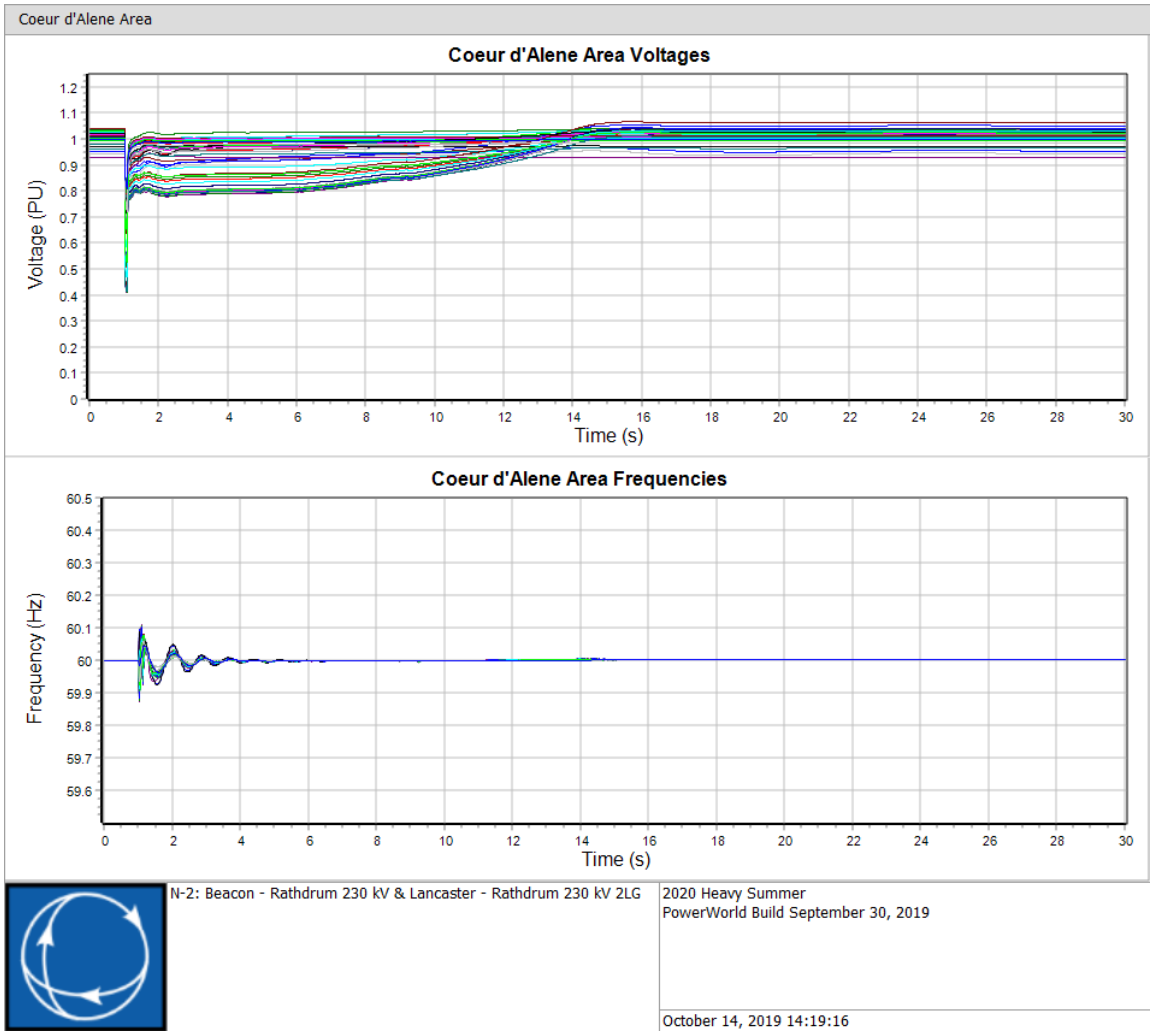


FIGURE 5: P7 CONTINGENCY VOLTAGE RECOVERY IN COEUR D'ALENE AREA.

5 SPARE EQUIPMENT ANALYSIS

Avista's 230/115kV transformer spare equipment strategy could result in the unavailability of these units for one year or more due to replacement lead time. The impact of a single transformer out of service and subsequent P0, P1 and P2 contingencies was studied by area.

5.1 Big Bend Area

Avista does not currently have any 230/115kV autotransformers, in service, in the Big Bend area.

5.2 Coeur d'Alene Area Transformers

Outage of either Rathdrum 230/115kV transformer may result in area overloads and low voltage problems for Rathdrum 115kV bus outages or the other Rathdrum transformer outage.

The Coeur d'Alene System Reinforcement Project has been identified for this purpose and will mitigate the bus issues.

Upgrading the existing #1 transformer, previously identified by Asset Management, will provide overload mitigation for some contingencies.

Additional analysis is required for mitigation of the double transformer outage.

5.3 Lewiston/Clarkston Area Transformers

Area transformer outages may result in overloads on the Lolo 230/115kV transformers. Area 115kV bus outages may result in area low voltage.

The Lolo Transformer Replacement Project Committed and Planned for completion by 2023 will mitigate the transformer overload problem.

Area low voltage mitigation will require further study.

5.4 Palouse Area Transformers

Outage of either the Moscow or Shawnee 230/115kV transformer may result in area low voltage and 115kV line overloads; outage of both transformers increases the severity.

The Palouse Area Reinforcement Project has been identified for this purpose.

5.5 Spokane Area Transformers

Outage of either Beacon 230/115kV transformer combined with an outage of either of the Boulder or Westside 230/115kV transformers may result in overload the Bell#6 230/115kV transformer. Additional instances of the Bell#6 transformer overloading as well area transformer overloading may occur for Beacon 230 and 115kV bus outages.

Upgrading of the BPA Bell#6 230/115kV transformer will mitigate the overload issues.

The South Spokane System Reinforcement Project has been identified for this purpose.

Additional analysis for an area solution is still required.

Detail results are presented in Appendix D.

6 SHORT CIRCUIT ANALYSIS

Sunset Substation was previously identified as having available short circuit current above the interrupting capability of at least one of the circuit breakers. No additional violations were identified in this year's assessment.

The Sunset Substation Rebuild Project is Committed and Planned for completion by 2023 which will mitigate this problem.

Detailed results are presented in Appendix E.

8 FEEDER CAPACITY ANALYSIS

Feeder Capacity analysis was done for feeders that have SCADA data available. Table 3 is a list of the 20 heaviest loaded feeders from the three year period 2016-2018. The peak represents the highest five minute average for the season- summer or winter. Seasonal Capacity is the SCADA Variable Limit for 0°C and 40°C ambient temperatures. Project planned indicates whether a project has been considered, planned, or under construction. It should be noted that peak values are taken without regard to system status.

Detailed results are presented in Appendix H.

Peak Feeder Loading (2016-2018)						
Feeder Name	**Summer Peak Load (Amps)**	**Winter Peak Load (Amps)**	**Summer Capacity Limit (Amps)**	**Winter Capacity Limit (Amps)**	**Max Usage**	**Project Planned**
WAK12F4	504	316	512	668	99%	Yes
ROS12F1	481	521	499	571	96%	
HUE142	493	325	512	613	96%	Yes
F&C12F2	468	318	512	668	91%	
NRC352	84	103	113	113	91%	
ODN731	284	297	312	456	91%	
COB12F1	463	343	512	668	90%	Yes
DAL132	462	262	512	668	90%	Yes
SE12F3	368	596	512	668	89%	Yes
ORI12F3	111	266	208	302	88%	
KET12F2	258	264	293	430	88%	
AIR12F2	427	435	485	668	88%	Yes
C&W12F6	446	355	512	608	87%	
DAL131	522	402	601	668	87%	Yes
LOL1359	356	258	413	635	86%	
SE12F2	516	502	601	668	86%	Yes
MEA12F1	440	284	512	668	86%	Yes
GLN12F2	440	398	512	668	86%	
APW112	477	436	557	618	86%	
F&C12F4	438	321	512	668	86%	

TABLE 3 PEAK FEEDER LOADING (2016-2018)

APPENDIX A - AVISTA GENERAL INFORMATION

A.1 GENERATION RESOURCES

Avista has a diverse mix of generation with a majority of its generation being hydro power based on various projects located on the Spokane River and Clark Fork River. Avista owns eight hydroelectric generating plants as well as coal (partial ownership), natural gas, and wood-waste combustion plants in five eastern Washington, northern Idaho, eastern Oregon, and eastern Montana locations. Avista also utilizes power supply purchase and sale arrangements of varying lengths to meet a portion of its load requirements. Table 4 through Table 6 summarize the operational capacities of Avista generating projects.

TABLE 4: AVISTA HYDROELECTRIC GENERATION RESOURCES.

Project Name	Fuel	Location	Area	Project Start Date	Maximum Capability (MW)F
Monroe Street	Spokane River	Spokane, WA	Spokane	1890	15.0
Post Falls	Spokane River	Post Falls, ID	CdA	1906	18.0
Nine Mile	Spokane River	Nine Mile Falls, WA	Spokane	1925	32.0
Little Falls	Spokane River	Ford, WA	Big Bend	1910	35.2
Long Lake	Spokane River	Ford, WA	Big Bend	1915	89.0
Upper Falls	Spokane River	Spokane, WA	Spokane	1922	10.2
Cabinet Gorge	Clark Fork River	Clark Fork, ID	CdA	1952	270.5
Noxon Rapids	Clark Fork River	Noxon, MT	CdA	1959	610.0
Total					1079.9

TABLE 5: AVISTA RENEWABLE GENERATION RESOURCES.

Project Name	Fuel	Location	Area	Project Start Date	Maximum Capability (MW)F
Palouse	Wind	Thornton, WA	Palouse	2012	104.0
Adams Neilson	Solar	Lind, WA	Big Bend	2018	19.2
Total					123.2

TABLE 6: AVISTA THERMAL GENERATION RESOURCES.

Project Name	Fuel	Location	Area	Project Start Date	Maximum Capability (MW)F
Colstrip 3&4 (15%)	Coal	Colstrip, MT	N/A	1984	247.0
Rathdrum (CT)	Gas	Rathdrum, ID	CdA	1995	176.0
Northeast (CT)	Gas	Spokane, WA	Spokane	1978	66.0
Boulder Park (IC)	Gas	Spokane, WA	Spokane	2002	24.6
Coyote Springs 2 (CC)	Gas	Boardman, OR	N/A	2003	317.5
Kettle Falls	Wood	Kettle Falls, WA	Big Bend	1983	50.7
Kettle Falls (CT)	Gas	Kettle Falls, WA	Big Bend	2002	11.0
Total					892.8

For more information on Avista's generation, please refer to the 2017 Integrated Resource Plan.

A.2 TRANSMISSION SYSTEM

Avista owns and operates a system of over 2,200 miles of electric transmission facilities which include approximately 685 miles of 230kV transmission lines and 1,527 miles of 115kV transmission lines. Figure 6 illustrates Avista's Transmission System within the region.

FIGURE 6 AVISTA TRANSMISSION LINE MAP

The Avista 230kV transmission lines are the backbone of Avista's Transmission System and consist of two networked systems centered near the Spokane/Coeur d'Alene area and the Lewiston/Clarkston area.

APPENDIX B - TRANSMISSION MODELS

B.1 PLANNING CASE DESCRIPTION

Avista's System Planning Group develops a set of base cases (Planning Cases) biannually to model its Transmission Planner and Planning Coordinator areas as well as the regional transmission system. The Planning Case development process outlined in the internal document ***TP-SPP-04 – Data for Power System Modeling and Analysis*** is used which includes using WECC approved base cases and applying steady state and dynamic data modifications as required to represent desired scenarios. The resulting Planning Cases represent a normal System condition (N-0). Planning Cases include the following:

- Existing facilities, new planned facilities and changes to existing facilities.
- Known outages of generation or transmission facilities with a duration of at greater than six months are represented. Presently, Avista does not have long duration planned outages.
- Forecasted real and reactive loads along with generation resources (supply or demand side) are modeled as described in ***TP-SPP-07 – Loads and Resources Data for Steady State and Dynamic Studies***.
- Known commitments for Firm Transmission Service and Interchange are incorporated. WECC Rated Paths are modeled with their published limits. Future commitments exceeding the limits of WECC Rated Paths are not presently studied.

The following scenarios were developed to represent various seasonal conditions:

- Heavy Summer – this is a typical summer peak scenario where the Avista Balancing Authority Area load is at peak. The local hydro generation is at mid-summer output levels, most thermal generation is on line, and moderate transfers are flowing into Avista's Balancing Authority Area. This scenario is limited by the summer thermal limits on various elements of the transmission system, which helps to identify where the system is near capacity.
- Light Summer – this is a typical summer night time scenario where the Avista Balancing Authority Area load is at a minimum.
- Heavy Winter – this is a typical winter peak scenario where the Avista Balancing Authority Area load is at peak. The local hydro generation is at late-winter output levels, most thermal generation is on line, and moderate transfers are flowing into Avista's Balancing Authority Area. This scenario represents Avista heaviest load conditions, but benefits from lower ambient temperature which increases the operating limits of the various elements of the Transmission System and power factors near unity.
- Light Winter – this is a typical winter night time scenario where the Avista Balancing Authority Area load is at a minimum.

- Light Spring – this is a typical late spring case that captures light loading conditions with high levels of generation. The local hydro generation is near full capacity due to spring runoff, local wind and solar generation is near full capacity, select thermal generation is off line for maintenance, and moderate transfers are flowing out of Avista's Balancing Authority Area. This scenario is also limited by the summer thermal limits on various elements of the transmission system, which helps to identify where the system is near capacity, due to power transfer.
- High East to West Transfer – this is a typical late spring case that captures light loading conditions with high levels of generation east of Avista's Balancing Authority Area. This scenario brings both West of Hatwai (Path 6) and Montana to Northwest (Path 8) up to their rated path limits. This scenario is also limited by the summer thermal limits on various elements of the transmission system, which helps to identify where the system is near capacity, due to power transfer.
- High West to East Transfer – this is a typical summer peak scenario where the Avista, Idaho Power and Northwestern Energy Balancing Authority Area load is near peak. The local hydro generation is at early-summer output levels, most thermal generation is off line, and moderate transfers are flowing across Avista's Balancing Authority Area to the west. This scenario is limited by the summer thermal limits on various elements of the transmission system, which helps to identify where the system is near capacity.