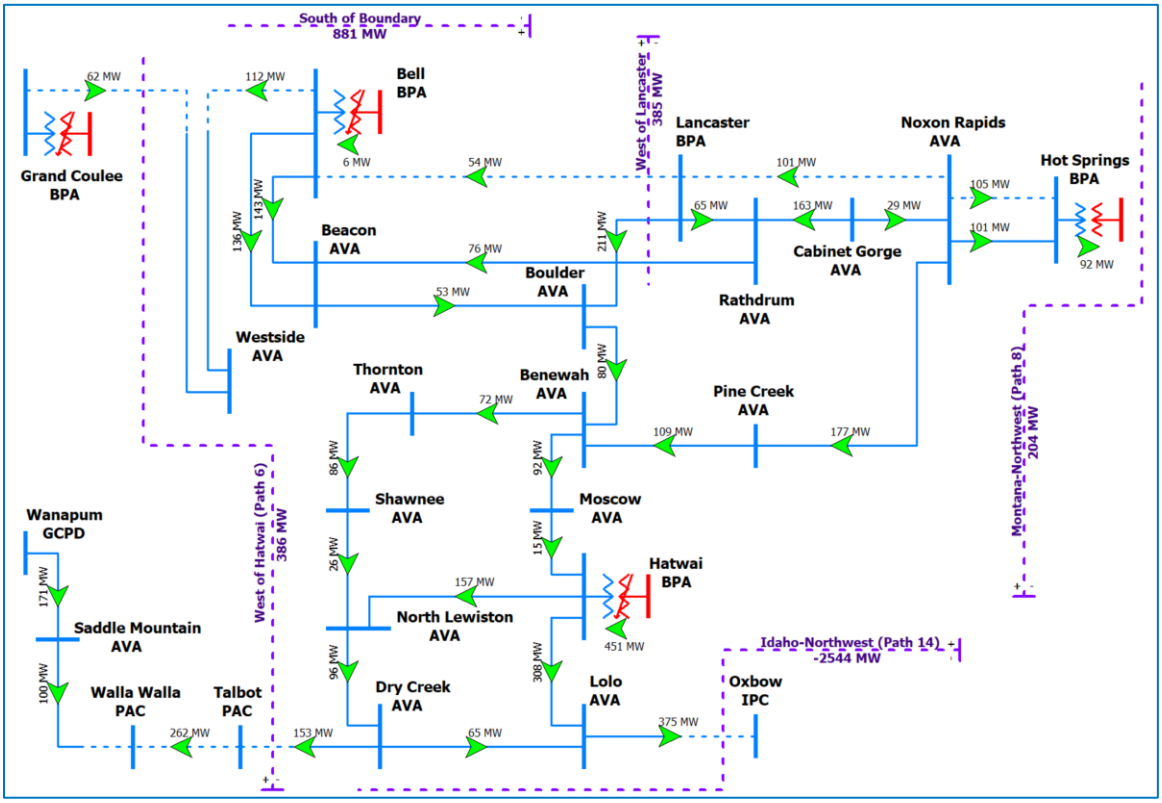
IRP Generation Integration Study

2024



Avista's 230kV Transmission System

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Version	Date	Description	Author	Review
A	3/26/24	Initial draft for scope & 1st order cost estimates	Spratt	Gross/Gall
B	7/26/24	Updates based on 2024 Cluster Study results	Spratt	Gross

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1. Generation Integration Study Request

Fall of 2023, Avista System Planning received a study request from Avista's Power Supply Department to refresh the 2021 study request, which identified system impacts from integrating additional generation for Native Load retail customers at the following interconnection points:

- New generation sites
  - Big Bend area near Lind 100MW
  - Big Bend area near Odessa 100, 200 and 300MW
  - Big Bend area near Othello 100, 200 and 300MW
  - Big Bend area near Reardan 50 and 100MW
  - Lewiston/Clarkston area 100, 200 and 300MW
  - Lower Granite area 100 and 300MW
  - Palouse area, near Benewah 100 and 200MW
  - Palouse area, near Tekoa 100 and 200MW
  - Rathdrum Prairie, near Greensferry Rd 100, 200, 300 and 400MW
  - Sandpoint area 50, 100 and 150MW
  - Tokio area, northeast of Ritzville 100 and 200MW
  - West Plains area, north of Airway Heights 100, 200 and 300MW
- Existing generation sites (increase capacity or add generation to existing POI)
  - Kettle Falls 50 and 100MW
  - Northeast CTs 50, 100 and 200MW
  - Palouse Wind (IPP) 100 and 200MW
  - Rathdrum CTs 25, 50, 100 and 200MW
  - Rattlesnake Flat Wind (IPP) 140MW

The scope of integration points did not need to be expanded or changed, so the following study mainly reflects increased integration costs due to recent increases in equipment costs and siting. The list was expanded to explore new generation in the Sandpoint area and a Battery Energy Energy Storage (BESS) at Northeast Station.

1.1. Results Summary

This study presents interconnection impacts and cost estimates associated with the integration of the above resources as Network Resource Interconnection Services (NRIS). During the study process, Avista's System Planning department conducts steady state power flow analysis to determine transmission system reinforcements necessary to integrate each project. Following is a summary of the study results:

POI Station or Area	Requested (MW)	POI Voltage	Cost Estimate ($ million)
Big Bend area near Lind (Tokio)	100/200	230kV	127.8
Big Bend area near Odessa	100/200/300	230kV	170.5
Big Bend area near Othello	100/200	230kV	216.8
Big Bend area near Othello	300	230kV	258.7
Big Bend area near Reardan	50	115kV	9.7
Big Bend area near Reardan	100	115kV	12.8
Lewiston/Clarkston area	100/200/300	230kV	1.9
Lower Granite area	100/200/300	230kV	2.9
Palouse area, near Benewah (Tekoa)	100/200	230kV	2.4
Rathdrum Prairie, north Greensferry Rd	100	230kV	34.0
Rathdrum Prairie, north Greensferry Rd	200/300/400	230kV	53.9
Sandpoint Area	50	115kV	1.6
Sandpoint Area	100/150	115kV	48.2
West Plains area north of Airway Heights	100/200/300	230kV	2.4

Table 1: New generation integration sites and estimate summary

POI Station or Area	Requested (MW)	POI Voltage	Cost Estimate ($ million)
Kettle Falls Station	50	115kV	1.6
Kettle Falls Station	100	115kV	19.0
Northeast Station	50	115kV	1.6
Northeast Station	100	115kV	7.7
Northeast Station	200	230kV	25.9
Palouse Wind, at Thornton Station	100/200	230kV	1.4
Rathdrum Station	25/50	115kV	11.1
Rathdrum Station	100	230kV	15.9
Rathdrum Station	200	230kV	48.4

Table 2: Existing generation integration sites and estimate summary

The Point of Interconnection (POI) estimates for integration onto Avista's existing transmission system, listed in Table 1, are based on previous IRP Generation Integration Studies and Large Generation Interconnection Request study results. The POI designations conform to Avista's *SP-SPP-02 – Facility Interconnection Requirements*.

2. Scope of Study

This study evaluates the impacts of the proposed interconnections on the reliability of the transmission system. Results are based on steady state continency analysis, operational knowledge of the system, and results from previous generation integration studies. The study considers existing generating facilities, pending senior queued serial process interconnection requests, and interconnection requests currently in Avista's

generation interconnection process. This study is for Avista's Power Supply Department to evaluate bundled retail service for native load customers only and does not replace tariffed generation interconnection process requirements for any future projects.

This interconnection study report includes the following information:

- Full contingency analysis identifying facility thermal and voltage violations resulting from the interconnection at the requested facility output level(s).
- Description and non-binding, good faith cost estimate of facilities required to interconnect the project to the Avista Transmission System and maintain reliable performance.

The transmission additions simulated in the study cases are based on the best information available at the time the study was initiated. The findings included in this study do not assure that the proposed Generation Project will be allowed to operate at full or reduced capacity under any or all operating conditions. Avista cannot guarantee future analysis (i.e. Transmission Service Requests or Operational Studies) will not identify additional problems or system constraints that require mitigation or reduced operation. It is possible that the actual plan of service will differ from the plan of service studied, and System Planning reserves the right to restudy this request if necessary.

This study utilizes the annual Cluster Study base cases. Refer to *Avista's 2024 Generator Interconnection Cluster Study Plan*[1] for additional information regarding the study cases used, assumptions, and methodology. Results will reflect only the most limiting scenario and will assume only one proposed generation interconnection point is on-line at a time to determine feasibility and the potential reinforcements required to integrate the new generation.

2.1. Large Generation Interconnection Request Summary

Prospective generation developers may request interconnection studies to understand the cost and timelines for integrating new generation projects. These requests follow an interconnection process outlined in Avista's Open Access Transmission Tariff (OATT) that has been accepted by FERC. After this process is complete, a contract offer to integrate the project may occur and negotiations can begin to enter into an interconnection agreement. Table 2 lists information associated with potential third-party resource additions currently in Avista's interconnection queue.[2]

Serial or Cluster Number	Output (MW)	Type	County	State	Point of Interconnection	Model
Q59	60	Solar/Storage	Adams	WA	Roxboro 115kV Station	No
Q60	150	Solar/Storage	Asotin	WA	Dry Creek 230kV Station	Yes
Q63	26	Hydro	Kootenai	ID	Post Falls 115kV Station	Yes
Q66	71	Wood Waste	Stevens	WA	Kettle Falls 115kV Station	Yes
Q97	100	Solar/Storage	Nez Perce	ID	Lolo 230kV Station	Yes
TCS-03	80	Solar/Storage	Adams	WA	Warden 115kV Station	Yes
TCS-14	375	Wind/Storage	Garfield	WA	Dry Creek 230kV Station	Yes
CS23-06	256	Wind	Whitman	WA	Shawnee - Thornton 230kV Line	No
CS23-12	199	Storage	Franklin	WA	AVAHub-04 230kV Station	No

[1] Generator_Interconnection_Cluster_Study_Plan_2023_-_V2.pdf (oati.com)
[2] Book1 (oati.com)

Serial or Cluster Number	Output (MW)	Type	County	State	Point of Interconnection	Model
CS23-13	40	Solar	Lincoln	WA	Davenport 115kV Station	No
CS23-14	40	Solar	Spokane	WA	North Fairchild 115kV Line Tap	No
CS24-01	1.1	Solar	Adams	WA	South Othello 13kV feeder	No
CS24-02	0.5	Storage	Spokane	WA	Third & Hatch 13kV feeder	No
CS24-03	150	Storage	Adams	WA	Saddle Mountain 115kV Station	No
CS24-04	100	Storage	Spokane	WA	Benewah 230kV Station	No
CS24-05	203	Natural Gas CT	Kootenai	ID	Rathdrum 230/115kV Station	No
CS24-06	120	Natural Gas CT	Bonner	ID	Bronx 115kV Station	No
CS24-07	2	Solar	Adams	WA	Othello 13kV feeder	No
CS24-08	199	Solar/Storage	Franklin	WA	AVAHub-04 230kV Station	No
CS24-09	9.5	Solar	Adams	WA	Othello 13kV feeder	No
CS24-10	80	Solar/Storage	Spokane	WA	Spangle 115kV Station	No
CS24-11	70	Solar	Whitman	WA	Thornton 230kV Station	No
CS24-12	40	Solar	Whitman	WA	Shawnee-Sunset 115kV Line	No
CS24-13	95	Solar	Whitman	WA	Benewah-Thornton 230kV Line	No
CS24-14	40	Solar	Spokane	WA	South Fairchild 115kV Line Tap	No
CS24-15	300	Wind/Storage	Lincoln	WA	Bluebird 230kV Station	No

Table 3: Existing Large Generation Interconnection Requests

2.2. Typical LGIR Integration Discussion

Large Generation Interconnection Requests (LGIR) are typically integrated onto Avista's transmission system at 115kV or 230kV. The backbone of the Avista transmission system is operated at 230kV. A station-level drawing of Avista's 230kV Transmission System including interconnections to neighboring utilities is shown below.

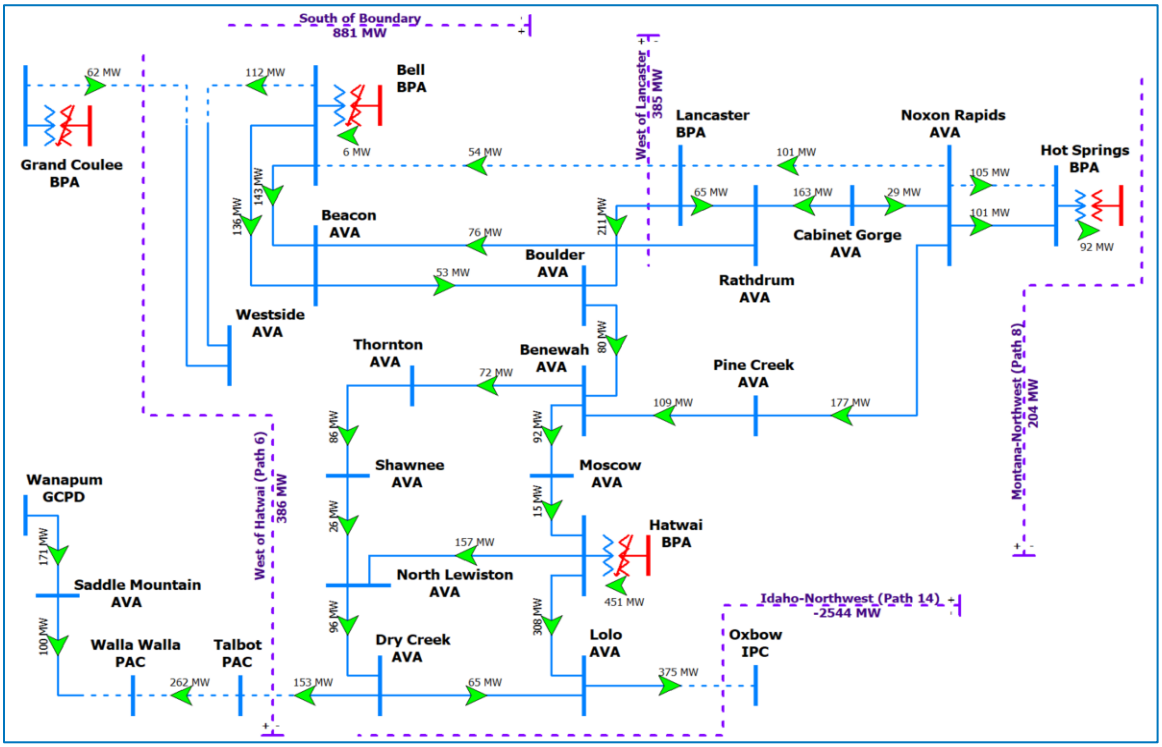

Figure 1: Avista 230kV transmission system, heavy summer 2029

Avista's 230kV Transmission System is interconnected to the Bonneville Power Administration's (BPA) 500kV transmission system at the Bell, Grand Coulee, Hatwai, and Hot Springs Stations.

The following sections describe the proposed generating facilities that have requested integration onto Avista's Transmission System. Assumptions, alternatives, and system performance are detailed for each individual Point of Interconnection (POI).

3. New Generation Integration Sites

3.1. Big Bend Area near Lind (Tokio)

3.1.1. Project description and one-line diagram

The following evaluates the impacts of integrating 100 to 200MW of new generation onto Avista's transmission system in the Lind area. The 115kV system in the Big Bend area, specifically the Lind area, is at capacity with local renewable generation using most of the existing transmission capacity. Local generation is currently curtailed under N-1 conditions. Adding generation only exacerbates the known issues. Previous studies have shown that new generation in this area will require an expansion of the 230kV network into the area.

This study will assume that the 1st phase of the 230kV expansion would add a 230kV hub approximately 15 miles east of Lind then build a 46-mile radial 230kV transmission line connecting the new hub station into Avista's primary load center with a termination at the Thornton Station. This request was modeled as a new 230kV system expansion as shown below.

These results are similar for the request at Tokio, given this location is withing 20 miles of 230kV network expansion.

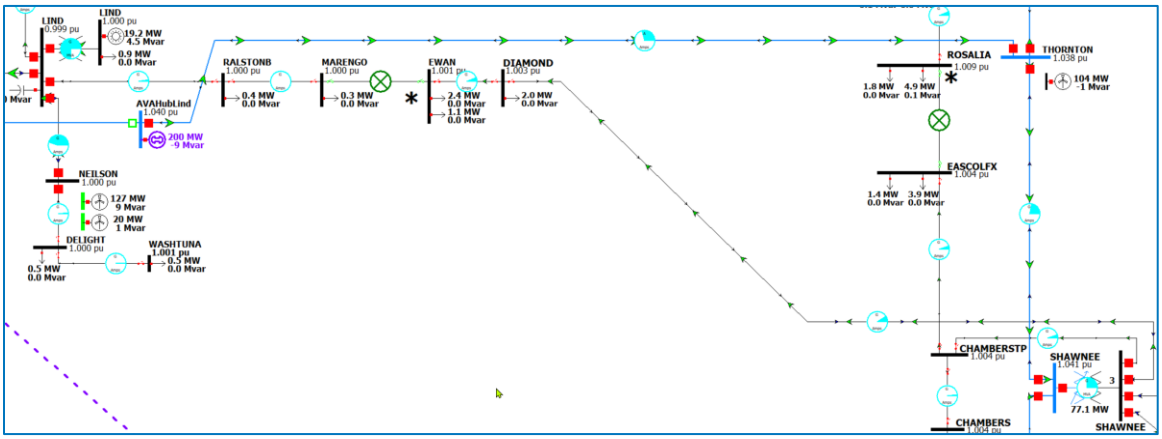

Figure 2: New generation at 230kV near Lind flowing into Thornton, heavy summer 2029

System performance in this area is dominated by several factors:

- This 230kV expansion transfers the proposed generation into the Palouse area.
- System flows are typically north to south.
- Existing local generation (104MW) at Palouse Wind.

In general, new generation in this area will sink into local load. As the local load service is met the additional power will flow south into the Lewiston/Clarkston load center.

3.1.2. Contingency Analysis

The worst system performance was during heavy summer conditions with high north to south ID-NW transfers. The issues identified below can be mitigated by adjustments to ID-NW flows. The spring and winter scenarios did not identify any issues.

Row Labels	29HS Base	29HS 100MW	29HS 200MW
P1			
T-1: Bell #6 230/115kV			
Beacon - Bell #1 115 kV	103.1	103.7	104.4
Beacon - Northeast 115 kV			95.1
P2			
BF: BEA A600, Beacon North & South Bus Tie			
Francis and Cedar - Northwest 115 kV	102.5	101.9	101.2
Northwest - Westside 115 kV	101.1	100.6	100.1
BF: BEA R427, Beacon Bus Tie			
Boulder - Irvin #1 115 kV (Boulder - Spokane Industrial Park)			95.3
BF: BELL A370, Bell S1 & S2 230kV			
Beacon - Bell #1 115 kV	100.4	101.1	101.8
BF: BELL A388, Bell S2 & S3 230kV			
Beacon - Bell #1 115 kV	96.3	97.1	98.1
BF: BLD A713, Boulder - Otis Orchards #1			
Boulder - Irvin #2 115 kV			98.1
BUS: Bell S2 230kV			
Beacon - Bell #1 115 kV	101.2	101.8	102.6
BUS: Boulder West 115kV			
Boulder - Irvin #2 115 kV		96.2	99.4

Table 4: Contingency results, heavy summer 2029

The worst performing contingency is a loss of both the Benewah – Thornton 230kV and North Lewiston – Shawnee 230kV Transmission Lines (N-1-1) forcing all the 230kV connected generation through the underlying 115k system as shown below.

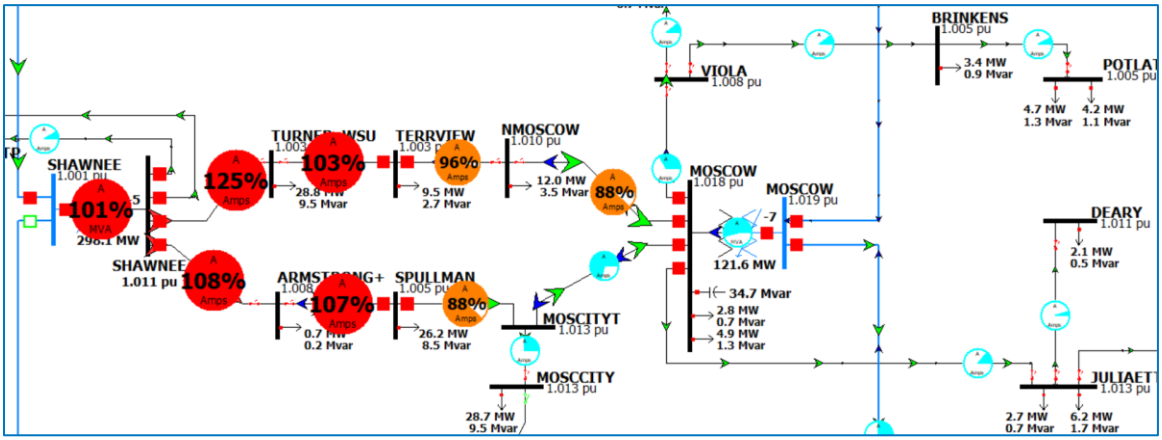

Figure 3: Worst performing contingency, heavy summer 2029

Generation would have to be curtailed during an outage of either of these 230kV transmission lines.

3.1.3. Weak System Analysis

A three-phase short circuit fault at this new radially fed 230kV hub is approximately 1,000MVA, therefore new generation would be limited to about 300MW to maintain grid stability. Generation additions beyond this limit, would require a second 230kV line into the Lind area to correct the weak grid issue.

3.1.4. Integration costs

The Thornton Station has a 230kV ring bus arrangement with space for a one new 230kV line.

POI Station or Area	Cost Estimate ($ million)
Point of Interconnection Station	
New AVAHubLind Station – property, termination, comms and metering	18.8
Projects necessary to mitigate new system violations at 100/200MW	
New (46) mile AVAHubLind-Thornton 230kV SCT transmission line	107.6
New 230kV line position at Thornton Station	1.4
total	***127.8***

Table 5: Generation integration estimate

Estimates assume that the Interconnection Customer will be responsible for the lead line up to the change of ownership, which is a dead-end tower at the POI Station.

3.2. Big Bend Area near Odessa

3.2.1. Project description and one-line diagram

The following evaluates the impacts of integrating 100 to 300MW of new generation onto Avista's transmission system in the Odessa area. The 115kV system in the Odessa area is near capacity and existing generation at Devils Gap and Stratford is already being curtailed for multiple N-1 operational issues. Previous studies have shown that new generation in this area will require an expansion of the 230kV network.

This study assumes that the first phase of that expansion would add a 230kV hub near Odessa Station, then build a (64) mile radial 230kV transmission line to connect the new hub station into Avista's primary load center with a termination at the planned Bluebird Station. This request was modeled as a new 230kV system expansion as shown below.

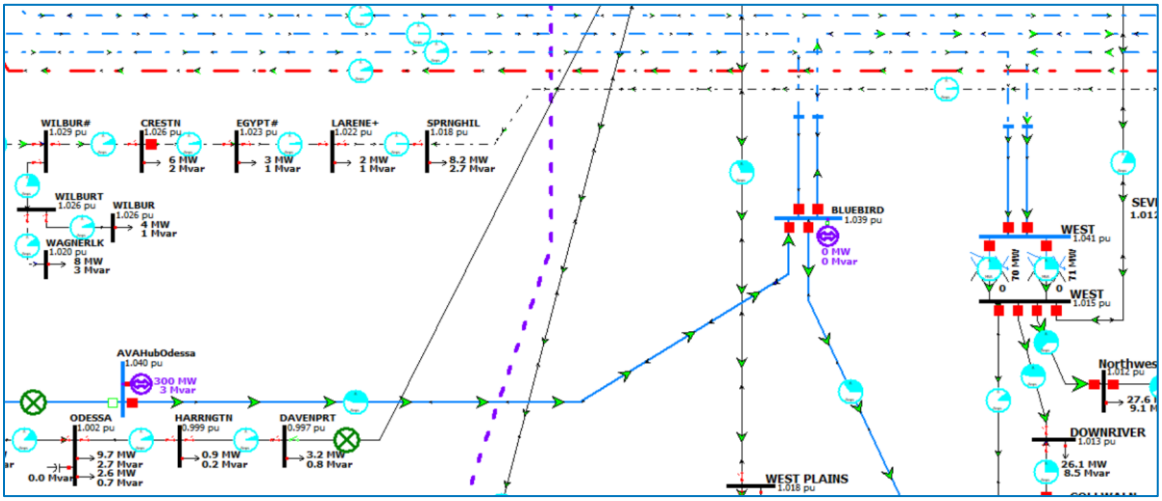

Figure 4: New generation at 230kV near Odessa flowing into Bluebird, heavy summer 2029

System performance in this area is dominated by several factors:

- 230kV expansion transfers the proposed generation into the West Plains area.
- System flows are typically east to west in the spring and west to east during heavy summer.
- There is no existing local generation.

In general, new generation in this area will sink into local load. As the local load service is met the additional power will flow east into the greater Spokane area.

3.2.2. Contingency Analysis

The worst system performance was during heavy summer conditions. The issues identified below result from moving power from the West Plains into the downtown Spokane load center. The spring and winter scenarios did not identify any issues.

Row Labels	29HS Base	29HS 100MW	29HS 200MW	29HS 300MW
P1				
T-1: Bell #6 230/115kV				
Beacon - Bell #1 115 kV	103.1	104	104.9	105.9
Beacon - Northeast 115 kV			95.6	96.4
P2				
BF: BEA A600, Beacon North & South Bus Tie				
Francis and Cedar - Northwest 115 kV	102.5	100.8	99.3	97.9
Northwest - Westside 115 kV	101.1	99.7	98.6	97.5
BF: BELL A370, Bell S1 & S2 230kV				
Beacon - Bell #1 115 kV	100.4	101.5	102.7	103.8
BF: BELL A388, Bell S2 & S3 230kV				
Beacon - Bell #1 115 kV	96.3	97.4	98.7	99.9
BUS: Bell S2 230kV				
Beacon - Bell #1 115 kV	101.2	102.3	103.4	104.6
Beacon - Northeast 115 kV				95.3

Table 6: Contingency Results, heavy summer 2029

The worst performing contingency is a loss of both the Bell – Bluebird 230kV and Bluebird - Coulee 230kV Transmission Lines (N-1-1) forcing all the 230kV connected generation through the underlying 115k system as shown below.

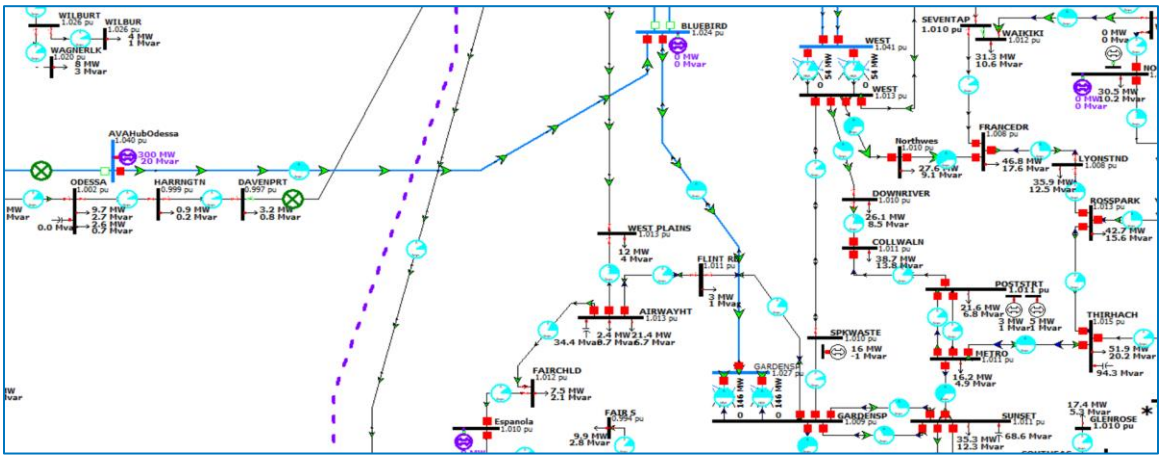

Figure 5: Worst performing contingency, heavy summer 2029

The area load and recent 115kV system reinforcements help to reliably transfer the new generation into the Spokane load center.

3.2.3. Weak System Analysis

A three-phase short circuit fault at this new radially fed 230kV hub is approximately 940MVA, therefore new generation would be limited to about 300MW to maintain grid stability. Generation additions beyond this limit, would require a second 230kV line into the Odessa area to correct the weak grid issue.

3.2.4. Integration costs

The planned Bluebird Station has a 230kV double breaker double bus arrangement with space for a new line position.

POI Station or Area	Cost Estimate ($ million)
Point of Interconnection Station	
New AVAHubOdessa Station – property, termination, comms and metering	18.8
Projects necessary to mitigate new system violations at 100/200/300MW	
New (64) mile AVAHubOdessa-Bluebird 230kV SCT transmission line	149.8
New 230kV line position at Bluebird Station	1.9
total	***170.5***

Table 7: Generation integration estimate

Estimates assume that the Interconnection Customer will be responsible for the lead line up to the change of ownership, which is a dead-end tower at the POI Station.

3.3. Big Bend Area near Othello

3.3.1. Project description and one-line diagram

The following evaluates the impacts of integrating 100 to 300MW of new generation onto Avista's transmission system in the Othello area. The 115kV system in the Big

Bend area is at capacity. Local generation is currently curtailed under N-1 conditions. Adding generation only exacerbates the known issues. Previous studies have shown that new generation in this area will require an expansion of the 230kV network into the area.

This study assumes that the second phase of a 230kV expansion would add another 230kV hub approximately 6 miles east of Othello, then Avista would build a (30+46) mile radial 230kV transmission line connecting the new hub station into Avista's primary load center with a termination at the Thornton station. This request was modeled as a new 230kV system expansion as shown below.

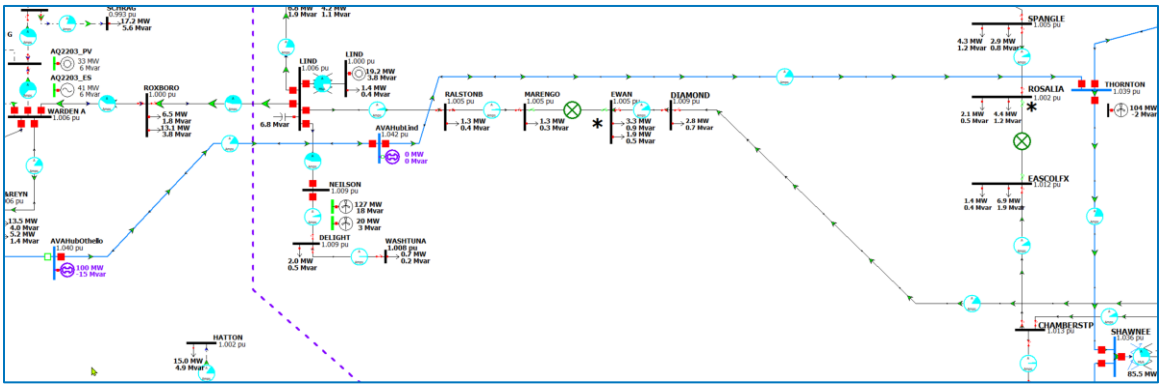

Figure 6: New generation at 230kV near Othello flowing into Thornton, heavy summer 2029

System performance in this area is dominated by several factors:

- 230kV expansion transfers the proposed generation into the Palouse area.
- System flows are typically north to south.
- Existing local generation (104 MW) from Palouse Wind.

In general, new generation in this area will sink into local load. As the local load service is met the additional power will flow south into the Lewiston/Clarkston load center.

Additionally, this long of a radial 230kV line will only support about 150MW due to weak grid issues. To meet the 300MW generation requested, the above 230kV expansion would also need to be networked. This will require an additional 17 miles of new 230kV transmission line and a new 230kV line termination into the existing Saddle Mountain Station as shown below.

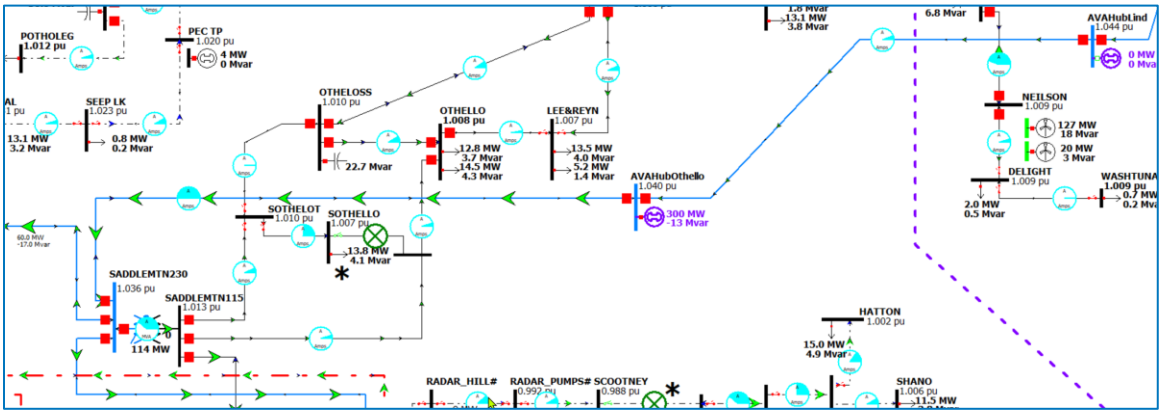

Figure 7: New generation at 230kV networked into Saddle Mountain, heavy summer 2029

Completing the 230kV network to Saddle Mountain shifts the bulk of power transfers to the west and moves the generation to the west side of the West of Hatwai (Path 6) cut plain.

3.3.2. Contingency Analysis

The worst system performance was during heavy summer conditions with high north to south ID-NW transfers. The issues identified below can be mitigated by adjustments to ID-NW flows. The spring and winter scenarios did not identify any issues.

Row Labels	29HS Base	29HS 100MW	29HS 200MW	29HS 300MW
P1				
N-1: Sand Dunes - Warden 115kV				
WARDEN A (48455) -> WARDEN T (46117) CKT 1 at WARDEN A			97.7	103.7
T-1: Bell #6 230/115kV				
Beacon - Bell #1 115 kV	102.9	104.4	103.2	103.4
Beacon - Northeast 115 kV		95.1		
P2				
BF: BEA A600, Beacon North & South Bus Tie				
Francis and Cedar - Northwest 115 kV	102.5	101.8	102.8	102.6
Northwest - Westside 115 kV	101.1	100.6	101.4	101.2
BF: BELL A370, Bell S1 & S2 230kV				
Beacon - Bell #1 115 kV	100.3	101.8	100.6	100.8
BF: BELL A388, Bell S2 & S3 230kV				
Beacon - Bell #1 115 kV	96.1	97.8	96.3	96.6
BF: BLD A713, Boulder - Otis Orchards #1				
Boulder - Irvin #2 115 kV		96.2		
BUS: Bell S2 230kV				
Beacon - Bell #1 115 kV	101.1	102.5	101.4	101.6
BUS: Boulder West 115kV				
Boulder - Irvin #2 115 kV		97.6		
BUS: Sand Dunes 115kV				
WARDEN A (48455) -> WARDEN T (46117) CKT 1 at WARDEN T			95.7	101.2

Table 8: Contingency results, heavy summer 2029

The worst performing contingency is a loss of both the Saddle Mountain - Wanapum 230kV and Saddle Mountain – Walla Walla 230kV Transmission Lines (N-1-1) forcing all the 230kV connected generation through the underlying 115k system as shown below.

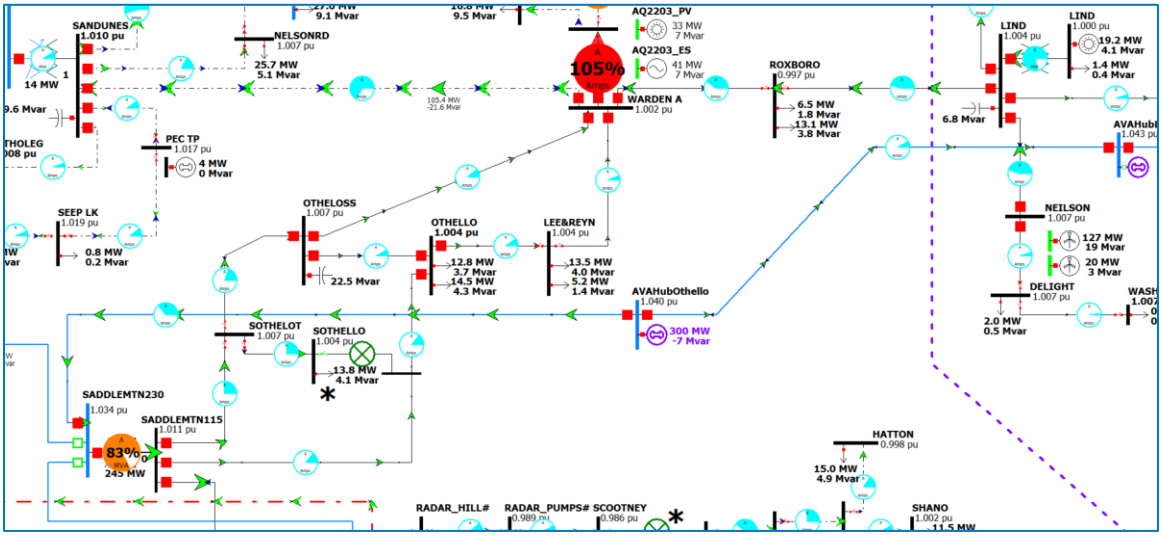

Figure 8: Worst performing contingency, heavy summer 2029

The bottleneck at Warden into GCPD's system is a known issue and is a LGIR contingent facility that may be corrected.

3.3.3. Weak System Analysis

A three-phase short circuit fault at the new longer radially fed 230kV hub is approximately 690MVA, therefore new generation would be limited to about 200MW to maintain grid stability. Generation additions beyond this limit, would require a second 230kV line into the area to correct the weak grid issue.

3.3.4. Integration costs

The Thornton Station has a 230kV ring bus arrangement with space for a one new 230kV line. The Saddle Mountain Station additionally has space to terminate a new line position.

POI Station or Area	Cost Estimate ($ million)
Point of Interconnection Station	
New AVAHubOthello station – property, termination, comms and metering	18.8
Projects necessary to mitigate new system violations at 100/200MW	
New AVAHubLind station – property, termination, comms and metering	18.8
New (46) mile AVAHubLind-Thornton 230kV transmission line	107.6
New (30) mile AVAHubLind- AVAHubOthello 230kV transmission line	70.2
New 230kV line position at Thornton Station	1.4
total radial	***216.8***
Projects necessary to mitigate new system violations at 300MW	
New AVAHubLind Station – property, termination, comms and metering	18.8
New (46) mile AVAHub05-Shawnee 230kV SCT transmission line	107.6
New (30) mile AVAHub05- AVAHub06 230kV SCT transmission line	70.2
New 230kV line position and xfmr breaker at Shawnee Station	1.4
New (17) mile AVAHub06- SaddleMtn 230kV SCT transmission line	39.8
New 230kV line position at Saddle Mountain Station	2.1
total networked	***258.7***

Table 9: Generation integration estimate

Estimates assume that the Interconnection Customer will be responsible for the lead line up to the change of ownership, which is a dead-end tower at the POI Station.

3.4. Big Bend Area near Reardan

3.4.1. Project description and one-line diagram

The following evaluates the impacts of integrating 50 to 100MW of new generation onto Avista's transmission system in the Big Bend area near Reardan. The Devils Gap – Lind 115 kV line is normally operated open at Ritzville, therefore any additional generation will flow north into Devils Gap, where the local hydro generation is using most of the existing transmission capacity. Local generation is currently curtailed under N-1 conditions. Adding generation only exacerbates the known issues as shown below.

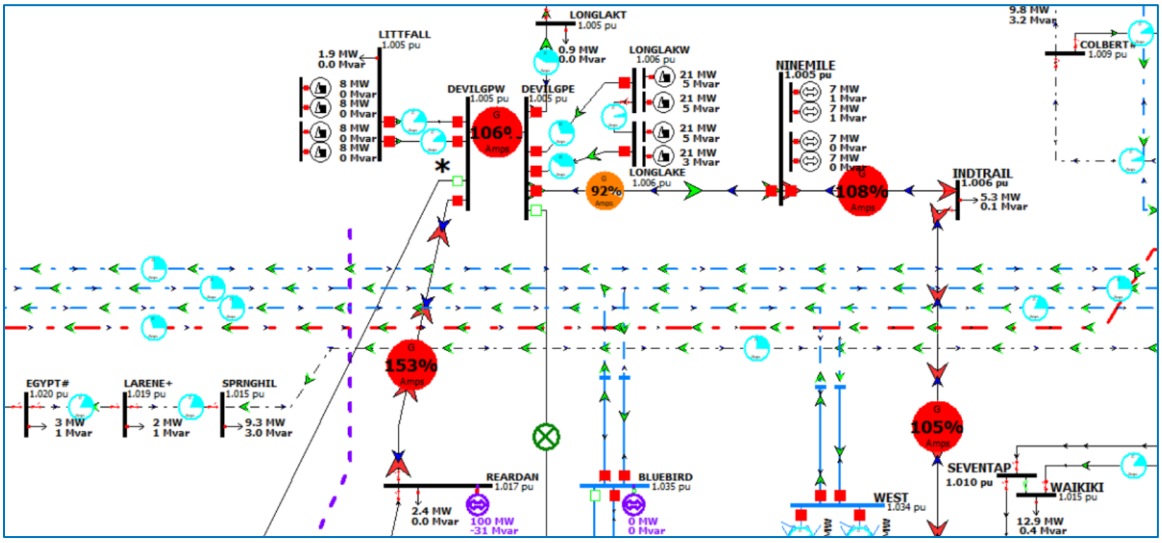

Figure 9: New generation at Reardan flowing into Devils Gap, light spring 2029

Given the existing 115kV system into Devils Gap is near capacity, this request was modeled as a new 115kV switching station in the West Plains load center near Espanola on the Airway Heights – Melville 115kV line as shown below.

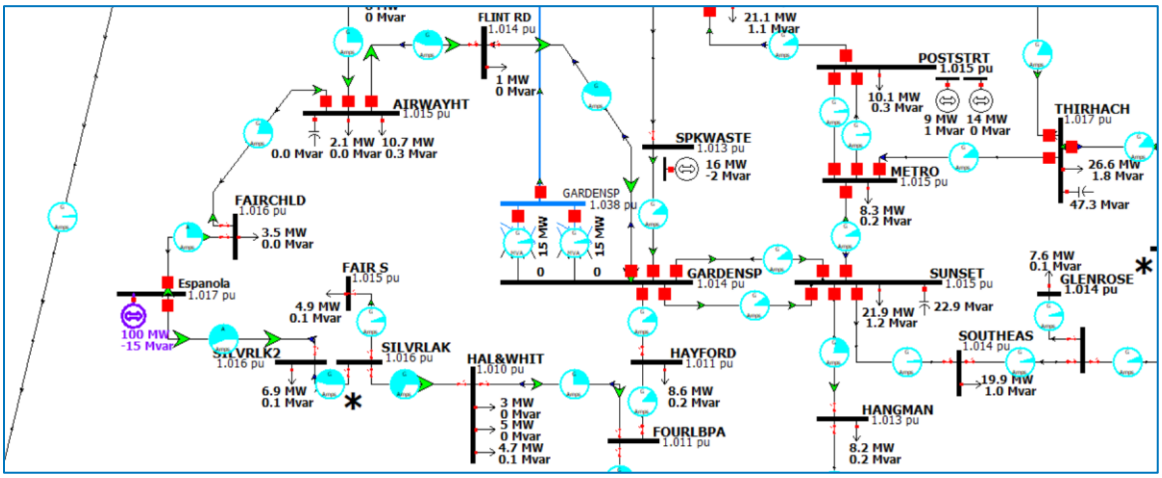

Figure 10: New generation flowing into the West Plains, light spring 2029

System performance in this area is dominated by several factors:

- 115kV expansion transfers the proposed generation into the West Plains area.
- West Plains area load ranges between 77MW and 160MW.
- Existing local generation (18MW) at Waste to Energy.

In general, new generation in this area will sink into local load. As the local load service is met the additional power will east into the downtown Spokane load center.

3.4.2. Contingency Analysis

Worst system performance was during light spring conditions with high east to west transfers and during heavy summer conditions. Outages on the 230kV system results in overloads on the underlying 115kV system, as shown below. The winter scenarios did not identify any issues.

The worst system performance was during light spring conditions with high north to south ID-NW transfers. The issues identified below can be mitigated by adjustments to ID-NW flows. The spring and winter scenarios did not identify any issues.

Row Labels	29LSp Base	29LSp 50MW	29LSp 100MW
P1			
N-1: Airway Heights - Garden Springs 115kV			
South Fairchild Tap 115kV (SLK Tap-H&W)			117.3
N-1: Airway Heights - Silver Lake 115kV			
South Fairchild Tap 115kV (SLK Tap-H&W)			102.8
P2			
BF: AIR A180, Airway Heights - Devils Gap			
South Fairchild Tap 115kV (SLK Tap-H&W)			102.7
BF: AIR A182, Airway Heights - Garden Springs 115kV			
South Fairchild Tap 115kV (SLK Tap-H&W)			102.7
BF: GDN A1303, Airway Heights - Garden Springs 115kV, Garden Springs - Westside 115kV			
South Fairchild Tap 115kV (SLK Tap-H&W)			119.2

BUS: Airway Heights 115kV			
South Fairchild Tap 115kV (SLK Tap-H&W)			102.7
P2.1			
N-1: Airway Heights - Garden Springs 115kV Open @ AIR			
South Fairchild Tap 115kV (SLK Tap-H&W)			117.3
N-1: Airway Heights - Garden Springs 115kV Open @ GDN			
South Fairchild Tap 115kV (SLK Tap-H&W)			116.2
N-1: Airway Heights - Silver Lake 115kV Open @ AIR			
South Fairchild Tap 115kV (SLK Tap-H&W)			102.8
N-1: Garden Springs - Silver Lake 115kV Open @ AIR			
South Fairchild Tap 115kV (SLK Tap-H&W)			102.8
N-1: Lind - Warden 115kV Open @ LIN			

Table 10: Contingency results, light spring 2029

The worst performing N-1 contingency is shown below.

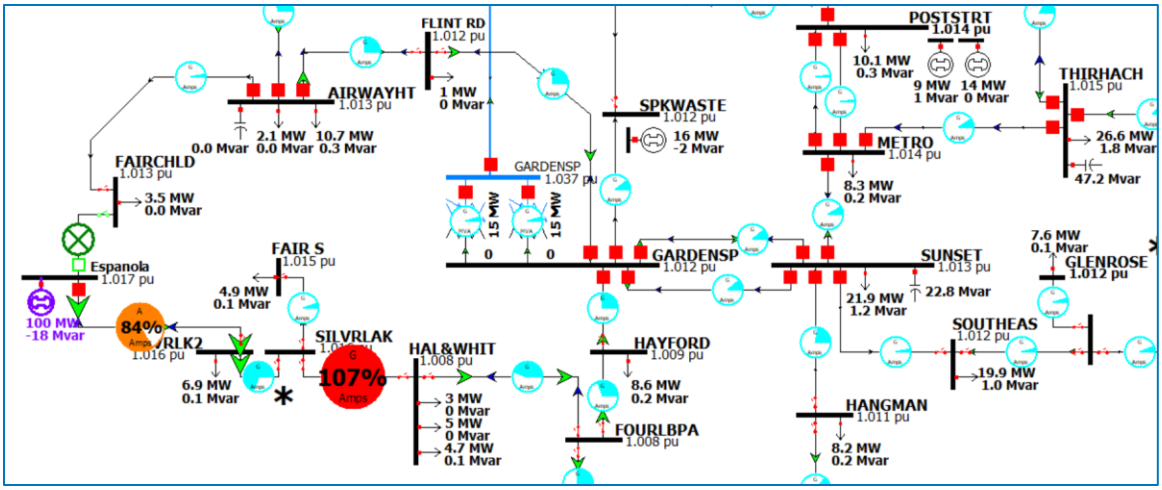

Figure 11: Worst performing contingency, light spring 2029

3.4.3. Integration costs

Integration will require a new Avista 115kV POI station on the west edge of the West Plains 115kV system.

POI Station or Area	Cost Estimate ($ million)
Point of Interconnection Station	
New 115kV Espanola Station – property, termination, comms and metering	9.1
Loop-in AirwayHeights-Silverlake 115kV into POI Station	0.6
Projects necessary to mitigate new system violations at 50MW	
None	0
total	***9.7***
Projects necessary to mitigate new system violations at 100MW	
Rebuild Hallet&White-Silverlake 115kV (fix 3.4mi 4/0acsr)	3.1
total	***12.8***

Table 11: Generation integration estimate

Estimates assume that the Interconnection Customer will be responsible for the lead line up to the change of ownership, which is a dead-end tower at the POI Station.

3.5. Lewiston/Clarkston Area

3.5.1. Project description and one-line diagram

The following evaluates the impacts of integrating 100 to 300MW of new generation onto Avista's transmission system in the Lewiston/Clarkston area. This request was modeled as a new 230kV line position at the Lolo Station as shown below.

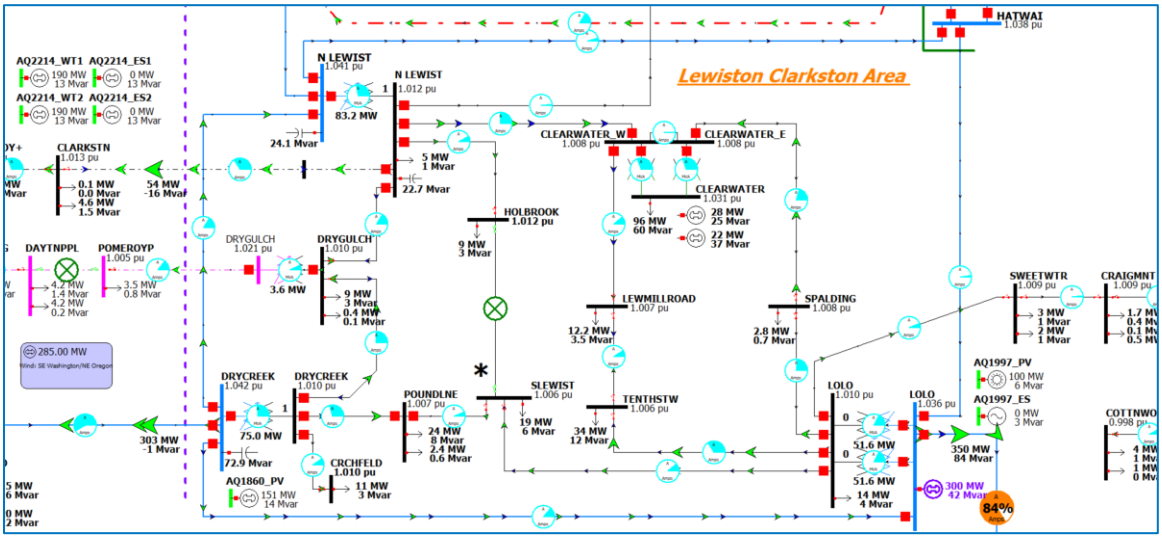

Figure 12: New generation at Lolo 230kV, heavy summer 2029

System performance in this area is dominated by several factors:

- High ID-NW transfers south in late spring and early summer. Idaho Power manages ID-NW flows and will insert line reactors or redispatch generation to mitigate overloads on the Lolo-Oxbow 230kV line.
- Large wind penetration to the west around the Walla Walla and Wallula load centers.
- Existing local generation (behind the meter 48MW) from Potlatch Forest Industries.
- New renewable generation at Dry Creek (375MW Wind/BESS on-line in 2026).
- The Longhorn – Hemingway 500kV modeled in-service in 2026.

In general, new generation in this area will sink into local load. As the local load service is met the additional power will flow south into Idaho, west into southeast Washington or up onto BPA's 500kV system at Hatwai.

3.5.2. Contingency Analysis

The worst system performance was during heavy summer conditions with high north to south ID-NW transfers. The issues identified below can be mitigated by adjustments to ID-NW flows. The spring and winter scenarios did not identify any issues.

Row Labels	29HS Base	29HS 100MW	29HS 200MW	29HS 300MW
PI				

N-1: Brownlee - Hells Canyon 230kV				
Lolo - Oxbow 230 kV (Lolo - Imnaha)			95.7	97.4
N-1: Hemingway-Longhorn 500kV				
Lolo - Oxbow 230 kV (Lolo - Imnaha)		96.1	97.8	99.5
T-1: Bell #6 230/115kV				
Beacon - Bell #1 115 kV	103.2	103.6	103.9	104.3
Beacon - Northeast 115 kV				95.1
P2				
BF: BEA A600, Beacon North & South Bus Tie				
Francis and Cedar - Northwest 115 kV	102.8	102.5	102.3	102
Northwest - Westside 115 kV	101.3	101.1	100.9	100.7
BF: BELL A370, Bell S1 & S2 230kV				
Beacon - Bell #1 115 kV	100.6	101	101.3	101.7
BF: BELL A388, Bell S2 & S3 230kV				
Beacon - Bell #1 115 kV	96.4	96.8	97.3	97.8
BF: BLD A713, Boulder - Otis Orchards #1				
Boulder - Irvin #2 115 kV				95
BUS: Bell S2 230kV				
Beacon - Bell #1 115 kV	101.4	101.7	102.1	102.5
BUS: Boulder West 115kV				
Boulder - Irvin #2 115 kV			95.3	96.5
P7				
N-2: Brownlee - Hells Canyon 230kV & Brownlee - Oxbow #1 230kV				
Lolo - Oxbow 230 kV (Lolo - Imnaha)				95.5

Table 12: Contingency results, heavy summer 2029

The worst performing contingency is the loss of both the Long Horn – Hemingway 500kV Transmission Line (N-1) shown below.

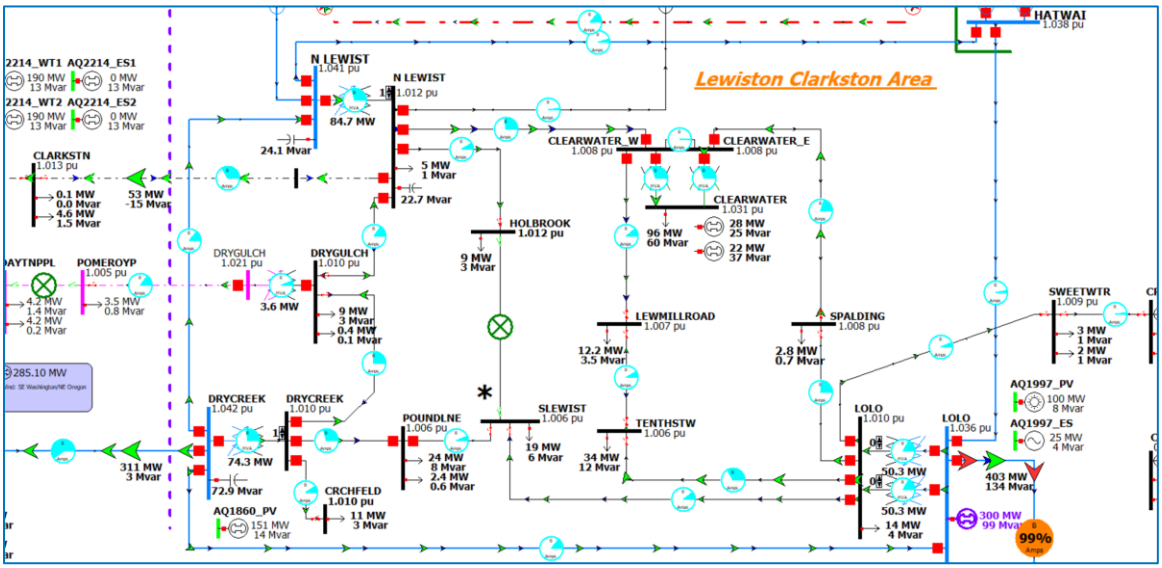

Figure 13: Worst performing contingency, heavy summer 2029

3.5.3. Integration costs

The Lolo Station has a 230kV double breaker double bus arrangement with space for a new line position.

POI Station or Area	Cost Estimate ($ million)
Point of Interconnection Station	
New 230kV position at Lolo Station	1.9
Projects necessary to mitigate new system violations at 100/200/300MW	
None	0
total	***1.9***

Table 13: Generation integration estimate

Estimates assume that the Interconnection Customer will be responsible for the lead line up to the change of ownership, which is a dead-end tower at the POI Station.

3.6. Lower Granite Area

3.6.1. Project description and one-line diagram

The following evaluates the impacts of integrating 100 to 300MW of new generation, north of Lower Granite Dam, onto Avista's transmission system in the Palouse area. This request was modeled as a new 230kV line position at Shawnee Station as shown below.

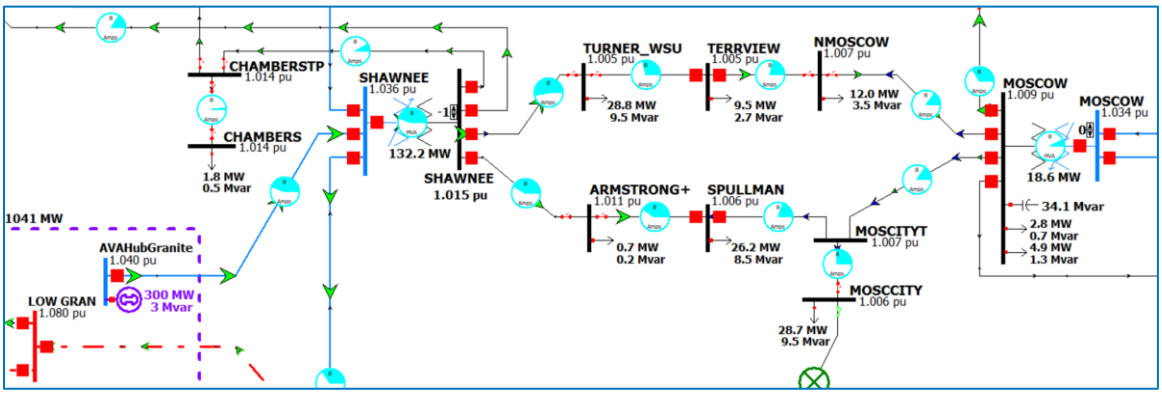

Figure 14: New generation near Lower Granite flowing into Shawnee, heavy summer 2029

System performance in this area is dominated by several factors:

- System flows are typically north to south.
- Existing local generation (104 MW) from Palouse Wind.

In general, new generation in this area will sink into local load. As the local load service is met the additional power will flow south into the Lewiston/Clarkston load center.

3.6.2. Contingency Analysis

The worst system performance was during heavy summer conditions with high north to south ID-NW transfers. The issues identified below can be mitigated by adjustments to ID-NW flows. The spring and winter scenarios did not identify any issues.

Row Labels	29HS Base	29HS 100MW	29HS 200MW	29HS 300MW
PI				
N-1: Brownlee - Hells Canyon 230kV				
Lolo - Oxbow 230 kV (Lolo - Imnaha)			**95.8**	**96.7**

N-1: Hemingway-Longhorn 500kV				
Lolo - Oxbow 230 kV (Lolo - Imnaha)	95.4	96.3	97.3	98.2
T-1: Bell #6 230/115kV				
Beacon - Bell #1 115 kV	103.1	103.7	104.2	104.8
Beacon - Northeast 115 kV			95	95.5
P2				
BF: BEA A600, Beacon North & South Bus Tie				
Francis and Cedar - Northwest 115 kV	102.9	102.4	101.9	101.4
Northwest - Westside 115 kV	101.4	101	100.6	100.2
BF: BELL A370, Bell S1 & S2 230kV				
Beacon - Bell #1 115 kV	100.5	101.1	101.6	102.3
BF: BELL A388, Bell S2 & S3 230kV				
Beacon - Bell #1 115 kV	96.2	97	97.7	98.5
BF: BLD A713, Boulder - Otis Orchards #1				
Boulder - Irvin #2 115 kV			95.8	98.1
BUS: Bell S2 230kV				
Beacon - Bell #1 115 kV	101.3	101.8	102.4	103
BUS: Boulder West 115kV				
Boulder - Irvin #2 115 kV			97.2	99.5
P7				
N-2: Brownlee - Hells Canyon 230kV & Lolo - Oxbow 230kV				
MCNRY S1 (41351) -> ROUNDUP (40905) CKT 1 at ROUNDUP	96.5	96.5	96.5	96.7

Table 14: Contingency results, heavy summer 2029

The worst performing contingency is a loss of both the Benewah – Thornton 230kV and North Lewiston – Shawnee 230kV Transmission Lines (N-1-1) forcing all the 230kV connected generation through the underlying 115k system as shown below.

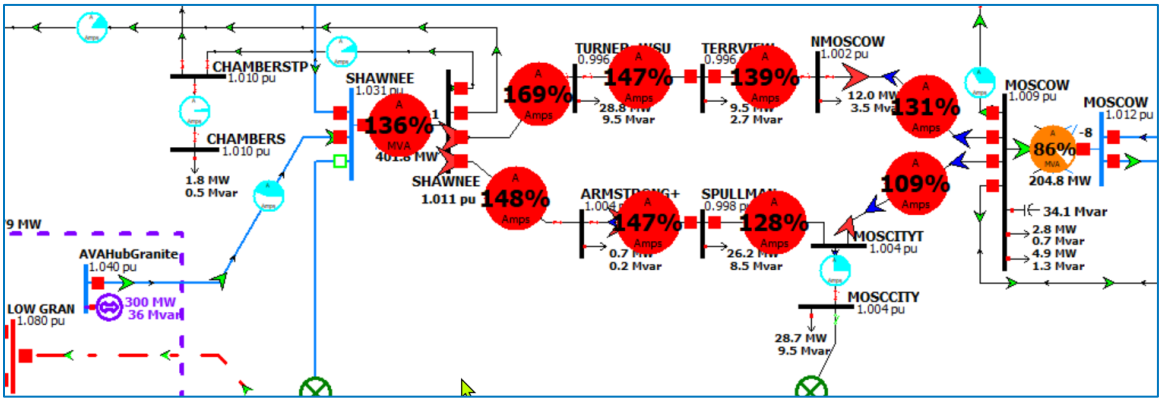

Figure 15: Worst performing contingency, heavy summer 2029

Generation would have to be curtailed during an outage of either of these 230kV transmission lines.

3.6.3. Integration costs

The Shawnee Station has a 230kV main/aux arrangement with space for a new line position and will also require a new 230kV auxiliary circuit breaker for reliability.

POI Station or Area	Cost Estimate ($ million)
Point of Interconnection Station	
New 230kV line position and aux breaker at Shawnee Station	2.9
Projects necessary to mitigate new system violations at 100/200/300MW	
None	0
total	***2.9***

Table 15: Generation integration estimate

Estimates assume that the Interconnection Customer will be responsible for the lead line up to the change of ownership, which is a dead-end tower at the POI Station.

3.7. Palouse area near Benewah (Tekoa)

3.7.1. Project description and one-line diagram

The following evaluates the impacts of integrating 100 to 200MW of new generation onto Avista's transmission system in the northern Palouse area, west of Plummer, Idaho. This request was modeled as a new 230kV line position at Benewah Station as shown below.

These results are similar for the request at Tekoa, given this location is withing 10 miles of Benewah Station.

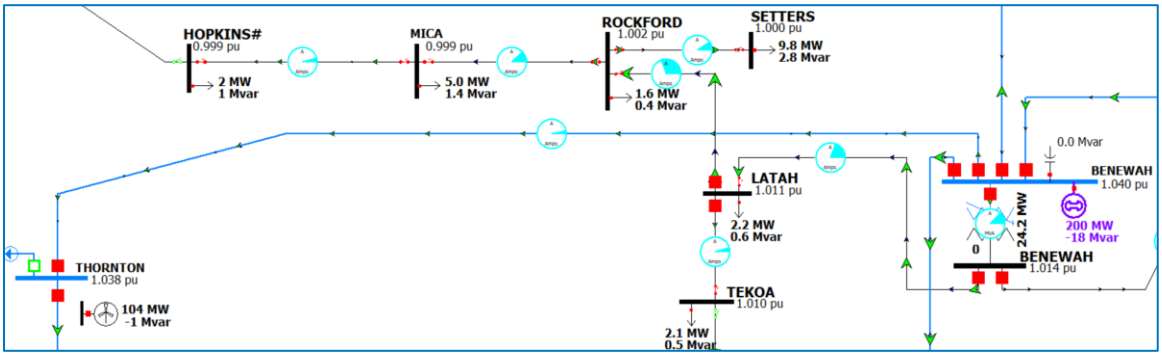

Figure 16: New generation at Benewah, heavy summer 2029

System performance in this area is dominated by several factors:

- System flows are typically north to south.
- Existing local generation (104 MW) from Palouse Wind.

In general, new generation in this area will sink into local load. As the local load service is met the additional power will flow south into the Lewiston/Clarkston load center.

3.7.2. Contingency Analysis

The worst system performance was during heavy summer conditions with high north to south ID-NW transfers. The issues identified below can be mitigated by adjustments to ID-NW flows. The spring and winter scenarios did not identify any issues.

Row Labels	29HS Base	29HS 100MW	29HS 200MW
PI			

N-1: Hemingway-Longhorn 500kV			
Lolo - Oxbow 230 kV (Lolo - Imnaha)	**95.4**	**95.9**	**96.5**
T-1: Bell #6 230/115kV			
Beacon - Bell #1 115 kV	**103.1**	**104**	**105**
Beacon - Northeast 115 kV			**95.6**
P2			
BF: BEA A600, Beacon North & South Bus Tie			
Francis and Cedar - Northwest 115 kV	**102.9**	**102**	**101.1**
Northwest - Westside 115 kV	**101.4**	**100.7**	**100**
BF: BEA R427, Beacon Bus Tie			
Boulder - Irvin #1 115 kV (Boulder - Spokane Industrial Park)			**95.9**
BF: BELL A370, Bell S1 & S2 230kV			
Beacon - Bell #1 115 kV	**100.5**	**101.4**	**102.4**
BF: BELL A388, Bell S2 & S3 230kV			
Beacon - Bell #1 115 kV	**96.2**	**97.4**	**98.7**
BF: BLD A712, Boulder - Irvin #1			
Boulder - Irvin #2 115 kV			**96.4**
BF: BLD A713, Boulder - Otis Orchards #1			
Boulder - Irvin #2 115 kV		**95.5**	**99.8**
BUS: Bell S2 230kV			
Beacon - Bell #1 115 kV	**101.3**	**102.2**	**103.2**
BUS: Boulder West 115kV			
Boulder - Irvin #2 115 kV		**97**	**101.3**

Table 16: Contingency results, heavy summer 2029

The worst performing contingency is shown below. This is a N-1-1 loss of the 230kV lines going south from Benewah and Thornton forcing all generation north without issue, showing the system would be capable of absorbing the full output of the proposed generation.

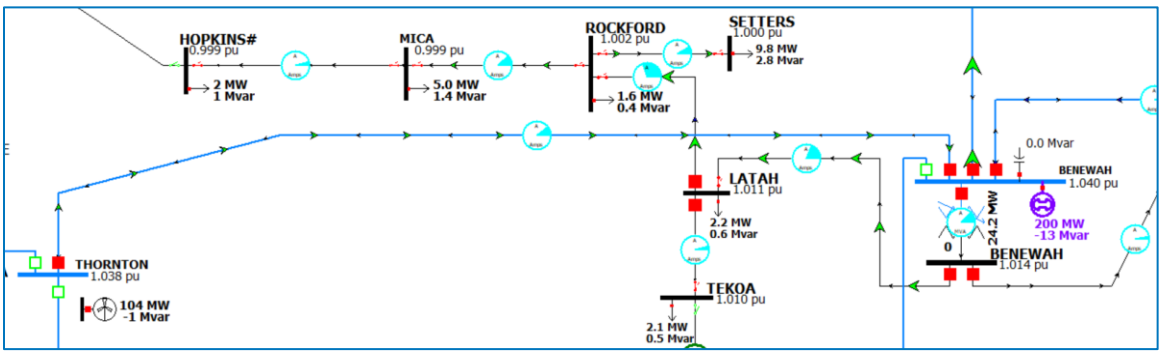

Figure 17: Worst performing contingency, heavy summer 2029

3.7.3. Integration costs

The Benewah Station has a 230kV double breaker double bus arrangement with space to terminate a new line position.

POI Station or Area	Cost Estimate ($ million)
Point of Interconnection Station	
New 230kV line position at Benewah Station	2.4
Projects necessary to mitigate new system violations at 100/200MW	
None	0
total	***2.4***

Table 17: Generation integration estimate

Estimates assume that the Interconnection Customer will be responsible for the lead line up to the change of ownership, which is a dead-end tower at the POI Station.

3.8. Rathdrum Prairie

3.8.1. Project description and one-line diagram

The following evaluates the impacts of integrating 100 to 400MW of new generation onto Avista's transmission system in the Coeur d'Alene area east of Rathdrum, Idaho. This request was modeled as a new station approximately 0.5 miles south of Lancaster Station on the Boulder - Lancaster 230kV Transmission Line as shown below.

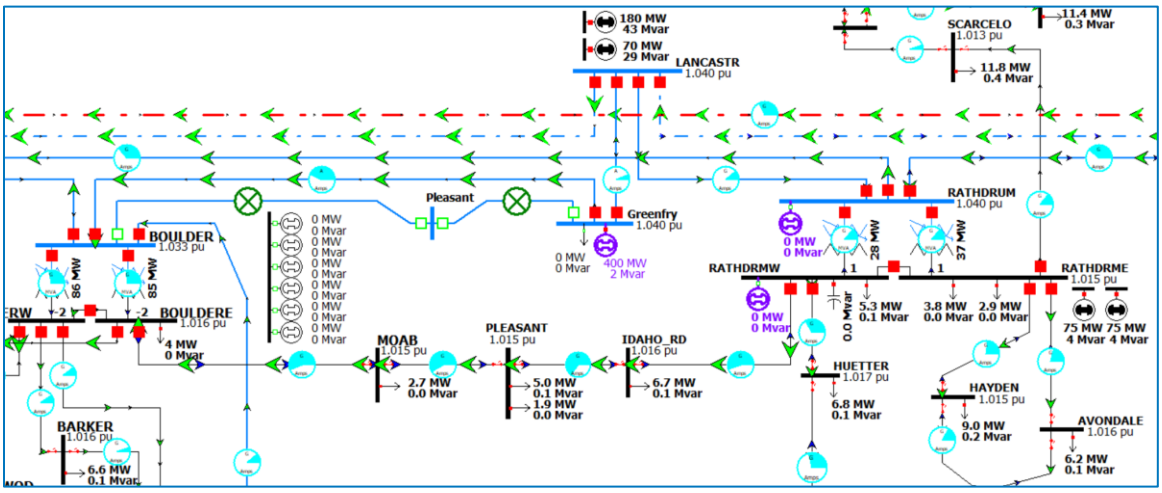

Figure 18: New generation at 230kV near Lancaster, light spring 2029

System performance in this area is dominated by several factors:

- High transfers from the east on the Cabinet – Rathdrum and Lancaster – Noxon 230kV transmission lines during spring runoff.
- Typical outflows to the west on the Beacon – Rathdrum, Bell – Lancaster, and Boulder – Lancaster 230kV transmission lines.
- Load in the Coeur d' Alene area primarily served from the Rathdrum station.
- Existing local generation (440MW) from Boulder, Lancaster, Post Falls, and Rathdrum stations.

In general, new generation in this area will sink into local load. As the local load is met the additional power will typically flow west into the Spokane load center or further west on BPA's 230kV system and up onto BPA's 500kV system at Bell.

3.8.2. Contingency Analysis

Worst system performance was during light spring conditions with high east to west transfers and during heavy summer conditions. Outages on the 230kV system results in overloads on the underlying 115kV system, as shown below. The winter scenarios did not identify any issues.

Many of the summer overload conditions are present with or without the added generation, due to isolation from P2 outages at Rathdrum. Mitigation for these issues is not included in the Network Upgrades and are shown here for reference only.

Row Labels	29LSp Base	29LSp 100MW	29LSp 200MW	29LSp 300MW	29LSp 400MW
P1					
N-1: Boulder - Greenfry 230kV					
Boulder - Rathdrum 115kV (Pleasant - Idaho Rd)					98.9
P2					
BF: BEA R427, Beacon Bus Tie					
Boulder - Irvin #1 115 kV (Boulder - Spokane Industrial Park)	101.1	106.6	112.1	117.5	123
BF: BLD R454, Boulder - Greenfry, Boulder #2 230/115					
Boulder - Rathdrum 115kV (Pleasant - Idaho Rd)				95.1	100.5
BF: BLD R554, Boulder - Greenfry, Boulder #1 230/115					
Boulder - Rathdrum 115kV (Pleasant - Idaho Rd)				95.1	100.5
BUS: Beacon South 230kV					
Boulder - Irvin #1 115 kV (Boulder - Spokane Industrial Park)					96.8
P7					
N-2: Beacon - Boulder 230kV & Beacon - Rathdrum 230kV					
Boulder - Irvin #1 115 kV (Boulder - Spokane Industrial Park)	96.6	102.6	108.6	114.7	120.7
N-2: Beacon - Boulder 230kV & Boulder - Irvin #2 115kV					
Boulder - Irvin #1 115 kV (Boulder - Spokane Industrial Park)	102.5	108.2	113.9	119.6	125.4
N-2: Beacon - Rathdrum 230kV & Boulder - Greenfry 230kV					
Boulder - Rathdrum 115kV (Moab - Pleasant)	100.5	109.2	118	126.7	135.5
Boulder - Rathdrum 115kV (Boulder - Moab)	98	106.7	115.4	124.2	132.9
Boulder - Rathdrum 115kV (Pleasant - Idaho Rd)	106.8	115.6	124.4	133.1	141.9
Post Falls - Ramsey 115kV (Post Falls - Prairie)		95.7	103.4	111	118.7
Boulder - Rathdrum 115kV (Idaho Rd - Rathdrum)			100.6	107.3	114.1
Post Falls - Ramsey 115kV (Prairie - Ramsey)				99.6	105.5
Otis Orchard - Post Falls 115 kV (Beck Road Tap - Post Falls)			96	102.6	109.3
LANCASTR (40624) -> BELL S3 (40090) CKT 1 at LANCASTR			96.8	106	115.2
N-2: Beacon - Rathdrum 230kV & Lancaster - Rathdrum 230kV					
Boulder - Rathdrum 115kV (Moab - Pleasant)	103	101.9	100.8	99.7	98.6
Boulder - Rathdrum 115kV (Boulder - Moab)	100.5	99.4	98.3	97.2	96.1
Boulder - Rathdrum 115kV (Pleasant - Idaho Rd)	109.3	108.2	107.2	106.1	105

Table 18: Contingency results, light spring 2029

The worst performing contingency is shown below. This shows the underlying 115kV system overloaded for the double-circuit outage.

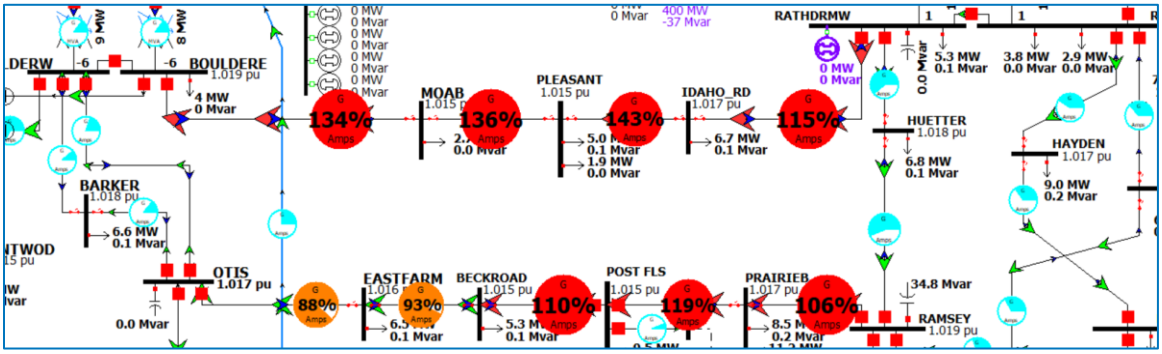

Figure 19: Worst performing contingency, light spring 2029

These overloads can be mitigated by rebuilding the underlying 115kV or by building a new 230kV transmission line. The 115kV mitigation was explored in the 2021 IRP analysis, which mitigated the issues, but resulted in little margin. The 230kV mitigation resulted in larger contingency margin and reduced the total rebuild scope.

3.8.3. Integration costs

BPA's Lancaster Station is a 230kV ring-bus arrangement and is not designed to be expanded. Integration will require a new Avista 230kV POI station west of BPA's Lancaster station.

POI Station or Area	Cost Estimate ($ million)
Point of Interconnection Station	
New 230kV (3) position Greensferry Station	18.8
Loop-in Beacon-Rathdrum 230kV into POI Station	1.4
Projects necessary to mitigate new facility violations at 100MW	
Rebuild Boulder-Irvin #1 115kV (BLD-SIP, fix 1.2mi 556aac)	1.1
Rebuild Boulder-Rathdrum 115kV (fix 11.2mi 250cu, 337acsr & 556aac)*	10.1
Rebuild PostFalls-Ramsey 115kV (PF-PRA, fix 2.9mi 250cu)*	2.6
total	***34.0***
Projects necessary to mitigate new facility violations at 200/300/400MW	
Rebuild Boulder-Irvin #1 115kV (BLD-SIP, fix 1.2mi 556aac)	1.1
Build new Boulder–Greensferry 230kV SCT (new 13.3mi ROW & structures)	31.0
New 230kV position at Boulder Station	1.6
total	***53.9***

Table 19: Generation integration estimate

Estimates assume that the Interconnection Customer will be responsible for the lead line up to the change of ownership, which is a dead-end tower at the POI Station.

3.9. Sandpoint Area

3.9.1. Project description and one-line diagram

The following evaluates the impacts of integrating 50 to 150MW of new generation onto Avista's transmission system in the Sandpoint area. This request was modeled as a new 115kV line position at the Bronx Station as shown below.

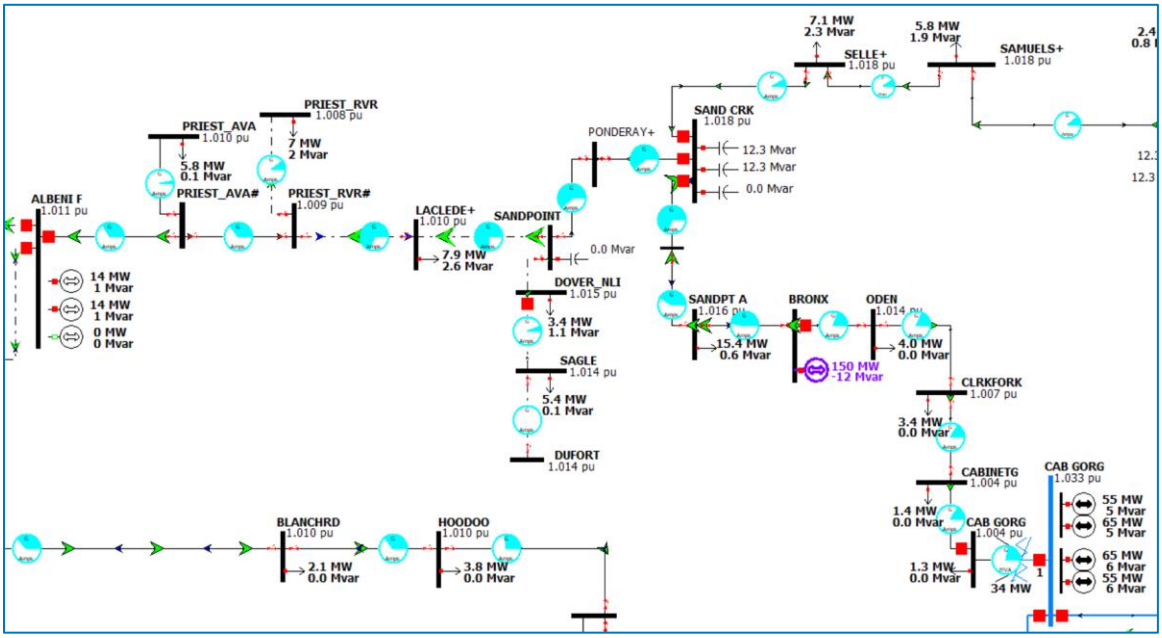

Figure 20: New generation at Bronx, light spring 2029

System performance in this area is dominated by several factors:

- East to west 115kV flows during spring runoff.
- Sandpoint area load ranges between 62MW and 225MW.
- Existing local generation (36MW) from Smith Creek Hydro.

In general, small levels of generation in this area will sink into local load. As the local load service is met the additional power will flow south into the greater Coeur d'Alene area. Larger generation integration impacts the total Western Montana Hydro Complex output, which is limited by a West of Lancaster constraint.

3.9.2. Contingency Analysis

The worst system performance was during light spring conditions with high South of Boundary transfers.

Row Labels	29LSp Base	29LSp 50MW	29LSp 100MW	29LSp 150MW
P1				
N-1: Bell - Sacheen 230kV				
Addy - Pine Street 115 kV (Newport - Pine Street)				101
N-1: Bronx - Cabinet 115kV				
SANDPOINT (40931) -> LACLEDE+ (40617) CKT 1 at SANDPOINT				98.2
N-1: Cabinet - Rathdrum 230kV				
SANDPOINT (40931) -> LACLEDE+ (40617) CKT 1 at SANDPOINT				95.7
N-1: Sand Dunes - Warden 115kV				
WARDEN A (48455) -> WARDEN T (46117) CKT 1 at WARDEN A	96.6	96.7	96.7	96.8
P2				
BF: CGS A219, Bronx - Cabinet				
SANDPOINT (40931) -> LACLEDE+ (40617) CKT 1 at SANDPOINT				98.2
BF: RAT R403, Cabinet - Rathdrum, Rathdrum #2 230/115				
SANDPOINT (40931) -> LACLEDE+ (40617) CKT 1 at SANDPOINT				96
BF: RAT R503, Cabinet - Rathdrum, Rathdrum #1 230/115				

SANDPOINT (40931) -> LACLEDE+ (40617) CKT 1 at SANDPOINT				**95.9**
P2.1				
N-1: Bell - Sacheen 230kV Open @ BELL				
Addy - Pine Street 115 kV (Newport - Pine Street)				**99.5**
N-1: Cabinet - Rathdrum 230kV Open @ CAB				
SANDPOINT (40931) -> LACLEDE+ (40617) CKT 1 at SANDPOINT				**95.7**
N-1: Cabinet - Rathdrum 230kV Open @ RAT				
SANDPOINT (40931) -> LACLEDE+ (40617) CKT 1 at SANDPOINT				**95.6**

Table 20: Contingency results, light spring 2029

The worst performing contingency is shown below.

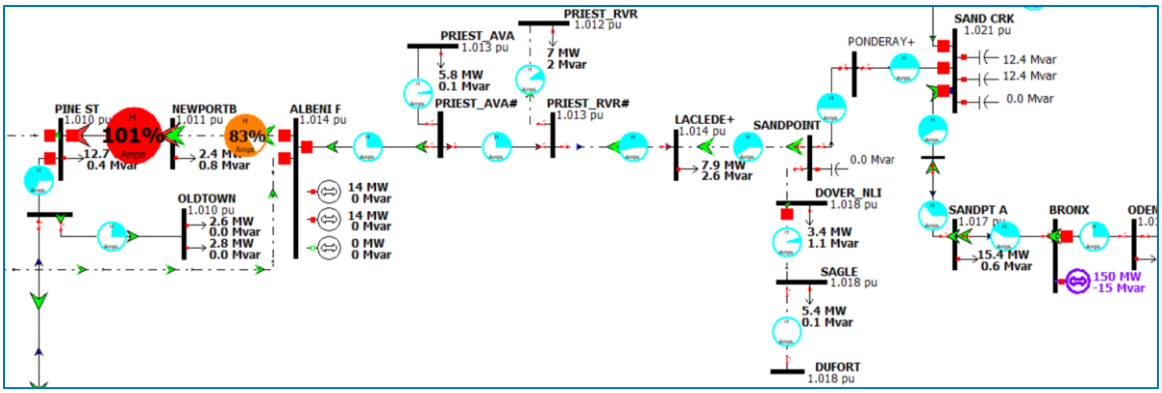

Figure 21: Worst performing contingency, light spring 2029

3.9.3. Integration costs

The Bronx Station has a 115kV single bus arrangement but is planned to be rebuilt. The rebuild will have space for a new line position.

POI Station or Area	Cost Estimate ($ million)
Point of Interconnection Station	
New 115kV line position at Bronx Station w/ metering & termination str	1.6
Projects necessary to mitigate new system violations at 50MW	
Assumes overloaded line section will be rebuilt as planned	0.0
total	***1.6***
Projects necessary to mitigate new system violations at 100/150MW	
Build new Boulder–Rathdrum 230kV SCT (new 17.8mi ROW & structures)	41.5
New 230kV position at Boulder Station and Rathdrum Station	3.2
total	***48.2***

Table 21: Generation integration estimate

Estimates assume that the Interconnection Customer will be responsible for the lead line up to the change of ownership, which is a dead-end tower at the POI Station.

3.10. West Plains Area

3.10.1. Project description and one-line diagram

The following evaluates the impacts of integrating 100 to 300MW of new generation onto Avista's transmission system in the West Plains area. This request was modeled as a new 230kV line position at planned Bluebird Station as shown below.

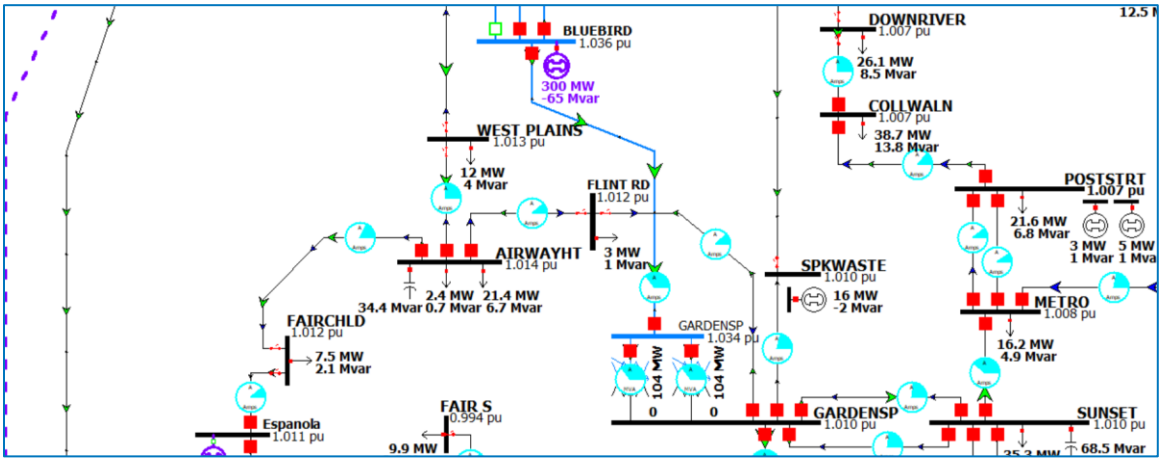

Figure 22: New generation at Bluebird, heavy summer 2029

System performance in this area is dominated by several factors:

- 230kV integration primary flows into the West Plains area.
- West Plains area load ranges between 77MW and 160MW.
- Existing local generation (18MW) at Waste to Energy.

In general, new generation in this area will sink into local load. As the local load service is met the additional power will flow east into the greater Spokane area.

3.10.2. Contingency Analysis

The worst system performance was during heavy summer conditions. The issues identified below result from moving power from the West Plains into the downtown Spokane load center. The spring and winter scenarios did not identify any issues.

Row Labels	29HS Base	29HS 100MW	29HS 200MW	29HS 300MW
P1				
N-1: Sand Dunes - Warden 115kV				
WARDEN A (48455) -> WARDEN T (46117) CKT 1 at WARDEN A	**96.9**	**96.9**	**96.9**	**96.9**
P2				
BF: BEA R427, Beacon Bus Tie				
Boulder - Irvin #1 115 kV (Boulder - Spokane Industrial Park)	**101.1**	**99.2**	**97.3**	**95.3**
P7				
N-2: Beacon - Boulder 230kV & Beacon - Rathdrum 230kV				
Boulder - Irvin #1 115 kV (Boulder - Spokane Industrial Park)	**96.6**			
N-2: Beacon - Boulder 230kV & Boulder - Irvin #2 115kV				
Boulder - Irvin #1 115 kV (Boulder - Spokane Industrial Park)	**102.5**	**100.5**	**98.6**	**96.6**
N-2: Beacon - Rathdrum 230kV & Boulder - Greenfry 230kV				
Boulder - Rathdrum 115kV (Moab - Pleasant)	**100.5**	**99.8**	**99.1**	**98.4**

Boulder - Rathdrum 115kV (Boulder - Moab)	98	97.3	96.6	95.9
Boulder - Rathdrum 115kV (Pleasant - Idaho Rd)	106.8	106.2	105.5	104.8
N-2: Beacon - Rathdrum 230kV & Lancaster - Rathdrum 230kV				
Boulder - Rathdrum 115kV (Moab - Pleasant)	103	102	101.1	100.2
Boulder - Rathdrum 115kV (Boulder - Moab)	100.5	99.5	98.7	97.7
Boulder - Rathdrum 115kV (Pleasant - Idaho Rd)	109.3	108.4	107.5	106.5

Table 22: Contingency results, heavy summer 2029

The worst performing contingency is a loss of both the Bell – Bluebird 230kV and Bluebird - Coulee 230kV Transmission Lines (N-1-1) forcing all the 230kV connected generation through the underlying 115k system as shown below.

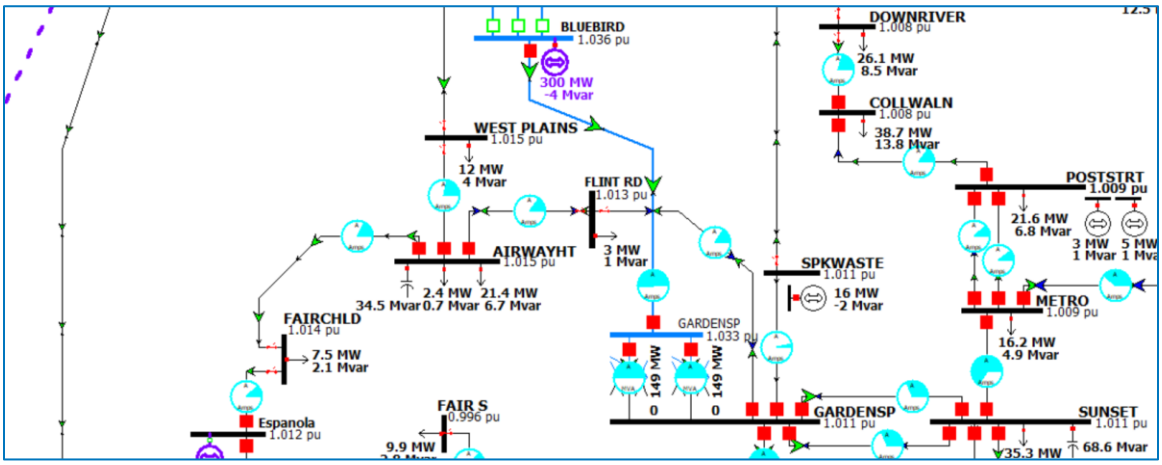

Figure 23: Worst performing contingency, heavy summer 2029

The area load and recent 115kV system reinforcements help to reliably transfer the new generation into the Spokane load center.

3.10.3. Integration costs

The planned Bluebird Station has a 230kV double breaker double bus arrangement with space for a new line position.

POI Station or Area	Cost Estimate ($ million)
Point of Interconnection Station	
New 230kV line position at Bluebird Station	2.4
Projects necessary to mitigate new system violations at 100/200/300MW	
None	0
total	***2.4***

Table 23: Generation integration estimate

Estimates assume that the Interconnection Customer will be responsible for the lead line up to the change of ownership, which is a dead-end tower at the POI Station.

4. Existing Generation Integration Sites

4.1. Kettle Falls Station

4.1.1. Project description and one-line diagram

The following evaluates the impacts of adding 50 to 100MW of new generation to the existing Kettle Falls generation site. This request was modeled as a new 115kV line position at the Kettle Falls Station as shown below.

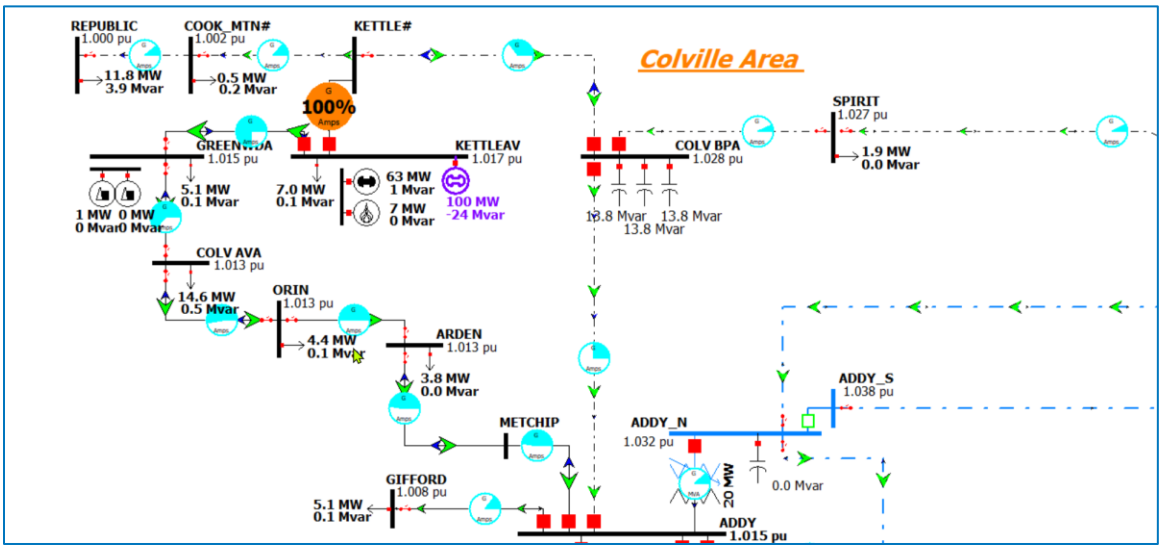

Figure 24: New generation at Kettle Falls, light spring 2029

System performance in this area is dominated by several factors:

- North to south flows on BPA's 230kV system and limited by the South of Boundary cut plane.
- Integration primarily flows into the Colville and West Plains areas.
- Kettle Falls area load ranges between 46MW and 62MW.
- Existing local generation (74MW) from Kettle Falls and Meyer Falls.

In general, new generation in this area will sink into local load. As the local load service is met the additional power will flow south into the greater Colville area.

4.1.2. Contingency Analysis

The worst system performance was during light spring conditions with high South of Boundary transfers.

Row Labels	29LSp Base	29LSp 50MW	29LSp 100MW
P1			
N-1: Addy - Colville BPA 115kV			
Addy - Kettle Falls 115 kV (Colville - Greenwood)			**95.9**
Addy - Kettle Falls 115 kV (Greenwood - Kettle Falls)			**112.6**
N-1: Addy - Kettle Falls 115kV			

Colville - Kettle Falls 115 kV (Kettle Falls - Republic Tap)			116.8
N-1: Kettle Falls Tap 115kV			
Addy - Kettle Falls 115 kV (Arden Tap - Metchip)			97.2
Addy - Kettle Falls 115 kV (Arden Tap - Orin)			99.9
Addy - Kettle Falls 115 kV (Colville - Greenwood)			113.3
Addy - Kettle Falls 115 kV (Colville - Orin)			103
Addy - Kettle Falls 115 kV (Greenwood - Kettle Falls)			132.4
Addy - Kettle Falls 115 kV (Addy - Metchip)			97.1
P2			
BF: ADDY B1135, Addy - Bell 115kV			
Colville - Kettle Falls 115 kV (Kettle Falls - Republic Tap)			97.6
BF: ADDY B1137, Addy - Devils Gap 115kV			
Colville - Kettle Falls 115 kV (Kettle Falls - Republic Tap)			97.7
BF: ADDY B1145, Addy - Kettle Falls 115kV			
Colville - Kettle Falls 115 kV (Kettle Falls - Republic Tap)			115.9
BF: COLV B1766, Boundary - Box Canyon - Colville BPA 115kV			
Addy - Kettle Falls 115 kV (Colville - Greenwood)			103.9
Addy - Kettle Falls 115 kV (Greenwood - Kettle Falls)			121.7
BF: COLV B1768, Colville BPA - Kettle Falls 115kV			
Addy - Kettle Falls 115 kV (Arden Tap - Metchip)			96.3
Addy - Kettle Falls 115 kV (Arden Tap - Orin)			99.1
Addy - Kettle Falls 115 kV (Colville - Greenwood)			112.8
Addy - Kettle Falls 115 kV (Colville - Orin)			102.2
Addy - Kettle Falls 115 kV (Greenwood - Kettle Falls)			131.8
Addy - Kettle Falls 115 kV (Addy - Metchip)			96.2
BUS: Addy 115kV			
Colville - Kettle Falls 115 kV (Kettle Falls - Republic Tap)			97.7
BUS: Colville 115kV			
Addy - Kettle Falls 115 kV (Colville - Greenwood)			103.9
Addy - Kettle Falls 115 kV (Greenwood - Kettle Falls)			121.7
P2.1			
N-1: Addy - Kettle Falls 115kV Open @ ADD			
Colville - Kettle Falls 115 kV (Kettle Falls - Republic Tap)			98.1
N-1: Addy - Kettle Falls 115kV Open @ KET			
Colville - Kettle Falls 115 kV (Kettle Falls - Republic Tap)			116.7
N-1: Kettle Falls Tap 115kV Open @ COLV			
Addy - Kettle Falls 115 kV (Colville - Greenwood)			104.5
Addy - Kettle Falls 115 kV (Greenwood - Kettle Falls)			122.4
N-1: Kettle Falls Tap 115kV Open @ KET			
Addy - Kettle Falls 115 kV (Arden Tap - Metchip)			97.2
Addy - Kettle Falls 115 kV (Arden Tap - Orin)			99.9
Addy - Kettle Falls 115 kV (Colville - Greenwood)			113.4
Addy - Kettle Falls 115 kV (Colville - Orin)			103
Addy - Kettle Falls 115 kV (Greenwood - Kettle Falls)			132.5
Addy - Kettle Falls 115 kV (Addy - Metchip)			97.1

Table 24: Contingency results, light spring 2029

The worst performing contingency is shown below.

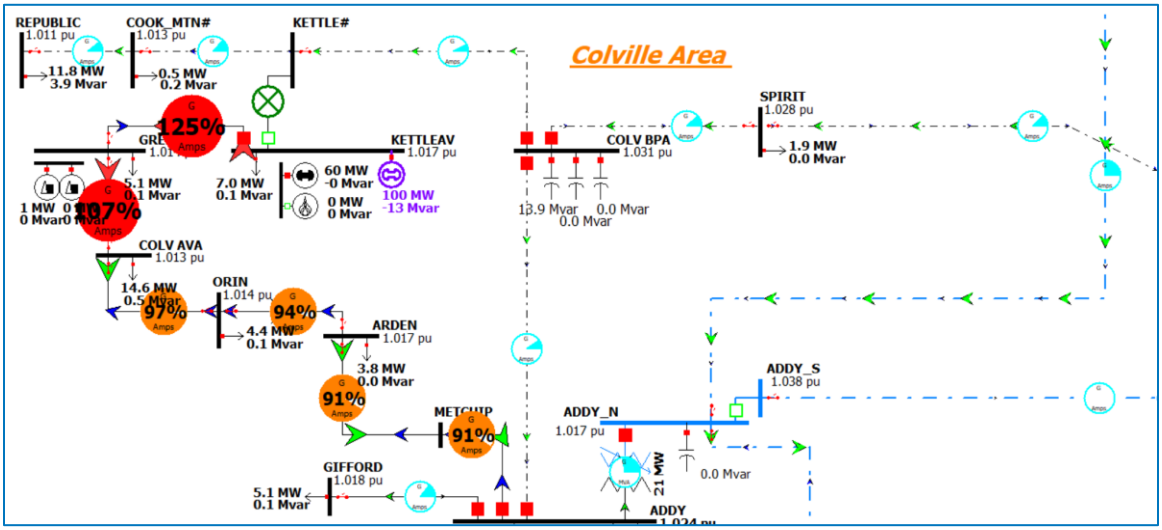

Figure 25: Worst performing contingency, light spring 2029

4.1.3. Integration costs

The Kettle Falls Station has a 115kV single bus arrangement with space for a new line position. Assumes communications and protection updates are completed at Kettle Falls Station increasing the Colville – Kettle Falls 115kV Transmission Line to the 556ACSR rating.

POI Station or Area	Cost Estimate ($ million)
Point of Interconnection Station	
New 115kV line position at Kettle Falls w/ metering & termination str	1.6
Projects necessary to mitigate new system violations at 50MW	
Protection upgrades at the Kettle Falls A621 Tap position is complete	0.0
total	***1.6***
Projects necessary to mitigate new system violations at 100MW	
Protection upgrades at the Kettle Falls A621 Tap position is complete	0.0
Rebuild Addy-KettleFalls 115kV (Arden to KettleFalls, fix 19.3mi 556AAC)	17.4
total	***19.0***

Table 25: Generation integration estimate

Estimates assume that the Interconnection Customer will be responsible for the lead line up to the change of ownership, which is a dead-end tower at the POI station.

4.2. Northeast Station

4.2.1. Project description and one-line diagram

The following evaluates the impacts of adding 50, 100 and 200MW of new generation to the existing Northeast generation site. The 50 and 100MW requests were modeled as a new 115kV line position at Northeast Station as shown below. The 200MW request was modeled as a new 230kV station sourced by a loop-in of the Beacon – Bell #5 230kV Transmission Line.

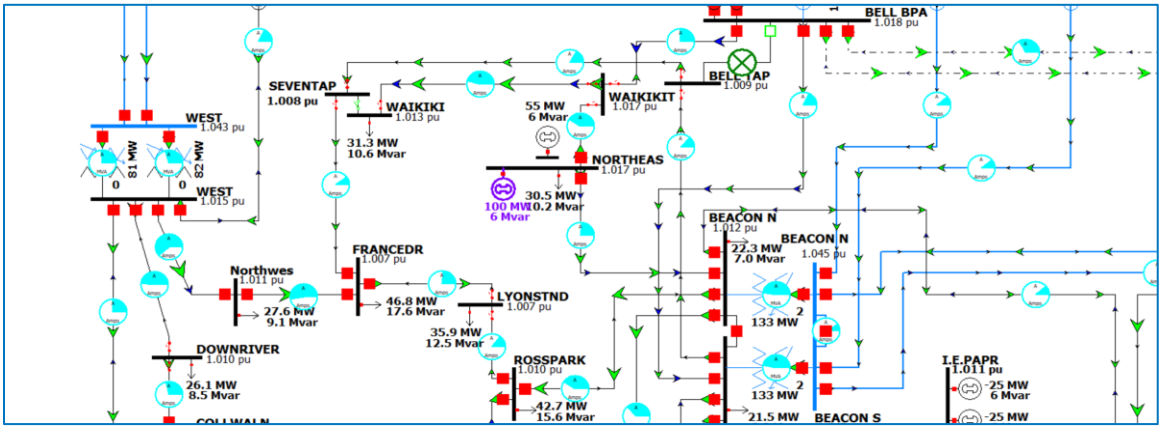

Figure 26: New generation at Northeast, heavy summer 2029

System performance in this area is dominated by several factors:

- Site is between the two primary sources for the Spokane area, which are Bell and Beacon Stations.
- North to south flows during heavy summer.
- Loading on the 115kV line ranges between 24MW and 59MW
- Existing local generation (55MW) from Northeast CT's.
- Equipment at Beacon Station is approaching rating limits based on fault duty, therefore large generation additions in this area may require a station rebuild.

In general, new generation in this area will sink into local load. As the local load service is met the additional power will flow south into the greater Spokane area.

4.2.2. Contingency Analysis

The worst system performance was during heavy summer conditions with high north to south flows.

Row Labels	29HS Base	29HS 50MW	29HS 100MW	29HS 200MW
P1				
N-1: Beacon - Northeast 115kV				
Bell - Northeast 115 kV (Waikiki Tap - Northeast)			101.5	
N-1: Bell - Northeast 115kV				
Beacon - Northeast 115 kV			102.3	
N-1: Hemingway-Longhorn 500kV				
Lolo - Oxbow 230 kV (Lolo - Imnaha)	95.5	95.6	95.7	95.8
T-1: Bell #6 230/115kV				
Beacon - Northeast 115 kV				96.3
Bell - Northeast 115 kV (Waikiki Tap - Northeast)		104.1	120.2	
Beacon - Bell #1 115 kV				105.8
P2				
BF: BEA A600, Beacon North & South Bus Tie				
Francis and Cedar - Northwest 115 kV	103	103	103	102.5
Northwest - Westside 115 kV	101.5	101.5	101.5	101.1
Bell - Northeast 115 kV (Waikiki Tap - Northeast)			102.6	

BF: BELL A370, Bell S1 & S2 230kV				
Bell - Northeast 115 kV (Waikiki Tap - Northeast)		104.5	119.7	
Beacon - Bell #1 115 kV				102.8
BF: BELL A388, Bell S2 & S3 230kV				
Bell - Northeast 115 kV (Waikiki Tap - Northeast)		102.2	117.1	
Beacon - Bell #1 115 kV				99.4
BF: BELL B356, Bell - Northeast 115kV				
Beacon - Northeast 115 kV			102.2	
BUS: Beacon North 115kV				
Bell - Northeast 115 kV (Waikiki Tap - Northeast)			101.8	
BUS: Bell S2 230kV				
Bell - Northeast 115 kV (Waikiki Tap - Northeast)		104.5	119.9	
Beacon - Bell #1 115 kV				103.6
P2.1				
N-1: Bell - Northeast 115kV Open @ NE				
Beacon - Northeast 115 kV			102.4	

Table 26: Contingency results, heavy summer 2029

The worst performing contingency is shown below.

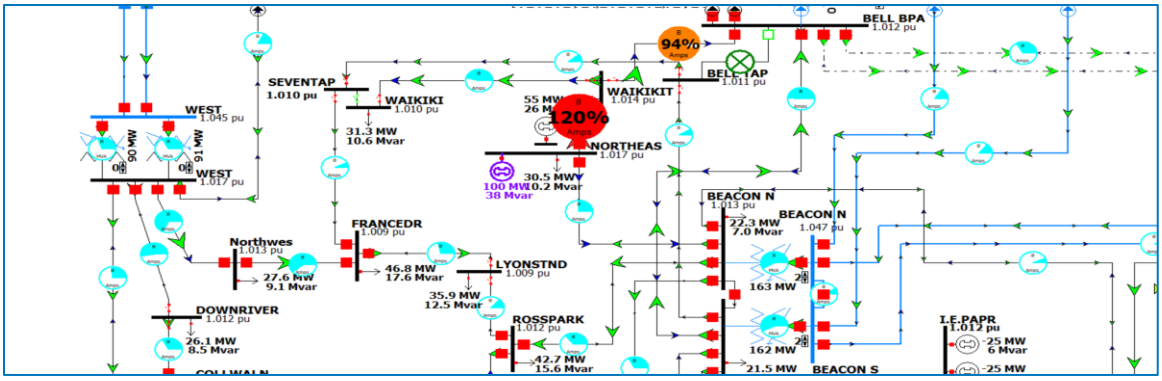

Figure 27: Worst performing contingency, heavy summer 2029

4.2.3. Integration costs

The Northeast Station has a 115kV single bus arrangement with space for a new line position.

POI Station or Area	Cost Estimate ($ million)
Point of Interconnection Station at 115kV	
New 115kV line position at Northeast Station w/ metering & termination structure	1.6
New 230kV (3) position Hanson Station	18.8
Loop-in Beacon-Bell #5 230kV into POI Station	1.4
Projects necessary to mitigate new system violations at 50MW	
None (North Spokane Reinforcement Project corrects overloads)	0
total	***1.6***
Projects necessary to mitigate new system violations at 100MW	
Rebuild Beacon-Northeast 115kV (fix 5.25mi 556acsr)	4.7
Rebuild Bell-Northeast 115kV (fix 1.53mi 556acsr)	1.4
total	***7.7***
Projects necessary to mitigate new system violations at 200MW	
Rebuild Beacon-Bell 115kV (fix 6.86mi 250cu & 556aac)	5.7
total	***25.9***

Table 27: Generation integration estimate

Estimates assume that the Interconnection Customer will be responsible for the lead line up to the change of ownership, which is a dead-end tower at the POI Station.

4.3. Palouse Wind

4.3.1. Project description and one-line diagram

The following evaluates the impacts of adding 100 to 200MW of new generation to the existing Palouse Wind generation site. This request was modeled as a new 230kV line position at the Thornton Station as shown below.

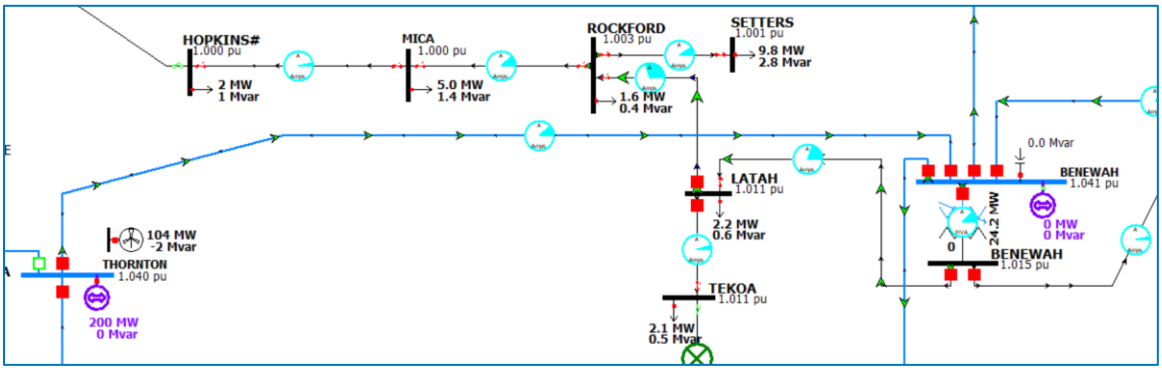

Figure 28: New generation at Thornton, heavy summer 2029

System performance in this area is dominated by several factors:

- System flows are typically north to South.
- Existing local generation (104MW) from Palouse Wind.

In general, new generation in this area will sink into local load. As the local load service is met the additional power will flow south into the Lewiston/Clarkston load center.

4.3.2. Contingency Analysis

The worst system performance was during heavy summer conditions with high north to south ID-NW transfers. The issues identified below can be mitigated by adjustments to ID-NW flows. The spring and winter scenarios did not identify any issues.

Row Labels	29HS Base	29HS 100MW	29HS 200MW
P1			
T-1: Bell #6 230/115kV			
Beacon - Bell #1 115 kV	103.1	103.7	104.4
Beacon - Northeast 115 kV			95.1
P2			
BF: BEA A600, Beacon North & South Bus Tie			
Francis and Cedar - Northwest 115 kV	102.5	101.9	101.2
Northwest - Westside 115 kV	101.1	100.6	100.1
BF: BEA R427, Beacon Bus Tie			
Boulder - Irvin #1 115 kV (Boulder - Spokane Industrial Park)			95.3
BF: BELL A370, Bell S1 & S2 230kV			
Beacon - Bell #1 115 kV	100.4	101.1	101.8
BF: BELL A388, Bell S2 & S3 230kV			
Beacon - Bell #1 115 kV	96.3	97.1	98.1
BF: BLD A713, Boulder - Otis Orchards #1			
Boulder - Irvin #2 115 kV			98.1
BUS: Bell S2 230kV			
Beacon - Bell #1 115 kV	101.2	101.8	102.6
BUS: Boulder West 115kV			
Boulder - Irvin #2 115 kV		96.2	99.4

Table 28: Contingency results, heavy summer 2029

The worst performing contingency is a loss of both the Benewah – Thornton 230kV and North Lewiston – Shawnee 230kV Transmission Lines (N-1-1) forcing all the 230kV connected generation through the underlying 115k system as shown below.

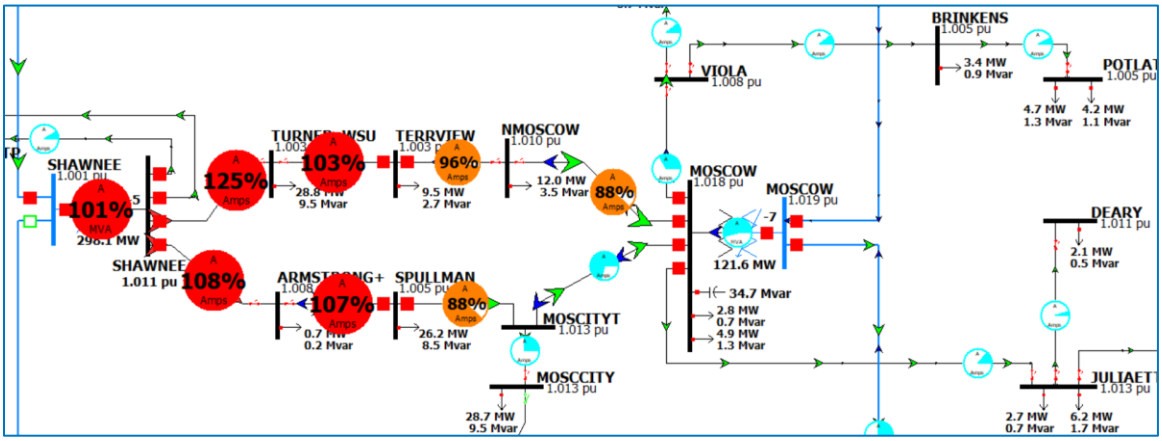

Figure 29: Worst performing contingency, heavy summer 2029

Generation would have to be curtailed during an outage of either of these 230kV transmission lines.

4.3.3. Integration costs

The Thornton Station has a 230kV ring bus arrangement with space for a one new 230kV line.

POI Station or Area	Cost Estimate ($ million)
Point of Interconnection Station	
New 230kV line position at Thornton Station	1.4
Projects necessary to mitigate new system violations at 100/200MW	
None	0
total	***1.4***

Table 29: Generation integration estimate

Estimates assume that the Interconnection Customer will be responsible for the lead line up to the change of ownership, which is a dead-end tower at the POI Station.

4.4. Rathdrum Station

4.4.1. Project description and one-line diagram

The following evaluates the impacts of adding 25, 50, 100 and 200MW of new generation to the existing Rathdrum generation site. The 25 and 50MW requests were modeled as a new 115kV line position at Rathdrum Station. The 100 and 200MW requests were modeled as a new 230kV line position at Rathdrum Station.

The existing Rathdrum CT's use 140 MW of the available integration capacity on the 115kV portion of the Rathdrum Station, leaving only 60MW available per Avista's interconnection standard. Both integration points are shown below.

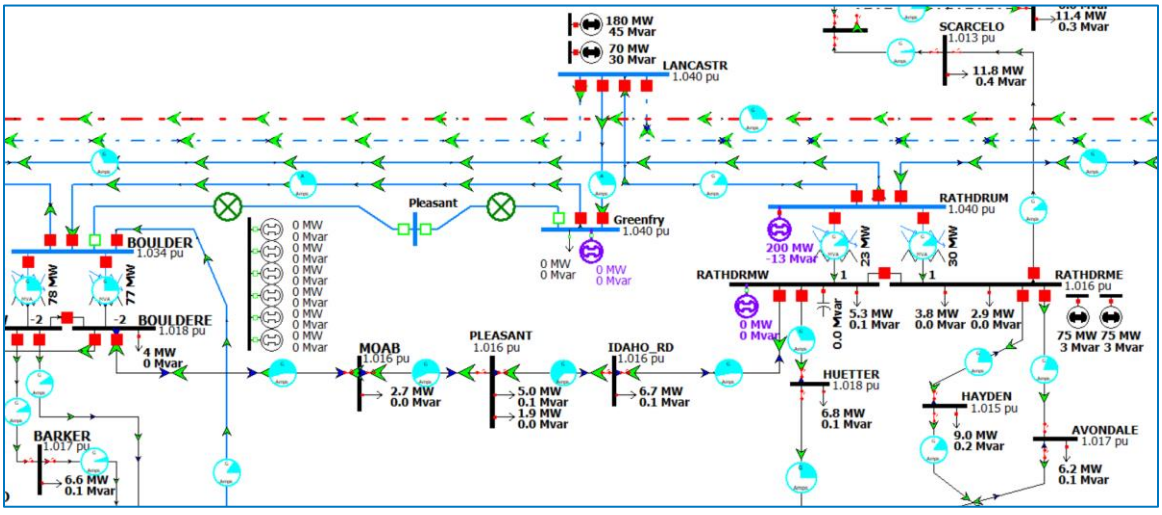

Figure 30: New generation at Rathdrum, light spring 2029

System performance in this area is dominated by several factors:

- High transfers from the east on the Cabinet – Rathdrum and Lancaster – Noxon 230kV transmission lines during spring runoff.
- Typical outflows to the west on the Beacon – Rathdrum, Bell – Lancaster, and Boulder – Lancaster 230kV transmission lines.

- Load in the Coeur d' Alene area primarily served from the Rathdrum station.
- Existing local generation (440MW) from Boulder, Lancaster, Post Falls, and Rathdrum stations.

In general, new generation in this area will sink into local load. As the local load is met the additional power will typically flow west into the Spokane load center or further west on BPA's 230kV system and up onto BPA's 500kV system at Bell.

4.4.2. Contingency Analysis

Worst system performance was during light spring conditions with high east to west transfers. Outages on the 230kV system results in overloads on the underlying 115kV system, as shown below. The summer and winter scenarios did not identify any issues.

Row Labels	29LSp Base	29LSp 25MW	29LSp 50MW	29LSp 100MW	29LSp 200MW
P2					
BF: BEA R427, Beacon Bus Tie					
Boulder - Irvin #1 115 kV (Boulder - Spokane Industrial Park)	101.1	102.7	104.2	106.6	112.1
P7					
N-2: Beacon - Boulder 230kV & Beacon - Rathdrum 230kV					
Boulder - Irvin #1 115 kV (Boulder - Spokane Industrial Park)	96.6	98.3	100	102.6	108.6
N-2: Beacon - Boulder 230kV & Boulder - Irvin #2 115kV					
Boulder - Irvin #1 115 kV (Boulder - Spokane Industrial Park)	102.5	104.2	105.9	107.6	112.7
N-2: Beacon - Rathdrum 230kV & Boulder - Greenfry 230kV					
Boulder - Rathdrum 115kV (Moab - Pleasant)	100.5	104.3	108.2	110.5	120.5
Boulder - Rathdrum 115kV (Boulder - Moab)	98	101.8	105.7	107.9	117.9
Boulder - Rathdrum 115kV (Pleasant - Idaho Rd)	106.8	110.7	114.6	116.9	126.9
Post Falls - Ramsey 115kV (Post Falls - Prairie)				96.8	105.5
Boulder - Rathdrum 115kV (Idaho Rd - Rathdrum)					102.5
Post Falls - Ramsey 115kV (Prairie - Ramsey)					95.3
Otis Orchard - Post Falls 115 kV (Beck Road Tap - Post Falls)					97.9
LANCASTR (40624) -> BELL S3 (40090) CKT 1 at LANCASTR					95.4
N-2: Beacon - Rathdrum 230kV & Lancaster - Rathdrum 230kV					
Boulder - Rathdrum 115kV (Moab - Pleasant)	103	109.8	116	125.9	148.3
Boulder - Rathdrum 115kV (Boulder - Moab)	100.5	107.3	113.6	123.4	145.8
Boulder - Rathdrum 115kV (Pleasant - Idaho Rd)	109.3	116.1	122.4	132.2	154.7
Post Falls - Ramsey 115kV (Post Falls - Prairie)		95.7	101.1	109.8	129.2
Boulder - Rathdrum 115kV (Idaho Rd - Rathdrum)			99	106.6	123.9
Post Falls - Ramsey 115kV (Prairie - Ramsey)				98.5	113.5
Otis Orchard - Post Falls 115 kV (Beck Road Tap - Post Falls)				101.7	118.7
Otis Orchard - Post Falls 115 kV (East Farms Tap - Beck Road Tap)					100.2
Otis Orchard - Post Falls 115 kV (East Farms Tap - Otis Orchard)					95.6

Table 30: Contingency results, light spring 2029

The worst performing contingency is shown below. This shows the underlying 115kV system overloaded for the double-circuit outage.

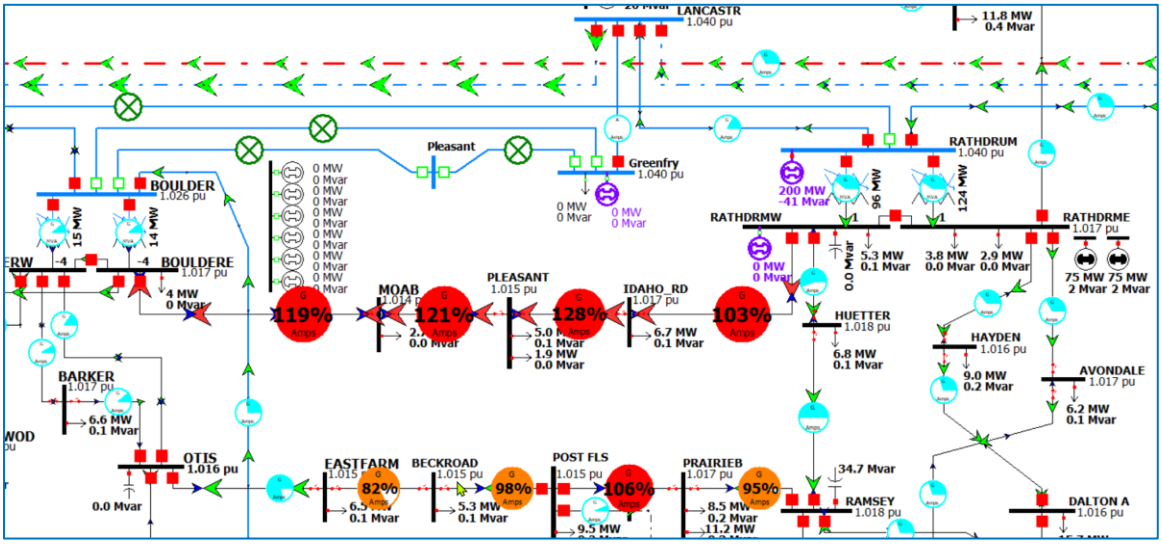

Figure 31: Worst performing contingency, light spring 2029

4.4.3. Integration costs

The Rathdrum Station has a 230kV double breaker double bus arrangement with space to terminate a new line position.

POI Station or Area	Cost Estimate ($ million)
Point of Interconnection Station	
New 115kV line position at Rathdrum Station w/ metering & termination str	1.7
New 230kV line position at Rathdrum Station w/ metering & termination str	2.1
Projects necessary to mitigate new facility violations at 25/50MW at 115kV	
Rebuild Boulder-Irvin #1 115kV (BLD-SIP, fix 1.2mi 556/795aac)	1.1
Rebuild Boulder-Rathdrum 115kV (BLD-IDR, fix 9.2mi 250cu & 337acsr)	8.3
total	***11.1***
Projects necessary to mitigate new facility violations at 100MW at 230kV	
Rebuild Boulder-Irvin #1 115kV (BLD-SIP, fix 1.2mi 556aac)	1.1
Rebuild Boulder-Rathdrum 115kV (fix 11.2mi 250cu, 337acsr & 556aac)	10.1
Rebuild PostFalls-Ramsey 115kV (PF-PRA, fix 2.9mi 250cu)	2.6
total	***15.9***
Projects necessary to mitigate new facility violations at 200MW at 230kV	
Rebuild Boulder-Irvin #1 115kV (BLD-SIP, fix 1.2mi 556aac)	1.1
Build new Boulder–Lancaster 230kV SCT (new 13.3mi ROW & structures)	31.0
Build new Lancaster-Rathdrum 230kV SCT (new 6.1mi ROW & structures)	14.2
total	***48.4***

Table 31: Generation integration estimate

Estimates assume that the Interconnection Customer will be responsible for the lead line up to the change of ownership, which is a dead-end tower at the POI Station.