BEFORE THE WASHINGTON UTILITIES AND TRANSPORTATION COMMISSION

DOCKET UE-240006

DOCKET UG-240007

EXH. JDD-7

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REPRESENTING AVISTA CORPORATION

1. Project Overview

The Orin area is seeing an increase of load of the past couple years. The load increase is densest near the lakes along Highway 20. With the increase of capacity needs and future growth, the existing distribution system in the area is not adequate to support the forecasted customer load. Infrastructure additions are required to meet established performance criteria.

Orin Station is a 115kV to 13.8kV distribution station located a couple miles south of Colville on Highway 395. It has a single 10MVA transformer feeding three Avista feeders. The substation serves approximately 2200 Avista service points and is radially fed by a tap off the Addy-Kettle Falls 115kV Transmission Line.

Orin Station is situated between Highway 395 and a hill. The three feeders, ORI12F1, ORI12F2 and ORI12F3, feed South towards Arden, a small section of the South side of Colville and a very long rural feed East to several lakes.

ORI12F1 has ties to both CLV12F2 and ARD12F2. However, existing small conductor on the ARD12F2 side of the tie only allows for ORI12F1 to pickup ARD12F2. Plans to upgrade small conductor to allow bidirectional load switching is tentatively in the 2024 resource plan.

The urban Orin feeder, ORI12F2, is land locked and lightly loaded. This feeder has a feeder tie to CLV12F2.

ORI12F3 has a very long run of feeder trunk. The trunk also has portions built on a scenic byways designated by the Washington Station Department of Transportation as shown in Figure 1. This feeder has multiple stages of regulation and sections of small conductor on the feeder trunk.

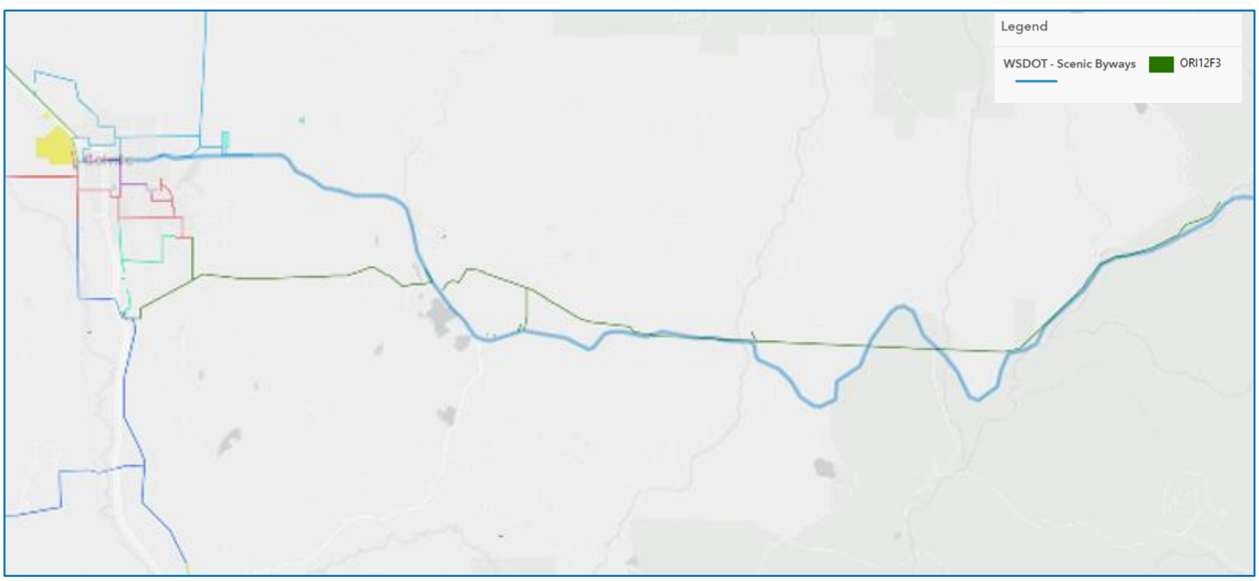


Figure 1: Scenic Byway and ORI12F3 trunk

Technical studies have been performed to analyze multiple mitigation projects to provide Orin Station acceptable system performance and mitigate, in part, specific performance issues identified over a ten-year planning horizon. The proposed project includes constructing a new distribution station located on the existing Colville Service

Center property with a 115kV tap to the Bonneville Power Administration Colville – Kettle Falls 115kV Transmission Line. The station will include a single 20MVA transformer and two distribution feeders.

1.1. Problem Statement

The electrical distribution system in the Colville area has capacity limitations identified in the System Assessment and observed operationally. The area is projected to experience moderate load growth over the next 10 years. The Orin 115/13kV Transformer 1 has exceeded the planning performance criteria in operational conditions. Anticipated load growth will exacerbate the transformer loading in the 10-year time horizon.

Table 1 shows loading data for the coldest recent day which occurred between January 13-15, 2024 at a peak high temperature of around 4°F. The Orin 115/13kV Transformer 1 exceeded its facility rating on January 13, 2024.

FDR/XFMR	2024
ARD12F1	47%
ARD12F2	54%
CLV12F1	31%
CLV12F2	51%
CLV12F3	64%
CLV12F4	68%
CLV34F1	63%
ORI12F1	32%
ORI12F2	15%
ORI12F3*	51%
ARD XFMR*	71%
CLV XFMR #1	38%
CLV XFMR #2	60%
CLV XFMR #3	59%
ORI XFMR	101%

Table 1: Percent Loading of Equipment on January 13, 2024 (PI data with AMI phase ratio)

like natural gas in many areas will further stress this area. Load transfers to adjacent feeders can be utilized to reduce heavy loading on the equipment in the short term. The Orin 115/13kV Transformer 1 can exceed 100% loading temporarily until a major transformer alarm occurs.

1.1.2. Need by Date

Technical studies show equipment ratings are already exceeded during peak winter conditions. Existing switching can reduce capacity concerns on the Orin 115/13kV Transformer 1 by a small percentage, which does not bring the transformer below the 90% threshold. Solutions to offload this transformer are need prior to the 2024/2025 winter season.

1.1.3. Technical Prioritization

Avista's Engineering Roundtable compares projects using a scoring matrix which evaluates both the technical importance and urgency of a project. Table 3 provides the suggested scoring for the Engineer Roundtable to use. The technical importance scoring accounts for the inability to serve load without experiencing capacity issues. The urgency scoring considers the need by date stated in Section 1.1.2.

Serve Load	Capacity	Reliability	System Perfor-mance	Safety	Environ-mental	Regula-tory	Tangential Benefits	Technical Score
3	3	1	3	0	0	1	0	**68**
Date Flexible	**Months Until**	**Budget**	**Transfor-mers**	**Foreign Utility**	**Number of Stations**			**Urgency Score**
6	6	2	0	2	2			**72**

Table 3: Engineering Roundtable prioritization scoring

1.2. Project Scope and Requirements

1.2.1. System Modifications

1.2.1.1. New Station Design

The Orin Capacity Mitigation project includes constructing a new distribution station located on the existing Colville Service Center property. The station will include a new 20MVA 115/13kV transformer, two 13.2kV distribution feeders with footprint and design for a future third feeder, and associated controls, communication, yard, panelhouse, grounding and facilities equipment. Estimates, design and schedule are high-level with some assumptions made. The project diagram provided in Figure 9 summarizes the project scope.

- 115 kV portion of the yard will be constructed as a line-tap with no provisions for a future 115 kV pass-thru bus nor 115 kV breakers
- Install new 20 MVA transformer will be protected by a S&C 2030 or equivalent circuit switcher
- Install distribution line-up of a 4-bay LVDS structure with 2 regulated feeders and 1 regulated aux position

- Fenced area and provisions will be provided to enable the installation of a mobile substation

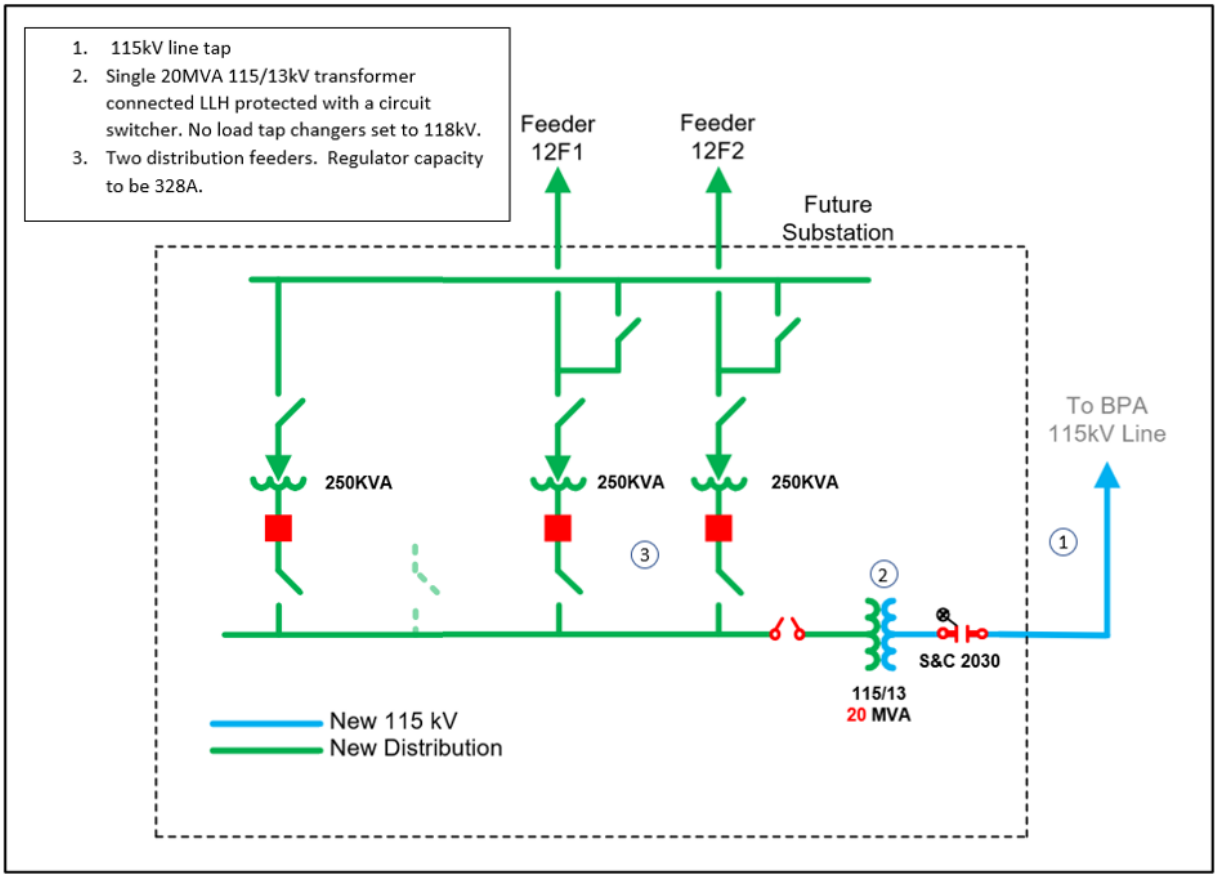


Figure 9: Orin Capacity Mitigation Project Diagram

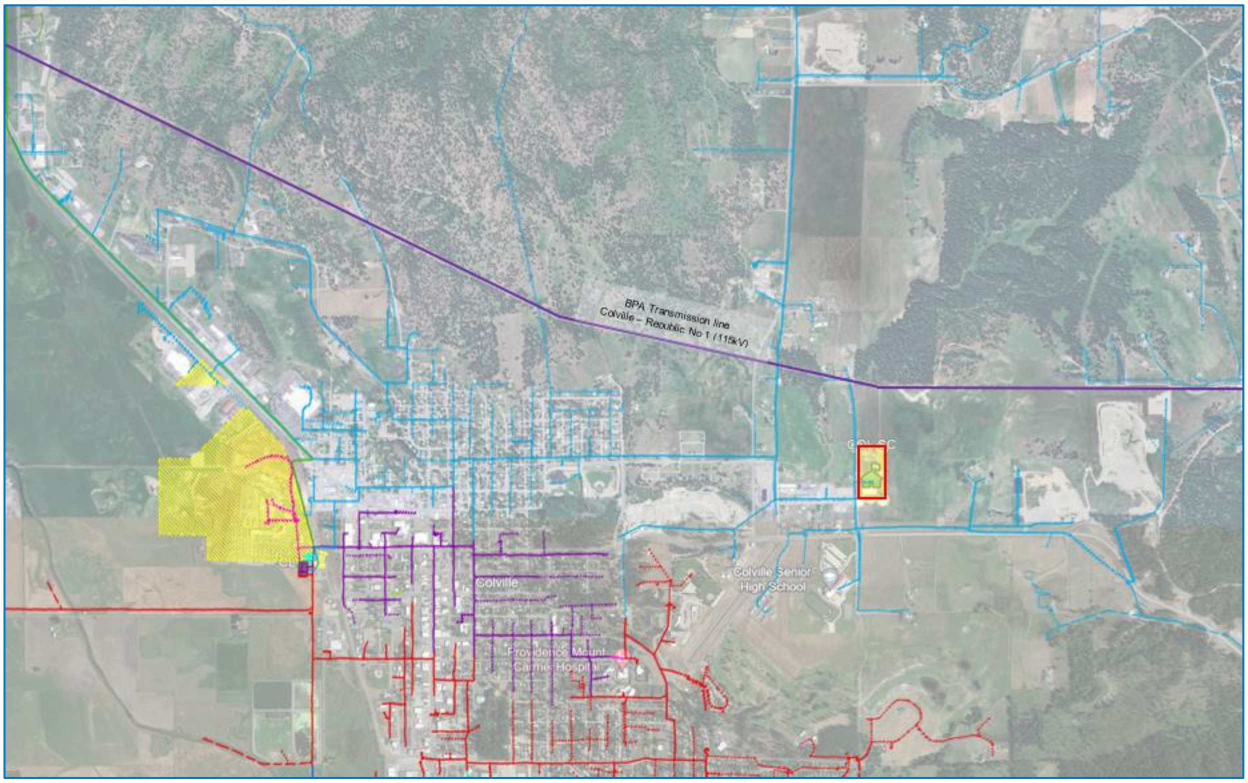


Figure 10: Proposed Station location

1.2.1.2. Distribution Integration Design

The following modification to the distribution system is necessary to integrate the new Tiger Highway feeders into the system and mitigate the identified performance issues:

- Build out both new feeders routing East along Tiger Highway. This will be double circuit for approximately 2.5 miles where one feeder will connect to a lateral on ORI12F3.
- One feeder will continue for another mile to connect to the trunk on ORI12F3. This feeder will offload ORI12F3 to the east of that connection point.
- The feeder connected to the lateral will take a small portion of ORI12F3 load but will also connect to the end of CLV12F4 with some conductor rebuilding to offload the end of that feeder.

1.2.1.3. Transmission Integration Design

Transmission integration will require requesting an interconnection to the BPA Colville – Republic 115kV Transmission Line. A radial transmission tap from the new station to BPA's transmission line will be approximately half a mile. BPA will determine the scope of work for interconnecting the transmission line. Avista will request BPA to include SCADA controlled, motor operated switches on each side of the transmission tap.

1.2.1.4. Protection Requirements

Standard transformer and feeder protection schemes will be used and coordinated with adjacent feeder protection schemes. Updates to the BPA protection scheme on the Colville – Republic 115kV Transmission Line are not anticipated.

1.2.1.5. Communication Requirements

Communication aided protection schemes for the BPA transmission line will not be in the project scope. The existing communication at the Colville Service Center can be extended to the new station to provide SCADA backhaul to the control centers.

1.2.1.6. Metering Requirements

Metering requirements will be determined during the interconnection study process with BPA.

1.3. Project Execution

1.3.1. Construction Schedule

Preliminary project schedule is as follows.

- BPA analysis - - - - - - - - - Summer 2024-2026
- Substation 20
  - Project Scoping - - - - - - - Mar 2026 - Apr 2026
  - Civil Design - - - - - - - Apr 2026 -Jun 2026
  - Integration Design - - - - - - Apr 2026 - Jul 2026
  - Protection Design - - - - - - - Apr 2026 - Jul 2026
  - Site Prep and Fence - - - - - - Jun 2026 - Nov 2026
  - Physical and Electrical Design - - - - Jul 2026 - Jan 2027
  - Network Design - - - - - - Sep 2026 - Jan 2027
  - EIM/Outage Coordination (if Applicable) - Oct 2026 - Mar 2027
  - Points List Released - - - - - - Feb 2027 - Feb 2027
  - Network Design Transmittal - - - Feb 2027 - Feb 2027
  - Integration Settings - - - - - Feb 2027 - Apr 2027
  - Protection Settings- - - - - - - Feb 2027 - Apr 2027
  - Network Procurement - - - - - - Feb 2027 - Mar 2027
  - M/S Construction - - - - - - - Mar 2027 - Jul 2027
  - Electrical Construction - - - - - Jul 2027 - Dec 2027
  - Relay Construction - - - - - - Dec 2027 - Feb 2028
  - Network Construction - - - - - - Jan 2028 - Mar 2028
  - T&C and Energize Substation - - - - Feb 2028 - Apr 2028
- Distribution
  - Design - - - - - - - - - Fall 2025-Spring 2026
  - Easements - - - - - - - - Summer 2024-Fall 2025
  - Equipment Orders - - - - - - - Summer 2026
  - Construction - - - - - - - Summer 2026-Mar 2028
- Transmission
  - Design - - - - - - - - - Fall 2025-Spring 2026
  - Easements - - - - - - - - Summer 2024-Fall 2025
  - Equipment Orders - - - - - - - Summer 2026
  - Construction - - - - - - - Summer 2026-Mar 2028
- Commissioning - - - - - - - - - April 2028

1.3.2. Cost Estimate

The preliminary project budget VROM has been estimated at approximately $9 Million. The preliminary project budget and allocations can be referenced below.

Substation	$6,600,000
Transmission	$850,000
Distribution	$1,500,000
Total	**$8,950,000**

Table 4: Project cost estimate

1.3.3. Long-Lead Time Equipment

Any electric system expansion may be delayed by long-lead time requirements, such as equipment, land acquisition, permitting and/or outage windows. Known schedule constraints that may impact the proposed project schedule are detailed in Table 5.

Potential Constraint	Historical Procurement	Extended Procurement	Impact
Communications equipment	3 months	6 months	No
Custom transmission structures	6 months	9 months	No
Main-grid auto-transformers	16 months	48 months	No
Main-grid circuit breakers	6 months	36 months	No
Main-grid capacitor/reactor	6 months	24 months	No
Main-grid station property siting, 20+ acres	24 months	36 months	No
Sub-transmission station property siting, 4+ acres	12 months	24 months	No
Sub-transmission transformers	9 months	18 months	No
Transmission right of way	24 months	60 months	No
Distribution station transformers	9 months	36 months	Yes
Distribution station circuit breaker	6 months	24 months	Yes

Table 5: Long-Lead Time Constraints

1.4. Contingent Facilities

Contingent facilities are unbuilt facilities which if delayed or not built could cause a need for restudying the proposed project.

The following contingent facilities were identified.

Initiative	ERT #	Project Name	Scope	Targeted Date of Operation	Status
N/A					

Table 6: Contingent Facilities

1.5. Other solutions considered

1.5.1. Replacing the Orin Transformer

This option is not possible in the existing station footprint and inability to expand.

1.5.2. Replacing Orin Station Near Existing Station

This option was considered but ultimately only resolves the capacity concerns on the Orin transformer. Capacity concerns at other locations, additional feeder ties for reliability, potential voltage improvement on ORI12F3 would not be resolved with this solution. Cost reduction due to decreased distribution needs would be negated by land costs for the new station and future work needed to resolve the issues listed above. This also decreases the overall feeder count and transformation capacity by replacing a station rather than adding a station.

1.5.3. Alternate routing of Tiger feeders

Routing of at least a single feeder would require buildout along Tiger Highway. This will be a difficult build however the addition of a double circuit along this route does not heavily impact cost or time. Routing the second feeder along a different route adds no value to the system performance but would add significant cost and potential time delays. These other routes were analyzed below but ultimately the double circuit solution was selected as the proposed plan.

2. Technical Analysis

2.1. Modeling Assumptions and Methodology

2.1.1. Load Assumptions

This analysis uses a projected winter loading scenario at -20°F. A linear load forecast was created using the most recent load to temperature data and then extrapolated out to estimate the system load to a one-in-ten year peak winter scenario. AMI data was used and then loaded in the model to match the forecast analysis. Load growth up to 3%, based on historical growth for each feeder, is factored in successive years. The base year load can be seen in Table 7.

Input	A Phase (A)	B Phase (A)	C Phase (A)	Average
ARD12F1	188	189	188	188
ARD12F2	252	284	223	253
CLV12F1	249	231	266	250
CLV12F2	380	358	442	390
CLV12F3	262	260	262	261
CLV12F4	558	457	447	487
CLV34F1	143	137	139	140
ORI12F1	231	176	154	187
ORI12F2	62	54	56	57
ORI12F3	341	342	355	346

Table 7: Projected Feeder Amps at -20°F

2.1.2. Customer Projects and Forecasted Load

This area, and Orin feeders specifically, are very rural feeders with lots of residential customers and limited natural gas service. Growth forecast, based on historical trends, was used for this analysis vs large step loads.

Feeder	Growth
CLV12F2	1.44%
ORI12F1	3.01%
ORI12F2	2.24%
ORI12F3	3.01%

Table 8: Non-zero growth rate feeders

2.1.3. Projects Modeled

Projects modeled are the Avista projects assumed to be completed and modeled within the distribution system models used for technical analysis.

No other projects were modeled within the technical study for Orin capacity mitigation. However, to analyze load transfer ability, switches were dummied in but conductor may or may not reflect accurate replacement. Conductor at this location was not analyzed for capacity within this project.

2.2. Cases and Results

Four cases are reviewed in this section. The first three cases consider installation of a new station at Tiger Highway with differing feeder routes and load transfers. These will have different costs associated with feeder buildout which can be a significant portion of the project cost. These cases also have differing values to other feeders in the area and overall load transferability and thus system reliability. The fourth case looks at replacement of the entire Orin sub with build out near the existing sub and no installation of the station at Tiger Highway. All solutions involve increasing transformation capacity in the area.

2.2.1. New Station Case 1

For this case the new Tiger Highway Station is installed near the Colville main campus. This station is fed via tap from the BPA transmission line and has a 20MVA transformer with two feeders. In this case the feeders route in different directions. One feeder routes through the city and interconnects near the existing Orin Station at the trunk. The other feeder routes down Tiger Highway and connects to ORI12F3 further along the trunk. This setup allows ORI12F3 to be split between the new feeders, offloading the existing Orin 115/13kV Transformer 1 and decreasing the voltage drop at the end of ORI12F3 via improved/upsized conductor from the new station to the existing trunk. The new station and distribution buildout can be seen in Figure 11 and the final feeder layout for both the Orin and Tiber Highway stations can be seen in Figure 12.

The multi-year analysis provides simulated expected equipment loading based on the assumptions stated above. The Orin Capacity Mitigation project is assumed to be completed before the summer of 2030. Table 9 and Table 10 includes the multi-year analysis results. Based on the analysis results, this case solution provides adequate capacity mitigation in the outer years but does not resolve near-term loading concerns nor does this imply voltage resolution.

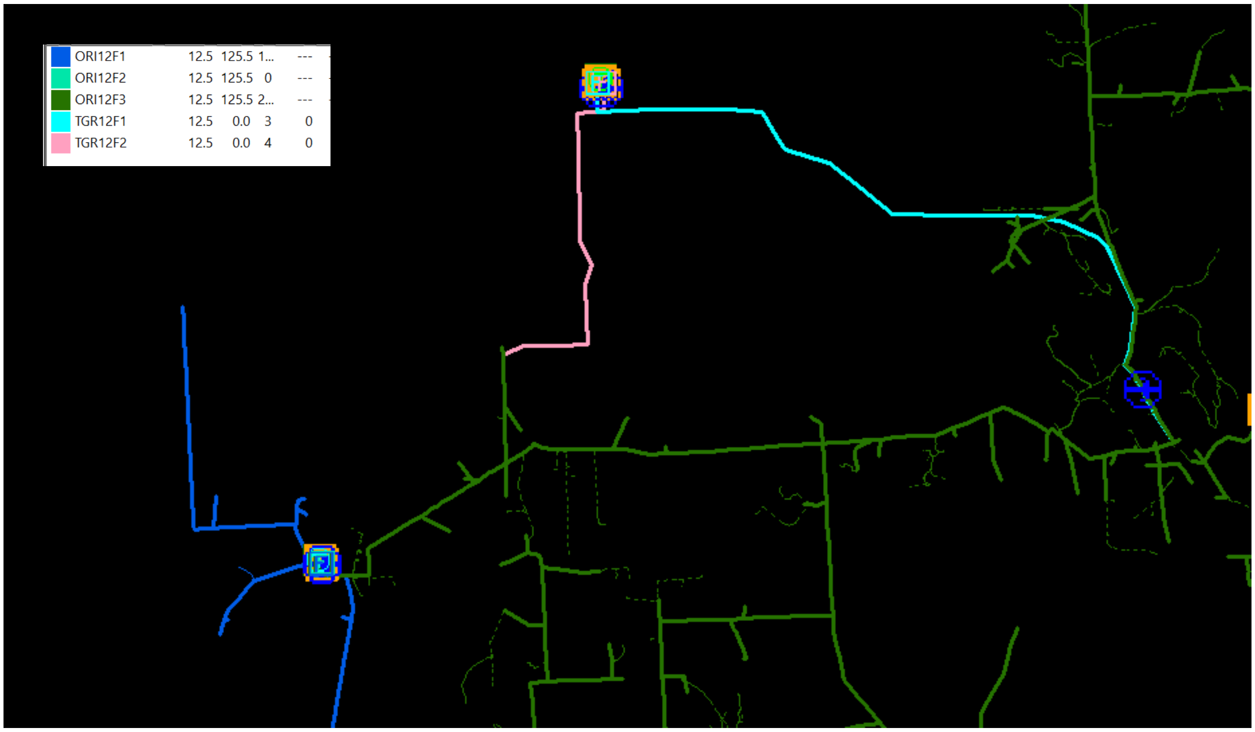


Figure 11: Station and Distribution Buildout Case 1

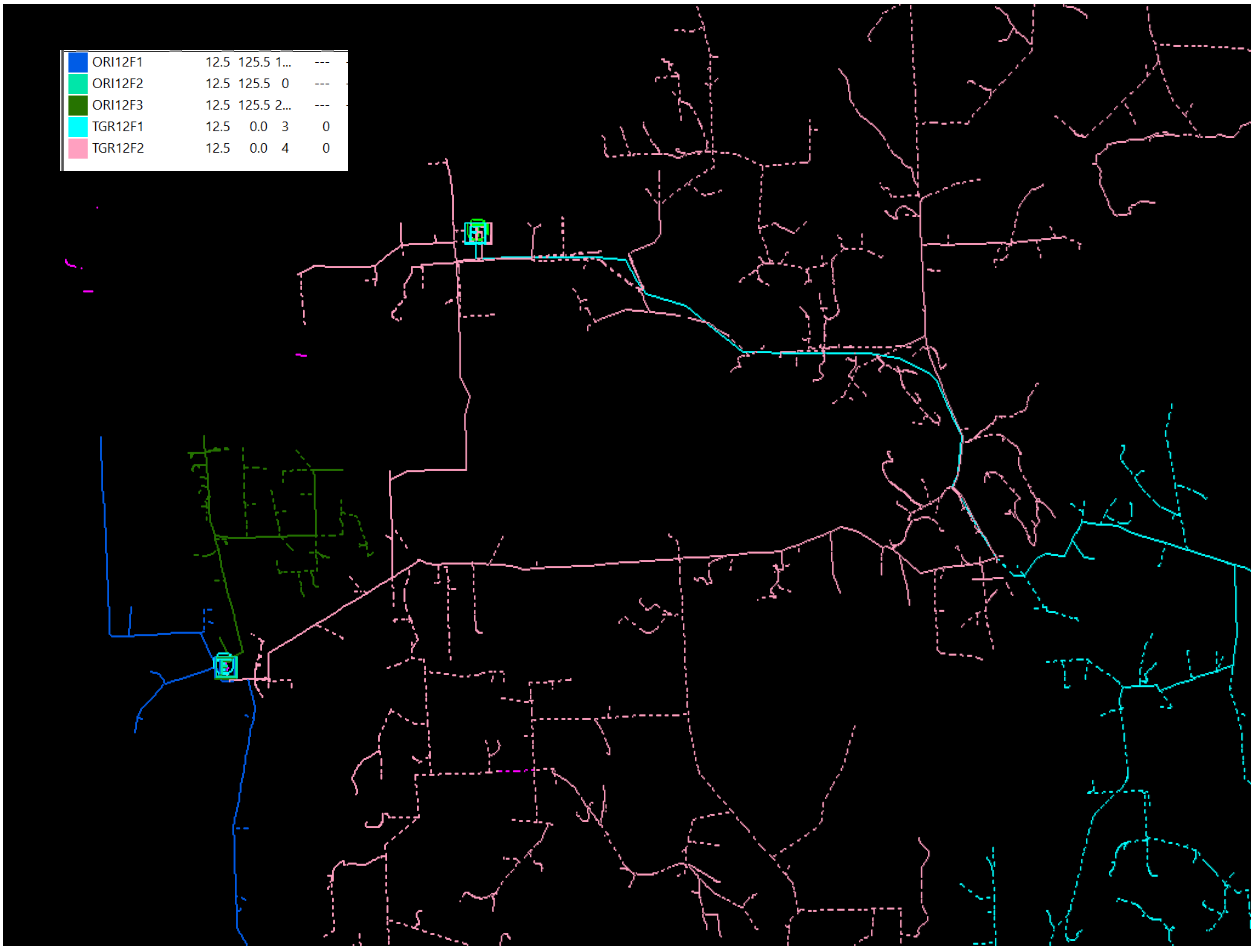


Figure 12: Final Orin and Tiger Highway Feeder Layout Case 1

Note: feeders and transformers are highlighted below when exceeding 80%, 90% and 100%

FDR/XFMR	2024	2025	2026	2027	2028	2029	2030	2031	2032	2033	2034
ARD12F1	47	47	47	47	47	47	47	47	47	47	47
ARD12F2	82	82	82	82	82	82	82	82	82	82	82
CLV12F1	40	40	40	40	40	40	40	40	40	40	40
CLV12F2	75	76	78	79	80	81	72	73	74	75	77
CLV12F3	64	64	64	64	64	64	64	64	64	64	64
CLV12F4	85	85	85	85	85	85	63	63	63	63	63
CLV34F1	72	72	72	72	72	72	72	72	72	72	72
ORI12F1	41	42	44	46	47	49	48	50	52	54	55
ORI12F2	-	-	-	-	-	-	-	-	-	-	-
ORI12F3*	56	58	60	62	64	66	12	12	12	12	13
TGR12F1	-	-	-	-	-	-	44	49	47	49	51
TGR12F2	-	-	-	-	-	-	41	42	42	43	44
ARD XFMR*	76	76	76	76	76	76	76	76	76	76	76
CLV XFMR #1	43	43	43	43	43	43	43	43	43	43	43
CLV XFMR #2	75	76	76	77	78	78	65	66	66	67	67
CLV XFMR #3	66	66	66	66	66	66	66	66	66	66	66
ORI XFMR	98	101	105	109	113	117	54	56	58	60	62

TIG XFMR	-	-	-	-	-	-	38	39	40	41	42

Table 9: Expected Percent Loading of Equipment with New Station

Note: feeders exceeding 100% are highlighted below

FDR/XFMR	2024	2025	2026	2027	2028	2029	2030	2031	2032	2033	2034
ARD12F1	187	187	187	187	187	187	187	187	187	187	187
ARD12F2	283	283	283	283	283	283	283	283	283	283	283
CLV12F1	266	266	266	266	266	266	266	266	266	266	266
CLV12F2	505	513	520	528	536	544	483	493	500	507	514
CLV12F3	255	255	255	255	255	255	255	255	255	255	255
CLV12F4	563	563	563	563	563	564	414	414	414	414	414
CLV34F1	144	144	144	144	144	144	144	144	144	144	144
ORI12F1	228	238	247	256	266	276	273	282	291	301	310
ORI12F2	-	-	-	-	-	-	-	-	-	-	-
ORI12F3*	337	348	360	371	384	398	69	71	72	74	76
TGR12F1	-	-	-	-	-	-	265	275	284	293	304
TGR12F2	-	-	-	-	-	-	247	250	254	258	264

Table 10: Expected Peak Amps with New Station

2.2.2. New Station Case 2

For this case the new Tiger Highway station is installed as in the previous case. One feeder routes the same as the above case to the southwest through the city and interconnects near the existing Orin Station at the trunk. The other feeder also routes the same as the case above, down Tiger highway but connects to ORI12F3 at a nearer lateral. This setup allows ORI12F3 to be almost completely offloaded to one of the new feeders, while the other feeder offloads a single lateral from ORI12F3 and a portion of CLV12F4 (another heavily loaded feeder in the area). The new station and distribution buildout can be seen in Figure 13 and the final feeder layout for both the Orin and Tiger Highway stations can be seen in Figure 14.

The multi-year analysis provides simulated expected equipment loading based on the assumptions stated above. The Orin Capacity Mitigation project is assumed to be completed before the summer of 2030. Table 11 and Table 12 includes the multi-year analysis results. Based on the analysis results, this case solution provides adequate capacity mitigation in the outer years but does not resolve near-term loading concerns nor does this imply voltage resolution.

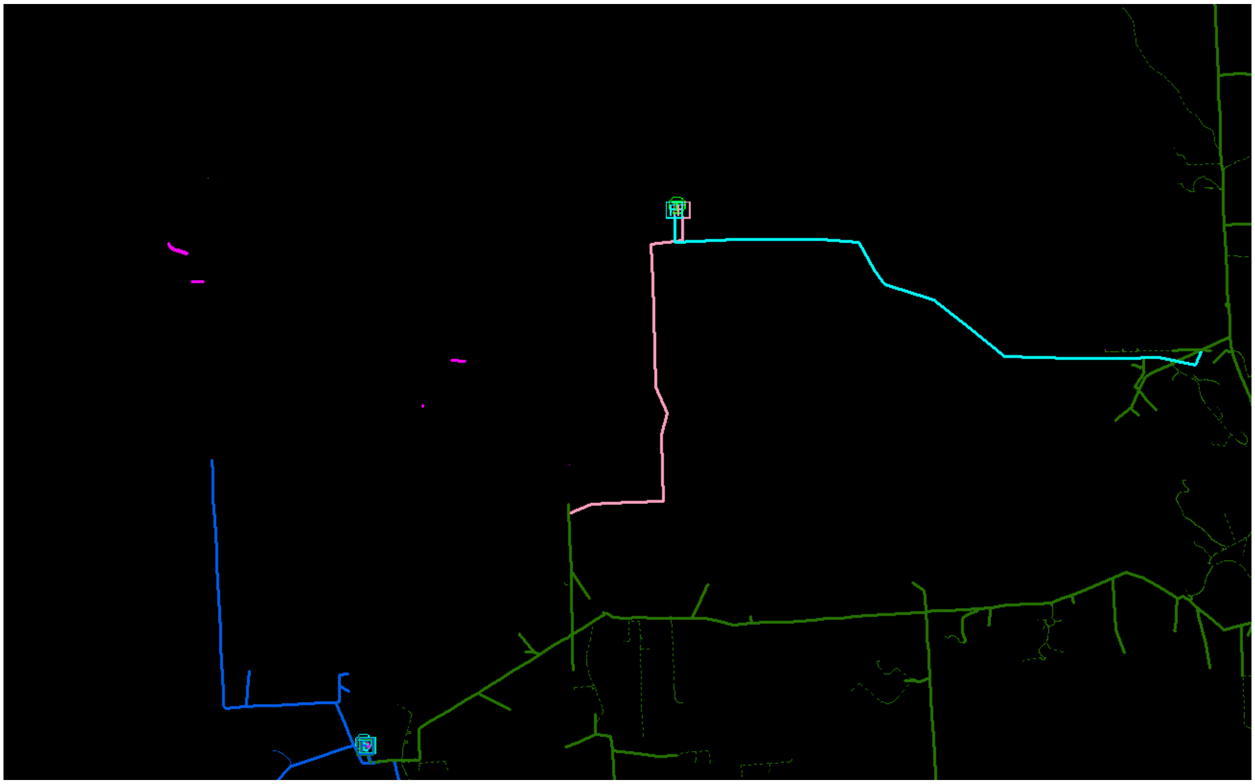


Figure 13: Station and Distribution Buildout Case 2

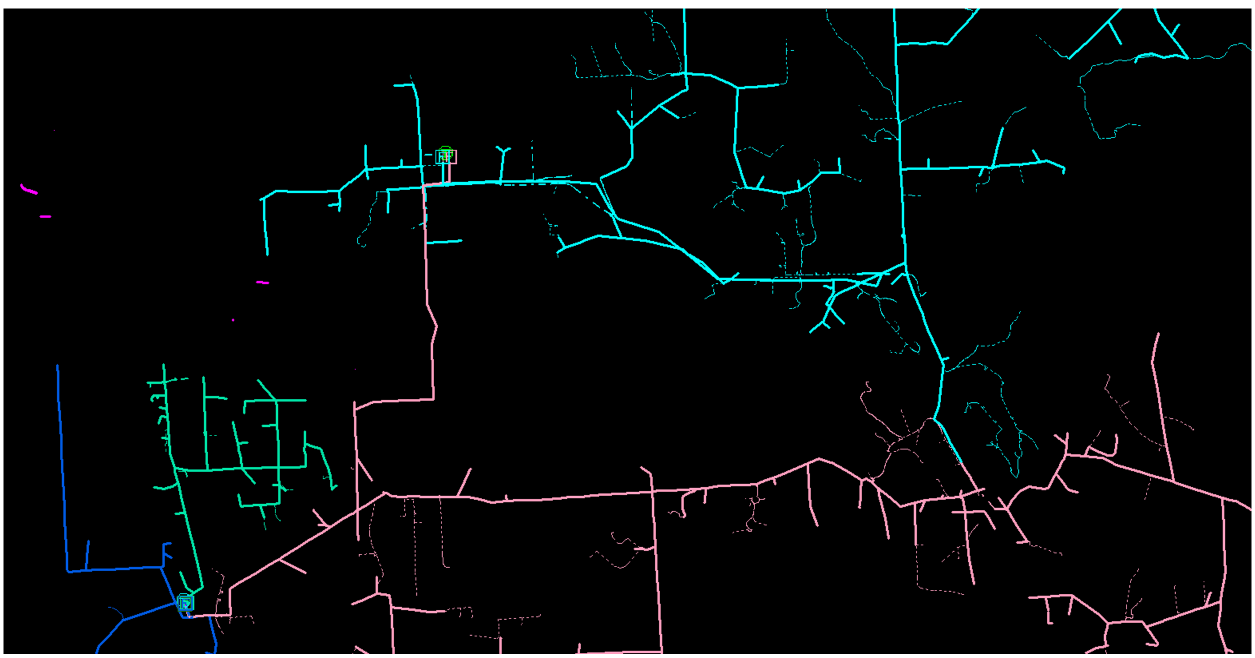


Figure 14: Final Orin and Tiger Highway Feeder Layout Case 2

Note: feeders and transformers are highlighted below when exceeding 80%, 90% and 100%

FDR/XFMR	2024	2025	2026	2027	2028	2029	2030	2031	2032	2033	2034
ARD12F1	47	47	47	47	47	47	47	47	47	47	47
ARD12F2	82	82	82	82	82	82	82	82	82	82	82
CLV12F1	40	40	40	40	40	40	40	40	40	40	40
CLV12F2	75	76	78	79	80	81	72	73	74	75	77
CLV12F3	64	64	64	64	64	64	64	64	64	64	64
CLV12F4	85	85	85	85	85	85	63	63	63	63	63
CLV34F1	72	72	72	72	72	72	72	72	72	72	72
ORI12F1	41	42	44	46	47	49	48	50	52	54	55
ORI12F2	0	0	0	0	0	0	20	21	21	22	22
ORI12F3*	56	58	60	61	64	66	-	-	-	-	-
TGR12F1	-	-	-	-	-	-	35	35	36	36	37
TGR12F2	-	-	-	-	-	-	60	62	64	66	68
ARD XFMR*	76	76	76	76	76	76	76	76	76	76	76
CLV XFMR #1	43	43	43	43	43	43	43	43	43	43	43
CLV XFMR #2	75	76	76	77	78	78	65	66	66	67	67
CLV XFMR #3	66	66	66	66	66	66	66	66	66	66	66
ORI XFMR	98	102	105	109	113	117	55	56	58	60	62
TIG XFMR	-	-	-	-	-	-	38	39	40	41	42

Table 11: Expected Percent Loading of Equipment with New Station

Note: feeders exceeding 100% are highlighted below

FDR/XFMR	2024	2025	2026	2027	2028	2029	2030	2031	2032	2033	2034
ARD12F1	187	187	187	187	187	187	187	187	187	187	187
ARD12F2	282	282	282	282	282	282	282	282	282	282	282
CLV12F1	266	266	266	266	266	266	266	266	266	266	266
CLV12F2	503	510	518	526	534	542	481	487	497	504	511
CLV12F3	255	255	255	255	255	255	255	255	255	255	255
CLV12F4	561	561	561	561	561	561	413	413	413	413	413
CLV34F1	143	143	143	143	143	143	143	143	143	143	143
ORI12F1	229	238	247	256	265	274	271	281	290	300	309
ORI12F2	0	0	0	0	0	0	69	71	73	74	76
ORI12F3*	337	348	360	371	384	398	-	-	-	-	-
TGR12F1	-	-	-	-	-	-	212	214	218	221	224
TGR12F2	-	-	-	-	-	-	361	373	384	396	410

Table 12: Expected Peak Amps with Tiger Highway Station Expansion

2.2.3. New Station Case 3 – Proposed Solution

For this case the new Tiger Highway station is installed as in the previous two cases. For this solution both feeders run as a double circuit east on Tiger Highway for approximately 2.5 miles where one feeder connects with a lateral off ORI12F3. The other feeder continues for another mile to connect to the trunk of ORI12F3. The second feeder will eventually feed the ORI12F3 feeder from the connection eastward. The first feeder takes a smaller portion off ORI12F3 which allows more of the CLV12F4 feeder to be offloaded. A small portion of load is left on the ORI12F3 feeder. This setup offloads a significant amount of ORI12F3, offloading the existing Orin 115/13kV Transformer 1 and decreasing the voltage drop at the end of CLV12F4 and ORI12F3 via shorter routing and improved/upsized conductor from the new station to the existing trunk. The new station and distribution buildout can be seen in Figure 15 and the final feeder layout for both the Orin and Tiger Highway stations can be seen in Figure 16.

The multi-year analysis provides simulated expected equipment loading based on the assumptions stated above. The Orin Capacity Mitigation project is assumed to be completed before the summer of 2030. Table 13 and Table 14 includes the multi-year analysis results. Based on the analysis results, this case solution provides adequate capacity mitigation in the outer years but does not resolve near-term loading concerns nor does this imply voltage resolution.

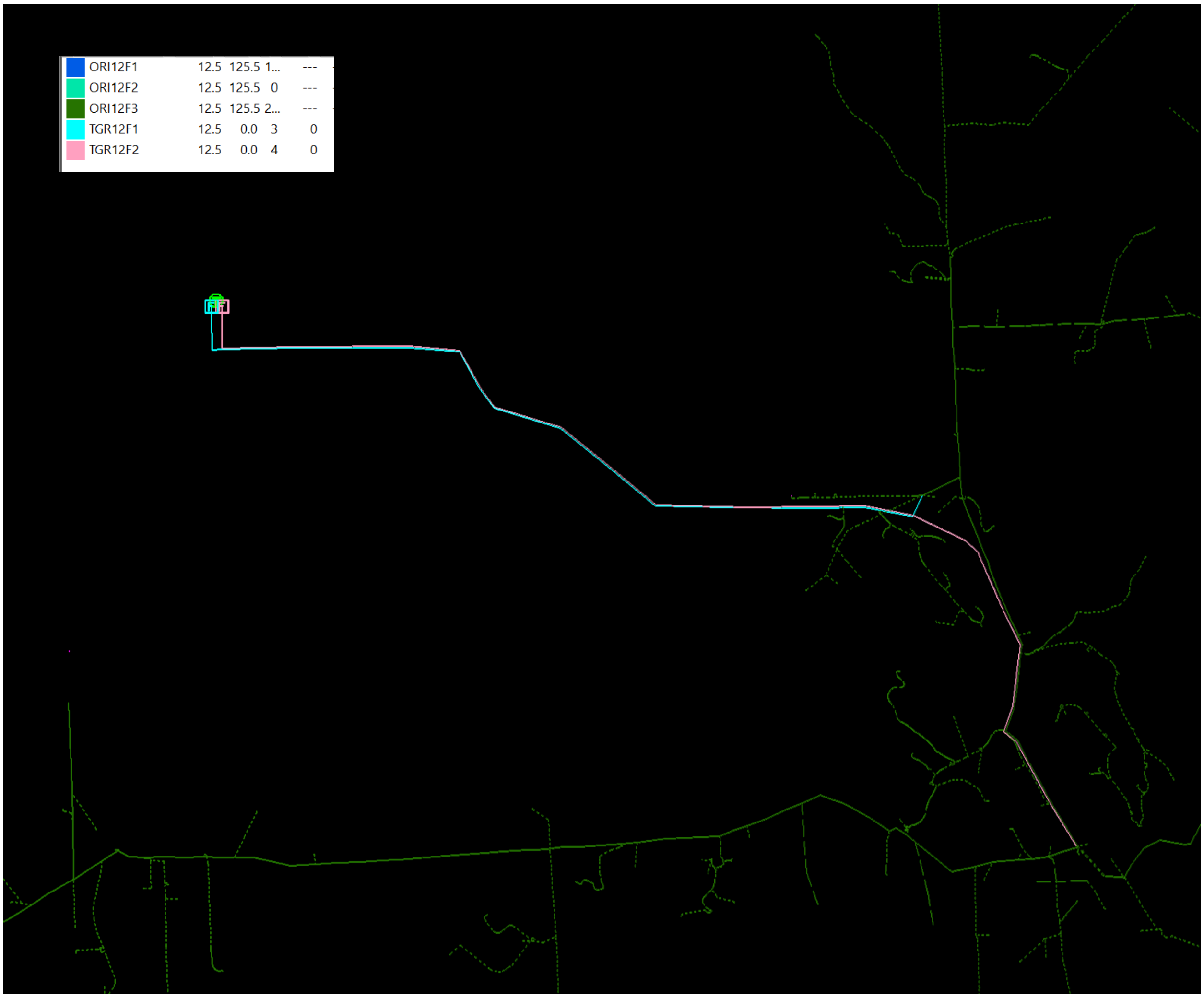


Figure 15: Station and Distribution Buildout Case 3

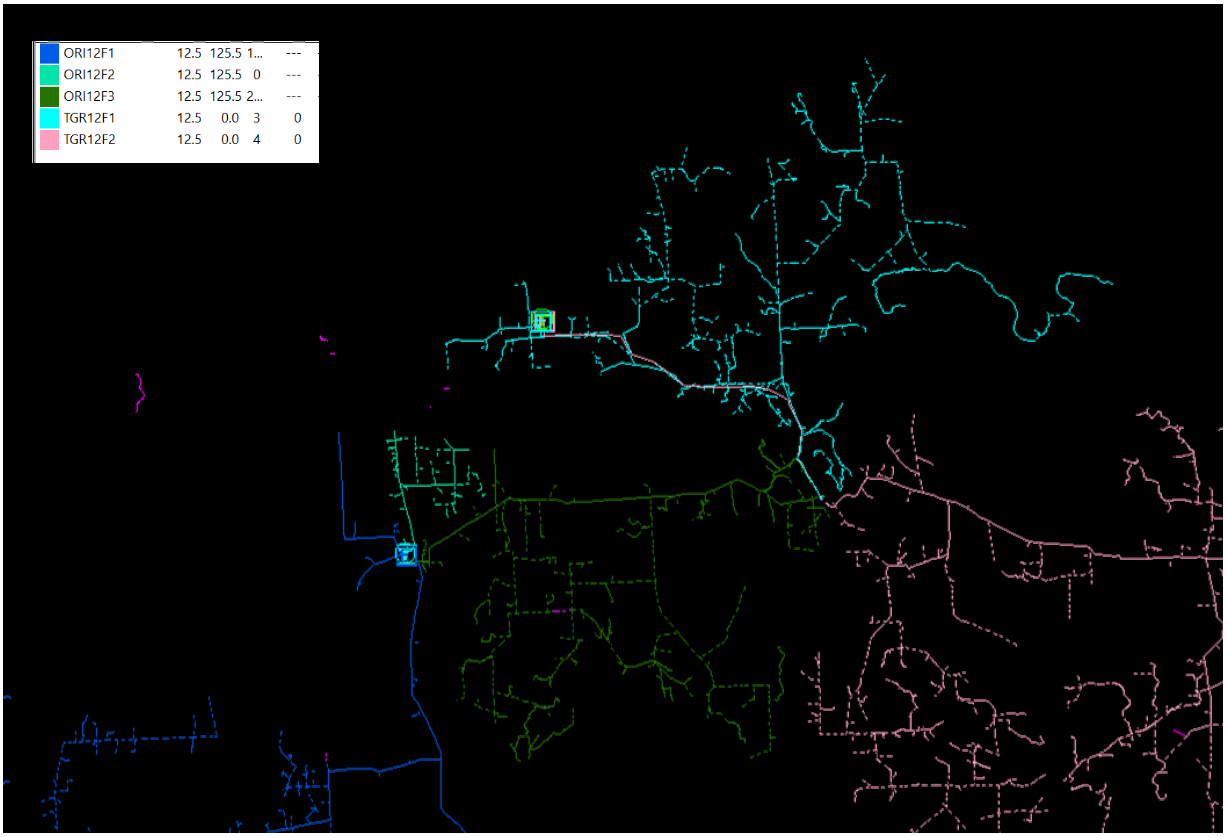


Figure 16: Final Orin and Tiger Highway Feeder Layout Case 3

Note: feeders and transformers are highlighted below when exceeding 80%, 90% and 100%

FDR/XFMR	2024	2025	2026	2027	2028	2029	2030	2031	2032	2033	2034
ARD12F1	47	47	47	47	47	47	47	47	47	47	47
ARD12F2	82	82	82	82	82	82	82	82	82	82	82
CLV12F1	40	40	40	40	40	40	44	44	44	44	44
CLV12F2	76	77	78	79	80	81	69	70	71	72	73
CLV12F3	64	64	64	64	64	64	64	64	64	64	64
CLV12F4	85	85	86	86	86	86	63	63	63	63	63
CLV34F1	72	72	72	72	72	72	72	72	72	72	72
ORI12F1	39	41	42	44	45	47	49	50	52	54	55
ORI12F2	-	-	-	-	-	-	20	21	21	22	22
ORI12F3*	56	58	60	62	64	66	16	16	17	17	18
TGR12F1	-	-	-	-	-	-	34	35	35	36	36
TGR12F2	-	-	-	-	-	-	43	44	46	47	48
ARD XFMR*	76	76	76	76	76	76	76	76	76	76	76
CLV XFMR #1	43	43	43	43	43	43	45	45	45	45	45
CLV XFMR #2	75	76	77	77	78	79	63	64	64	65	65
CLV XFMR #3	66	66	66	66	66	66	66	66	66	66	66
ORI XFMR	98	101	105	109	113	117	68	70	73	75	77
TIG XFMR	-	-	-	-	-	-	35	36	37	38	39

Table 13: Expected Percent Loading of Equipment with New Station

Note: feeders exceeding 100% are highlighted below

FDR/XFMR	2024	2025	2026	2027	2028	2029	2030	2031	2032	2033	2034
ARD12F1	187	187	187	187	187	187	187	187	187	187	187
ARD12F2	283	283	283	283	283	283	283	283	283	283	283
CLV12F1	266	266	266	266	266	266	289	290	290	290	291
CLV12F2	505	513	520	528	536	544	460	466	473	479	486
CLV12F3	255	255	255	255	255	255	255	255	255	255	255
CLV12F4	563	563	563	563	563	564	414	414	414	414	414
CLV34F1	144	144	144	144	144	144	144	144	144	144	144
ORI12F1	228	238	247	256	266	276	273	282	290	301	310
ORI12F2	-	-	-	-	-	-	69	71	73	74	76
ORI12F3*	337	348	360	371	384	398	93	96	99	102	106
TGR12F1	-	-	-	-	-	-	206	210	213	215	218
TGR12F2	-	-	-	-	-	-	258	266	274	282	291

Table 14: Expected Peak Amps with Tiger Highway Station Expansion

2.2.4. Near-Term Mitigation Options

Peak shaving to mitigate capacity concerns until a long-term solution can be installed is necessary. The Orin 115/13kV Transformer 1 exceeded 90% for 4 hours during the latest cold spell. Batteries could help shave this peak. The overnight lows at this time did drop below 80% of capacity which would allow the batteries to recharge for consecutive days of high demand. An existing project to purchase mobile batteries is under development but not finalized and selection of locations to use the batteries has not been determined. Purchasing a battery for this solution would add a cost up to $4 million to the project.

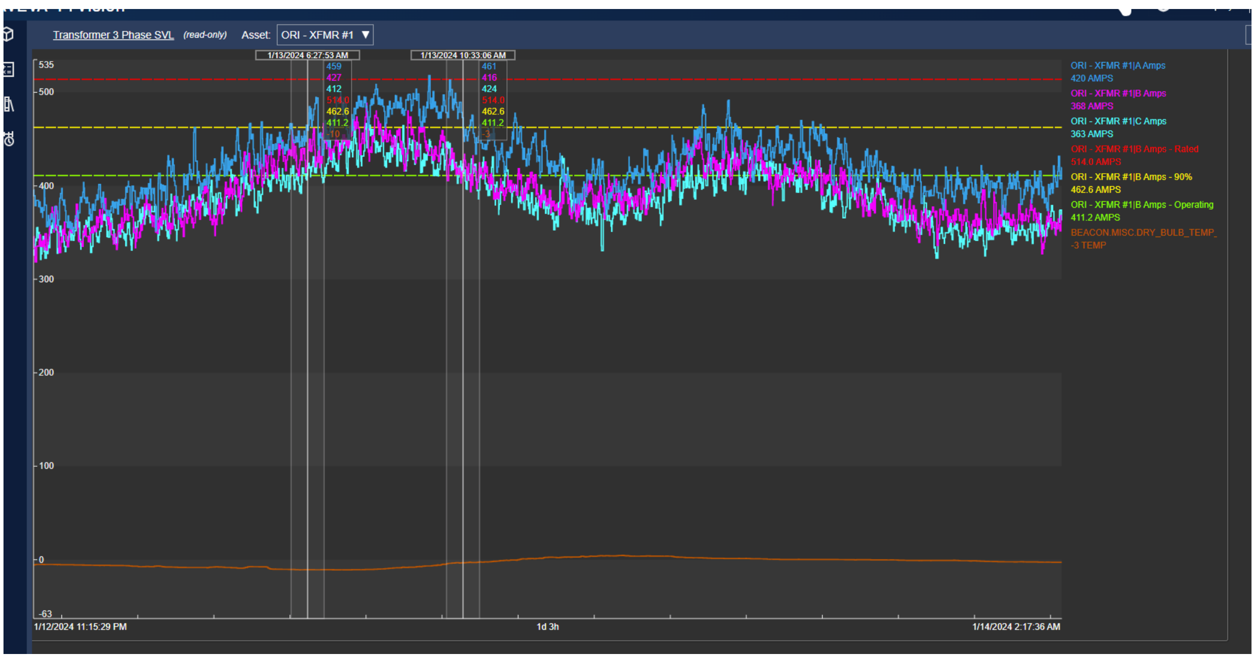


Figure 17: Orin 115/13kV Transformer 1 loading January 13, 2024

Alternatively, the transformer could be offloaded via mobile transformer prior to forecasted cold temperatures. However, this would likely cause an outage of the same duration as a load shedding event. The outage would also impact nearly all the customers on the Orin Station as only small portions could be offloaded to other nearby stations. This solution is also not a guaranteed solution as the mobile may not fit within the small Orin Station footprint.

The final proposed solution would require more analysis to get a program started.

2.3. Short Circuit Analysis

A short circuit analysis was conducted by Distribution Planning to determine an order of magnitude available fault current and Thevenin impedance at the new Tiger Highway station.

2.3.1. Available Fault Current

The estimated three phase and single line to ground fault current at the new Tiger Highway station following the completion of the project is provided in Table 15. These values are assumed based on the Thevenin data in Table 16, proposed conductor installation and, generic transformer and equipment.

Location	Three Phase Fault	Single Line to Ground Fault
115kV Bus	5,189 A	4,595 A
13kV Bus 1	4,940 A	5,156 A

Table 15: Available fault current

2.3.2. Thevenin Impedance

The estimated Thevenin equivalent positive sequence impedance at the new Tiger Highway Station is provided in Table 16. These values are assumed based off bus 40607 (Kettle Falls Tap) that also taps off the Colville-Republic No 1 BPA transmission line.

Location	Thevenin Impedance (pu)
115kV Bus	1.8788+j12.6560

Table 16: Thevenin impedance

2.4. Redlined SCADA Variable Limits

Preliminary SCADA Variable Limits are prepared with the intent of identifying constraints along modified or new equipment.

2.4.1. Feeders

The new feeders at Tiger Highway station are expected to have a minimum 600A rating at 40°C ambient temperature. The limiting element should be the main feeder trunk conductor of 556 AAC. This will allow load transfers to occur and improve overall system resiliency and reliability. Winter feeder limits for the all cases is assumed to be ~600A.

2.4.2. Transformers

The new transformer at Tiger Highway station is expected to have a minimum 22MVA (20MVA nominal) at 40°C ambient temperature. The limiting element should be the transformer. Winter transformer limits for all cases is assumed to be ~1200A.

				AMBIENT TEMPERATURE (C)								
Residential (75% LF)				-30	-20	-10	0	10	20	30	40	50
LOCATION	DEVICE	TYPE	RATING (Amps.)	AMPS	AMPS	AMPS	AMPS	AMPS	AMPS	AMPS	AMPS	AMPS
PRIMARY SIDE XFMR	AIR SWITCH	PASCOR TYPE CBSC	1200	2141	2036	1926	1809	1684	1549	1401	1236	1044
(@ 115 kV)	CKT. SWR.	S&C 2030	1200	1200	1200	1200	1200	1200	1200	1200	1200	1044
	CONDUCTOR	795 AAC		1304	1232	1158	1079	999	910	810	694	552
		3" Al. Pipe (85'C)		3591	3432	3262	3079	2879	2659	2414	2133	1799
		2" Al. Pipe (85'C)		2196	2099	1995	1883	1762	1629	1481	1313	1114
	BUSH. C.T.(/5)	1200/5 M.R.	600	600	600	600	600	600	600	600	600	600
(55/65°C)	TRANSFMR	WEST. OA/FA/FOA	115	150	150	150	150	143	136	127	117	104
	22400000	112750										

				AMBIENT TEMPERATURE (C)								
				-30	-20	-10	0	10	20	30	40	50
LOCATION	DEVICE	TYPE	RATING (Amps.)	AMPS	AMPS	AMPS	AMPS	AMPS	AMPS	AMPS	AMPS	AMPS
PRIMARY SIDE XFMR	AIR SWITCH	PASCOR TYPE CBSC	9804	17493	16635	15736	14780	13759	12656	11447	10098	8530
referred to secondary	CKT. SWR.	S&C 2030	9804	9804	9804	9804	9804	9804	9804	9804	9804	8534
(@ 13kV)	CONDUCTOR	795 AAC		10654	10066	9461	8816	8162	7435	6618	5670	4510
		3" Al. Pipe (85'C)		29340	28040	26651	25156	23522	21725	19723	17427	14698
		2" Al. Pipe (85'C)		17942	17149	16300	15385	14396	13309	12100	10728	9102
	BUSH. C.T.(/5)	1200/5 M.R.	4902	4902	4902	4902	4902	4902	4902	4902	4902	4902
SECONDRY SIDE XFMR	DISCONN SW	BRIDGES "SE"	1200	2141	2036	1926	1809	1684	1549	1401	1236	1044
(@ 13kV)	CONDUCTOR	1000 MCM CU		1853	1751	1646	1532	1418	1291	1149	983	854
		2" IPS CU PIPE		2841	2677	2511	2329	2151	1952	1725	1457	1117
	BUSH. C.T.(/5)	2000/5 M.R.	1200	***1214***	***1214***	***1214***	***1214***	1200	1200	1200	1200	1200
(55/65°C)	TRANSFMR	WEST. OA/FA/FOA	937	1228	1228	1228	1228	***1171***	***1115***	***1040***	***956***	***853***
	22400000	13800										
SYSTEM CURRENT LIMIT FOR SPECIFIC TEMPERATURE				1214	1214	1214	1214	1171	1115	1040	956	853

2.5. Conclusion

The Colville area has limited load transferability and smaller, older equipment. Existing stations were not built to allow for the growing demand in the area. Many of the longer rural feeders do not have natural gas as a power source and thus demand for future load is only going to increase. Mitigation efforts have been underway to help capacity concerns via phase balancing and conductor work but a large-scale solution is needed now. The proposed solution improves reliability through feeder ties, helps voltage concerns on feeders in the area, brings in a new transmission source adding redundancy, adds transformation capacity and most importantly reduces the load on the existing Orin 115/13kV Transformer 1 to below capacity concerns.

3. Stakeholder Acknowledgement

The Avista stakeholders listed in Table 17 have acknowledged they were informed and consulted during the development of the proposed project.

Function	Name	Date
Substation Engineering	Brian Chain	6/13/24
Transmission Engineering	Ken Sweigart	6/18/24
Distribution Engineering	Cesar Godinez	6/18/24
Protection Engineering	Kevin Damron	4/30/24
Project Delivery	Katie Prugh	5/13/24
SCADA/EMS		
Transmission Operations	Rich Hydzik	6/18/24

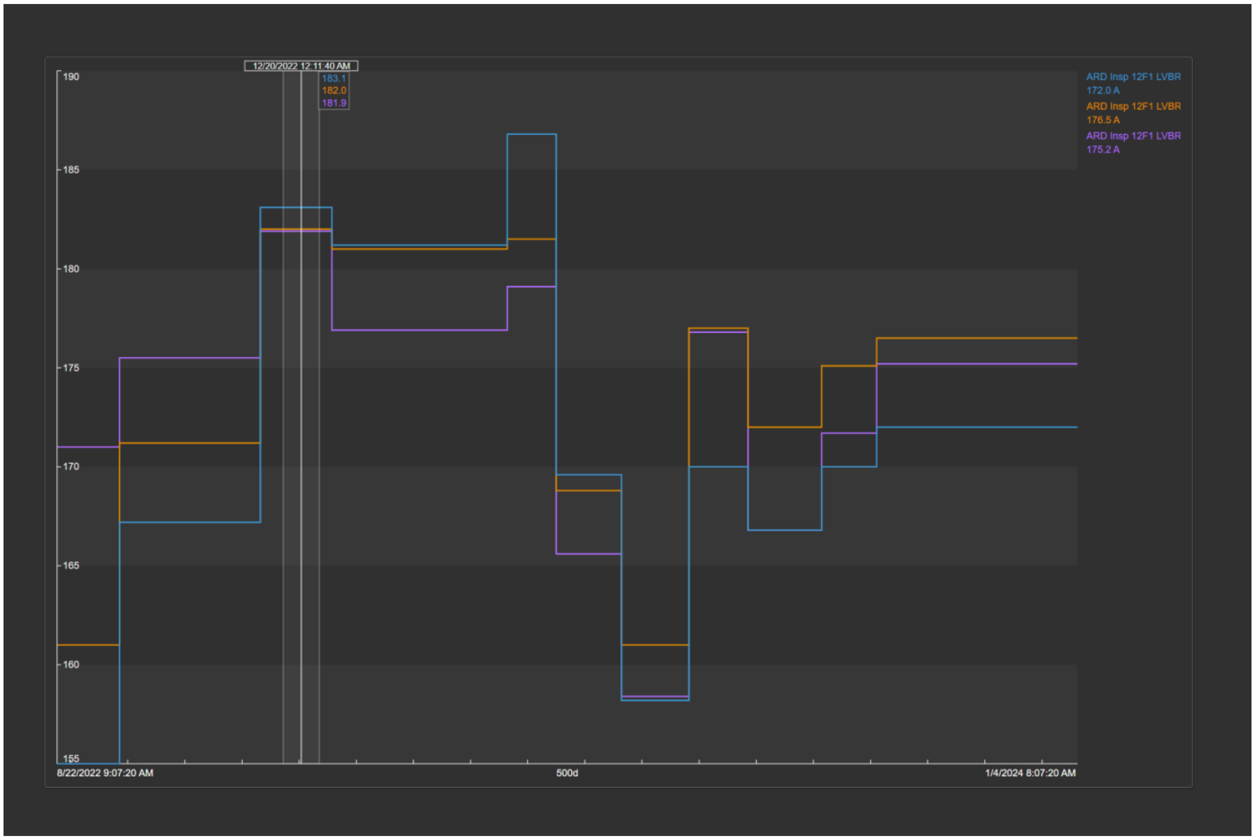
Distribution Operations	Tyler Dornquast	6/19/2024
Network Engineering		

Table 17: Avista stakeholder acknowledgement

4. Appendix

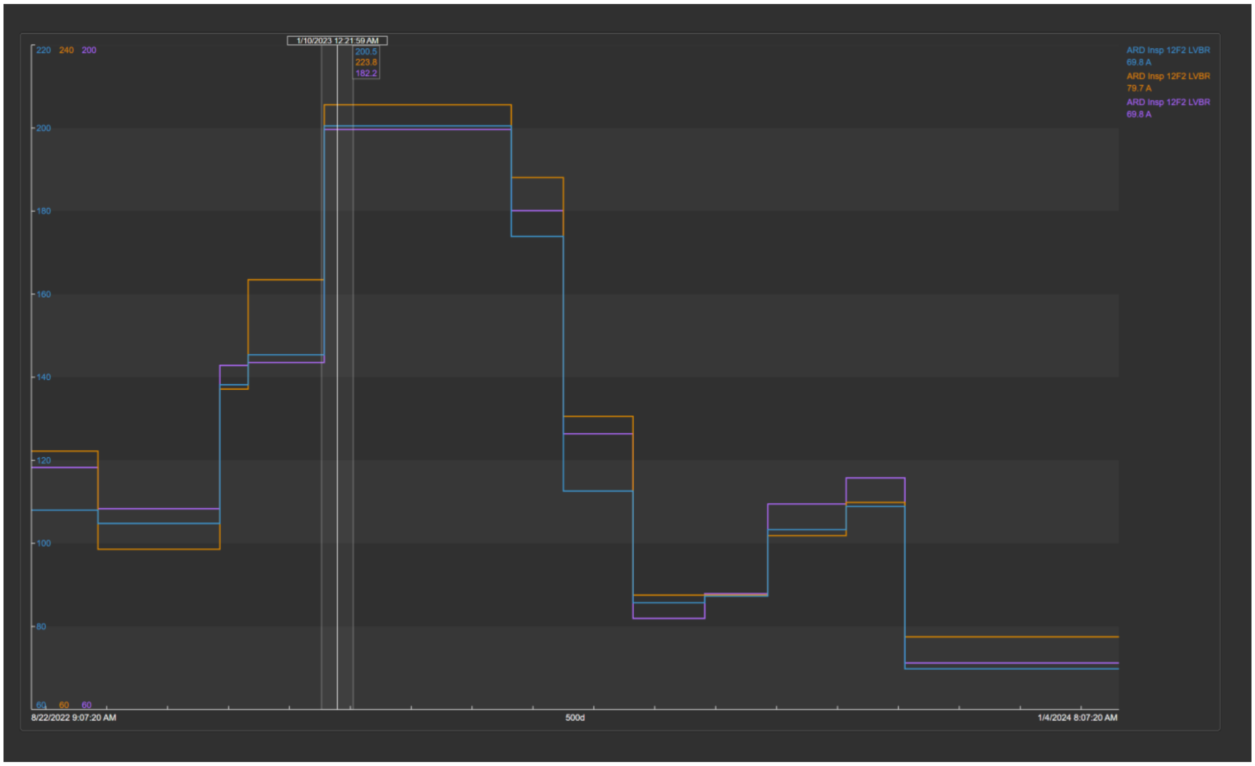
4.1. Winter Peak data

4.1.1. ARD12F1



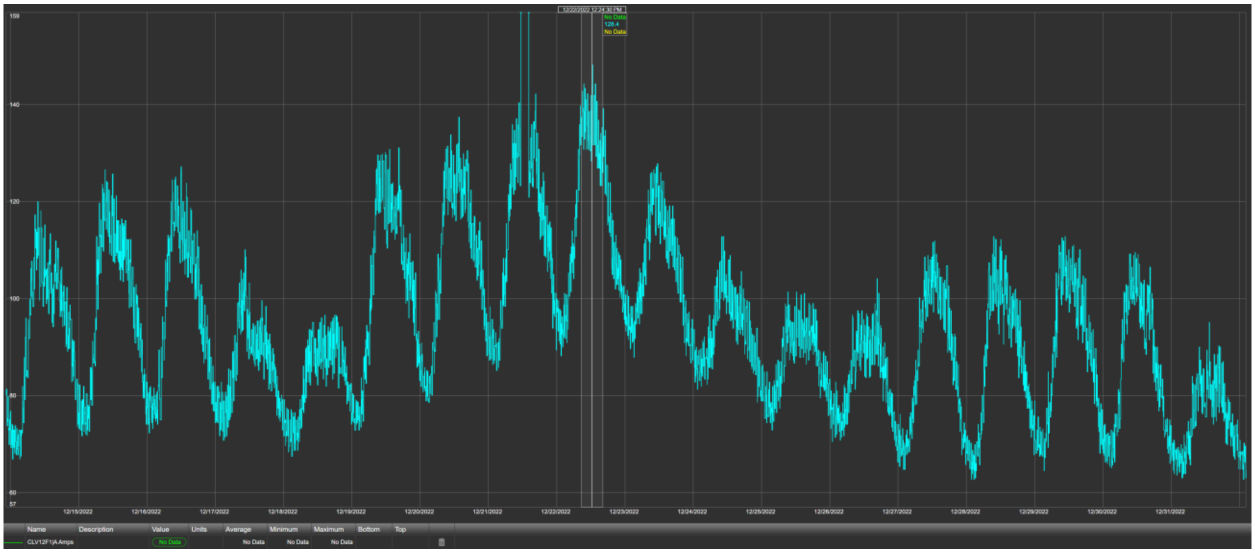
Inspection winter peak of ~182A for all phases during December of 2022.

4.1.2. ARD12F2

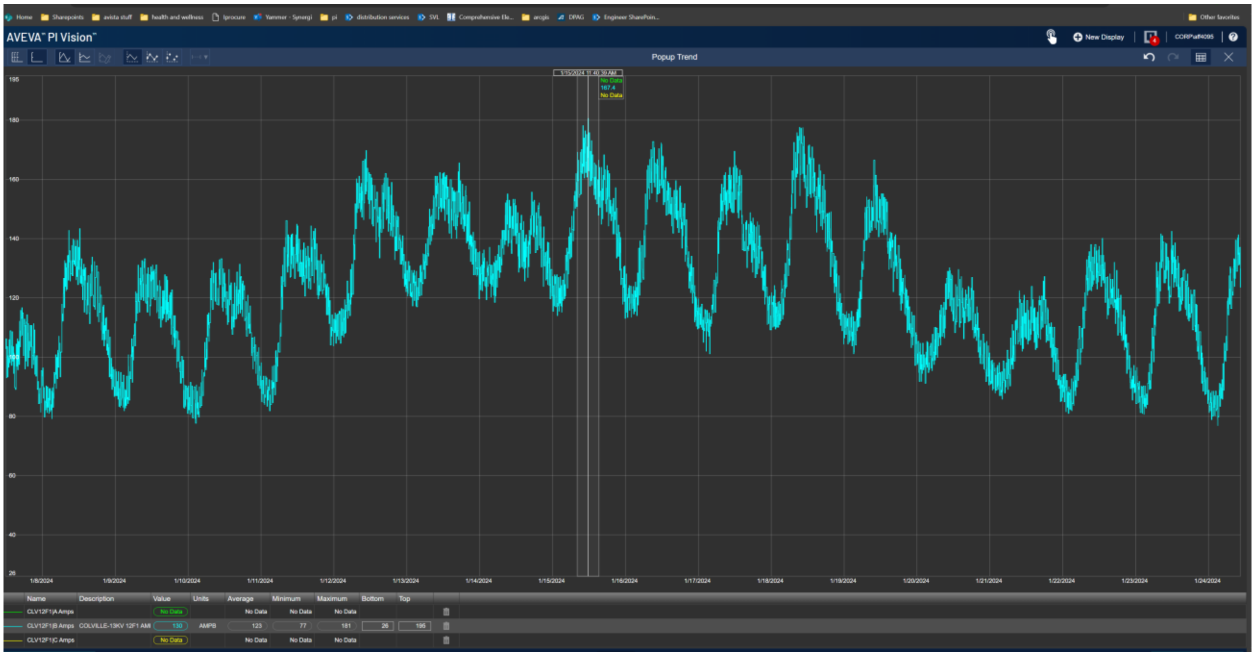


Inspection winter peak of 200/224/182A for the first inspection after December of 2022.

4.1.3. CLV12F1

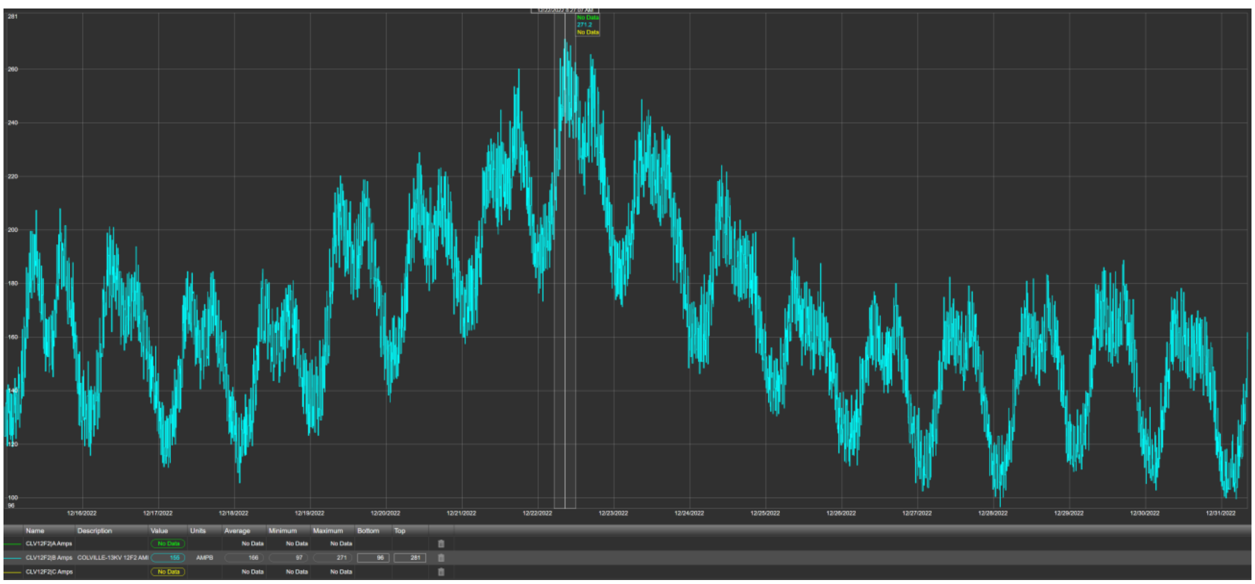


B-phase winter peak of 128A at 4:30pm on Dec 22, 2022

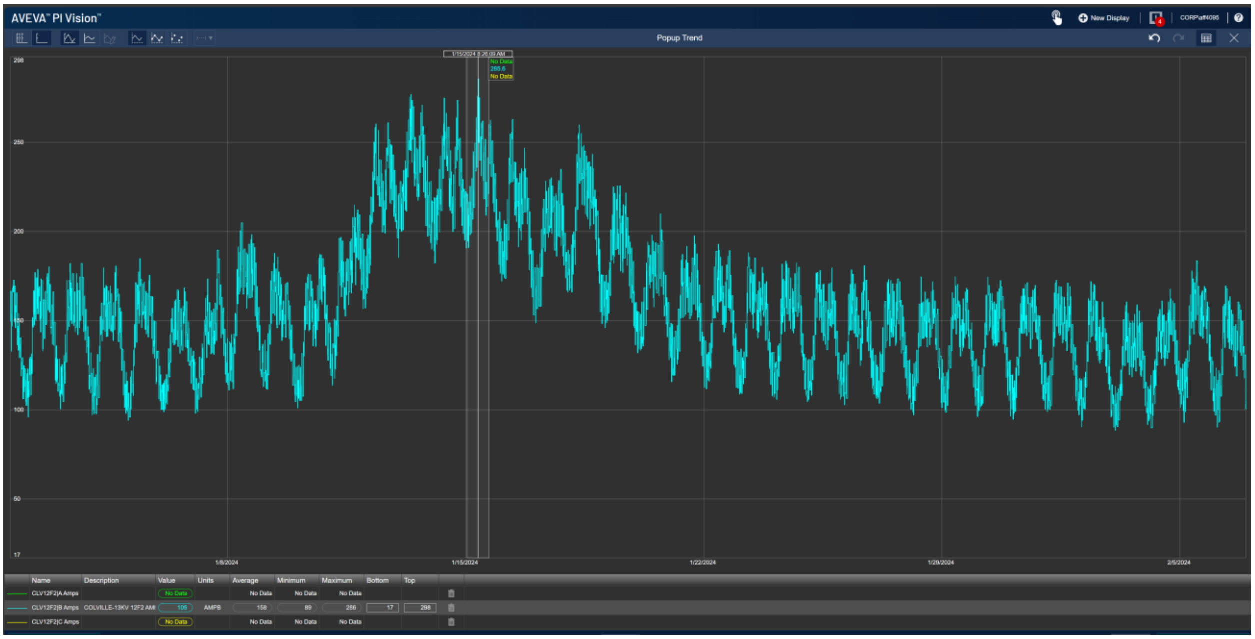


B-phase winter peak of 181A at 11:40am on Jan 15, 2023

4.1.4. CLV12F2

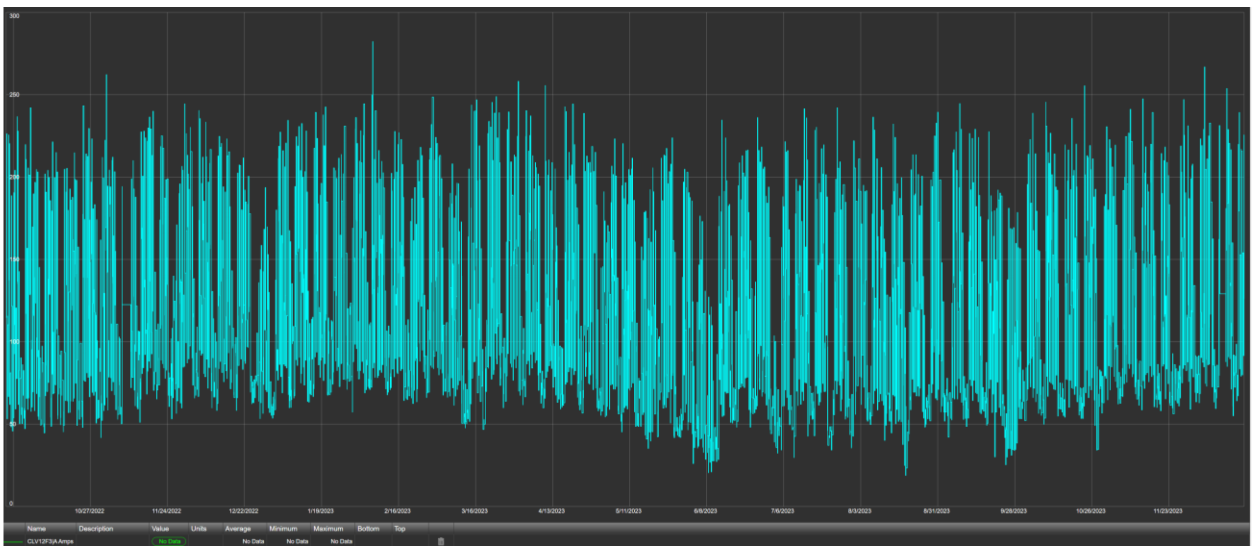


B-phase winter peak of 271A at 8:30am on Dec 22, 2022

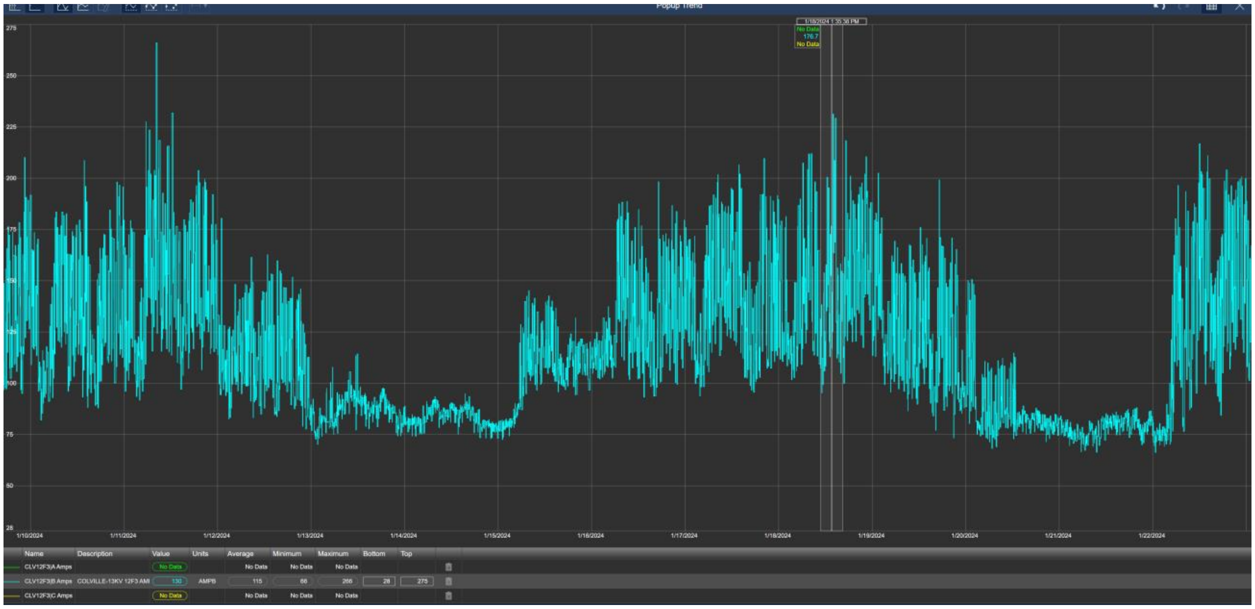


B-phase winter peak of 286A at 8:26am on Jan 15, 2023

4.1.5. CLV12F3

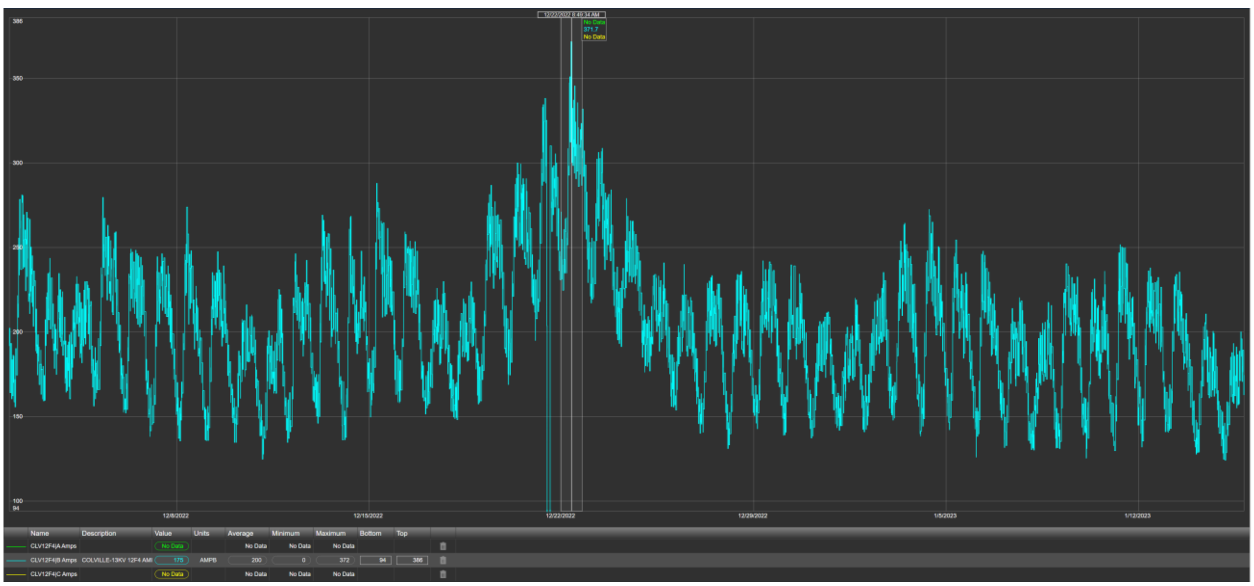


Peak did not occur on Dec 22, 2022 however the load is fairly steady with approx. 200-250A as the peak. Date used Dec 7, 2022 at 10:00pm



B-phase winter peak of 266A at 8:26am on Jan 18, 2023

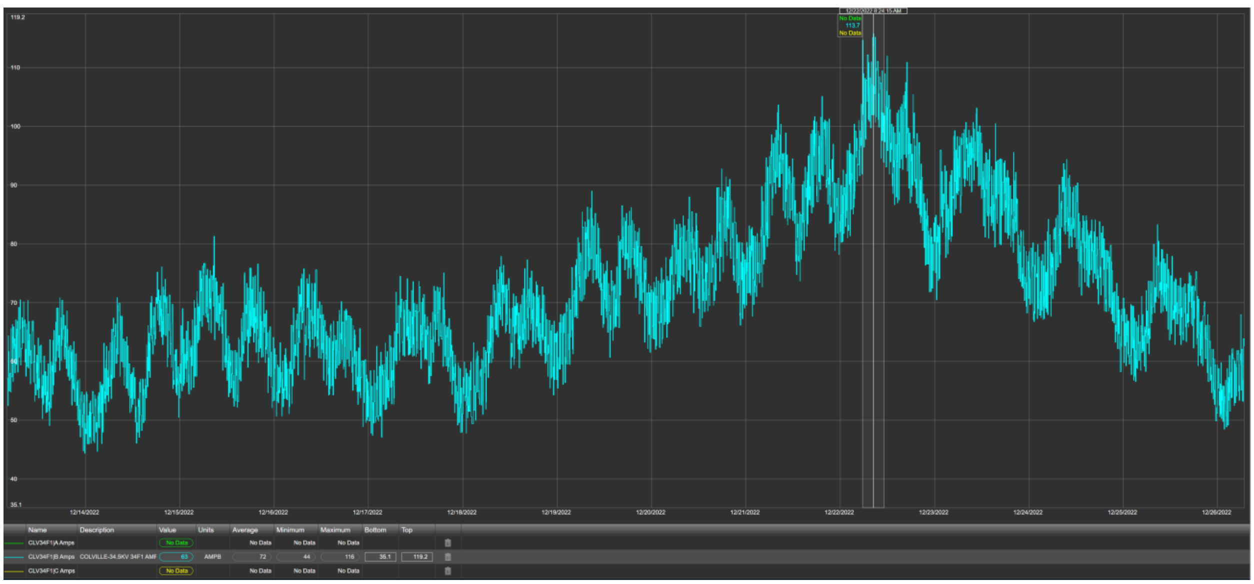
4.1.6. CLV12F4



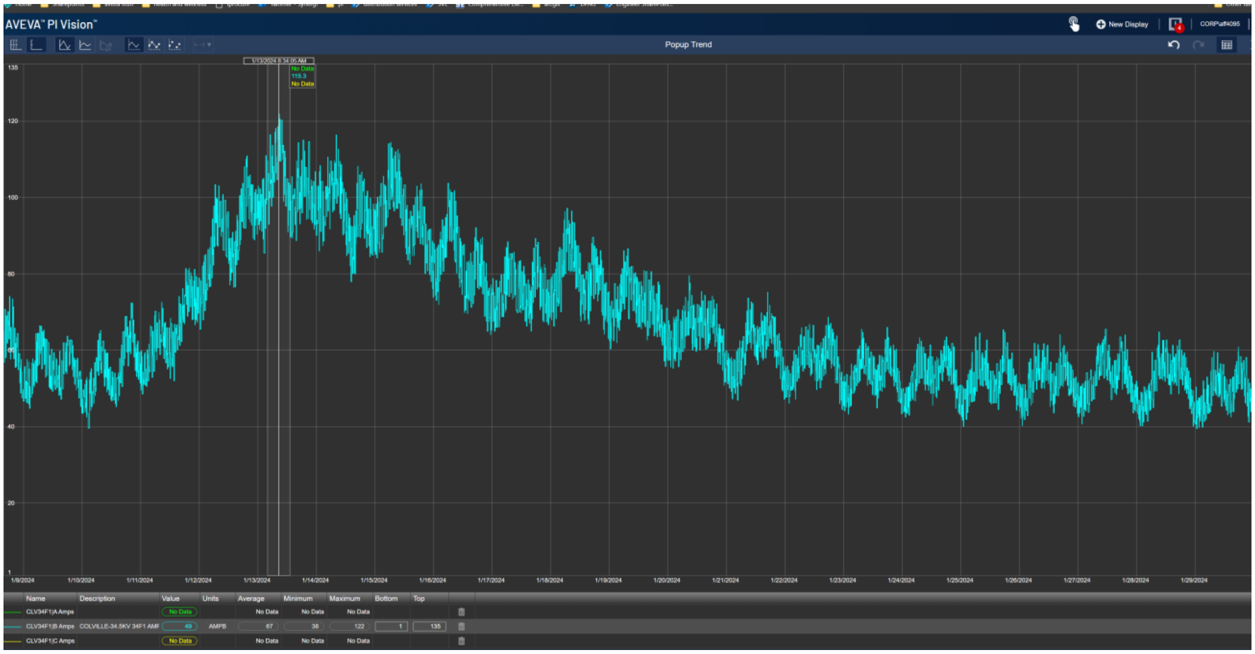
B-phase winter peak of 372A at 8:45am on Dec 22, 2022

B-phase winter peak of 366A at 9:05am on Jan 15, 2023

4.1.7. CLV34F1

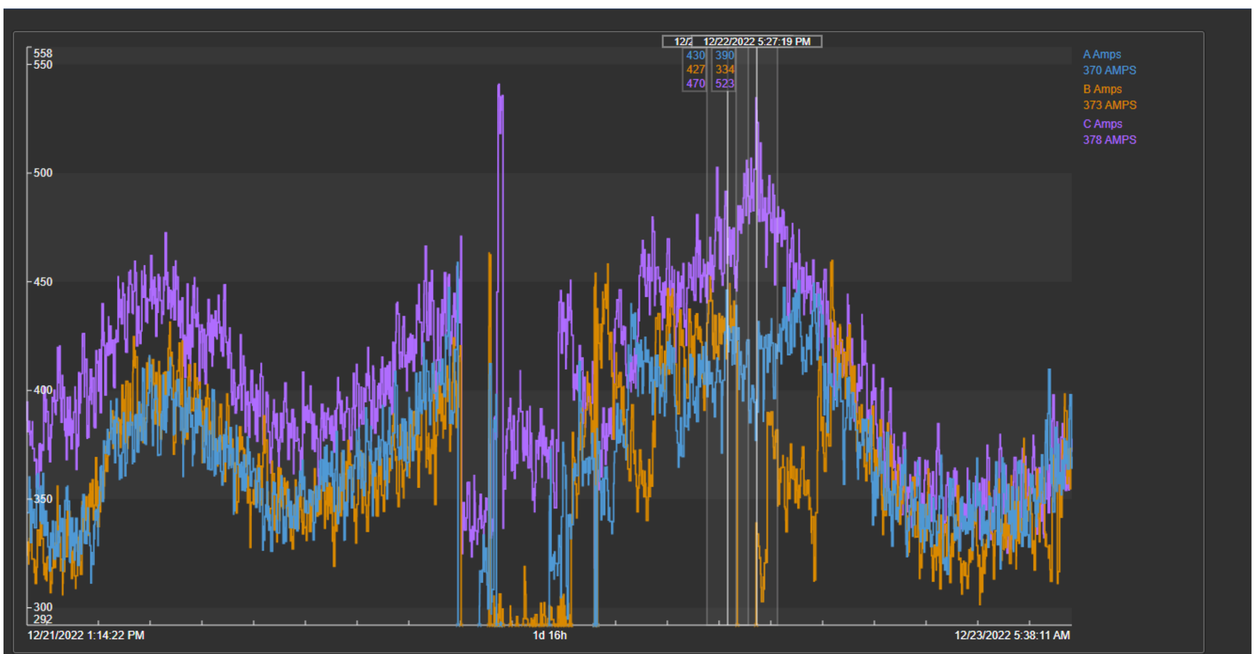


B-phase winter peak of 114A at 8:30am on Dec 22, 2022



B-phase winter peak of 122A at 8:34am on Jan 15, 2023

4.1.8. Orin Transformer

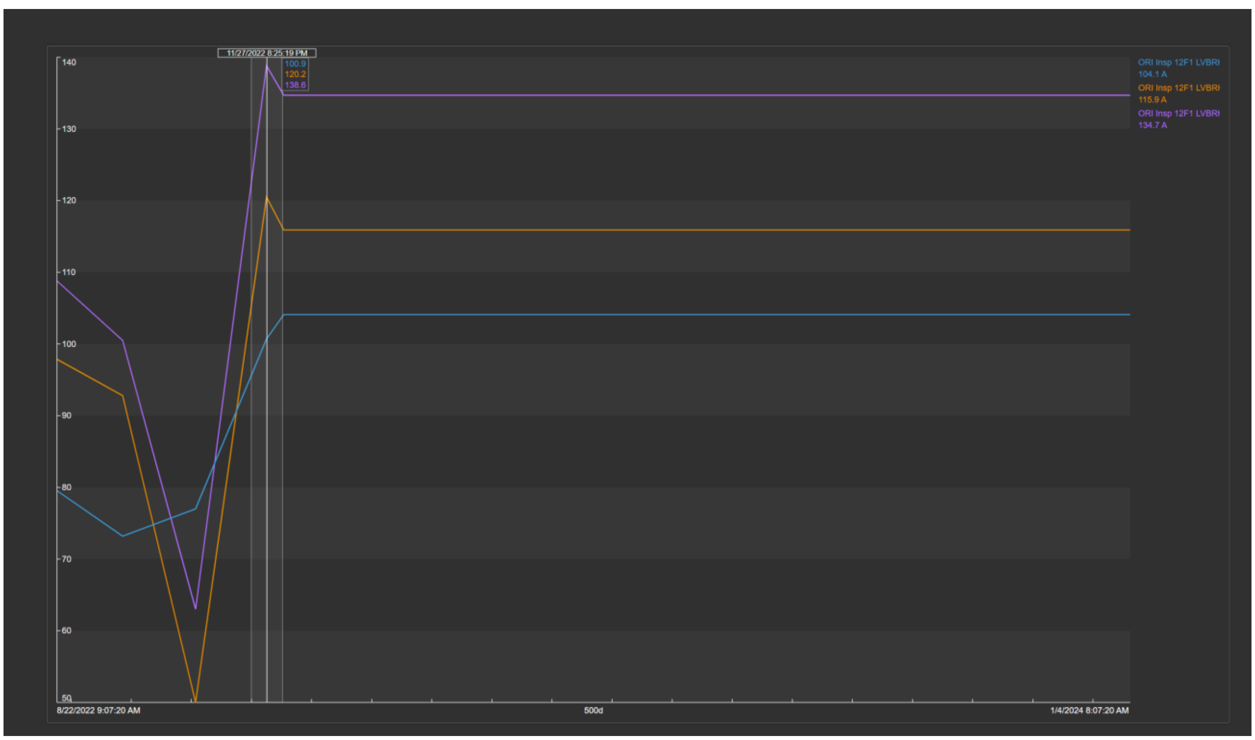


Name	Description	Value	Units	Minimum	Maximum
ORI - XFMR #1|A Amps	A Phase Current	370	AMPS	184	459
ORI - XFMR #1|B Amps	B Phase Current	373	AMPS	208	463
ORI - XFMR #1|C Amps	C Phase Current	378	AMPS	318	541

Right before ORI12F3 tripped, 430A/427A/470A and the not quite rebounded peak 390A/334A/523A~ assuming at the time the loading was similar in phasing as before the trip but with a C ph value of 523A.

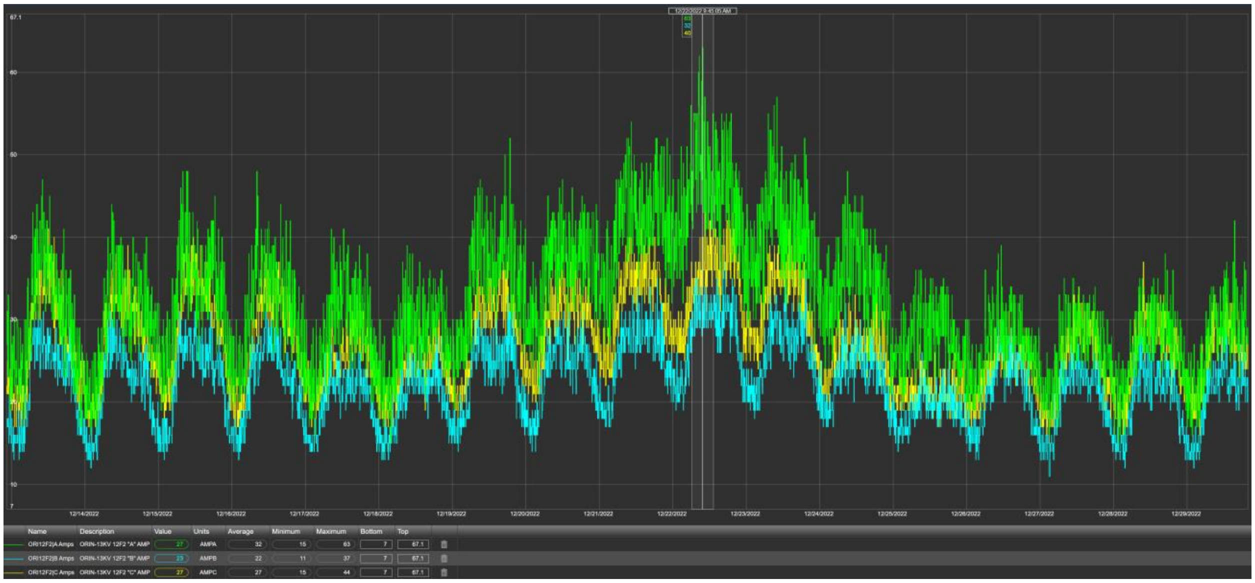
518A/433A/437A on January 13, 2024

4.1.9. ORI12F1

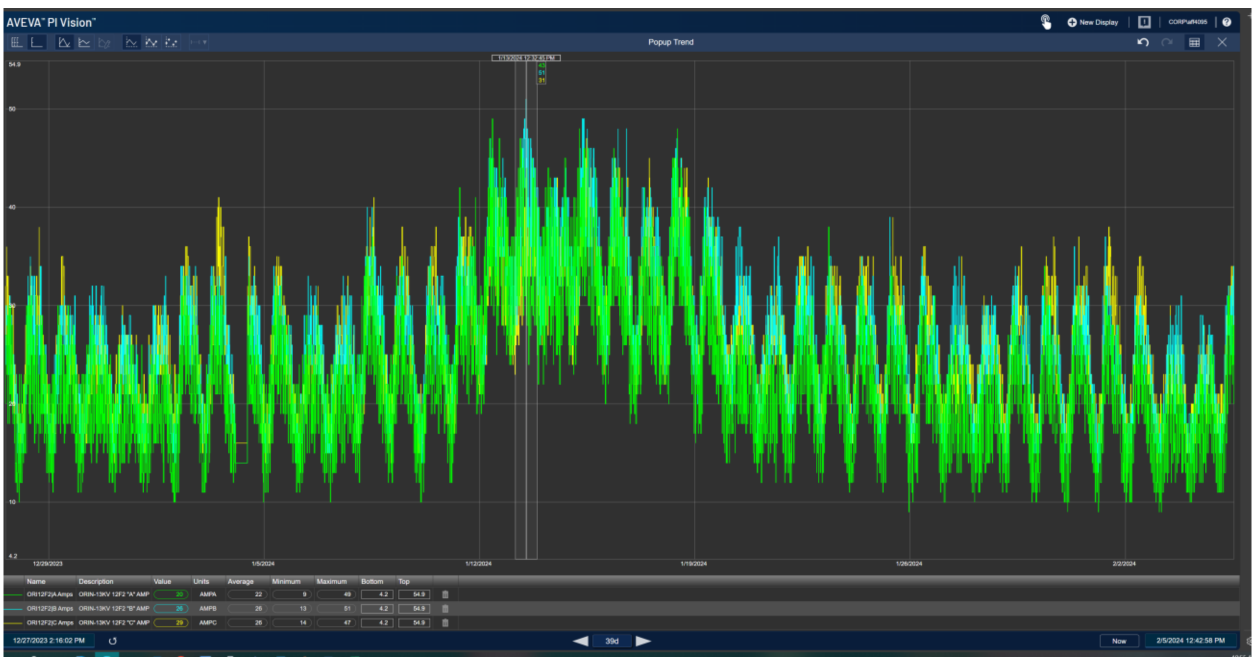


The most recent winter seemingly accurate inspection data comes from November of 2022 with a peak of 100/120/139A

4.1.10. ORI12F2

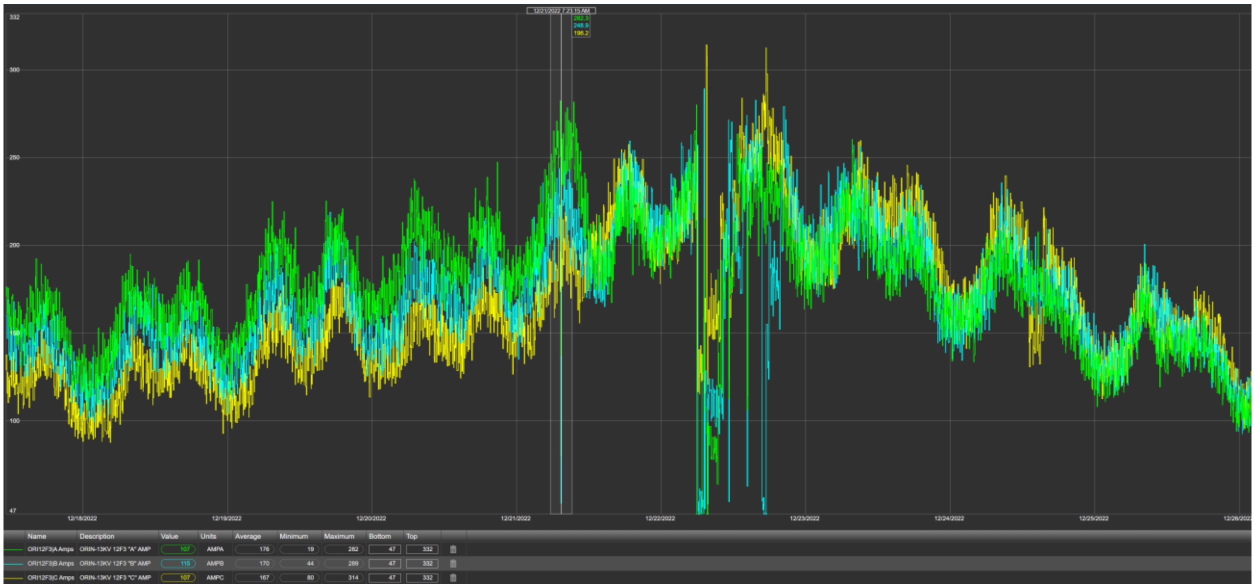


A-phase winter peak of 63A at 9:45am on Dec 22, 2022

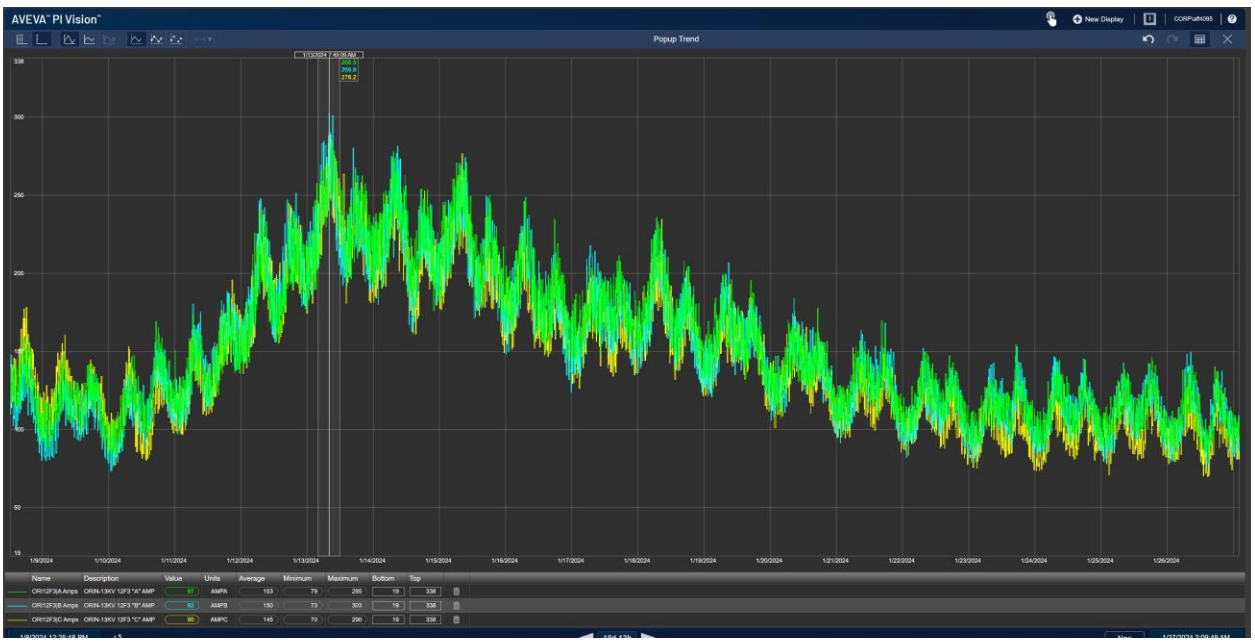


Winter peak of 49/51/47A at 7:49am on Jan 13, 2023

4.1.11.ORI12F3



Load shedding due to capacity constraints on Dec 22 thus the lower capacity demands from Dec 21, 2022 were used with A phase winter peak of 282A at 7:25am



Winter peak of 285/303/290A at 7:49am on Jan 13, 2023

4.2. SVL Changes

4.2.1. ARDEN TRANSFOMER N0. 1

Old and new SVL and Synergi information for the Arden transformer and ORI12F3 feeder.

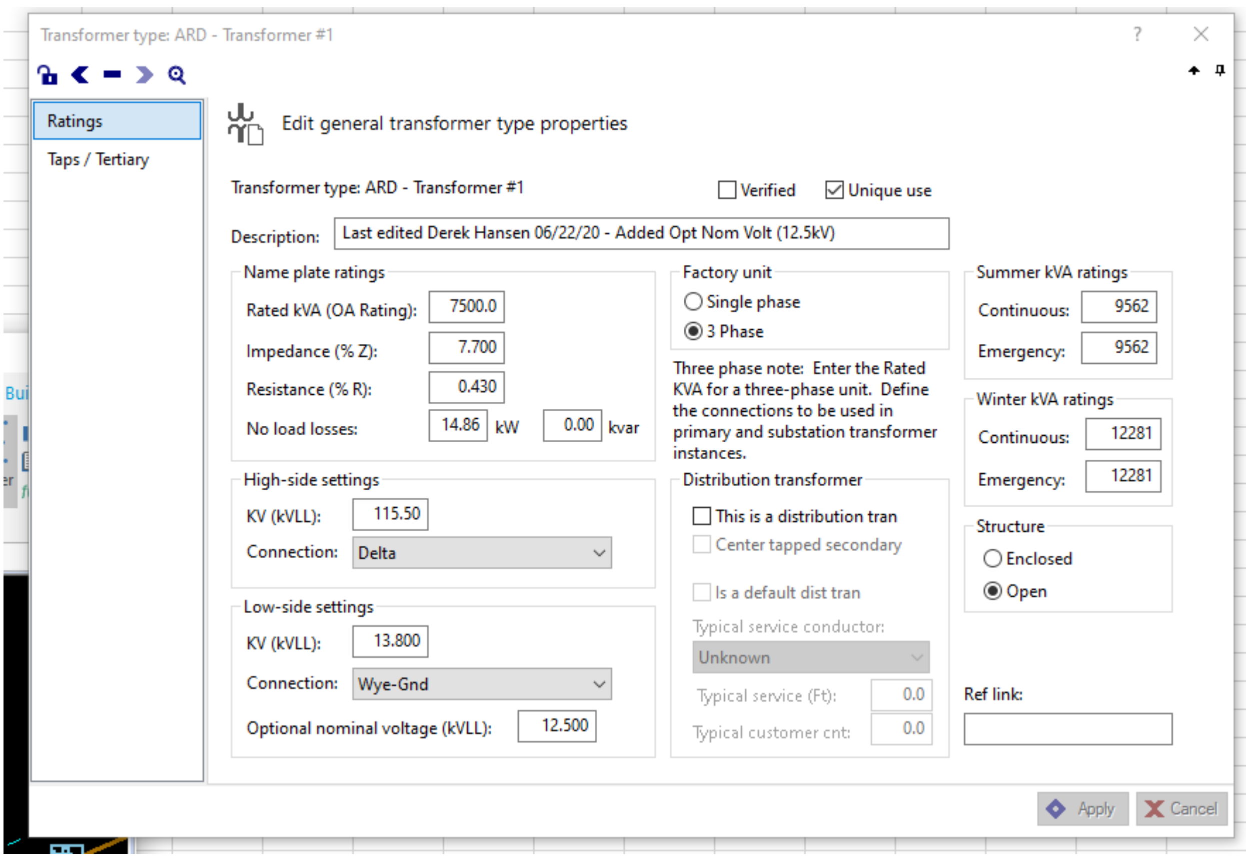
ARDEN - ARDEN, WASHINGTON -- 115-13.8kV XFMR NO. 1

(and ASSOCIATED 115 & 13.8kV BUSES)

				AMBIENT TEMPERATURE (C)								
Residential (75% LF)				-30	-20	-10	0	10	20	30	40	50
LOCATION	DEVICE	TYPE	RATING (Amps.)	AMPS	AMPS	AMPS	AMPS	AMPS	AMPS	AMPS	AMPS	AMPS
PRIMARY SIDE XFMR	AIR SWITCH	AC Type TA-1C (BO2)	600	1070	1018	963	905	842	775	701	618	522
	FUSE	SS HPA 115kV	100	100	100	100	100	100	100	100	100	100
(@ 115kV)	CONDUCTOR	2/0 ACSR "Quail" (80°C)		412	392	370	346	323	297	269	238	200
		1" IPS CU Pipe (75°C)		1607	1527	1440	1345	1240	1122	986	824	614
		#2/0 CU (75°C)		531	503	473	441	409	374	335	290	236
(55°C)	XFMR	HK Porter OA/FA	47	61	61	61	61	59	56	52	48	43
	9375000	115500										

				AMBIENT TEMPERATURE (C)								
				-30	-20	-10	0	10	20	30	40	50
LOCATION	DEVICE	TYPE	RATING (Amps.)	AMPS	AMPS	AMPS	AMPS	AMPS	AMPS	AMPS	AMPS	AMPS
PRIMARY SIDE XFMR	AIR SWITCH	AC Type TA-1C (BO2)		8955	8520	8060	7574	7047	6486	5867	5172	4369
	FUSE	SS HPA 115kV		837	837	837	837	837	837	837	837	837
referred to secondary	CONDUCTOR	2/0 ACSR "Quail" (80°C)		3448	3281	3097	2896	2703	2486	2251	1992	1674
(@ 13.8kV)		1" IPS CU Pipe (75°C)		13450	12780	12052	11257	10378	9391	8252	6897	5139
		#2/0 CU (75°C)		4441	4207	3959	3691	3423	3130	2804	2427	1975
SECONDARY SIDE XFMR	CONDUCTOR	500 MCM CU (75°C)		1222	1157	1087	1010	936	853	761	654	523
(@ 13.8kV)	CURRENT XFMR	GE JKW-5 600/5 S.R.	conn. 600/5 (TRF=1.5)	900	900	900	900	900	900	900	900	900
	XFMR	HK Porter OA/FA	392	**514**	**514**	**514**	**514**	**490**	**467**	**435**	**400**	**357**
(55°C)	9375000	13800										
SYSTEM CURRENT LIMIT FOR SPECIFIC TEMPERATURE				**514**	**514**	**514**	**514**	**490**	**467**	**435**	**400**	**357**

CREATED: 12/24/2018 Relay protective device ratings verified. R.Spacek.
Ratings updated to reflect present conditions. S.Wilson



ARDEN - ARDEN, WASHINGTON -- 115-13.8kV XFMR NO. 1

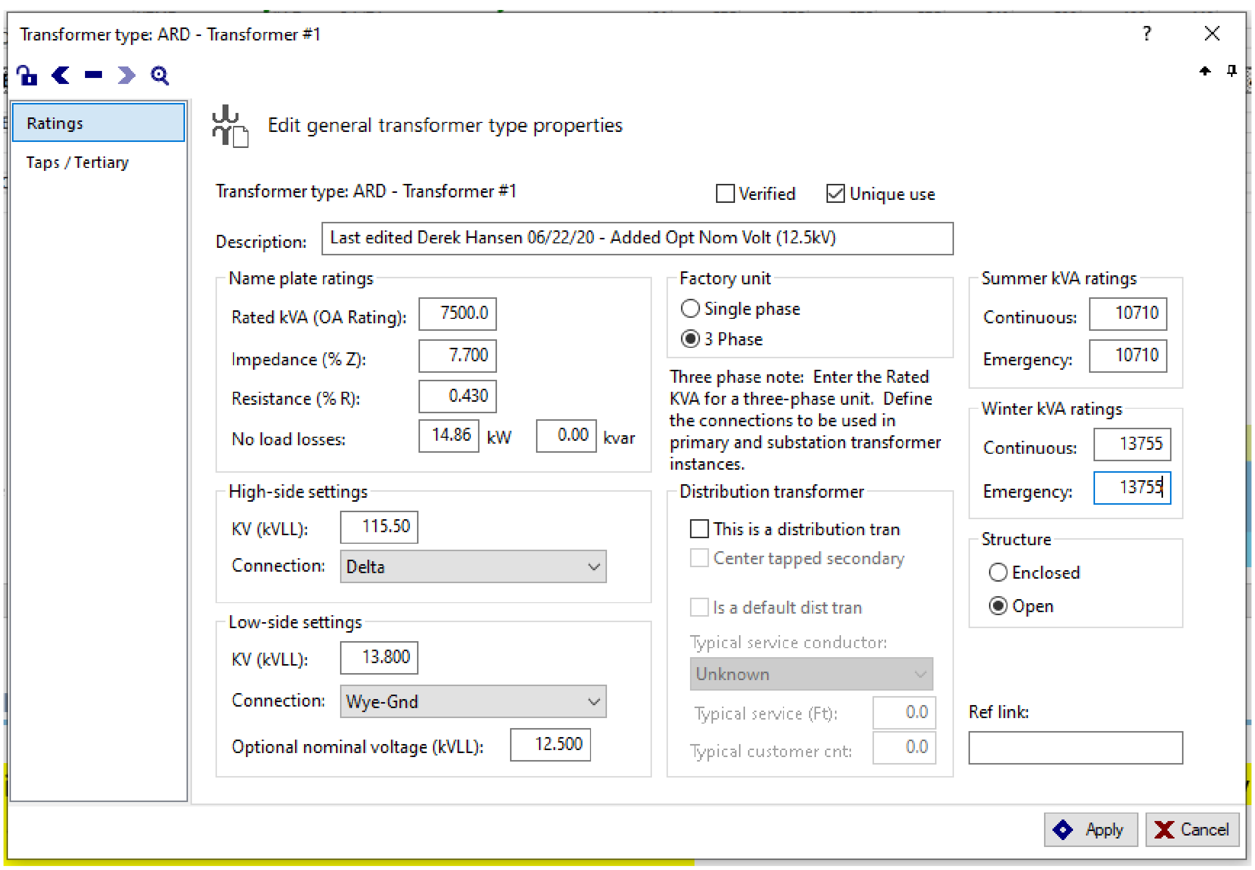
(and ASSOCIATED 115 & 13.8kV BUSES)

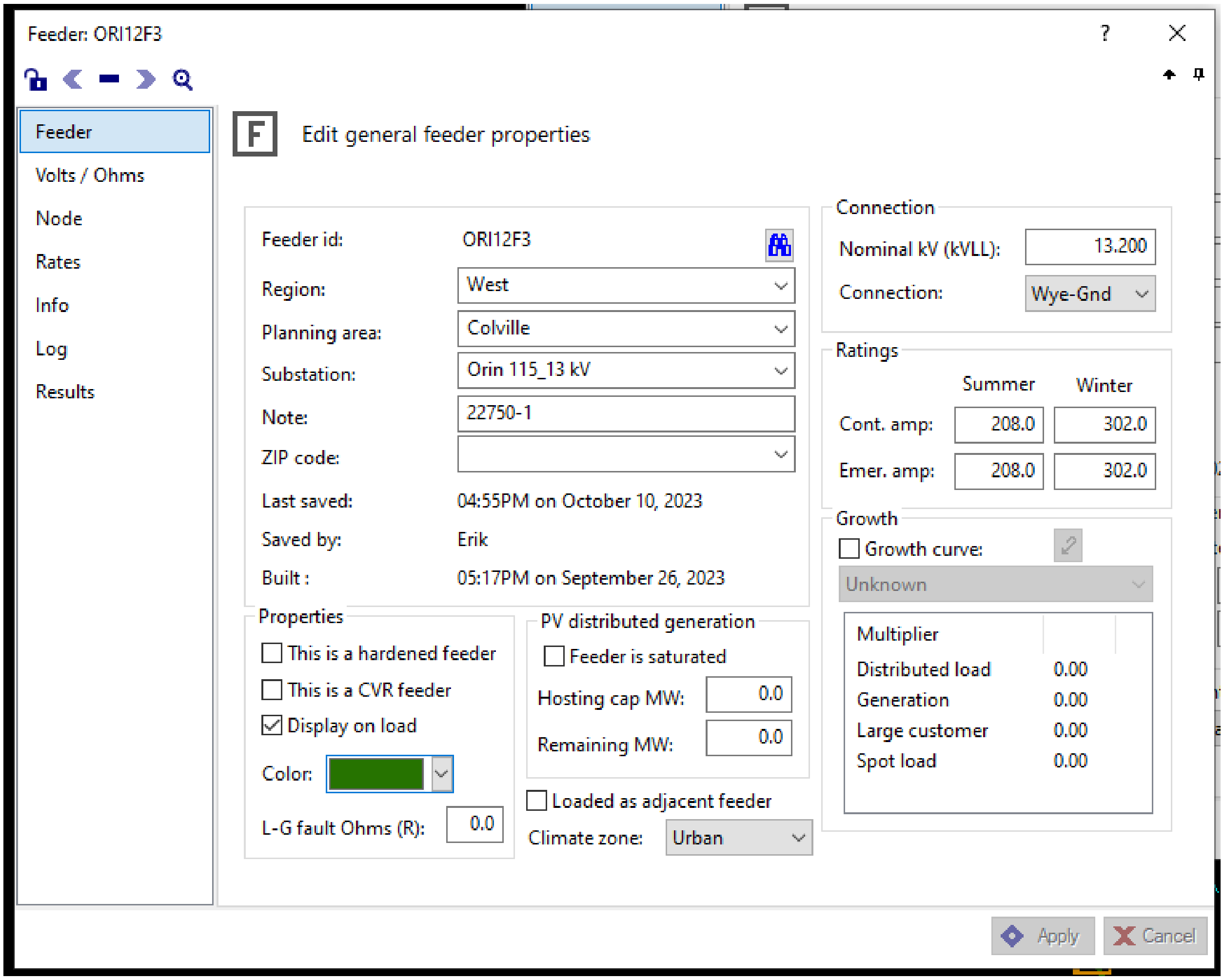
Residential (75% LF)				AMBIENT TEMPERATURE (C) -30	-20	-10	0	10	20	30	40	50
LOCATION	**DEVICE**	**TYPE**	**RATING (Amps.)**	**AMPS**	**AMPS**	**AMPS**	**AMPS**	**AMPS**	**AMPS**	**AMPS**	**AMPS**	**AMPS**
PRIMARY SIDE XFMR	AIR SWITCH	AC Type TA-1C (BO2)	600	1070	1018	963	905	842	775	701	618	522
	FUSE	SS HPA 115kV	100	100	100	100	100	100	100	100	100	100
(@ 115kV)	CONDUCTOR	2/0 ACSR "Quail" (80°C)		412	392	370	346	323	297	269	238	200
		1" IPS CU Pipe (75°C)		1607	1527	1440	1345	1240	1122	986	824	614
		#2/0 CU (75°C)		531	503	473	441	409	374	335	290	236
(55/65°C)	XFMR	HK Porter OA/FA	52	69	69	69	69	66	62	58	54	48
	10500000	115500										

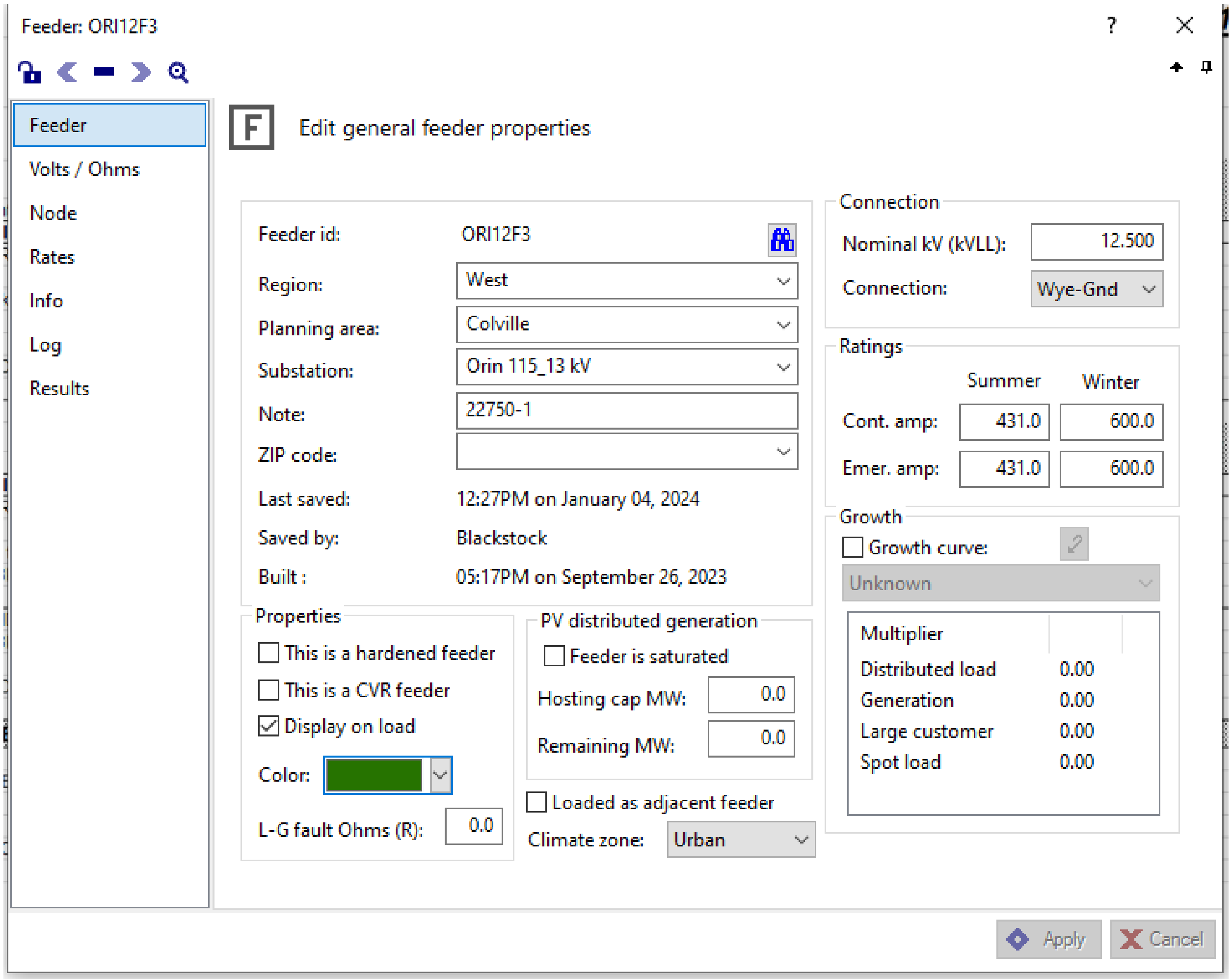
				AMBIENT TEMPERATURE (C) -30	-20	-10	0	10	20	30	40	50
LOCATION	**DEVICE**	**TYPE**	**RATING (Amps.)**	**AMPS**	**AMPS**	**AMPS**	**AMPS**	**AMPS**	**AMPS**	**AMPS**	**AMPS**	**AMPS**
PRIMARY SIDE XFMR	AIR SWITCH	AC Type TA-1C (BO2)		8955	8520	8060	7574	7047	6486	5867	5172	4369
	FUSE	SS HPA 115kV		837	837	837	837	837	837	837	837	837
referred to secondary	CONDUCTOR	2/0 ACSR "Quail" (80°C)		3448	3281	3097	2896	2703	2486	2251	1992	1674
(@ 13.8kV)		1" IPS CU Pipe (75°C)		13450	12780	12052	11257	10378	9391	8252	6897	5139
		#2/0 CU (75°C)		4441	4207	3959	3691	3423	3130	2804	2427	1975
SECONDARY SIDE XFMR	CONDUCTOR	500 MCM CU (75°C)		1222	1157	1087	1010	936	853	761	654	523
(@ 13.8kV)	CURRENT XFMR	GE JKW-5 800/5 S.R.	conn. 800/5 (TRF=1.5)	1200	1200	1200	1200	1200	1200	1200	1200	1200
	XFMR	HK Porter OA/FA	439	**575**	**575**	**575**	**575**	**549**	**523**	**488**	**448**	**400**
(55/65°C)	10500000	13800										
SYSTEM CURRENT LIMIT FOR SPECIFIC TEMPERATURE				**575**	**575**	**575**	**575**	**549**	**523**	**488**	**448**	**400**

CREATED: 12/24/2018 Relay protective device ratings verified. R.Spacek.
Ratings updated to reflect present conditions. S.Wilson

REVISION: 01/08/2024 Updated transformer rating to reflect 65 C transformer
Ratings updated to reflect present conditions. S. Koeff




Feeder: ORI12F3
Feeder
Volts / Ohms
Node
Rates
Info
Log
Results
Edit general feeder properties
Feeder id: ORI12F3
Region: West
Planning area: Colville
Substation: Orin 115_13 kV
Note: 22750-1
ZIP code:
Last saved: 04:55PM on October 10, 2023
Saved by: Erik
Built : 05:17PM on September 26, 2023
Properties
This is a hardened feeder
This is a CVR feeder
Display on load
Color:
L-G fault Ohms (R): 0.0
PV distributed generation
Feeder is saturated
Hosting cap MW: 0.0
Remaining MW: 0.0
Loaded as adjacent feeder
Climate zone: Urban
Connection
Nominal kV (kVLL): 13.200
Connection: Wye-Gnd
Ratings
Summer
Winter
Cont. amp: 208.0 302.0
Emer. amp: 208.0 302.0
Growth
Growth curve:
Unknown
Multiplier
Distributed load 0.00
Generation 0.00
Large customer 0.00
Spot load 0.00
Apply
Cancel



ORIN - COLVILLE, WASHINGTON - 12.5kV FDR 12F3

(via 115-13.8kV XFMR NO.1)

				AMBIENT TEMPERATURE (C)								
Residential(75% LF)				-30	-20	-10	0	10	20	30	40	50
LOCATION	**DEVICE**	**TYPE**	**RATING (A)**	**AMPS**	**AMPS**	**AMPS**	**AMPS**	**AMPS**	**AMPS**	**AMPS**	**AMPS**	**AMPS**
	V.C.B.	G&W VIP378ER-12S	800	800	800	800	800	800	800	800	800	729
	DISCONN. SW.	S&C SPST (BO2)	600	1070	1018	963	905	842	775	701	618	522
		BRIDGES SPTT (BO2)	600	1070	1018	963	905	842	775	701	618	522
	CONDUCTOR	250 CU (75°C)		794	751	707	660	612	559	499	431	348
	CURRENT XFMR	1000/1 M.R.	conn. 500/1 (TRF=1.6)	800	800	800	800	800	800	800	800	800
*	5% VOLT. REG.	250 KVA	525	668	668	668	668	668	643	590	512	433
	-------(7.5%)	*MAX CURRENT =*	*394*	*561*	*561*	*561*	*561*	*522*	*482*	*443*	*384*	*325*
	-------(10%)	*668*	*328*	*467*	*467*	*467*	*467*	*435*	*402*	*369*	*320*	*271*
	PROTECTION	SEL-351R (50P1P)	1500	600	600	600	600	600	600	600	600	600
		SEL-351R (51P1P)	1500	600	600	600	600	600	600	600	600	600
DISTRIBUTION LINE		1/0 ACSR "Raven" (80°C)		**359**	**341**	**322**	**302**	**282**	**260**	**235**	**208**	**175**
SYSTEM CURRENT LIMIT FOR SPECIFIC TEMPERATURE				**359**	**341**	**322**	**302**	**282**	**260**	**235**	**208**	**175**

***NOTE:** FOR SYSTEM CURRENT LIMITS, IT IS ASSUMED THAT VOLTAGE REGULATORS ARE OPERATING WITHIN A RANGE OF 5% BUCK TO 5% BOOST. AMPACITY LIMITS FOR THE RANGES OF (+/-)7.5% AND (+/-)10%, HOWEVER, HAVE ALSO BEEN LISTED TO AID ACTUAL OPERATING DECISIONS.

ORIN - COLVILLE, WASHINGTON - 12.5kV FDR 12F3

(via 115-13.8kV XFMR NO.1)

				AMBIENT TEMPERATURE (C)								
				-30	-20	-10	0	10	20	30	40	50
LOCATION	**DEVICE**	**TYPE**	**RATING (A)**	**AMPS**	**AMPS**	**AMPS**	**AMPS**	**AMPS**	**AMPS**	**AMPS**	**AMPS**	**AMPS**
	V.C.R.	G&W VIP378ER-12S	800	800	800	800	800	800	800	800	800	729
	DISCONN. SW.	S&C SPST (BO2)	600	1070	1018	963	905	842	775	701	618	522
		BRIDGES SPTT (BO2)	600	1070	1018	963	905	842	775	701	618	522
	CONDUCTOR	1000 kCM CU (75°C)		1862	1763	1653	1534	1420	1293	1150	983	778
		500 kCM CU (75°C)		1222	1157	1087	1010	936	853	761	654	523
		250 kCM CU (75°C)		794	752	707	658	610	**557**	**498**	**430**	**347**
	CURRENT XFMR	1000/1 M.R.	conn. 500/1 (TRF=1.6)	800	800	800	800	800	800	800	800	800
*	5% VOLT. REG.	250 KVA	525	668	668	668	668	668	647	588	500	411
	-------(7.5%)	*MAX CURRENT =*	*394*	*573*	*573*	*573*	*573*	*529*	*485*	*441*	*375*	*309*
	-------(10%)	*668*	*328*	*478*	*478*	*478*	*478*	*441*	*404*	*367*	*312*	*257*
	PROTECTION	SEL-351R (50P1P)	1500	**600**	**600**	**600**	**600**	**600**	600	600	600	600
		(51P1P)		**600**	**600**	**600**	**600**	**600**	600	600	600	600
DISTRIBUTION LINE		556.5 AAC "Dahlia" (80°C)		1059	1006	948	886	825	759	685	601	502
SYSTEM CURRENT LIMIT FOR SPECIFIC TEMPERATURE				**600**	**600**	**600**	**600**	**600**	**557**	**498**	**430**	**347**

***NOTE:** FOR SYSTEM CURRENT LIMITS, IT IS ASSUMED THAT VOLTAGE REGULATORS ARE OPERATING WITHIN A RANGE OF 5% BUCK TO 5% BOOST. AMPACITY LIMITS FOR THE RANGES OF (+/-)7.5% AND (+/-)10%, HOWEVER, HAVE ALSO BEEN LISTED TO AID ACTUAL OPERATING DECISIONS.

CREATED: 3/29/2012 Ratings reflect present conditions. S.Wilson

REVISION: 08/03/2017 Regulators replaced.
Relay protective device ratings verified. E.Andrews
Ratings updated to reflect present conditions. S.Wilson

REVISION: 01/08/2024 Distribution Conductor updated.
Distribution line conductor verified. Tyler Dornquast
Relay protective device ratings verified. Randy Spacek
Ratings updated to reflect present conditions. Ryan Town

Project models

- Base Case – PI data
- Base Case STF neg20 – forecasted load at -20
- New sub 1 – new sub with ORI12F3 load split plan
- New sub 2 – new sub with limited build on scenic byway and offload of most of ORI12F3 to a single new feeder
- New sub 2 – new sub with limited build on scenic byway and offload of most of ORI12F3 to a single new feeder
- New sub transfer – demonstration that offloading of a transformer is now possible in this area

4.2.2. Alternate Routing costs

4.2.2.1. Alternate feeder routing costs

The major difference in cost for either alternate route and the selected option is the distribution build out. Separating the feeders at the station increases the costs. The preliminary project budget VROM is below.

Substation	$6,600,000
Transmission	$850,000
Distribution	$2,100,000
Total	**$9,550,000**

Table 18: Project cost estimate

4.2.2.2. New Orin Station costs

The major difference in cost for replacing vs adding a station is in the distribution and transmission cost reduction. This reduction would depend on where the proximity of the new station to its predecessor. Land would need to be purchased. This adds approximately $700k and would take anywhere from 3-36 months. The preliminary project budget VROM is below. This cost does not include any future costs to help with loading on other feeders or voltage concerns at the end of feeders.

Substation	$7,300,000
Transmission	$100,000
Distribution	$100,000
Total	**$7,500,000**

Table 19: Project cost estimate