

**TRANSMISSION PLANNING**

**GENERATION INTERCONNECTION REPORT**

**2025 TRANSITION CLUSTER STUDY (TCS)**

**CLUSTER AREA: WESTERN WA, PHASE 1, Revision 0**

**(25TCS CA-WE1 P1-0)**

G0921
G0922
G0973
G0992
G1007
G1014
G1048

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# 1 Executive Summary

In 2025, Bonneville Power Administration (BPA) initiated the Transition Cluster Study (TCS) under the new Large Generator Interconnection Transition Process, Attachment R of BPA’s Open Access Transmission Tariff (OATT).<sup>1</sup> BPA received 167 Transition Requests that were eligible to participate in the Transition Cluster Study with a total requested Interconnection Service level of approximately 61,100 MW.

This TCS Phase One Cluster Study (TCS PH1) report examines the feasibility and impact of interconnecting the proposed generation projects to BPA’s transmission system. Requests in the Cluster Area were studied at the Points of Interconnection (POIs) according to table below. The generation type, requested MW of Interconnection Service level, project location, and requested Commercial Operation Date are also shown.

Cluster Area Western Washington (WE1) is comprised of Interconnection Requests (IRs) in Skagit, Mason, Thurston and Cowlitz counties of Washington state. It includes 7 total IRs seeking combined 1,581 MW total Interconnection Service and 1,211 MW total of grid charging.

**Table 1.1: 2025 TCS PH1 WE1 Participants**

GI #	Gen Type	Studied POI	MW Requested (Generating)	MW Requested (Charging)	Plant Location (County, State)	Requested COD
G921	Wind, BESS	Paul 500 kV	300	-361	Thurston, WA	Oct 2030
G922	BESS	Longview 230 kV Annex	100	-100	Cowlitz, WA	Dec 2026
G973	Wind	Shelton 230 kV	300	0	Mason, WA	Dec 2029
G992	Wind	New Monroe-Custer 500 kV station	131	0	Skagit, WA	Sep 2028
G1007	Wind, BESS	Paul 500 kV	300	-300	Thurston, WA	Oct 2030
G1014	BESS	Olympia 230 kV	250	-250	Thurston, WA	Dec 2029
G1048	Solar, BESS	New Shelton-Fairmount #4 230 kV station	200	-100	Mason, WA	Dec 2027

Studied POI locations and requirements for each IR are summarized in Table 1.2. Scalable Plan Blocks (SPB) are indicated where applicable.

All IRs will be required to have the necessary communications and controls equipment installed to be available for generator tripping to maintain flexibility and effectiveness of BPA’s Main Grid Remedial Action Schemes (RAS).

<sup>1</sup> Capitalized terms that are not defined in the text of this report refer to defined terms in BPA’s OATT.



**Table 1.2: 2025 TCS PH1 WE1 Requirements**

GI #	Studied POI	Total GI Scope	Total Cost	Contingent Facilities
G0921, G1007	Paul 500 kV	New 500 kV BAAH Bay at Paul, 1x shared gen-tie line, BPA WS-RAS Participation	\$42M	TSEP: Schultz-Olympia 500 kV Line Rebuild
G0922	Longview 230 kV	New 230 kV main-Aux Bay at Longview Annex, BPA RAS Participation	\$22M	N/A
G0973	Shelton 230 kV	New 230 kV BAAH Bay at Shelton, BPA WS-RAS Participation	\$30M	TSEP: Schultz-Olympia 500 kV Line Rebuild
G0992	Midline Monroe-Custer 500 kV	New 500 kV BAAH 2-Bay Substation looped in on the Monroe-Custer #1 500 kV line, WS-BPA RAS Participation	\$180M	N/A
G1014	Olympia 230 kV	New 230 kV main-Aux Bay at Olympia, BPA WS-RAS Participation	\$22M	TSEP: Schultz-Olympia 500 kV Line Rebuild
G1048	Midline Shelton-Fairmount #4 230 kV	New 230 kV BAAH 2-Bay Substation looped in on the Shelton-Fairmount #4 230 kV line, BPA WS-RAS Participation	\$83M	TSEP: Schultz-Olympia 500 kV Line Rebuild

BPA’s construction of equipment and facilities required to interconnect a generator typically takes between 3 and 10 years to complete depending on the scope and scale of the plan of service. The estimated time to construct a plan of service is refined through the subsequent stages of the interconnection process.



## 2 Purpose

The Bonneville Power Administration (BPA) processes requests to interconnect Large Generating Facilities to the BPA Transmission System under the Large Generator Interconnection Transition Process, Attachment R of BPA’s OATT, and the Standard Large Generator Interconnection Procedures (LGIP), Attachment L of BPA’s OATT. BPA conducted the TCS PH1 to evaluate the impacts of all eligible Transition Requests in the Transition Cluster on the reliability of BPA’s Transmission System. The TCS PH1 evaluates equipment and facilities required to reliably interconnect requests at the requested MW of Interconnection Service. The TCS PH1 consists of short circuit analysis and power flow analysis. The TCS PH1 report preliminarily identifies: (1) equipment where short circuit capability limits or thermal or voltage ratings have been exceeded, and (2) Interconnection Facilities and Network Upgrades expected to be required to address those issues.

BPA performed the TCS PH1 by segmenting and studying the Interconnection Requests according to geographically and electrically relevant areas on BPA’s Transmission System; those segments are identified as Cluster Areas. BPA identified plans of service for a subset of Interconnection Requests within a Cluster Area in some instances, identified as Scalable Plan Blocks. Cost and timeframe estimates for plans of service identified in this report are non-binding good faith estimates. Costs are allocated amongst Interconnection Requests as outlined in Section 4.2.3 of the LGIP.

## 3 Disclaimers

**This document contains the technical study results of an evaluation of the impact of all proposed Interconnection Requests in the Cluster Area on the reliability of BPA’s Transmission System. The TCS PH1 evaluates providing Interconnection Service, meaning the service provided by BPA to interconnect a Large Generating Facility to BPA’s Transmission System to enable BPA’s Transmission System to receive energy and capacity from the Large Generation Facility at the Point of Interconnection. The study results reflect evaluation of providing Energy Resource Interconnection Service to all Interconnection Requests, allowing each Large Generating Facility to connect and be eligible to deliver output on an “as available” basis up to the requested MWs of Interconnection Service. The interconnection process for Large Generating Facilities does not evaluate the requirements or potential impediments to providing transmission of the electrical output of a Large Generating Facility beyond the Point of Interconnection. A customer that wishes to obtain the right to deliver or inject energy from a Large Generating Facility beyond the Point of Interconnection must take a separate action to obtain transmission delivery service under BPA’s OATT. The provision of Point-to-Point Transmission Service or Network Integration Transmission Service may require the construction of additional transmission equipment and facilities.**

**In addition, the technical studies results do not address generator balancing services that may be required to interconnect a Large Generating Facility to BPA’s Transmission System.**

**These studies were conducted using the best available information at the time of the study. Findings and recommendations are based on information and assumptions that could**



**change. BPA reserves the right to add, delete, or modify any content in this report if new information is provided.**

#### Additional Disclaimers

- 1) A customer’s inclusion of an optional requested POI on a Transition Request does not guarantee that the customer’s request was studied for interconnection at that POI. BPA, in its sole discretion, determined the POI for each Large Generating Facility to improve the reliability benefits, cost and/or benefits of the interconnection for the Cluster Area.
- 2) Energy storage grid charging is defined for this study as importing energy from beyond the POI to the IR storage device. This study evaluates grid charging where elected by each IR, but does not assess all resultant Transmission System requirements beyond the POI. This study presumes that energy storage grid charging connected to BPA’s Transmission System will be treated as a generator (not a load) in context of expected transmission curtailments, expected transmission operating limits, or generation tripping RAS.
- 3) The TCS PH1 does not include the following analyses, which will be provided in the Transition Cluster Study Phase Two Cluster Study or Interconnection Facilities Study:
  - a) Provision of Network Resource Interconnection Service (NRIS);
  - b) Voltage & Transient Stability studies;
  - c) Electromagnetic Transient (EMT) studies; and
  - d) Fault Duty studies for detailed equipment sizing.
- 4) In electing to participate in the TCS, all customers attested that the Generating Facility proposed in a Transition Request would be designed to meet the BPA Transmission Standard “*Technical Requirements for Interconnection to the BPA Transmission Grid*” (STD-N-000001) posted to the BPA Interconnection webpage.
- 5) Any plan of service identified in this study report that would require access and usage of property associated with the Northwest AC Intertie (NWACI) to construct may require the consent of all owners of NWACI facilities to proceed and be beyond BPA’s ability to grant. BPA will continue to study this plan of service but cannot guarantee that the Large Generating Facility may be interconnected under that plan of service.
  - i) As noted above, the TCS PH1 does not evaluate requirements or potential impediments to providing transmission delivery service. Any plan of service identified in this study report that would provide electrical connectivity between a Large Generating Facility and a NWACI facility does not provide the customer any right or ability to obtain transmission delivery service on a NWACI facility.

## 4 Study Assumptions

### 4.1 General Assumptions

BPA Transmission uses PowerWorld for positive sequence analysis (CTG Tool add-on, ATC Tool add-on, PV/QV Tool add-on, Transient Stability Tool add-on).

For the TCS PH1, “MW injection limit” tests are applied at each POI, to determine IR’s MW thresholds at which a steady state system limiter occurs and requires mitigation. Injection limits are also applied in the reverse direction, at POIs that have requested Battery Energy Storage



System (BESS) grid charging. PowerWorld’s ATC Tool is used to conduct these injection limit tests.

All analysis presumes Energy Resource Interconnection Service (ERIS) only. BPA Planning presumes IRs are not all dispatched simultaneously. Generally, BPA Planning only presumes IRs are dispatched simultaneously when at most one to two Bulk Electric System (BES) nodes away from the POI under study.

The TCS PH1 assumes all Generating Facilities studied are designed to the standards in STD-N-000001 at the time of publication of this report. Adherence to BPA STD-N-000001 includes many detailed requirements covering but not limited to: minimum BPA communications network transport; BPA control system hardware; participation in BPA RAS; protective relaying; disturbance monitoring; scheduling and metering; voltage control; frequency response; reactive power quality; and more.

#### 4.2 Senior-Queued IRs and non-BPA IRs

The following list of IRs were deemed impactful and senior to the Cluster Area. The list includes BPA Bypass IRs, BPA Transition Late-Stage IRs, and non-BPA IRs in adjacent Transmission Provider queues if known. Where applicable, these senior-queued resources were dispatched online as starting assumptions.

Table 4.2: Senior Queued IRs Assumed In-Service

Queue #	POI (owner)	MW Generating	MW Grid-Charging	Fuel Type
BPA G0830	Olympia 115 kV (BPA)	20	20	BESS
BPA G0942	Olympia 115 kV (BPA)	20	20	BESS

#### 4.3 Communications and Control Capability (C&C)

The TCS PH1 assumed:

1. All POI stations are capable of BPA Main Grid Remedial Action Scheme (RAS) participation. There is WECC-Class 1 communications (fully redundant, alternately routed) to each generation facility where the Main Grid RAS Generation Dropping (GD) will occur.
2. All POI stations have:
  - a. BPA SCADA Control & Indication
  - b. Transfer Trip or Current Differential protective relaying on all gen-ties from BPA station to customer station
  - c. Control Phasor Measurement Units (CPMUs)
  - d. Revenue Metering and telemetry for each IR

### 5 Study Methodology

#### 5.1 Cluster Area Definitions

The following maps illustrate the geographic coordinates for the IRs assessed in Cluster Area WE1.



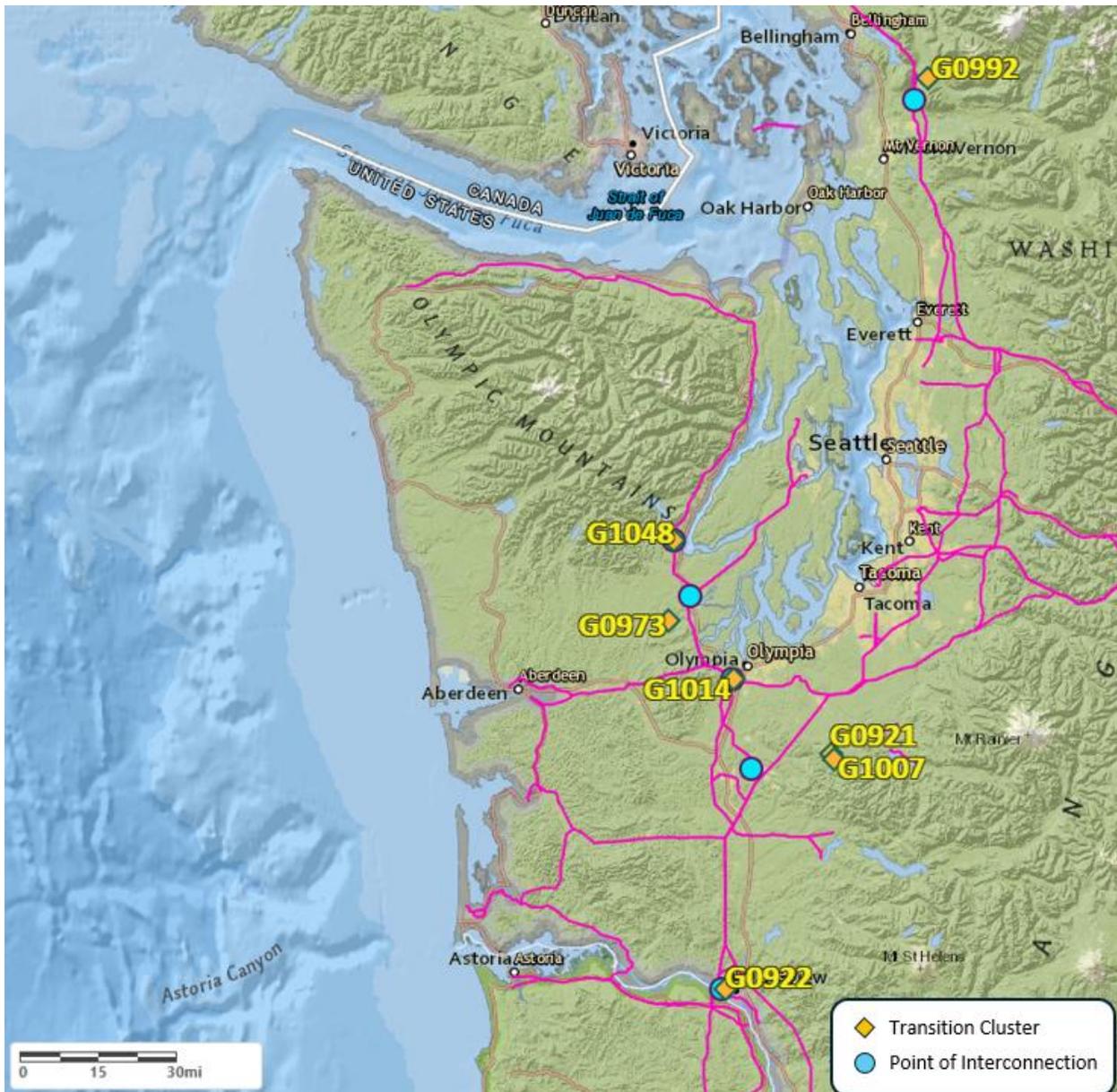


Figure 1: Western Washington Cluster Area



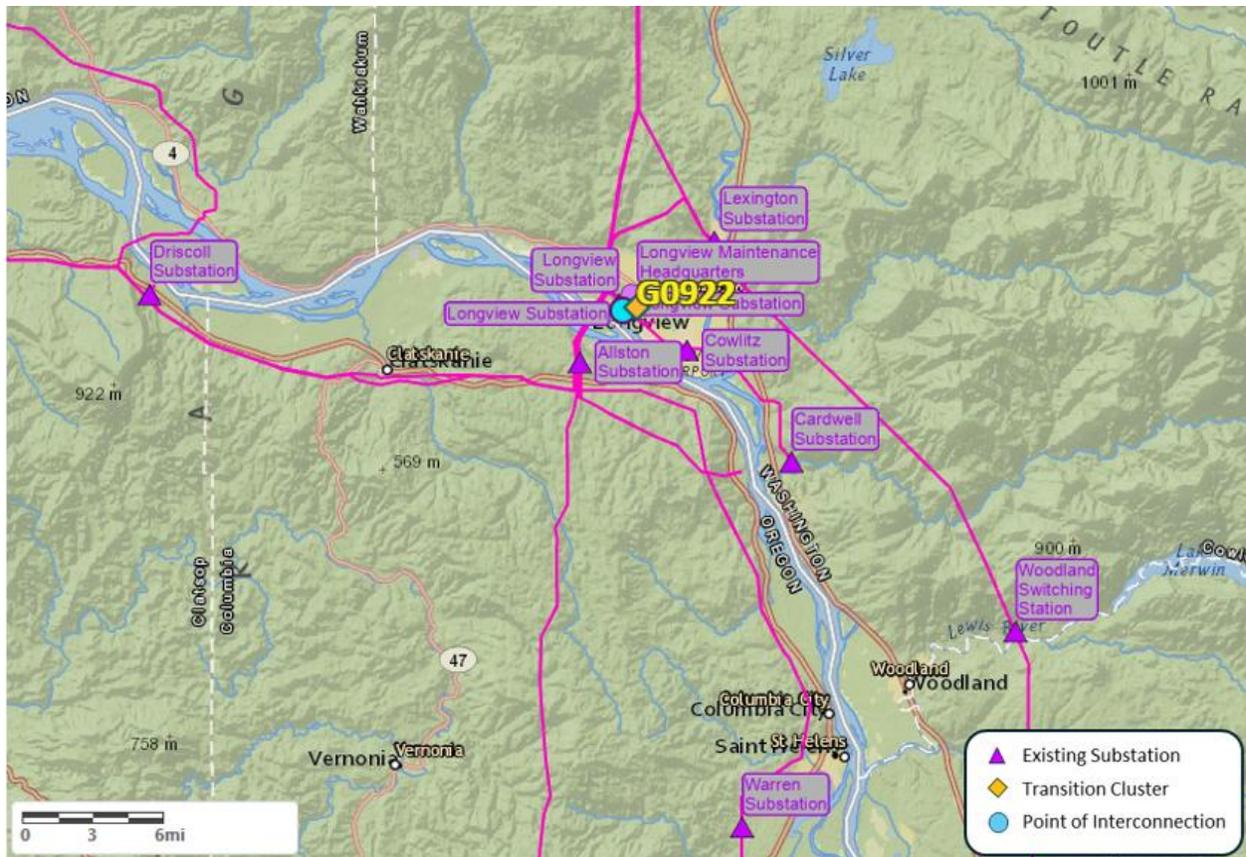


Figure 2: Longview Annex POI



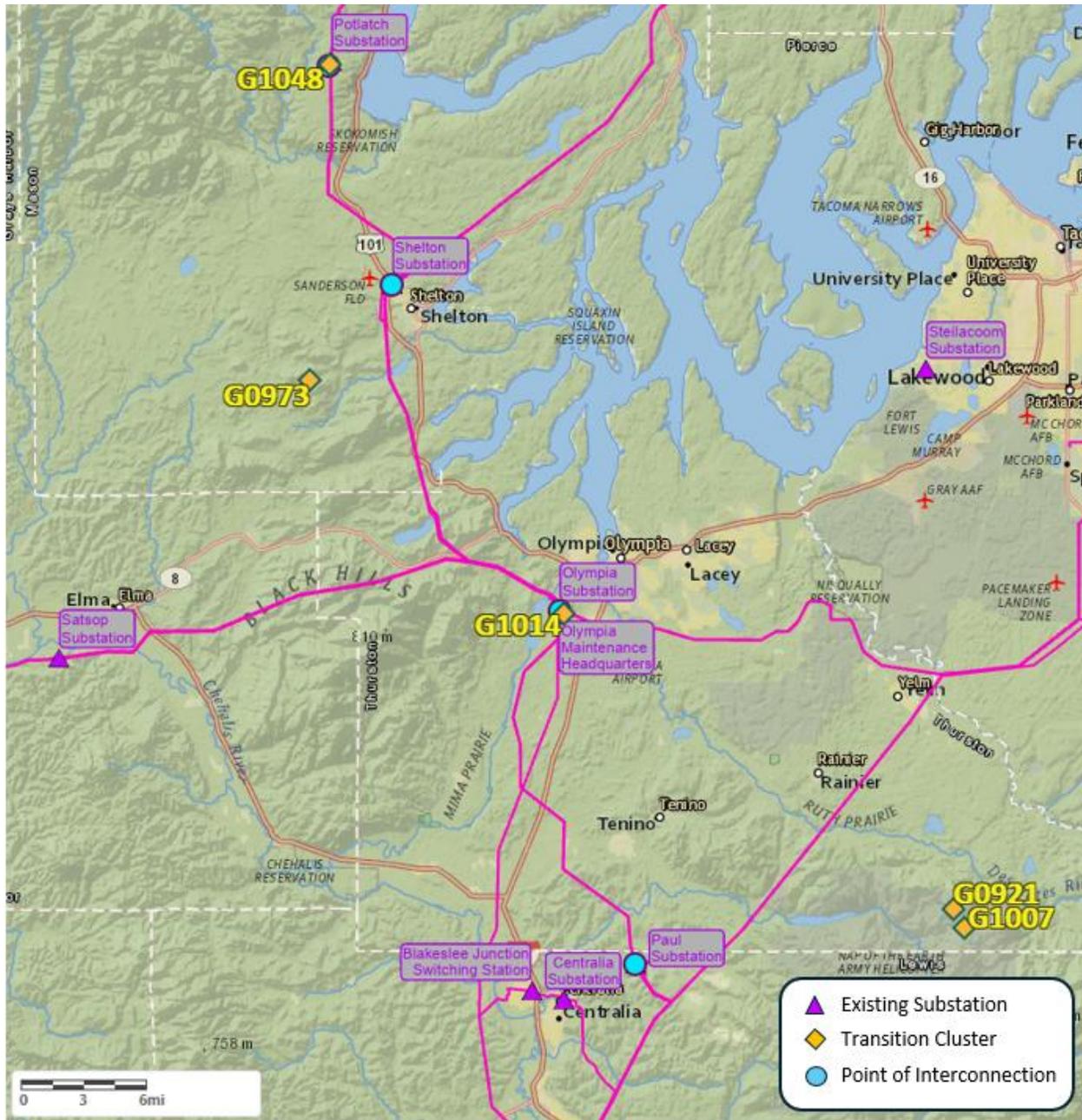


Figure 3: South Puget Sound POIs



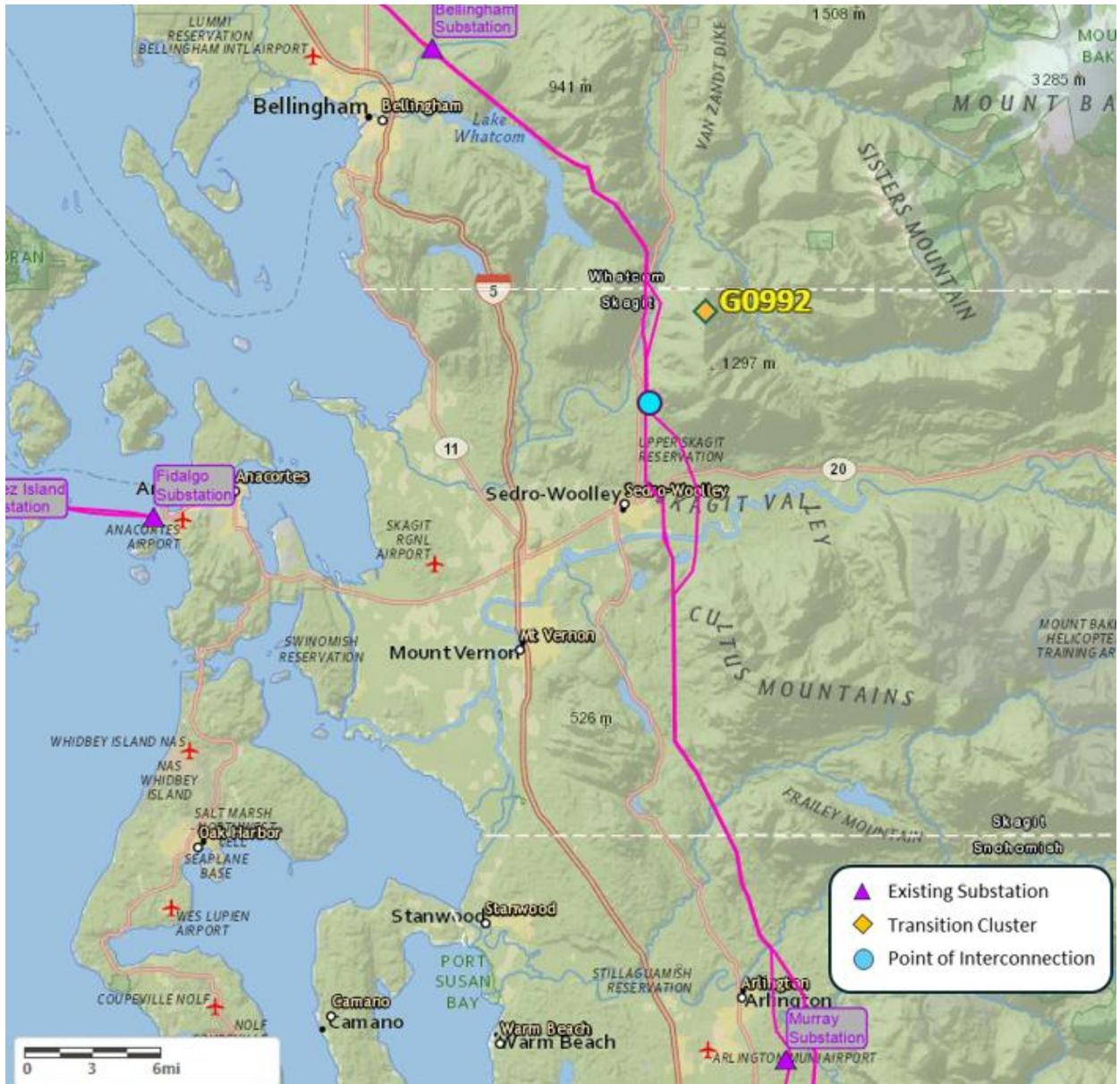


Figure 4: Skagit County POI



### 5.2 Studied POIs

The following table indicates the final studied POI for each request in the Cluster Area.

Table 5.2: Studied POI locations

GI #	Gen Type	MW Generating	MW Grid-Charging	Studied POI
G0921	Wind, BESS	300	-361	Paul 500 kV
G0922	BESS	100	-100	Longview 230 kV Annex
G0973	Wind	300	0	Shelton 230 kV
G0992	Wind	131	0	Monroe-Custer #1 500 kV Line
G1007	Wind, BESS	300	-300	Paul 500 kV
G1014	BESS	250	-250	Olympia 230 kV
G1048	Solar, BESS	200	-100	Shelton-Fairmount #4 230 kV Line

### 5.3 Starting Base Cases

The following WECC Cases were used for Cluster Area WE1.

- 2026 Heavy Summer (HS)
- 2030 Heavy Summer (HS)
- 2030 Heavy Winter (HW)

Cases were modified to include applicable senior-queued IR POIs and their associated Plans of Service as reported in their associated System Impact or Facility study reports published on host utility’s OASIS.

In addition, select planned BPA Projects were modeled as senior to the TCS and impactful to the POI performance. Impactful topology additions for CA WE1 include:

- Monroe-Novelt Hill #1 230 kV line upgrade (BPA)
- South Elma-Satsop Park #1 115 kV line impairments and shunts (BPA)

The following BPA load interconnection requests were deemed impactful to the POI performances and were also modeled online for various scenarios, where applicable.

- L0373 Grand Ridge Substation
- L0407 Totten Substation
- L0464 Duckabush
- L0465 Port Angeles Substation
- L0466 T3badas Substation
- L0504 Belfair Substation
- L0559 Substation FG Rebuild
- L0591 Diesel Refinery Additional Load
- L0592 Donald Nys Substation
- L0593 Dutch Canyon Substation
- L0597 Refinery Substation Load Addition
- L0599 Pacific Northwest Renewable Energy's Load
- L0603 Getchell Substation Load
- L0608 Port Angeles Load Addition



Additional summary of significant projects deemed Contingent and assumed in-service as base-state for this Cluster Area are specified in section 6.

**5.3.1 Load and Resource Scenario Descriptions**

The 2026 HS, 2030 HS, and 2030 HW WECC cases were further modified to simulate both a north-to-south (British Columbia to California) and a south-to-north (Washington to British Columbia) operating pattern. The Puget Sound Area (PSA) Generation pattern G4, which has a PSA total output of approximately 683 MW (summer) and 711 MW (winter), is a historically agreed upon ‘minimum generation’ value to assume during peak load scenarios amongst the PSA Transmission Planning entities and was used for the study. Local generation near POIs if applicable was studied at varying levels to determine the impact of the generation on the POI.

**5.4 Phase 1 POI Injection Tests**

Steady state contingency analysis was conducted at each POI increasing total generating or grid-charging amounts until a reliability limit is reached. Output at each POI was sunk to the following power flow buses, split equally among each bus:

Table 5.4: ATC Source/Sink Nodes

Mode	Source	Sink
Generating	POI Generator	OR/CA Border
Grid Charging	Upper Columbia/BC Hydro	POI Grid Charging BESS

**5.5 Phase 1 POI Short Circuit Ratio Strength Tests**

Per BPA STD-N-000001, all LIR POIs shall have Short Circuit Ratio (SCR) of 3 or greater for all critical NERC TPL-001 P1 conditions.

All evaluated POIs passed BPA’s SCR strength test requiring the SCR to exceed 5.0 for all lines in service and 3.0 for the worst P1 contingency prior to installing the plan of service. Results in section 7 will not require SCR mitigations.



## 6 Contingent Facilities Assumed In-Service

### 6.1 Longview Annex 230 kV POI

There are no impactful projects assumed in-service as Contingent for POI Longview Annex 230 kV.

### 6.2 Monroe-Custer 500 kV POI

The following project is deemed a Contingent Facility for this study and is required to be energized prior to IRs at POI Monroe-Custer 500 kV taking Interconnection Service.

Table 6.1: Monroe-Custer 500 kV Contingent Facilities

Project Name	Driver	Estimated Cost	Estimated I/S Date
Monroe-Novelty Hill 230 kV Upgrade	BPA Internal Project	\$2.4 M	12/30/2026

The Monroe-Novelty Hill #1 230 kV line upgrade is a corrective action project to rebuild the line from 60 C MOT to 100 C MOT.

### 6.3 Olympia 230 kV POI

The following project is assumed in-service for POI Olympia 230 kV. It is deemed a Contingent Facility for this study and is required to be energized prior to IRs at Olympia 230 kV taking Interconnection Service.

Table 6.1: Olympia 230 kV Contingent Facilities

Project Name	Driver	Estimated Cost	Estimated I/S Date
Schultz-Olympia 500 kV Line Rebuild	BPA TSEP 2023	\$853 M	2033-2034

The Schultz-Olympia 500 kV project rebuilds the Schultz-Olympia portion of the Coulee-Olympia 287 kV line to 500 kV. The project also includes an expansion of an Olympia 500 kV yard, a new 500/230 kV transformer bank, and three new 500 kV shunt capacitors.

### 6.4 Paul 500 kV

The following project is assumed in-service for POI Paul 500 kV. It is deemed a Contingent Facility for this study and is required to be energized prior to IRs at Paul 500 kV taking Interconnection Service.

Table 6.2: Paul 500 kV Contingent Facilities

Project Name	Driver	Estimated Cost	Estimated I/S Date
Schultz-Olympia 500 kV Line Rebuild	BPA TSEP 2023	\$853 M	2033-2034

The Schultz-Olympia 500 kV project rebuilds the Schultz-Olympia portion of the Coulee-Olympia 287 kV line to 500 kV. The project also includes an expansion of an Olympia 500 kV yard, a new 500/230 kV transformer bank, and three new 500 kV shunt capacitors.



### 6.5 Shelton 230 kV

The following project is assumed in-service for POIs in the Shelton Area. It is deemed a Contingent Facility for this study and is required to be energized prior to IRs at Shelton 230 kV taking Interconnection Service.

Table 6.3: POI Shelton Contingent Facilities

Project Name	Driver	Estimated Cost	Estimated I/S Date
Schultz-Olympia 500 kV Line Rebuild	BPA TSEP 2023	\$853 M	2033-2034

The Schultz-Olympia 500 kV project rebuilds the Schultz-Olympia portion of the Coulee-Olympia 287 kV line to 500 kV. The project also includes an expansion of an Olympia 500 kV yard, a new 500/230 kV transformer bank, and three new 500 kV shunt capacitors.

### 6.6 Shelton-Fairmount #4 230 kV

The following project is assumed in-service for POI Shelton-Fairmount #4 230 kV. It is deemed a Contingent Facility for this study and is required to be energized prior to IRs at Shelton 230 kV or on the Shelton-Fairmount #4 230kv line taking Interconnection Service.

Table 6.3: POI Shelton Contingent Facilities

Project Name	Driver	Estimated Cost	Estimated I/S Date
Schultz-Olympia 500 kV Line Rebuild	BPA TSEP 2023	\$853 M	2033-2034

The Schultz-Olympia 500 kV project rebuilds the Schultz-Olympia portion of the Coulee-Olympia 287 kV line to 500 kV. The project also includes an expansion of an Olympia 500 kV yard, a new 500/230 kV transformer bank, and three new 500 kV shunt capacitors.

## 7 Technical Analysis & Study Results

### 7.1 Longview 230 kV Annex

#### TCS System Performance

Table 7.1: Results for Longview Annex POI

POI MW Threshold	IRs Affected	Limiting Element (Contingency Category)	Mitigation
-475 to 0	G0922	Longview – Chehalis 230 kV (TPL-001 P2)	BPA WS-RAS participation
0 to 175	G0922	Longview Annex – NDP 230 kV (TPL-001 P2)	BPA WS-RAS participation

#### Proposed Mitigations

There are no mitigations required for connecting +/- 100 MW at Longview 230 kV Annex. Participation in existing BPA Westside RAS (WS-RAS) gen-tripping algorithms will be required for proximity to existing WS-RAS participant POIs.



## 7.2 Monroe-Custer 500 kV

### TCS System Performance

Table 7.2: Results for Monroe-Custer 500 POI

POI MW Threshold	IRs Affected	Limiting Element (Contingency Category)	Mitigation
0 to 575	G0992	Northern Intertie & South of Custer Path TTCs (TPL-001 P1)	BPA WS-RAS participation

### Proposed Mitigations

Interconnecting at Monroe-Custer 500 kV will require participation in existing BPA WS-RAS gen-tripping algorithms for proximity to existing WS-RAS participant POIs. Otherwise, there are no mitigations required for connecting the full 131 MW amount.

## 7.3 Olympia 230 kV

### TCS System Performance

Table 7.3: Results for Olympia 230 kV POI

POI MW Threshold	IRs Affected	Limiting Element (Contingency Category)	Mitigation
-375 to 0	G1014	Grand Coulee-Olympia 230 kV (Multiple TPL-001 Contingencies)	TSEP Schultz-Olympia 500 kV project (Contingent Facility)
0 to 475	G1014	None	BPA WS-RAS participation

### Proposed Mitigations

All grid charging at this POI requires the Contingent Facility TSEP Schultz-Olympia 500 kV project, which upgrades the Grand-Coulee-Olympia 230 kV limiting element. Participation in existing BPA Westside RAS gen-tripping algorithms will be required for proximity to existing WS-RAS participant POIs. No other mitigations are required for connecting the full 250MW amount.

## 7.4 Paul 500 kV

### TCS System Performance

Table 7.4: Results for Paul 500 POI

POI MW Threshold	IRs Affected	Limiting Element (Contingency Category)	Mitigation
-661 to 0	G0921, G1007	Olympia-Paul #1 500 kV and Grand Coulee-Olympia 230 kV (TPL-001 P1)	TSEP Schultz-Olympia 500 kV project (Contingent Facility), BPA WS-RAS participation
0 to 600	G0921, G1007	None	BPA WS-RAS participation

### Proposed Mitigations

All grid charging at this POI is contingent on TSEP Schultz-Olympia 500 kV project which upgrades the Grand-Coulee 230 kV limiting element. Participation in existing BPA Westside RAS gen-tripping algorithms will be required for proximity to existing WS-RAS participant POIs. No other mitigation is required for connecting +600/-661 MW to Paul 500 kV.



### 7.5 Shelton 230 kV Substation

#### TCS System Performance

Table 7.5: Results for Shelton Area 230 kV POI

POI MW Threshold	IRs Affected	Limiting Element (Contingency Category)	Mitigation
0-300	G0973	Aberdeen-Cosmopolis 115 kV (TPL-001 P7)	BPA WS-RAS participation

#### Proposed Mitigations

New RAS for a P7 common tower outage is required for any incremental generation to mitigate overloads on the Aberdeen-Cosmopolis 115 kV line section, owned by Gray’s Harbor PUD. Participation in existing BPA Westside RAS gen-tripping algorithms will also be required for proximity to existing WS-RAS participant POIs. No other mitigation is required for connecting 300 MW to Shelton 230 kV.

### 7.6 Shelton-Fairmount #4 230 kV Line

#### TCS System Performance

Table 7.6: Results for Shelton-Fairmount #4 230 kV POI

POI MW Threshold	IRs Affected	Limiting Element (Contingency Category)	Mitigation
-100 to 0	G1048	Grand Coulee-Olympia 230 kV (Multiple Contingencies), Shelton-Potlach 115 kV (TPL-001 P1)	TSEP Schultz-Olympia 500 kV project (Contingent Facility), BPA WS-RAS participation
1 to 200	G1048	Aberdeen-Cosmopolis 115 kV (TPL-001 P7)	BPA WS-RAS participation

#### Proposed Mitigations

All grid charging at this POI is contingent on Schultz-Olympia 500 kV project which upgrades the Grand-Coulee 230 kV limiting element. RAS for grid-charging from this location is not viable mitigation for Grand Coulee-Olympia 230 kV loading, because the number of event-based inputs (outages) exceeds BPA planning guidelines for new RAS Algorithms. A new WS-RAS will also be required for grid-charging, to mitigate local outage impacts on Shelton-Potlach 115 kV.

New RAS for a P7 common tower outage is required for any amount of generation, to mitigate overloads on Aberdeen-Cosmopolis 115 kV line section, owned by Gray’s Harbor PUD.. Participation in existing BPA Westside RAS gen-tripping algorithms will also be required for proximity to existing WS-RAS participant POIs. No other mitigation is required for connecting full 200 MW at the POI.

## 8 Interconnection Facility Requirements

### 8.1 Longview Annex 230 kV

Table 8.1: POI Longview 230 kV Facility requirements

G#	BPA Station Work	BPA Non-Station Work
G0922	1x 230 kV gen-tie Terminal	N/A



Longview Substation is a 230/115 kV BPA owned substation. The 230 kV portion is comprised of a main yard and an adjacent annex substation. The station is designed as a main-aux bus configuration. Requirements for this POI:

1. Develop a 230 kV, main aux bay at Longview 230 kV Annex which includes 1 power circuit breaker, 3 disconnect switches, one line position with arrestors, and associated control, relaying, and communications equipment.
2. Participate in BPA WS-RAS algorithms
3. Installation of BPA-required C&C equipment at each customer’s Collector site (RAS, Meters, relays, Control House space)
4. Minor Development of C&C hardware at BPA’s POI substation.

The customer will construct a 230 kV line from the BPA POI station to their generation facility. The customer will then construct a 230/34.5 kV substation directly adjacent to the POI line to support their 34.5 kV feeders at their collector site.

**8.2 Monroe-Custer 500 kV POI**

Table 8.2: POI Monroe-Custer 500 kV Facility requirements

G#	BPA Station Work	BPA Non-Station Work
G0992	New 500 kV Breaker and a half substation, 1x 500 kV gen-tie terminal	N/A

Requirements for this POI:

1. Develop a 500 kV, 4 breaker ring bus substation at the POI, 54 miles north of Monroe, which includes development of a new substation, 4 power circuit breakers, 10 disconnect switches and associated control, relaying, and communications equipment.
2. Participate in BPA WS-RAS algorithms
3. Installation of BPA-required C&C equipment at customer’s Collector site (RAS, Meters, relays, Control House space).
4. Moderate development of C&C hardware at BPA’s POI substation.

The customer will construct a 500 kV line from the BPA POI station to their generation facility. The customer will then construct a 500/34.5 kV substation directly adjacent to the POI line to support their 34.5 kV feeders at their collector site.

**8.3 Olympia 230 kV POI**

Table 8.3: POI Olympia 230 Facility requirements

G#	BPA Station Work	BPA Non-Station Work
G1014	1x 230 kV gen-tie Terminal	N/A

Olympia Substation is a 230/115 kV BPA owned substation with a 500 kV transformer terminated line to Paul substation. The station is designed as a main-aux bus configuration.



1. Develop a 230 kV, main aux bay at Olympia 230 kV which includes 1 power circuit breaker, 3 disconnect switches, one line position with arrestors, and associated control, relaying, and communications equipment
2. Participate in new and existing BPA WS-RAS algorithms
3. Installation of BPA-required C&C equipment at each customer’s Collector site (RAS, Meters, relays, Control House space)
4. Minor Development of C&C hardware at BPA’s POI substation

The customer will construct a 230 kV line from the BPA POI station to their generation facility. The customer will then construct a 230/34.5 kV substation directly adjacent to the POI line to support their 34.5 kV feeders at their collector site.

**8.4 Paul 500 kV POI**

Table 8.4: POI Paul 500 kV Facility requirements

G#	BPA Station Work	BPA Non-Station Work
G0921, G1007	1x 500 kV shared gen-tie Terminal	N/A

Paul Substation is a 500 kV BPA owned substation. The station is designed as a breaker-and-a-half configuration.

1. Develop a 500 kV bay at Paul 500 kV substation which includes 2 power circuit breakers, 4 disconnect switches and associated control, relaying, and communications equipment
2. Participate in new and existing BPA WS-RAS algorithms
3. Installation of BPA-required C&C equipment at each customer’s Collector site (RAS, Meters, relays, Control House space)
4. Minor Development of C&C hardware at BPA’s POI substation

The customer will construct a 500 kV line from the BPA POI station to their generation facility. The customer will then construct a 500/34.5 kV substation directly adjacent to the POI line to support their 34.5 kV feeders at their collector site

**8.5 Shelton 230 kV POI**

Table 8.5: Shelton Area Facility requirements

G#	BPA Station Work	BPA Non-Station Work
G0973	1x 230 kV gen-tie Terminal	N/A

Shelton Substation is a 230/115 kV BPA owned substation. The 230 yard is designed as a breaker-and-a-half configuration.

1. Develop a 230 kV, main aux bay at Shelton 230 kV which includes 1 power circuit breaker, 4 disconnect switches, one line position with arrestors, and associated control, relaying, and communications equipment
2. Participate in new and existing BPA WS-RAS algorithms
3. Installation of BPA-required C&C equipment at each customer’s Collector site (RAS, Meters, relays, Control House space)



4. Moderate development of C&C hardware at BPA’s POI substation

The customer will construct a 230 kV line from the BPA POI station to their generation facilities. The customer will then construct a 230/34.5 kV substation directly adjacent to the POI lines to support their 34.5 kV feeders at their collector sites.

**8.6 Shelton-Fairmount 230 kV POI**

Table 8.6: Shelton Area Facility requirements

G#	BPA Station Work	BPA Non-Station Work
G1048	New 230 kV Breaker-and-half substation, 1x 230 kV gen-tie terminal	N/A

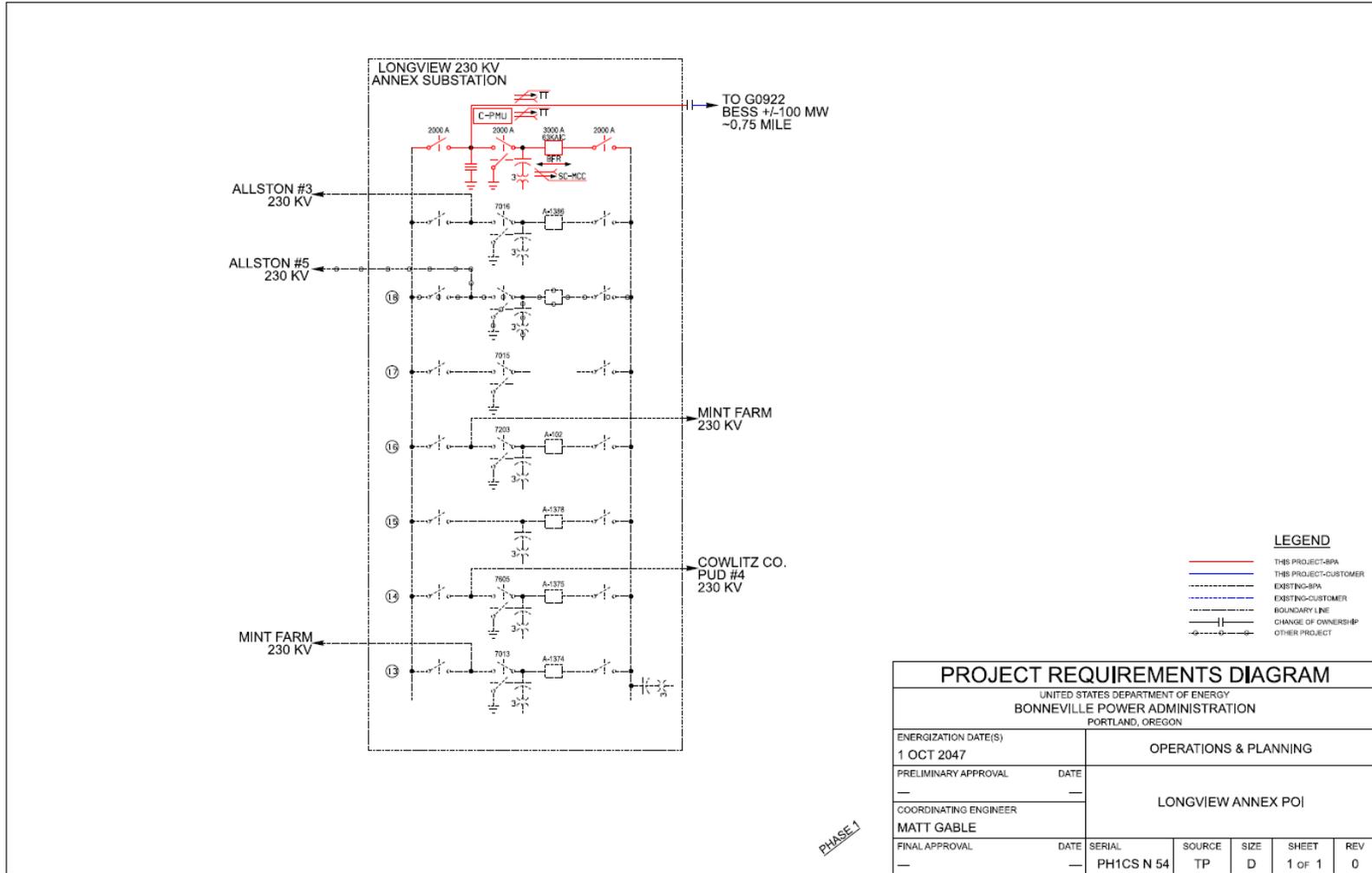
1. Develop a 230 kV, 4 breaker ring bus substation at the POI which includes development of a new substation, 4 power circuit breakers, 9 disconnect switches and associated control, relaying, and communications equipment
2. Participate in new and existing BPA WS-RAS algorithms
3. Installation of BPA-required C&C equipment at each customer’s Collector site (RAS, Meters, relays, Control House space)
4. Moderate development of C&C hardware at BPA’s POI substation

The customer will construct a 230 kV line from the BPA POI station to their generation facilities. The customer will then construct a 230/34.5 kV substation directly adjacent to the POI lines to support their 34.5 kV feeders at their collector sites.

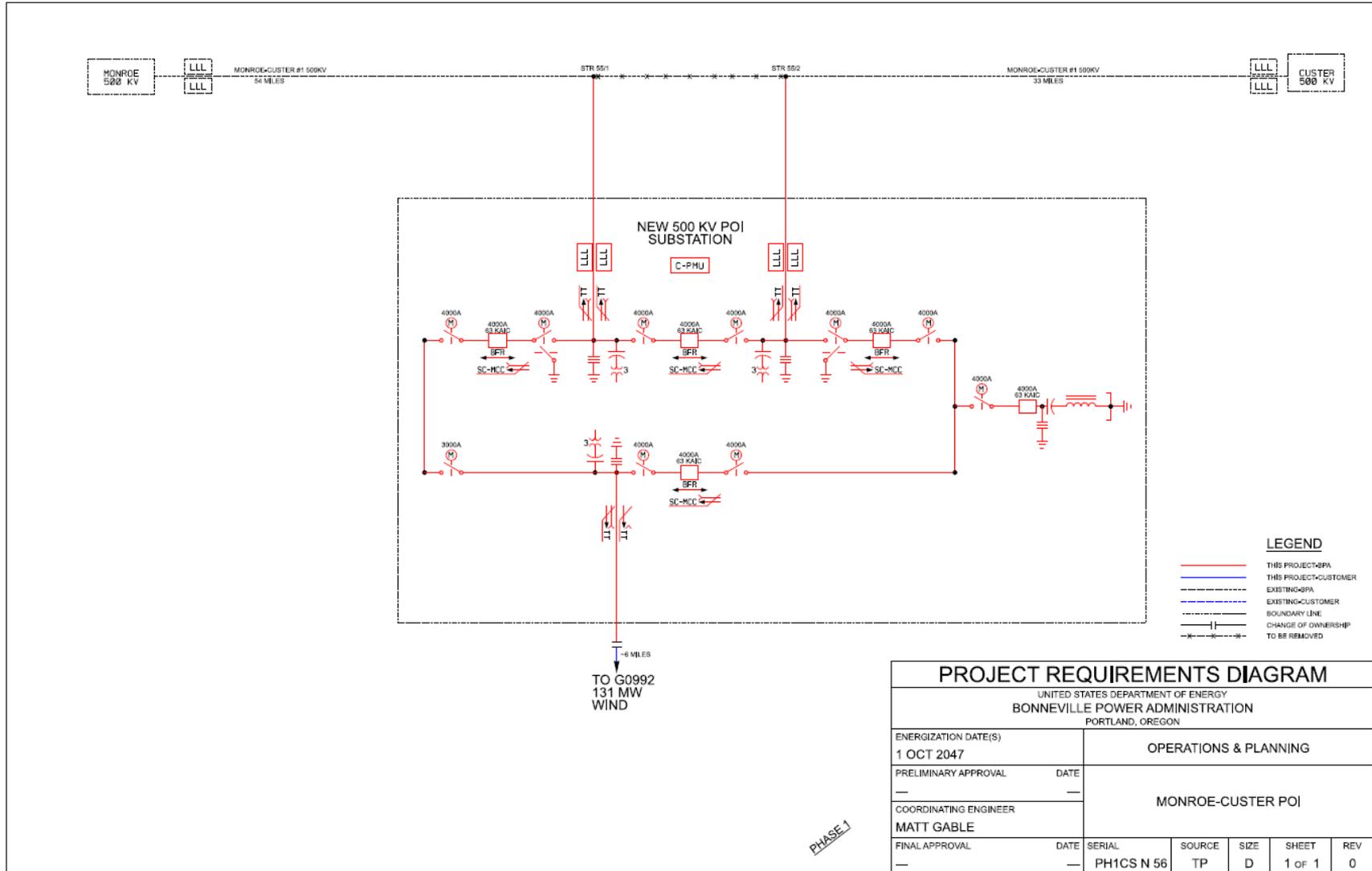


# 9 Project One-Line Drawings

## 9.1 Longview Annex 230 kV POI

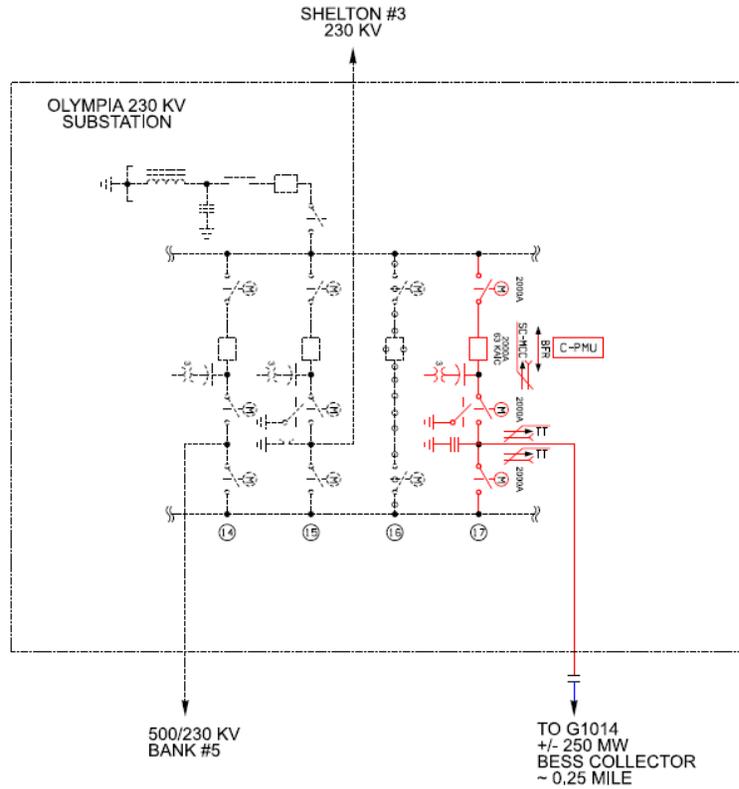


9.2 *Monroe-Custer 500 kV POI*



PROJECT REQUIREMENTS DIAGRAM						
UNITED STATES DEPARTMENT OF ENERGY BONNEVILLE POWER ADMINISTRATION PORTLAND, OREGON						
ENERGIZATION DATE(S) 1 OCT 2047			OPERATIONS & PLANNING			
PRELIMINARY APPROVAL		DATE	MONROE-CUSTER POI			
COORDINATING ENGINEER MATT GABLE						
FINAL APPROVAL	DATE	SERIAL	SOURCE	SIZE	SHEET	REV
—	—	PH1CS N 56	TP	D	1 OF 1	0

### 9.3 Olympia 230 kV POI



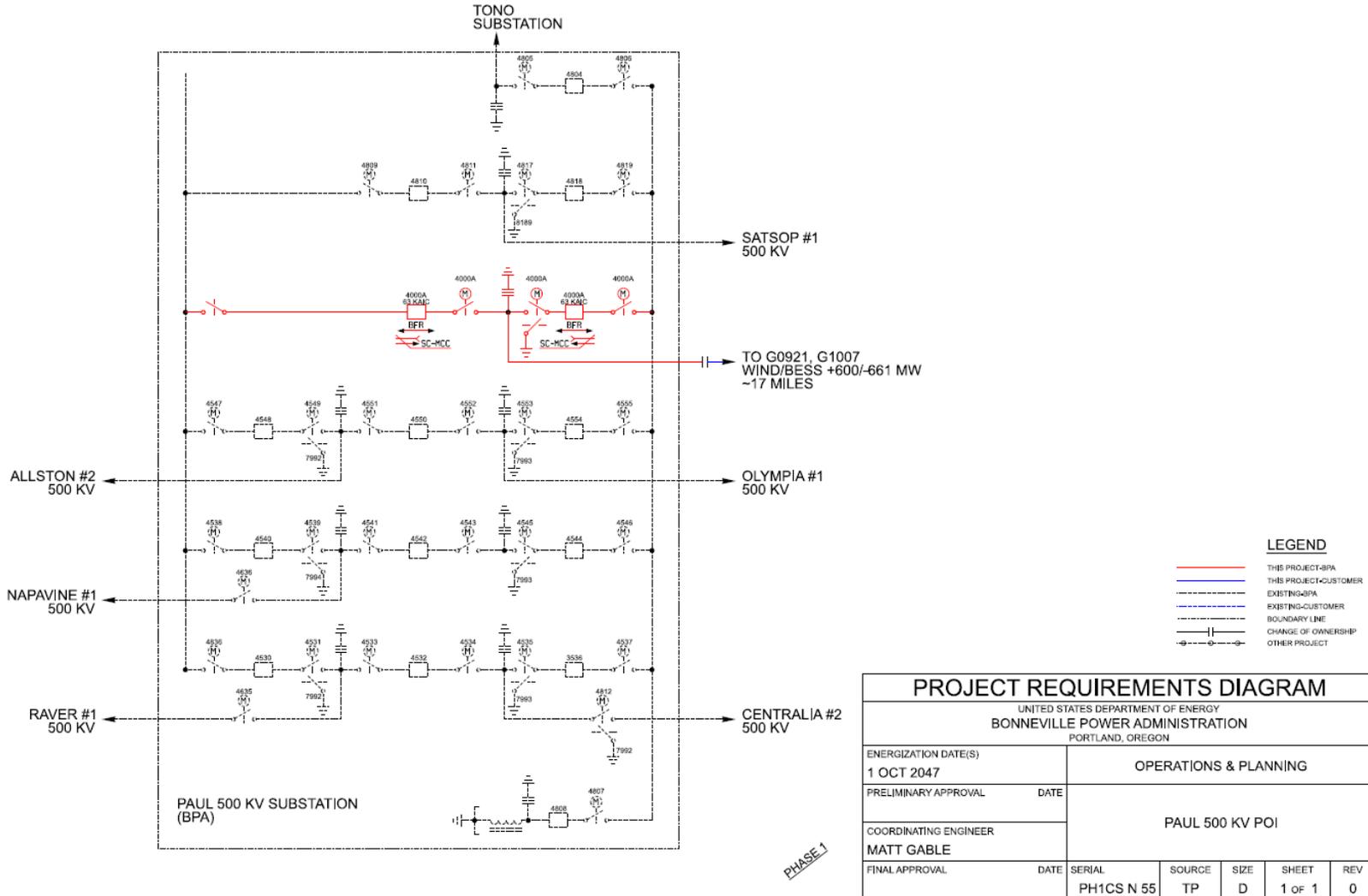
**LEGEND**

<span style="color: red;">—</span>	THIS PROJECT-BPA
<span style="color: blue;">—</span>	THIS PROJECT-CUSTOMER
<span style="color: red;">---</span>	EXISTING-BPA
<span style="color: blue;">---</span>	EXISTING-CUSTOMER
<span style="border-bottom: 1px dashed black;"> </span>	BOUNDARY LINE
<span style="border-bottom: 1px solid black;"> </span>	CHANGE OF OWNERSHIP
<span style="border-bottom: 1px dashed black;"> </span>	OTHER PROJECT

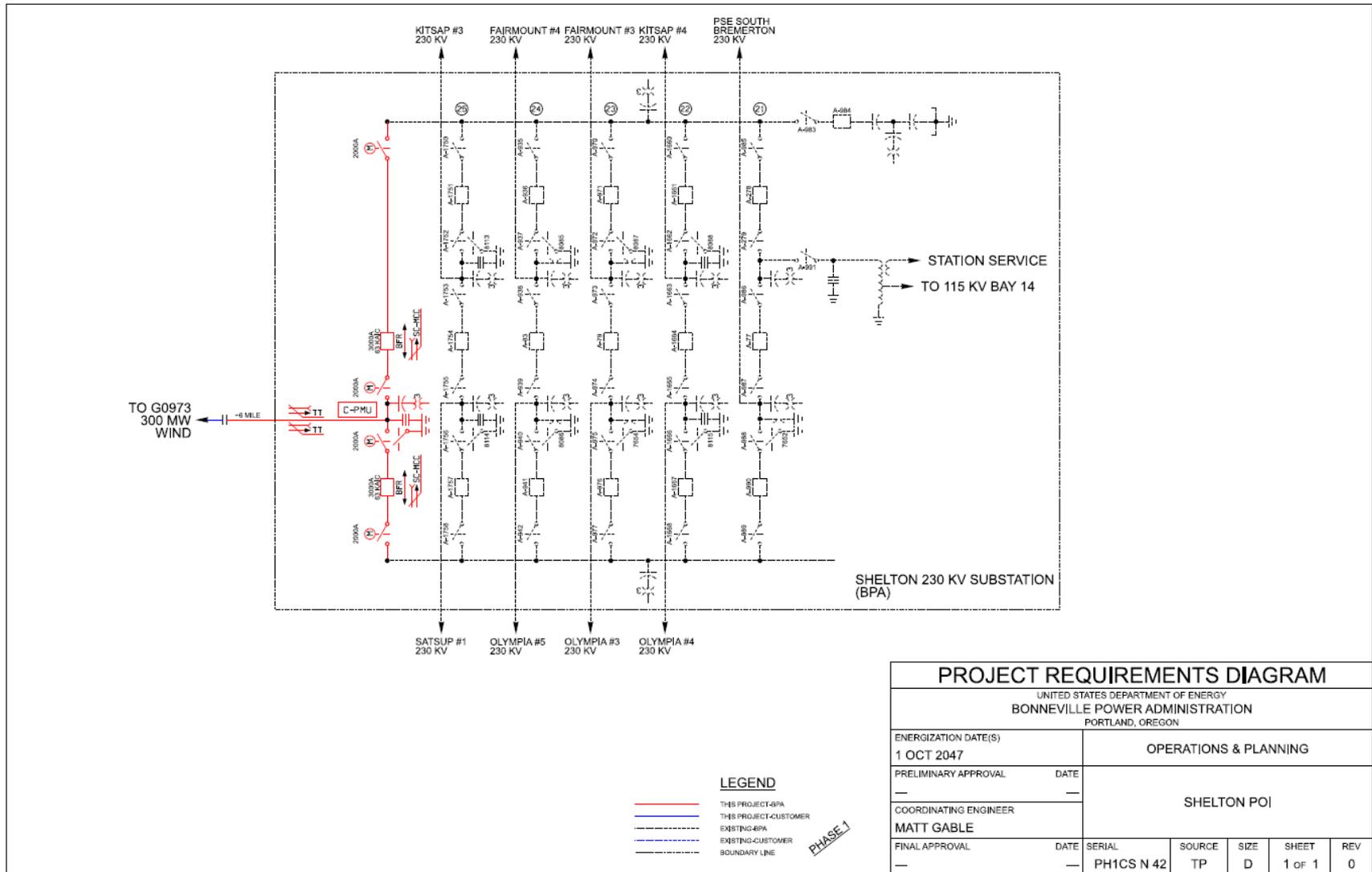
PROJECT REQUIREMENTS DIAGRAM						
UNITED STATES DEPARTMENT OF ENERGY BONNEVILLE POWER ADMINISTRATION PORTLAND, OREGON						
ENERGIZATION DATE(S)		OPERATIONS & PLANNING				
1 OCT 2047						
PRELIMINARY APPROVAL	DATE	OLYMPIA POI				
COORDINATING ENGINEER						
MATT GABLE						
FINAL APPROVAL	DATE	SERIAL	SOURCE	SIZE	SHEET	REV
		PH1CS N 50	TP	D	1 of 1	0

PHASE 1

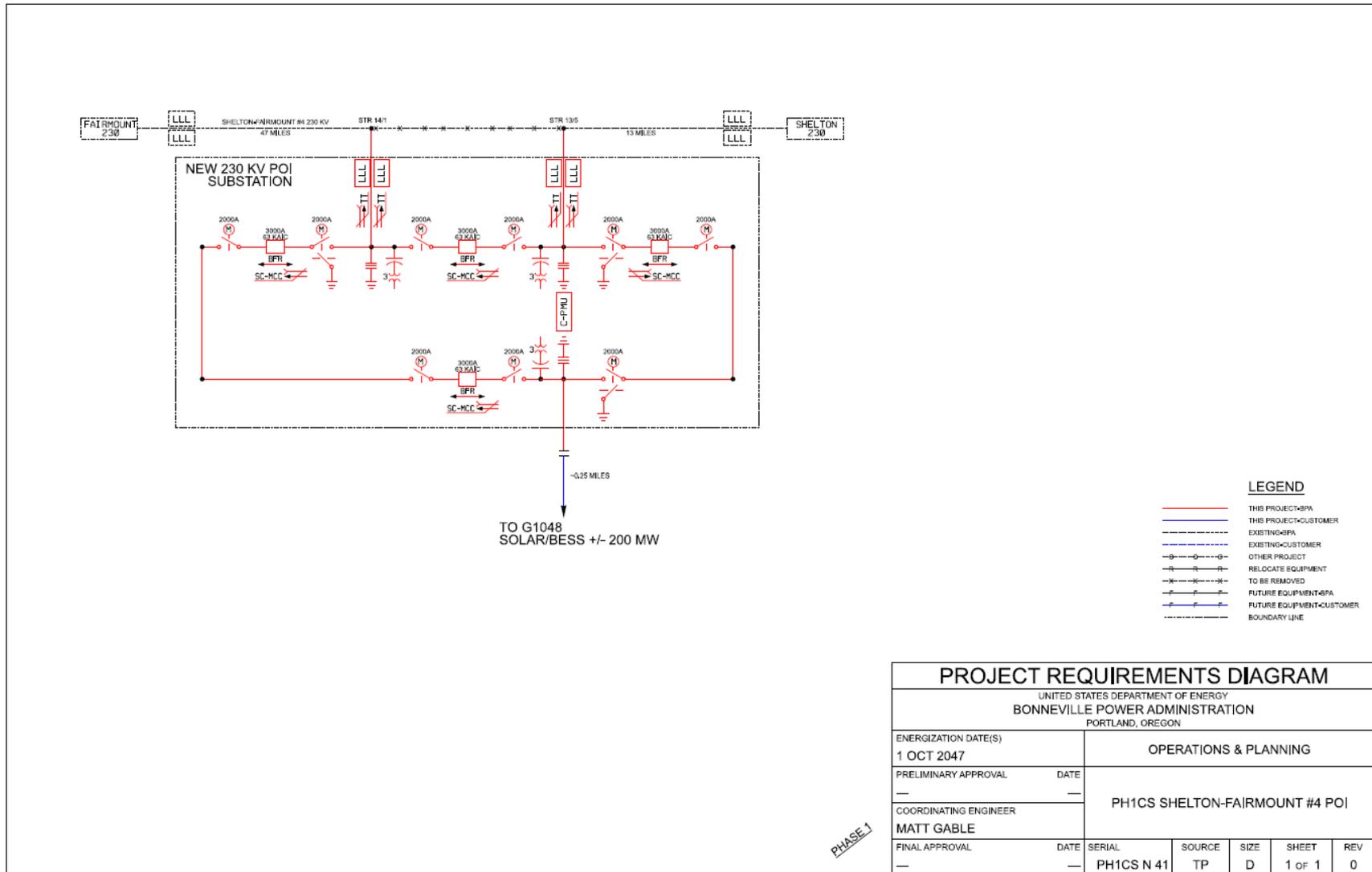
9.4 Paul 500 kV POI



9.5 Shelton 230 kV POI



9.6 Shelton-Fairmount 230 kV POI



## 10 Cost and Schedules

### 10.1 Estimated Schedule

The schedule is dependent on,

- 1) The acquisition of long lead time equipment,
- 2) BPA's ability to fit the project into its construction work plan, and
- 3) The customer's ability to obtain any necessary permits for the project and progress through the interconnection process in a timely manner.

A non-binding good faith estimated time to construct is 3-5 years for substation equipment and 7-10 years for transmission line upgrades after design activities begin. The estimated time to construct a plan of service is refined through the subsequent stages of the interconnection process.

BPA will not begin construction of a plan of service required for interconnection until the Interconnection customer has executed a Standard Large Generator Interconnection Agreement (LGIA). BPA's decision to offer an LGIA is dependent on the completion of an environmental compliance decision under the National Environmental Policy Act (NEPA). BPA's environmental compliance decision under NEPA requires the Interconnection customer to have obtained required permitting, certification, and environmental approvals for any facilities that BPA will not own.

### 10.2 Cost Estimates and Cost Allocations

The following are non-binding good faith estimates of cost based on previous estimates for similar projects. They represent only scopes of work that will be performed by BPA. Costs for any work being performed by the customer are not included. These costs include overhead rates for BPA labor & materials, and for contract labor & materials. The costs also include a 40% contingency. Not included in these estimates are costs for land acquisition, permitting and environmental mitigations. More accurate estimates based on scoping for the project will be available at the completion of the Interconnection Facilities Study.

Detailed Communications and Control (C&C) equipment required for each generation facility and interconnection into the BPA transmission system at the BPA-TS POI substation will be determined in an Interconnection Facilities Study. The TCS PH1 estimates C&C equipment scope and costs based on whether required upgrades fall into the following categories:

- 1) customer Station (\$5M): for BPA-required C&C equipment at a customer's collector site (RAS, Meters, relays, Control House space)
- 2) Minor (\$5M): BES additions to an existing BPA station
- 3) Moderate (\$10M): BES creation of a new BPA substation near existing C&C infrastructure, or significant expansion of an existing BPA substation
- 4) Significant (\$15M): BES creation of BPA substation very remote from any existing C&C infrastructure.

When multiple projects owned by affiliated entities interconnected at the same POI, BPA assumed the IRs to be sharing a tie line where applicable. These IRs were treated as a single customer for per capita cost allocation of station equipment Network Upgrades as outlined in Section 4.2.3(a) of the LGIP. In the below cost estimate tables, this treatment is identified by the senior-queued IR being allocated the full per capita cost share and the junior-queued IR being allocated 0% of costs for station equipment



Network Upgrades. IRs assumed to be sharing a tie line are identified in the one-line drawings provided in section 9 of this report.

**10.3 POI 1: Longview 230 kV Annex**

Table 10.1 POI 1 – Longview 230 kV Annex Station Cost Estimate

<i>Estimate Summary</i>									
Estimate #	Description		Quantity	Contract		BPA		Misc.	Total
				Labor	Material	Labor	Material		
	<u>Longview Annex 230 kV POI</u>		-	-	-	-	-	-	
ST-070-19-11	230 kV Main-Aux Bay		1	\$2,180,000	\$1,402,000	\$522,000	\$0	\$12,000	\$4,116,000
C&C	C&C: BPA station Small		1	\$0	\$0	\$0	\$0	\$5,000,000	\$5,000,000
C&C	C&C: Collector Stations		1	\$0	\$0	\$0	\$0	\$5,000,000	\$5,000,000
Contingency %	40%		Subtotal:	\$2,180,000	\$1,402,000	\$522,000	\$0	\$10,012,000	\$14,116,000
Overhead %	Labor	Materials	Contingency:	\$872,000	\$560,800	\$208,800	\$0	\$4,004,800	\$5,646,400
	26%	9%	Overhead:	\$793,520	\$176,652	\$190,008	\$0	\$1,261,512	\$2,421,692
<b>Grand Total:</b>	<i>(rounded to two significant figures)</i>			<b>\$3,800,000</b>	<b>\$2,100,000</b>	<b>\$920,000</b>	<b>\$0</b>	<b>\$15,000,000</b>	<b>\$22,000,000</b>

Table 10.2 POI 1 – Longview 230 kV Annex Cost Allocation

Queue #	Requested MW	Station Equipment	Station Equipment Allocation (Per Capita)	Station Equipment Cost	Non-Station Equipment	Non-Station Equipment Allocation (Per MW)	Non-Station Equipment Cost	Non-Network Direct Assigned	Direct Assigned Cost	Cost Assignment
G0922	100	Longview Annex 230kV Bayw/ Comm Expansion	100%	\$13M	N/A	N/A	N/A	Collector Station C&C and RAS	\$9M	\$22M



**10.4 POI 2: Monroe-Custer 500 kV New POI**

**Table 10.3 POI 2 – Monroe-Custer 5500 kV New POI Station Cost Estimate**

<i>Estimate Summary</i>									
Estimate #	Description		Quantity	Contract		BPA		Misc.	Total
				Labor	Material	Labor	Material		
	<u>Monroe-Custer 500 kV POI</u>		-	-	-	-	-	-	-
ST-070-133-7	4x PCB, 4pos 2xbay BAAH, w/180MVAR Shunt Reactor		1	\$44,512,000	\$46,842,000	\$5,690,000	\$816,000	\$0	\$97,860,000
C&C	C&C: BPA station Mid		1	\$0	\$0	\$0	\$0	\$10,000,000	\$10,000,000
C&C	C&C: Collector Stations		1	\$0	\$0	\$0	\$0	\$5,000,000	\$5,000,000
Contingency %	40%		<b>Subtotal:</b>	\$44,512,000	\$46,842,000	\$5,690,000	\$816,000	\$15,000,000	\$112,860,000
Overhead %	Labor	Materials	<b>Contingency:</b>	\$17,804,800	\$18,736,800	\$2,276,000	\$326,400	\$6,000,000	\$45,144,000
	26%	9%	<b>Overhead:</b>	\$16,202,368	\$5,902,092	\$2,071,160	\$102,816	\$1,890,000	\$26,168,436
<b>Grand Total:</b>	<i>(rounded to two significant figures)</i>			<b>\$79,000,000</b>	<b>\$71,000,000</b>	<b>\$10,000,000</b>	<b>\$1,250,000</b>	<b>\$23,000,000</b>	<b>\$180,000,000</b>

**Table 10.4 POI 2 – Monroe-Custer 500 kV New POI Cost Allocation**

Queue #	Requested MW	Station Equipment	Station Equipment Allocation (Per Capita)	Station Equipment Cost	Non-Station Equipment	Non-Station Equipment Allocation (Per MW)	Non-Station Equipment Cost	Non-Network Direct Assigned	Direct Assigned Cost	Cost Assignment
G0992	131	New 500kV Substation w/ Comm Expansion	100%	\$171M	N/A	N/A	N/A	Collector Station C&C and RAS	\$9M	\$180M



**10.5 POI 3: Olympia230 kV**

**Table 10.5 POI 3 – Olympia 230 kV Station Cost Estimate**

<i>Estimate Summary</i>									
Estimate #	Description		Quantity	Contract		BPA		Misc.	Total
				Labor	Material	Labor	Material		
	<u>Olympia 230 kV POI</u>		-	-	-	-	-	-	-
ST-070-19-11	230 kV Main-Aux Bay		1	\$2,180,000	\$1,402,000	\$522,000	\$0	\$12,000	\$4,116,000
C&C	C&C: BPA station Small		1	\$0	\$0	\$0	\$0	\$5,000,000	\$5,000,000
C&C	C&C: Collector Stations		1	\$0	\$0	\$0	\$0	\$5,000,000	\$5,000,000
Contingency %	40%		Subtotal:	\$2,180,000	\$1,402,000	\$522,000	\$0	\$10,012,000	\$14,116,000
Overhead %	Labor	Materials	Contingency:	\$872,000	\$560,800	\$208,800	\$0	\$4,004,800	\$5,646,400
	26%	9%		Overhead:	\$793,520	\$176,652	\$190,008	\$0	\$1,261,512
Grand Total:	<i>(rounded to two significant figures)</i>			<b>\$3,800,000</b>	<b>\$2,100,000</b>	<b>\$920,000</b>	<b>\$0</b>	<b>\$15,000,000</b>	<b>\$22,000,000</b>

**Table 10.6 POI 3 – Olympia 230 kV Cost Allocation**

Queue #	Requested MW	Station Equipment	Station Equipment Allocation (Per Capita)	Station Equipment Cost	Non-Station Equipment	Non-Station Equipment Allocation (Per MW)	Non-Station Equipment Cost	Non-Network Direct Assigned	Direct Assigned Cost	Cost Assignment
G1014	250	Olympia 230kV Expansion w/ Comm Expansion	100%	\$13M	N/A	N/A	N/A	Collector Station C&C and RAS	\$9M	\$22M



10.6 POI 4: Paul 500 kV

Table 10.7 POI 4 – Paul 500 kV Station Cost Estimate

Estimate Summary									
Estimate #	Description		Quantity	Contract		BPA		Misc.	Total
				Labor	Material	Labor	Material		
	Paul 500 kV POI		-	-	-	-	-	-	-
ST-070-65-10	500kV BAAH Bay (1 term,2 PCB)		0.5	\$5,854,000	\$4,807,000	\$905,000	\$0	\$29,000	\$11,595,000
	C&C	C&C: BPA station Small	1	\$0	\$0	\$0	\$0	\$5,000,000	\$5,000,000
	C&C	C&C: Collector Stations	2	\$0	\$0	\$0	\$0	\$10,000,000	\$10,000,000
Contingency %	40%		Subtotal:	\$5,854,000	\$4,807,000	\$905,000	\$0	\$15,029,000	\$26,595,000
Overhead %	Labor	Materials	Contingency:	\$2,341,600	\$1,922,800	\$362,000	\$0	\$6,011,600	\$10,638,000
	26%	9%	Overhead:	\$2,130,856	\$605,682	\$329,420	\$0	\$1,893,654	\$4,959,612
Grand Total:	<i>(rounded to two significant figures)</i>			\$10,300,000	\$7,300,000	\$1,600,000	\$0	\$23,000,000	\$42,000,000

Table 10.8 POI 4 – Paul 500 kV Cost Allocation

Queue #	Requested MW	Station Equipment	Station Equipment Allocation (Per Capita)	Station Equipment Cost	Non-Station Equipment	Non-Station Equipment Allocation (Per MW)	Non-Station Equipment Cost	Non-Network Direct Assigned	Direct Assigned Cost	Cost Assignment
G0921	300	Paul 500kV Expansion w/ Comm Expansion	100%	\$24M	N/A	N/A	N/A	Collector Station C&C and RAS	\$9M	\$33M
G1007	300		0%	N/A	N/A	N/A	N/A	Collector Station C&C and RAS	\$9M	\$9M



10.7 POI 5: Shelton 230 kV

Table 10.9 POI 5 – Shelton 230 kV Station Cost Estimate

<i>Estimate Summary</i>								
Estimate #	Description	Quantity	Contract		BPA		Misc.	Total
			Labor	Material	Labor	Material		
	Shelton 230 kV POI	-	-	-	-	-	-	-
ST-070-19-11	230 kV Main-Aux Bay	1	\$2,180,000	\$1,402,000	\$522,000	\$0	\$12,000	\$4,116,000
C&C	C&C: BPA station Mid	1	\$0	\$0	\$0	\$0	\$10,000,000	\$10,000,000
C&C	C&C: Collector Stations	1	\$0	\$0	\$0	\$0	\$5,000,000	\$5,000,000
Contingency %	40%	Subtotal:	\$2,180,000	\$1,402,000	\$522,000	\$0	\$15,012,000	\$19,116,000
Overhead %	Labor	Contingency:	\$872,000	\$560,800	\$208,800	\$0	\$6,004,800	\$7,646,400
	Materials		9%	Overhead:	\$793,520	\$176,652	\$190,008	\$0
Grand Total:	<i>(rounded to two significant figures)</i>		<b>\$3,800,000</b>	<b>\$2,100,000</b>	<b>\$920,000</b>	<b>\$0</b>	<b>\$23,000,000</b>	<b>\$30,000,000</b>

Table 10.10 POI 5 – Shelton 230 kV Cost Allocation

Queue #	Requested MW	Station Equipment	Station Equipment Allocation (Per Capita)	Station Equipment Cost	Non-Station Equipment	Non-Station Equipment Allocation (Per MW)	Non-Station Equipment Cost	Non-Network Direct Assigned	Direct Assigned Cost	Cost Assignment
G0973	300	Shelton 230kV Expansion w/ Comm Expansion	100%	\$21M	N/A	N/A	N/A	Collector Station C&C and RAS	\$9M	\$30M



**10.8 POI 6: Shelton-Fairmount 230 kV New POI**

**Table 10.11 POI 6 – Shelton-Fairmount 230 kV New POI Station Cost Estimate**

<i>Estimate Summary</i>									
Estimate #	Description		Quantity	Contract		BPA		Misc.	Total
				Labor	Material	Labor	Material		
	Shelton-Fairmount 230 kV POI		-	-	-	-	-	-	-
ST-070-39-12	4x PCB, 4pos 2x bay BAAH, w/ 60MVAR Shunt Reactor		1	\$18,348,000	\$12,624,000	\$4,830,000	\$0	\$118,000	\$35,920,000
C&C	C&C: BPA station Mid		1					\$10,000,000	\$10,000,000
C&C	C&C: Collector Stations		1	\$0	\$0	\$0	\$0	\$5,000,000	\$5,000,000
Contingency %	40%		Subtotal:	\$18,348,000	\$12,624,000	\$4,830,000	\$0	\$15,118,000	\$50,920,000
Overhead %	Labor	Materials	Contingency:	\$7,339,200	\$5,049,600	\$1,932,000	\$0	\$6,047,200	\$20,368,000
	26%	9%	Overhead:	\$6,678,672	\$1,590,624	\$1,758,120	\$0	\$1,904,868	\$11,932,284
Grand Total:	<i>(rounded to two significant figures)</i>			<b>\$32,000,000</b>	<b>\$19,000,000</b>	<b>\$8,500,000</b>	<b>\$0</b>	<b>\$23,000,000</b>	<b>\$83,000,000</b>

**Table 10.12 POI 6 – Shelton-Fairmount 230 kV New POI Cost Allocation**

Queue #	Requested MW	Station Equipment	Station Equipment Allocation (Per Capita)	Station Equipment Cost	Non-Station Equipment	Non-Station Equipment Allocation (Per MW)	Non-Station Equipment Cost	Non-Network Direct Assigned	Direct Assigned Cost	Cost Assignment
G1048	200	New 230kV Substation w/ Comm Expansion	100%	\$74M	N/A	N/A	N/A	Collector Station C&C and RAS	\$9M	\$83M

