

TRANSMISSION PLANNING

GENERATION INTERCONNECTION REPORT

2025 TRANSITION CLUSTER STUDY (TCS)

CLUSTER AREA: NORTH1, PHASE 1, Revision 0

(25TCS CA-NO1 P1-0)

G0639	G0688	G0732	G0744
G0753	G0760	G0761	G0817
G0819	G0820	G0828	G0829
G0840	G0853	G0858	G0914
G0915	G0916	G0953	G0954
G0955	G0956	G0985	G1001
G1010	G1016	G1025	G1032
G1035	G1037	G1038	G1040
G1043	G1047		

January 2026



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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).¹ 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, project location, and requested Commercial Operation Date are also shown.

Cluster Area North 1 (NO1) is comprised of Interconnection Requests (IRs) in Yakima (county), Grant (county), Lincoln (county), Benton (county), and Douglas (county) of Washington state. It includes 34 total IRs seeking a total combined 10,865 MW of Interconnection Service and 7,140 MW of grid charging.

Table 1: Participants in 2025 TCS PH1 CA North 1

IR #	Gen Type	Studied POI	MW Requested (Generating)	MW Requested (Charging)	Plant Location (County, State)	Requested COD
G0639	Solar, BESS	Columbia 230 kV	200	-100	Douglas, WA	8/1/2023
G0688	Solar, BESS	Wautoma 500 kV	500	-500	Benton, WA	12/31/2025
G0732	Solar, BESS	Wautoma 500 kV	200	-200	Benton, WA	4/15/2027
G0744	Solar, BESS	Vantage 500 kV	200	-200	Grant, WA	12/30/2026
G0753	Solar, BESS	Columbia 230 kV	300	-300	Douglas, WA	12/31/2025
G0760	Natural Gas, BESS	Vantage 500 kV	590	-590	Grant, WA	12/31/2025
G0761	Wind	Vantage 500 kV	290	0	Grant, WA	6/30/2026
G0817	Solar, BESS	Wautoma-Rock Creek 500 kV	215	-110	Yakima, WA	12/31/2025
G0819	Wind	Grand Coulee-Columbia #3 230 kV	200	0	Douglas, WA	12/1/2027
G0820	Solar, BESS	Grand Coulee-Columbia #3 230 kV	200	-200	Douglas, WA	12/1/2027
G0828	BESS	Vantage 230 kV	100	-100	Grant, WA	12/31/2026
G0829	BESS	Columbia 230 kV	20	-20	Douglas, WA	12/31/2026
G0840	Solar, BESS	Chief Joseph-Sickler 500 kV	300	-300	Douglas, WA	12/31/2027
G0853	Solar, BESS	Chief Joseph-Sickler 500 kV	300	-300	Douglas, WA	12/31/2027
G0858	BESS	Columbia 230 kV	130	-130	Douglas, WA	12/31/2026
G0914	BESS	Grand Coulee 500 kV	1000	-1000	Douglas, WA	12/1/2028
G0915	BESS	Grand Coulee 500 kV	500	-500	Douglas, WA	12/1/2028
G0916	BESS	Grand Coulee 500 kV	500	-500	Douglas, WA	12/1/2028
G0953	Wind	Grand Coulee-Bell 500 kV	600	0	Lincoln, WA	9/1/2026
G0954	Wind	Grand Coulee-Bell 500 kV	350	0	Lincoln, WA	9/1/2026
G0955	Wind	Grand Coulee-Bell 500 kV	350	0	Lincoln, WA	9/1/2026
G0956	Wind	Grand Coulee-Bell 500 kV	400	0	Benewah, WA	9/1/2026

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



IR #	Gen Type	Studied POI	MW Requested (Generating)	MW Requested (Charging)	Plant Location (County, State)	Requested COD
G0985	Solar, BESS	Grand Coulee-Creston 115 kV (Wilbur Tap)	150	-75	Lincoln, WA	12/31/2027
G1001	Solar	Grand Coulee-Hanford 500 (Rocky Ford 500/230 kV)	150	0	Grant, WA	12/3/2029
G1010	Solar	Alfalfa 230 kV	70	0	Yakima, WA	12/31/2027
G1016	Solar	Chief Joseph-Sickler 500 kV	400	0	Klickitat, WA	12/31/2029
G1025	Wind, Solar, BESS	Columbia 230 kV	250	-515.1	Douglas, WA	12/1/2029
G1032	Solar	Grand Coulee-Hanford 500 kV	500	0	Grant, WA	10/31/2028
G1035	Solar	Chief Joseph 500 kV	400	0	Douglas, WA	10/28/2028
G1037	Solar, BESS	Wautoma-Rock Creek 500 kV	400	-400	Benton, WA	12/31/2030
G1038	Solar, BESS	Wautoma-Rock Creek 500 kV	400	-400	Benton, WA	12/31/2030
G1040	Solar, BESS	Wautoma-Rock Creek 500 kV	400	-400	Benton, WA	12/31/2030
G1043	BESS	Grand Coulee-Hanford 500 kV (Rocky Ford 500/230 kV)	150	-150	Grant, WA	12/31/2026
G1047	BESS	Columbia 230 kV	150	-150	Grant, WA	12/31/2026

POI location requirements for each IR are summarized in Table 2. Scalable Plan Blocks (SPB) are indicated where applicable.

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

Table 2: 2025 TCS PH1 CA North 1 Requirements

IR #	Studied POI	Total Scope	Cost Share	Contingent Facilities
G1010	Alfalfa 230 kV	New 230 kV yard at Alfalfa on the Midway-North Bonneville 230 kV line.	\$115M	TSEP: Schultz-Raver #3 and #4 500 kV new series capacitors and line upgrades TSEP: New Schultz-Olympia #1 500 kV Line TSEP: Rock Creek-John Day 500 kV Line Upgrade
G1035	Chief Joseph 500 kV	Develop a new bay in the Chief Joseph 500 kV yard Participate in new North of Schultz RAS	\$35M	TSEP: Schultz-Raver #3 and #4 500 kV new series capacitors and line upgrades TSEP: New Schultz-Olympia #1 500 kV Line TSEP: Rock Creek-John Day 500 kV Line Upgrade
G0840 G0853	Chief Joseph-Sickler 500kV New POI Substation	New 500/230 kV substation on the Chief Joseph-Sickler 500 kV line. Participate in new North of Schultz RAS	\$204M	TSEP: Schultz-Raver #3 and #4 500 kV new series capacitors and line upgrades TSEP: New Schultz-Olympia #1 500 kV Line
G1016	Chief Joseph-Sickler 500kV New POI Substation	New 500/230 kV substation on the Chief Joseph-Sickler 500 kV line Participate in new North of Schultz RAS	\$172M	TSEP: Schultz-Raver #3 and #4 500 kV new series capacitors and line upgrades TSEP: New Schultz-Olympia #1 500 kV Line TSEP: Rock Creek-John Day 500 kV Line Upgrade



IR #	Studied POI	Total Scope	Cost Share	Contingent Facilities
G0639	Columbia 230 kV	New Columbia 500 kV yard Loop-in Grand Coulee-Schultz #1 500 kV New Columbia 230 kV yard New Columbia 500/230 kV transformer New Columbia substation 230 kV tie line Remove existing Grand Coulee-Schultz #1 and #2 series capacitors Participate in new North of Schultz RAS	\$88M	None
G0753	Columbia 230 kV	New Columbia 500 kV yard Loop-in Grand Coulee-Schultz #1 500 kV New Columbia 230 kV yard New Columbia 500/230 kV transformer New Columbia substation 230 kV tie line Remove existing Grand Coulee-Schultz #1 and #2 series capacitors Participate in new North of Schultz RAS	\$99M	None
G0829 G0858	Columbia 230 kV	New Columbia 500 kV yard Loop-in Grand Coulee-Schultz #1 500 kV New Columbia 230 kV yard New Columbia 500/230 kV transformer New Columbia substation 230 kV tie line Remove existing Grand Coulee-Schultz #1 and #2 series capacitors Participate in new North of Schultz RAS	\$91M	TSEP: Schultz-Raver #3 and #4 500 kV new series capacitors and line upgrades TSEP: New Schultz-Olympia #1 500 kV Line
G1025	Columbia 230 kV	New Columbia 500 kV yard Loop-in Grand Coulee-Schultz #1 500 kV New Columbia 230 kV yard New Columbia 500/230 kV transformer New Columbia substation 230 kV tie line Remove existing Grand Coulee-Schultz #1 and #2 series capacitors Participate in new North of Schultz RAS	\$94M	TSEP: Schultz-Raver #3 and #4 500 kV new series capacitors and line upgrades TSEP: New Schultz-Olympia #1 500 kV Line TSEP: Rock Creek-John Day 500 kV Line Upgrade
G1047	Columbia 230 kV	New Columbia 500 kV yard Loop-in Grand Coulee-Schultz #1 500 kV New Columbia 230 kV yard New Columbia 500/230 kV transformer New Columbia substation 230 kV tie line Remove existing Grand Coulee-Schultz #1 and #2 series capacitors Participate in new North of Schultz RAS	\$83M	TSEP: Schultz-Raver #3 and #4 500 kV new series capacitors and line upgrades TSEP: New Schultz-Olympia #1 500 kV Line TSEP: Rock Creek-John Day 500 kV Line Upgrade
G0819	Grand Coulee-Columbia #3 230 kV New POI Substation	New 230 kV substation on the Grand Coulee-Columbia #3 230 kV line Participate in new North of Schultz RAS New COUL 500/230 kV transformer (SPB)	\$58M	TSEP: Schultz-Raver #3 and #4 500 kV new series capacitors and line upgrades
G0820	Grand Coulee-Columbia #3 230 kV New POI Substation	New 230 kV substation on the Grand Coulee-Columbia #3 230 kV line Participate in new North of Schultz RAS New COUL 500/230 kV transformer (SPB)	\$58M	TSEP: Schultz-Raver #3 and #4 500 kV new series capacitors and line upgrades TSEP: New Schultz-Olympia #1 500 kV Line



IR #	Studied POI	Total Scope	Cost Share	Contingent Facilities
G0914	Grand Coulee 500 kV	New 500 kV yard New COUL 500/230 kV transformer (SPB) New 500 kV substation tie-line Participate in new North of Schultz RAS Participate in new Local RAS	\$142M	TSEP: Schultz-Raver #3 and #4 500 kV new series capacitors and line upgrades TSEP: New Schultz-Olympia #1 500 kV Line
G0915 G0916	Grand Coulee 500 kV	New 500 kV yard New COUL 500/230 kV transformer (SPB) New 500 kV substation tie-line Participate in new North of Schultz RAS Participate in new Local RAS	\$151M	TSEP: Schultz-Raver #3 and #4 500 kV new series capacitors and line upgrades TSEP: New Schultz-Olympia #1 500 kV Line TSEP: Rock Creek-John Day 500 kV Line Upgrade
G0953 G0954 G0955	Grand Coulee-Bell 500 kV New POI Substation	New 500 kV substation on the Grand Coulee-Bell 500 kV line Participate in new North of Schultz RAS New COUL 500/230 kV transformer (SPB)	\$160M	TSEP: Schultz-Raver #3 and #4 500 kV new series capacitors and line upgrades TSEP: New Schultz-Olympia #1 500 kV Line TSEP: Rock Creek-John Day 500 kV Line Upgrade
G0956	Grand Coulee-Bell 500 kV New POI Substation	New 500 kV substation on the Grand Coulee-Bell 500 kV line Participate in new North of Schultz RAS New COUL 500/230 kV transformer (SPB)	\$114M	TSEP: Schultz-Raver #3 and #4 500 kV new series capacitors and line upgrades TSEP: New Schultz-Olympia #1 500 kV Line TSEP: Rock Creek-John Day 500 kV Line Upgrade
G0985	Grand Coulee-Creston 115 kV New Substation (Wilbur Tap)	New 115 kV substation on the Grand Coulee-Creston 115 kV line Participate in new North of Schultz RAS	\$87M	TSEP: Schultz-Raver #3 and #4 500 kV new series capacitors and line upgrades TSEP: New Schultz-Olympia #1 500 kV Line TSEP: Rock Creek-John Day 500 kV Line Upgrade
G1001	New Rocky Ford 500/230 kV Station	New 230 kV bay at the future BPA Rocky Ford 500/230 kV substation Participate in new North of Schultz RAS	\$24M	L0544: New Rocky Ford 500/230 Station TSEP: Schultz-Raver #3 and #4 500 kV new series capacitors and line upgrades TSEP: New Schultz-Olympia #1 500 kV Line TSEP: Rock Creek-John Day 500 kV Line Upgrade
G1043	New Rocky Ford 500/230 kV Station	New 230 kV bay at the future BPA Rocky Ford 500/230 kV substation Participate in new North of Schultz RAS	\$24M	L0544: New Rocky Ford 500/230 Station TSEP: Schultz-Raver #3 and #4 500 kV new series capacitors and line upgrades TSEP: New Schultz-Olympia #1 500 kV Line TSEP: Rock Creek-John Day 500 kV Line Upgrade
G0688 G0732	Wautoma 500 kV	New 230 kV yard New VANT 500/230 kV transformer (SPB)	\$222M	None
G0817	Wautoma-Rock Creek 500 kV New POI Substation	New 500 kV substation on the Wautoma-Rock Creek 500 kV line	\$116M	TSEP: Schultz-Raver #3 and #4 500 kV new series capacitors and line upgrades
G1037 G1038 G1040	Wautoma-Rock Creek 500 kV New POI Substation	New 500 kV substation on the Wautoma-Rock Creek 500 kV line	\$134M	TSEP: Schultz-Raver #3 and #4 500 kV new series capacitors and line upgrades TSEP: New Schultz-Olympia #1 500 kV Line TSEP: Rock Creek-John Day 500 kV Line Upgrade
G0744	Vantage 500 kV	New 230 kV yard New VANT 500/230 kV transformer (SPB) New 500 kV bay 500 kV yard conversion from ring to BAAH	\$87M	None



IR #	Studied POI	Total Scope	Cost Share	Contingent Facilities
G0760	Vantage 500 kV	New 230 kV yard New POI 500/230 kV transformer 500 kV yard conversion from ring to BAAH New substation 230 kV tie line	\$146M	None
G0761	Vantage 500 kV	New 230 kV yard New POI 500/230 kV transformer New 500 kV bay 500 kV yard conversion from ring to BAAH	\$53M	TSEP: Schultz-Raver #3 and #4 500 kV new series capacitors and line upgrades
G0828	Vantage 230 kV	New 230 kV yard New POI 500/230 kV transformer 500 kV yard conversion from ring to BAAH New substation 230 kV tie line	\$24M	TSEP: Schultz-Raver #3 and #4 500 kV new series capacitors and line upgrades TSEP: New Schultz-Olympia #1 500 kV Line

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 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 (BEES) 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 study 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 and were assumed to be dispatched online for the TCS PH1. The list includes Interconnection Requests that were not subject to Attachment R of BPA’s OATT (Bypass IRs), Late-Stage Projects that elected to proceed serially, and non-BPA queued IRs in adjacent Transmission Provider queues if known.

Table 3: Senior Queued IRs Assumed In-Service

Queue #	POI (owner)	MW Generating	MW Grid-Charging	Fuel Type
BPA G0335	Rock Creek 230 kV (BPA)	17	0	Biofuel
BPA G0586	Spring Creek 230 kV (BPA)	100	0	Solar
BPA G0589	Knight 500 kV (BPA)	381	0	Solar
BPA G0596	Midway Goose Prairie 115 kV (BPA)	80	0	Solar, BEES
BPA G0598	Knight 500 kV (BPA)	160	0	Solar, BEES
BPA G0602	Vantage 230 kV (BPA)	170	0	Solar



BPA G0626	Vantage 230 kV (BPA)	90	0	Solar
BPA G0637	Knight 500 kV (BPA)	190	0	BESS
Grant PUD No. 7	Columbia-Rocky Ford 230 kV (Grant PUD)	200	0	Solar
BPA G0656	Vantage 500 kV (BPA)	500	500	BESS
BPA G0660	North Hawk 230 kV (BPA)	200	0	Solar, BEES
BPA G0668	North Hawk 230 kV (BPA)	400	0	Solar, BEES
BPA G0670	Wautoma 500 kV(BPA)	500	500	Solar, BEES
BPA G0676	Spring Creek 230 kV (BPA)	125	125	Solar, BEES
PAC C1-37	Pomona-Vantage 230 kV (PAC)	199	0	Solar, BEES
PAC C1-40	Midway-Union Gap 230 (PAC)	150	0	Solar, BEES
BPA G0683	Wautoma (BPA)	200	0	Wind
BPA G0684	Wautoma (BPA)	470	235	Solar, BEES
BPA G0686	Benton (BPA)	127.5	0	Solar
BPA G0717	Rock Creek (BPA)	75	75	BESS
BPA L0544	Rocky Ford (BPA)	N/A	N/A	N/A

4.3 Communications & 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 Definition

The following map illustrates the geographic coordinates of the IRs assessed in NO1. IRs are indicated by a green dot and the boundary of NO1 is presented as the yellow dashed line. NO1 is divided into two parts, a north and a south portion, indicated by the yellow dashed line splitting the circle into two portions.



IR #	Studied POI	Gen Type	MW Generating	MW Grid-Charging
G0955	Grand Coulee-Bell 500 kV	Wind	350	0
G0956	Grand Coulee-Bell 500 kV	Wind	400	0
G0819	Grand Coulee-Columbia #3 230 kV	Wind	200	0
G0820	Grand Coulee-Columbia #3 230 kV	Solar, BESS	200	-200
G0985	Grand Coulee-Creston 115 kV (Wilbur Tap)	Solar, BESS	150	-75
G1001	Rocky Ford 500/230 kV New Substation, 230 kV bus POI	Solar	150	0
G1043	Rocky Ford 500/230 kV New Substation, 230 kV bus POI	BESS	150	-150
G0828	Vantage 230 kV	BESS	100	-100
G0744	Vantage 500 kV	Solar, BESS	200	-200
G0760	Vantage 500 kV	Natural Gas, BESS	590	-590
G0761	Vantage 500 kV	Wind	290	0
G0688	Wautoma 230 kV	Solar, BESS	500	-500
G0732	Wautoma 230 kV	Solar, BESS	200	-200
G0817	Wautoma-Rock Creek 500 kV	Solar, BESS	215	-110
G1037	Wautoma-Rock Creek 500 kV	Solar, BESS	400	-400
G1038	Wautoma-Rock Creek 500 kV	Solar, BESS	400	-400
G1040	Wautoma-Rock Creek 500 kV	Solar, BESS	400	-400

5.3 Starting Base Cases

The following WECC cases were used for NO1.

- 2026 Heavy Summer (HS)
- 2026 Heavy Winter (HW)
- 2026 Light Spring (LSP)

These 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. The study cases were updated to include North area projects estimated to be energized in the next 5 to 10 years. The following system updates were made:

- Alfalfa- North Bonneville 230 kV line section upgrade
- Midway-Ashe (Hanford) 230 kV loop project
- Grant PUD’s Wanapum-Mountain View 230 kV line
- Jump-off Ridge loads increased to 43.3 MW each
- Clovis substation and load on the Urban Industry-Rapids 230 kV line
- Rocky Reach-Maple Valley returned to 345 kV operation

An additional summary of significant projects deemed Contingent Facilities 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 cases represent typical demands and system transfers in the area by season. The loads were left at the levels provided in the WECC cases and the following tables provide interface flows



and existing generation amounts. The values in the tables include the senior queue IRs (at maximum active power) in the North area. The senior queue IRs total power (4335 MW) was exported out of the North area and absorbed by sink loads added to the 500 kV buses at major delivery substations in the Northwest. The senior queue IR power was divided evenly across each of the sink loads. The assumption is that regional load growth will continue to be served by resource expansion in the North area rather than simply displacing local hydro generation. The sink loads provide a means to absorb the POI injections outside of the North area, approximating regional load growth.

Sink Load Buses

Number	Name	kV
41007	SNO_KING	500
40693	MAPLE_VA	500
40869	RAVER	500
40821	PAUL	500
40045	ALLSTON	500
40601	KEELER	500
40827	PEARL	500
40809	OSTRANDER	500
40723	MCNARY	500
40325	LONGHORN	500
40687	MALIN	500

Area Generation

Name	26HW	26LSP	26HS
Grand Coulee	3445	5237	4800
Grand Coulee 230	1890	1602	1689
Grand Coulee 500	1555	3634	3111
Chief Joe	2396	2139	2044
Chief Joe 230	1296	1086	1140
Chief Joe 500	1100	1053	905
Upper Columbia Hydro	5841	7376	6845
Wells	750	751	750
Rocky Reach	1060	1062	1060
Rock Island	475	476	475
Wanapum	1020	1021	1020
Priest Rapids	801	802	801
Mid-Columbia Hydro	4106	4112	4106
McNary	498	276	588
John Day	1389	808	1262
The Dalles	1087	741	1094
Bonneville	613	486	553
Lower Columbia Hydro	3587	2310	3496
Lower Granite	395	501	376
Little Goose	528	501	528
Lower Monumental	640	501	509
Ice Harbor	88	285	285
Lower Snake Hydro	1651	1788	1697
CGS	1100	1100	1100
Chelan Hydro	60	60	60



Name	26HW	26LSP	26HS
North Mid-C East Headwork	0	25	25
North Mid-C East Sub Avista Lind and Rattlesnake	18	18	18
North Mid-C East Sub Grant Quin CH and PEC	0	6	9
North Mid-C East Summer Fall	0	90	90
North Mid-C West Goose Prairie	70	70	70
North Mid-C West Roza and Tieton	11	11	11
North Mid-C West Wind Ridge	0	0	0
Bettas Road	0	0	0
Big Horn	0	0	0
Wild Horse	0	0	0

Area Path Flows

Name	26HW	26LSP	26HS
Columbia Injection	-292	-761	-708
Wanapum Injection	-3	-95	114
NORTH OF HANFORD	-2590	2324	1442
MONTANA - NORTHWEST	462	1705	278
WEST OF HATWAI	575	2407	542
WEST OF LOWER MONUMENTAL	2165	2931	2347
WEST OF CASCADES - NORTH*	10704	8942	7439
WEST OF CASCADES - SOUTH	7677	4833	6360
WEST OF MCNARY	776	515	1386
WEST OF SLATT	1739	1929	2772
WEST OF JOHN DAY	1118	1140	2831
NORTHERN INTERTIE	1334	-674	-1683
NORTHERN INTERTIE - EAST	0	141	-166
NORTHERN INTERTIE - WEST	1336	-813	-1514
NWACI	1060	3010	2535
PACIFIC DC INTERTIE (PDCI)	-1837	1601	2601
*Includes the new Schultz-Olympia 500 kV line contingent facility			

5.4 Phase 1 POI Injection Tests

Steady state contingency analysis was conducted at each POI injecting total generating or grid-charging amounts. POIs were evaluated one at a time to determine injection capability at each POI. To keep the North area generation and load unchanged the POI power injection was delivered to a group of “sink” loads placed at 500 kV buses in the Northwest. The “sink” loads were placed at 500 kV buses representing substations located near major delivery points. Detailed findings of these injection tests can be found in the Results Section.

“Sink” Loads Applied

Number	Name	kV
41007	SNO_KING	500
40693	MAPLE_VA	500
40869	RAVER	500
40821	PAUL	500
40045	ALLSTON	500
40601	KEELER	500
40827	PEARL	500
40809	OSTRANDER	500



Number	Name	kV
40723	MCNARY	500
40325	LONGHORN	500
40687	MALIN	500

In addition to the individual POI injection capability evaluations, the total North area injection capability was evaluated. Steady state contingency analysis was conducted at each POI increasing total generating or grid-charging amounts until a reliability limit was reached. The active power total (approximately 11 GW) is much larger than the individual POI active power evaluations. To sink the 11 GW ramp, a large Northwest generation injection group was used. This injection group includes:

- Large hydro plants in the Northwest on the Columbia and Snake Rivers
- Northwest area gas generation plants
- Northwest area wind generation plants
- Large hydro plants in British Columbia: Mica, Revelstoke, Gordon M. Shrum, Site C (Peace Canyon)

5.5 Phase 1 POI Short Circuit Ratio Strength Tests

Per BPA STD-N-000001, all IR 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 except two: new midline POI on Wautoma-Rock Creek 500 kV, and new midline POI on Grand Coulee-Bell 500 kV. Configuration of these POIs results in simple 2-line connections outbound from the new BPA 500 kV station. The lowest short circuit ratios identified at both POIs are in the light spring season.

Grand Coulee-Bell 500 kV POI SCR is 1.3, for Grand Coulee-POI 500 kV out of service with 1700 MW injected at the POI. Reducing injection to 740 MW increases the SCR to 3.

Wautoma-Rock Creek 500 kV POI SCR is 2.1 for Wautoma-POI 500 kV out of service with 1410 MW injected at the POI. Reducing injection to 990 MW increases the SCR to 3.

These two POIs will require additional evaluation in TCS Phase Two Cluster Study, including confirmation that the new resources can operate in a manner that improves the system strength and stability during radial service (one POI 500 kV line out of service). Alternatively, the POI will be evaluated for local 500 kV line N-1 RAS and generation restrictions during N-1 system conditions at the POI to meet the SCR strength test requirements. Failing those potential mitigations, new networked transmission lines might be required at the POI during the Phase Two Cluster Study if the total requested MW amounts are not reduced to levels with SCR of at least 3.

6 Contingent Facilities Assumed In-Service

The following projects are assumed in-service for the associated POIs. They are deemed Contingent Facilities for this study, and are required to be energized prior to IRs taking Interconnection Service.

Table 6.1: Required Contingent Facilities for TCS POIs



Project Name	Total Cluster Area MW Threshold	Required for IRs	Driver	Cost	Estimated I/S Date
TSEP: Schultz-Raver #3 and #4 500 kV Line upgrade	1,990	G0761, G0817, G0819, G0820, G0828, G0829, G0840, G0853, G0858, G0914, G0915, G0916, G0953, G0954, G0955, G0956, G0985, G1001, G1010, G1016, G1025, G1032, G1035, G1037, G1038, G1040, G1043, G1047	Commercial TSRs	\$350 M	Dec 2031
TSEP: Schultz-Raver #3 and #4 500 kV Line new series capacitors at Schultz				N/A*	N/A*
TSEP: New Schultz-Olympia #1 500 kV Line	2,695	G0820, G0828, G0829, G0840, G0853, G0858, G0914, G0915, G0916, G0953, G0954, G0955, G0956, G0985, G1001, G1010, G1016, G1025, G1032, G1035, G1037, G1038, G1040, G1043, G1047	Commercial TSRs	N/A*	N/A*
TSEP: Rock Creek-John Day 500 kV Line Upgrade	4,745	G0915, G0916, G0953, G0954, G0955, G0956, G0985, G1001, G1010, G1016, G1025, G1032, G1035, G1037, G1038, G1040, G1043, G1047	Commercial TSRs	\$114 M	Dec 2030
L0544: new BPA Rocky Ford 500/230 kV substation on the Grand Coulee-Hanford 500 kV line	N/A	G1001, G1043	L0544	\$270 M	Dec 2028

*Project is still in pre-scoping, total costs and schedule not available

Additional details on the TSEP contingent facilities:

- Reconductor & rebuild portions of the existing Schultz-Raver #3 and Schultz-Raver #4 500 kV lines to matched higher line ratings.
- Install new series capacitors on the Schultz-Raver #3 and Schultz-Raver #4 500 kV lines.
- Rebuild the portion of the Coulee-Olympia 230 kV line from Schultz to Olympia to 500 kV to create a new Schultz-Olympia 500 kV line
- Rebuild Rock Creek-John Day #1 500 kV line to achieve a higher line rating.

The L0544 BPA Rocky Ford substation on the Grand Coulee-Hanford 500 kV line is a unique contingent facility for G1001 and G1043. The L0544 project develops a new substation well situated as the POI for interconnection of G1001 and G1043. The new substation location is estimated to be about 53 miles south of Grand Coulee along the Grand Coulee-Hanford 500 kV line.

Six of the thirty-four North area IRs (roughly 1990 MW of incremental generation) can be added without these Contingent Facilities:

- G0639 (POI: Columbia substation)
- G0688 (POI: Wautoma substation)
- G0732 (POI: Wautoma substation)
- G0744 (POI: Vantage substation)
- G0753 (POI: Columbia substation)



- G0760 (POI: Vantage substation)

7 Technical Analysis & Study Results

There are three existing and new constraints for the entire NO1 Cluster Area, and two locational specific constraints for NO1.

The following figure 7.1 shows the three wider area system constraints for NO1:

- 1) West of Cascades North (WOCN): several parallel transmission lines are limiting for this path (Schultz-Raver #3 and #4 500 kV; and Grand Coulee-Olympia 230 kV). To resolve the constraint three Contingent Facility plans must be assumed in-service:
 - TSEP: Schultz-Raver #3 and #4 500 kV Line new series capacitors at Schultz
 - TSEP: Schultz-Raver #3 and #4 500 kV Line upgrades
 - TSEP: New Schultz-Olympia #1 500 kV Line
- 2) Rock Creek-John Day 500 kV line: An existing system limiter for flows inside and out of NO1. To resolve the constraint the following contingent facility must be assumed in-service:
 - TSEP: Rock Creek-John Day 500 kV Line Upgrade
- 3) New North of Schultz (NOSZ): multiple new lines north of the Schultz substation are new limiters and requires new mitigations.

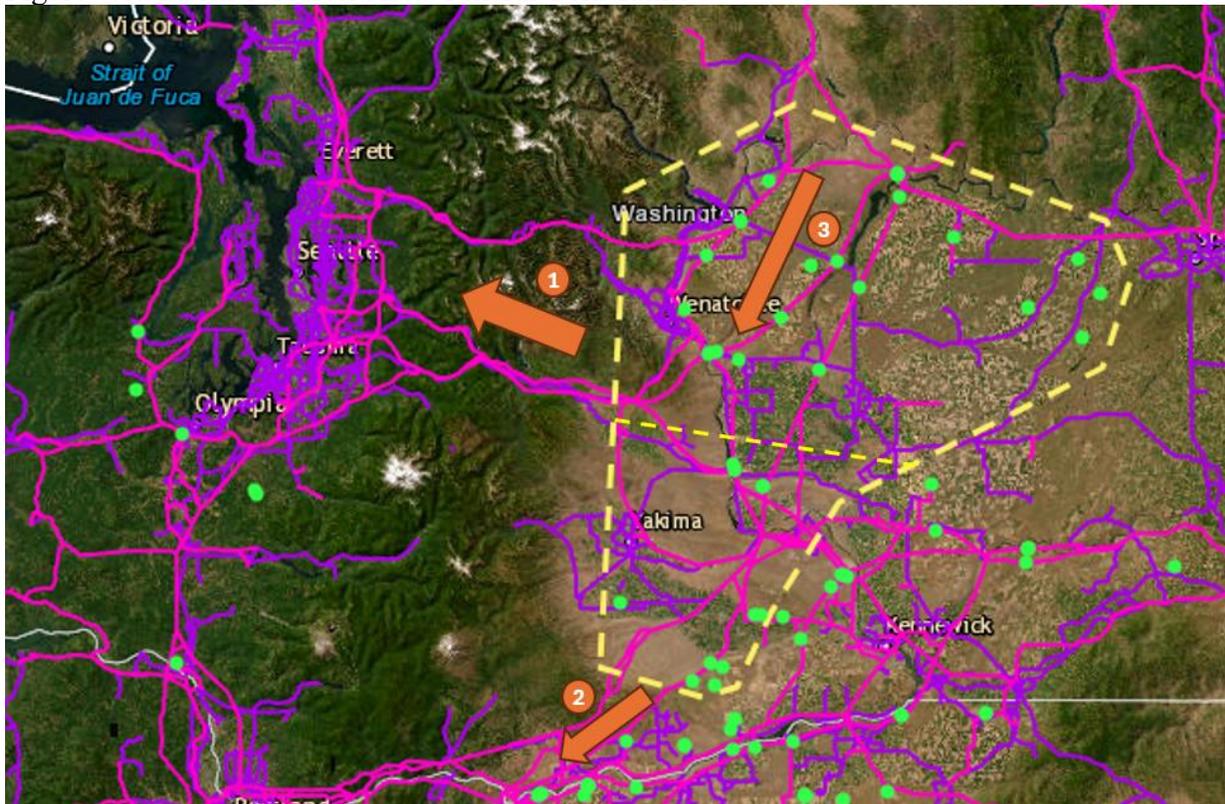
There are also two new locational specific constraints in NO1:

- Grand Coulee 500/230 kV transformer (requires new mitigation)
- Vantage 500/230 kV transformers #1 and #2 (requires new mitigation)

Sections 7.1, 7.2, and 7.3 contain more details about the new constraints and new mitigations.



Figure 7.1: North 1 Cluster Area General Constraints



7.1 North of Schultz Performance

This constraint involves the parallel 500 kV transmission lines between the Upper Columbia substations (Grand Coulee 500 kV and Chief Joseph 500 kV) and the Schultz 500 kV substation; and the Grand Coulee-Hanford 500 kV transmission line. The mitigation of this constraint is a new “North of Schultz” RAS algorithm (NOSZ RAS).

Limiters 1: North of Schultz (NOSZ) constraints

Mitigation 1: NOSZ RAS. The NOSZ constraint and RAS described below will be required for all GIs at POIs in the northern half of NO1. The northern half locations increase transfers on the NOSZ constraint.

The NOSZ RAS will automatically trip generation for single line losses (SLL) and double line loss (DLL) events. GIs at POIs in the northern portion of the North area will be included in the new NOSZ RAS algorithm as plants available to be tripped, per **Table 7.2:**

- SLL: Grand Coulee-Columbia #1 500 kV line (after splitting the Grand Coulee-Schultz #1 500 kV line)
- SLL: Columbia-Schultz #1 500 kV line (after splitting the Grand Coulee-Schultz #1 500 kV line)
- SLL: Grand Coulee-Schultz #2 500 kV line
- SLL: Sickler-Schultz #1 500 kV line
- SLL: Chief Joseph-Sickler #1 500 kV line



- DLL: Grand Coulee-Columbia #1 500 kV line (after splitting the Grand Coulee-Schultz #1 500 kV line) and Grand Coulee-Schultz #2 500 kV line
- DLL: Columbia-Schultz #1 500 kV line (after splitting the Grand Coulee-Schultz #1 500 kV line) and Grand Coulee-Schultz #2 500 kV line

7.2 Grand Coulee POI Performance

The Grand Coulee substation POI has a limiter specific to this location and POIs on the 230 kV lines adjacent to Grand Coulee substation. The existing Grand Coulee 500/230 kV transformer brings existing 230 kV connected hydro power to the Grand Coulee 500 kV bus. This transformer can exceed its rating for events forcing more power across it.

Limiter 2: Existing Grand Coulee 500/230 kV transformer.

Mitigation 2: New, 2nd Grand Coulee 500/230 kV transformer.

The existing transformer experiences heavy loading transferring existing 230 kV connected hydro power to the 500 kV bus at Grand Coulee. Any new integration of power on the 230 kV system near Grand Coulee contributes addition loading on the existing transformer and requires mitigation to avoid rating exceedances. This also applies to integration of new resources grid-charging from the 500 kV system at Grand Coulee. Any new GIs that increase power on the existing transformer require a new 500/230 kV transformer at Grand Coulee

Limiter 3: Existing and new Grand Coulee 500/230 kV transformers.

Mitigation 3: Local RAS at Grand Coulee to trip the Grand Coulee 500 kV connected GIs.

Land is constrained at the existing Grand Coulee 500 kV substation, and there are not enough bay positions to enable the number and MW size of IRs. The few remaining vacant bay positions are planned for other BPA line projects. A new Grand Coulee 500 kV “annex” site is required as the POI for new IRs. The new 500 kV POI annex will connect to the existing Grand Coulee 500 kV yard via a short 500 kV station tie-line; and to the existing Grand Coulee 230 kV yard via a new 500/230 kV transformer. Loss of the new 500 kV tie-line will exceed the ratings of both existing and new Grand Coulee 500/230 kV banks. A new local RAS will be required to trip the new GIs for this local POI outage.

7.3 Vantage POI Performance

The Vantage substation POI has a limiter specific to this location. The existing substation has two 500/230 kV transformers that move local 230 kV connected generation to the 500 kV bus. These transformer ratings can be exceeded during conditions when more of the local generation needs to step up to the 500 kV bus for transfer out of the area. This is seen in the lighter load spring case. New GIs injecting power on the Vantage 230 kV bus or new GIs with BESS charging from the Vantage 500 kV bus will increase the loading on these transformers.

Limiter 4: Existing Vantage 500/230 kV transformers, #1 and #2.

Mitigation 4: New, 3rd Vantage 500/230 kV transformer.

The following table summarizes the system constraints relevant to each POI and that require newly identified mitigation plans.



Table 7.2: Results by POI, Specific Limiters and Required Mitigations

POI	IRs Affected	New Limiters (L)	New Mitigation (M)
Alfalpa 230 kV	G1010, 70 MW (solar) Total: 70 MW	None	None
Chief Joseph 500 kV	G1035, 400 MW (solar) Total: 400 MW	L1. North of Schultz constraint	M1. NOSZ RAS
Chief Joseph-Sickler 500 kV line, 230 bus POI	G0840, +/-300 MW (solar/BESS) G0853, +/-300 MW (solar/BESS) G1016, 400 MW (solar) Total: 1000 MW, -600 MW	L1. North of Schultz constraint	M1. NOSZ RAS
Columbia 230 kV	G0639, 200 MW, -100 MW (solar/BESS) G0829, +/- 20 MW (BESS) G0858, +/- 130 MW (BESS) G0753, +/- 300 MW (solar/BESS) G1025, 250 MW, -515 MW (wind/solar/BESS) G1047, +/- 150 MW (solar/BESS) Total: 1050 MW, -1215 MW	L1. North of Schultz constraint	M1. NOSZ RAS
Grand Coulee 500 kV	G0914, +/- 1000 MW (BESS) G0915, +/- 500 MW (BESS) G0916, +/- 500 MW (BESS) Total: 2000 MW, -2000 MW	L1. North of Schultz constraint L2. Existing Grand Coulee 500/230 kV transformer L3. Existing and new Grand Coulee 500/230 kV transformers	M1. NOSZ RAS M2. New, 2nd Grand Coulee 500/230 kV transformer M3. New RAS for loss of the new Grand Coulee 500 kV yard tie-line
Coulee-Bell 500 kV line, 500 bus POI	G0953, 600 MW (wind) G0954, 350 MW (wind) G0955, 350 MW (wind) G0956, 400 MW (wind) Total: 1700 MW	L1. North of Schultz constraint L2. Existing Grand Coulee 500/230 kV transformer	M1. NOSZ RAS M2. New, 2nd Grand Coulee 500/230 kV transformer
Columbia-Coulee #3 230 kV line, 230 bus POI	G0819, 200 MW (Wind) G0820, +/- 200 MW (Solar/BESS) Total: 400 MW, -200 MW	L1. North of Schultz constraint L2. Existing Grand Coulee 500/230 kV transformer	M1. NOSZ RAS M2. New, 2nd Grand Coulee 500/230 kV transformer
Coulee-Hanford 500 kV line, 500 bus POI	G1032, 500 MW (solar) Total: 500 MW	L1. North of Schultz constraint	M1. NOSZ RAS
BPA Rocky Ford 500/230 kV Substation, 230 bus POI	G1001, 150 MW (solar) G1043, +/-150 MW (solar/BESS) Total: 300 MW, -150 MW	L1. North of Schultz constraint	M1. NOSZ RAS
Vantage 500 and 230 bus POIs	G0744, +/-200 MW (solar/BESS) G0760, +/-590 MW (natural gas/BESS) G0761, 290 MW (wind) G0828, +/-100 MW (BESS) Total: 1180 MW, -890 MW	L4. Existing Vantage 500/230 kV transformers, #1 and #2	M4. New, 3 rd Vantage 500/230 kV transformer
Wautoma 500 kV	G0688, +/-500 MW (solar/BESS) G0732, +/-200 MW (solar/BESS) Total: 700 MW, -700 MW	None	None
Wautoma-Rock Creek 500 kV line, 500 bus POI	G0817, 215 MW, -110 MW (solar/BESS) G1037, +/-400 MW (solar/BESS) G1038, +/-400 MW (solar/BESS) G1040, +/-400 MW (solar/BESS) Total: 1415 MW, -1310 MW	None	None
Grand Coulee-Creston #1 115 kV line	G0985, 150 MW, -75 MW (solar/BESS) Total: 150 MW, -75 MW	L1. North of Schultz constraint	M1. NOSZ RAS



8 Affected System Impacts

The analysis of the proposed interconnections studied in this Cluster Area identified potential adverse system impacts on the Affected Systems identified below. The results of this study report will be shared with the Affected System Operator/s of those Affected System/s. The Affected System Operator/s identified below may determine a study is required and that actions are required on that Affected System to mitigate the impacts of the proposed interconnection on BPA’s Transmission System. **Plans of service identified in this report may be modified or revised in response to an affected utility system study result.**

Any plans of service identified to interconnect a request, including plans of service identified in an affected system study, that require access and usage of real property associated with the Northwest AC Intertie (NWACI) to construct or impact the rights of an owner of a NWACI facility may require the consent of all owners to proceed and be beyond BPA’s ability to grant. BPA cannot guarantee that the Large Generating Facility can be interconnected under that plan of service.

Affected System	Elements Impacted	POI (G#)
Grant PUD	L0544 (COUL-HANF midline station)	Rocky Ford 500/230 (G1001, G1043)
PGE & PAC	Chief Joe 500 kV (partial NWACI facility)	CHJO-SICK 500 (G0840, G0853, G1016) CHJO 500 (G1035)



9 Interconnection Requirements

9.1 Alfalfa Substation

Table 9.1: POI Alfalfa Substation Facility Requirements

G#	BPA Station Work	BPA Non-Station Work	Contingent Facilities
G1010	New 230 kV Yard	None	TSEP: Schultz-Raver #3 and #4 500 kV new series capacitors and line upgrades TSEP: New Schultz-Olympia #1 500 kV Line TSEP: Rock Creek-John Day 500 kV Line Upgrade

1. Develop a 230 kV yard with a 4 breaker ring, breaker-and-a-half (BAAH) construction with associated disconnect switches, control, relaying, and communications equipment.
2. The Midway-North Bonneville 230 kV line will be looped into the new 230 kV yard splitting the line into two new lines.
3. Installation of BPA-required C&C equipment at each customer’s collector site (RAS, Meters, relays, Control House space)
4. Significant development of C&C hardware to BPA’s POI substation.

G1010 will construct a 230 kV transmission line from the BPA POI substation to its generation facility. The estimated length of the transmission line is 12 miles.

9.2 Chief Joseph Substation

Table 9.2: POI Chief Joseph Substation Facility Requirements

G#	BPA Station Work	BPA Non-Station Work	Contingent Facilities
G1035	New 500 kV terminal	None	TSEP: Schultz-Raver #3 and #4 500 kV new series capacitors and line upgrades TSEP: New Schultz-Olympia #1 500 kV Line TSEP: Rock Creek-John Day 500 kV Line Upgrade

1. Develop a new 500 kV bay with 2 breakers and with associated disconnect switches, control, relaying, and communications equipment.
2. Participate in a new North of Schultz single line loss/double line loss Remedial Action Scheme (NOSZ SLL/DLL RAS)
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.

G1035 will construct a 500 kV transmission line from the BPA POI substation to its generation facility. The estimated length of the transmission line is 6 miles.



9.3 Chief Joseph-Sickler 500 kV Line New Substation

Table 9.3: POI Chief Joseph-Sickler 500 kV New Substation Facility Requirements

G#	BPA Station Work	BPA Non-Station Work	Contingent Facilities
G0840 G0853	New 500/230 kV Yard, 1x shared 230 kV Terminal	POI 500/230 kV transformer	TSEP: Schultz-Raver #3 and #4 500 kV new series capacitors and line upgrades TSEP: New Schultz-Olympia #1 500 kV Line
G1016	New 500/230 kV Yard, 1x 230 kV Terminal	POI 500/230 kV transformer	TSEP: Schultz-Raver #3 and #4 500 kV new series capacitors and line upgrades TSEP: New Schultz-Olympia #1 500 kV Line TSEP: Rock Creek-John Day 500 kV Line Upgrade

1. Develop a new 500 kV yard 3 breaker ring, BAAH construction with associated disconnect switches, control, relaying, and communications equipment. Include a new 180 MVAR shunt reactor.
2. The Chief Joseph-Sickler 500 kV line will be looped into the new 500 kV yard splitting the line into two new lines.
3. Develop a new 230 kV yard 3 breaker ring, BAAH construction with associated disconnect switches, control, relaying, and communications equipment.
4. Install a new 500/230 kV transformer.
5. Participate in a new North of Schultz single line loss/double line loss Remedial Action Scheme (NOSZ SLL/DLL RAS)
6. Installation of BPA-required C&C equipment at each customer’s collector site (RAS, Meters, relays, Control House space)
7. Minor development of C&C hardware at BPA’s POI substation.

G840 and G853 will construct a 230 kV line from the BPA POI substation to their generation facilities. The estimated length of the transmission line is 8 miles.

G1016 will construct a 230 kV line from the BPA POI substation to its generation facility. The estimated length of the transmission line is 8 miles.

9.4 Columbia Substation

Table 9.4: POI Columbia Substation Facility Requirements

G#	BPA Station Work	BPA Non-Station Work	Contingent Facilities
G0639	New 500 kV Yard, 1x 230 kV Terminal	POI 500/230 kV transformer, 230 kV substation tie-line	None
G0753	New 500 kV Yard, 1x 230 kV Terminal	POI 500/230 kV transformer, 230 kV substation tie-line	None
G0829 G0858	New 500 kV Yard, 1x shared 230 kV Terminal	POI 500/230 kV transformer, 230 kV substation tie-line	TSEP: Schultz-Raver #3 and #4 500 kV new series capacitors and line upgrades TSEP: New Schultz-Olympia #1 500 kV Line
G1025	New 500 kV Yard 1x 230 kV Terminal	POI 500/230 kV transformer, 230 kV substation tie-line	TSEP: Schultz-Raver #3 and #4 500 kV new series capacitors and line upgrades TSEP: New Schultz-Olympia #1 500 kV Line TSEP: Rock Creek-John Day 500 kV Line Upgrade



G#	BPA Station Work	BPA Non-Station Work	Contingent Facilities
G1047	New 500 kV Yard 1x 230 kV Terminal	POI 500/230 kV transformer, 230 kV substation tie-line	TSEP: Schultz-Raver #3 and #4 500 kV new series capacitors and line upgrades TSEP: New Schultz-Olympia #1 500 kV Line TSEP: Rock Creek-John Day 500 kV Line Upgrade

1. The Grand Coulee-Schultz #1 and #2 500 kV line series capacitors are to be removed.
2. Develop a new 500 kV yard with a 3 breaker ring, BAAH construction with associated disconnect switches, control, relaying, and communications equipment. Include a new 180 MVAR shunt reactor
3. The Grand Coulee-Schultz #1 500 kV line will be looped into the new 500 kV yard splitting the line into two new lines.
4. Install a 500/230 kV transformer
5. Install a substation tie-line between the existing 230 kV yard and the new 230 kV yard
6. Participate in a new North of Schultz single line loss/double line loss Remedial Action Scheme (NOSZ SLL/DLL RAS)
7. Installation of BPA-required C&C equipment at each customer’s collector site (RAS, Meters, relays, Control House space)
8. Minor development of C&C hardware at BPA’s POI substation.

G0639 will construct a 230 kV line from the BPA POI substation to its generation facility. The estimated length of the transmission line is 14 miles.

G0829 and G0858 will construct a 230 kV line from the BPA POI substation to their generation facilities. The estimated length of the transmission line is 0.1 miles.

G0753 will construct a 230 kV line from the BPA POI substation to its generation facility. The estimated length of the transmission line is 9 miles.

G1025 will construct a 230 kV line from the BPA POI substation to its generation facility. The estimated length of the transmission line is 2 miles.

9.5 Grand Coulee Substation

Table 9.5: POI Grand Coulee Annex 500 kV New Substation Facility Requirements

G#	BPA Station Work	BPA Non-Station Work	Contingent Facilities
G0914	New 500 kV Yard 500 kV Terminal	SPB: New Coulee 500/230 kV transformer, 500 kV substation tie line	TSEP: Schultz-Raver #3 and #4 500 kV new series capacitors and line upgrades TSEP: New Schultz-Olympia #1 500 kV Line
G0915 G0916	New 500 kV Yard 500 kV Terminal	SPB: New Coulee 500/230 kV transformer 500 kV substation tie line	TSEP: Schultz-Raver #3 and #4 500 kV new series capacitors and line upgrades TSEP: New Schultz-Olympia #1 500 kV Line TSEP: Rock Creek-John Day 500 kV Line Upgrade

1. Develop a new 500 kV 6 breaker yard, BAAH construction with associated disconnect switches, control, relaying, and communications equipment. Include a 180 MVAR shunt reactor.



2. Participate in new Coulee Annex 500/230 transformer bank (SPB)
3. Develop a new substation tie line from the new Annex 500 kV yard to the existing Coulee 500 kV yard.
4. Develop a local RAS for loss of the new substation 500 kV yard tie line. The RAS will trip G0914, G0915, and G0916 to prevent exceeding the ratings on the existing Grand Coulee 500/230 kV transformer.
5. Participate in a new North of Schultz single line loss/double line loss Remedial Action Scheme (NOSZ SLL/DLL RAS)
6. Installation of BPA-required C&C equipment at each customer’s collector site (RAS, Meters, relays, Control House space)
7. Minor development of C&C hardware at BPA’s POI substation.

G0915 and G0916 will construct a 500 kV line from the BPA POI substation to their generation facilities. The estimated length of the transmission line is 1.5 miles.

G0914 will construct a 500 kV line from the BPA POI substation to its generation facility. The estimated length of the transmission line is 1.5 miles.

9.6 Grand Coulee-Bell 500 kV Line New Substation

Table 9.6: POI Grand Coulee-Bell 500 kV New Substation Facility Requirements

G#	BPA Station Work	BPA Non-Station Work	Contingent Facilities
G0953 G0954 G0955	New 500 kV Yard, 1x shared 500 kV Terminal	New Grand Coulee 500/230 transformer	TSEP: Schultz-Raver #3 and #4 500 kV new series capacitors and line upgrades TSEP: New Schultz-Olympia #1 500 kV Line TSEP: Rock Creek-John Day 500 kV Line Upgrade
G0956	New 500 kV Yard, 1x new 500 kV Terminal	New Grand Coulee 500/230 transformer	TSEP: Schultz-Raver #3 and #4 500 kV new series capacitors and line upgrades TSEP: New Schultz-Olympia #1 500 kV Line TSEP: Rock Creek-John Day 500 kV Line Upgrade

1. Develop a new 500 kV 4 breaker ring, BAAH construction with associated disconnect switches, control, relaying, and communications equipment.
2. The Grand Coulee-Bell #1 500 kV line will be looped into the new 500 kV yard splitting the line into two new lines.
3. Participate in a new North of Schultz single line loss/double line loss Remedial Action Scheme (NOSZ SLL/DLL RAS)
4. Participate in new Coulee Annex 500/230 transformer bank (SPB)
5. Installation of BPA-required C&C equipment at each customer’s collector site (RAS, Meters, relays, Control House space)
6. Minor development of C&C hardware at BPA’s POI substation.

G0956 will construct a 500 kV line from the BPA POI substation to its generation facilities. The estimated length of the transmission line is 20 miles.

G0953, G0954, and G0955 will construct a 500 kV line from the BPA POI substation to their generation facilities. The estimated length of the gen-tie lines are 27 miles for G0955, 7 miles for G0954, and 18 miles for G0953.



Two 500 kV lines from the BPA POI substation to the generation facilities are required in the design to ensure a single branch loss does not trip power greater than 1500 MW. BPA requirements for interconnection require that there be no Most Severe Single Contingency (MSCC) resulting in a resource loss of more than 1,500 MW.

9.7 Grand Coulee-Columbia #3 230 kV New Substation

Table 9.7: POI Grand Coulee-Columbia #3 230 kV New Substation Facility Requirements

G#	BPA Station Work	BPA Non-Station Work	Contingent Facilities
G0819	New 230 kV Yard, 230 kV Terminal	SPB: New Grand Coulee 500/230 transformer	TSEP: Schultz-Raver #3 and #4 500 kV new series capacitors and line upgrades
G0820	New 230 kV Yard 230 kV Terminal	SPB: New Grand Coulee 500/230 transformer	TSEP: Schultz-Raver #3 and #4 500 kV new series capacitors and line upgrades TSEP: New Schultz-Olympia #1 500 kV Line

1. Develop a new 230 kV 4 breaker ring, BAAH construction with associated disconnect switches, control, relaying, and communications equipment.
2. The Grand Coulee-Columbia #3 230 kV line will be looped into the new 230 kV yard splitting the line into two new lines.
3. Participate in new Coulee Annex 500/230 transformer bank (SPB)
4. Participate in a new North of Schultz single line loss/double line loss Remedial Action Scheme (NOSZ SLL/DLL RAS)
5. Participate in the installation of a new 500/230 kV transformer at Grand Coulee substation*
6. Installation of BPA-required C&C equipment at each customer’s collector site (RAS, Meters, relays, Control House space)
7. Moderate development of C&C hardware at BPA’s POI substation.

*Generation integrating into the 230 kV system near Grand Coulee increases loading on the existing Grand Coulee 500/230 kV transformer, power transferring from 230 kV to 500 kV. The increase in power produces rating exceedance requiring a new 500/230 kV transformer to mitigate the impact.

G0819 will construct a 230 kV line from the BPA POI substation to its generation facility. The estimated length of the transmission line is 0.1 miles.

G0820 will construct a 230 kV line from the BPA POI substation to its generation facility. The estimated length of the transmission line is 7 miles.



9.8 Grand Coulee-Hanford 500 kV Line New Substation

Table 9.8: POI Grand Coulee-Hanford 500 kV New Substation Facility Requirements

G#	BPA Station Work	BPA Non-Station Work	Contingent Facilities
G1032	New 500 kV substation, 1x new 500 kV terminal	None	TSEP: Schultz-Raver #3 and #4 500 kV new series capacitors and line upgrades TSEP: New Schultz-Olympia #1 500 kV Line TSEP: Rock Creek-John Day 500 kV Line Upgrade

1. Develop a new 500 kV 3 breaker ring, BAAH construction with associated disconnect switches, control, relaying, and communications equipment. Include 180 MVAR shunt reactor.
2. The Grand Coulee-Hanford 500 kV line will be looped into the new 500 kV yard splitting the line into two new lines.
3. Participate in a new North of Schultz single line loss/double line loss Remedial Action Scheme (NOSZ SLL/DLL RAS).
4. Installation of BPA-required C&C equipment at each customer’s collector site (RAS, Meters, relays, Control House space)
5. Significant development of C&C hardware at BPA’s POI substation.

G1032 will construct a 500 kV line from the BPA POI substation to its generation facility. The estimated length of the transmission line is 0.1 miles.

9.9 BPA Rocky Ford 500/230 kV New Substation

Table 9.9: POI Rocky Ford Substation Facility Requirements

G#	BPA Station Work	BPA Non-Station Work	Contingent Facilities
G1001	230 kV Terminal	None	L0544: New BPA Rocky Ford Substation TSEP: Schultz-Raver #3 and #4 500 kV new series capacitors and line upgrades TSEP: New Schultz-Olympia #1 500 kV Line TSEP: Rock Creek-John Day 500 kV Line Upgrade
G1043	230 kV Terminal	None	L0544: New BPA Rocky Ford Substation TSEP: Schultz-Raver #3 and #4 500 kV new series capacitors and line upgrades TSEP: New Schultz-Olympia #1 500 kV Line TSEP: Rock Creek-John Day 500 kV Line Upgrade

1. Develop a new 230 kV breaker-and-half bay with associated disconnect switches, control, relaying, and communications equipment.
2. Participate in a new North of Schultz single line loss/double line loss Remedial Action Scheme (NOSZ SLL/DLL RAS)
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.



G1001 will construct a 230 kV line from the BPA POI substation to its generation facility. The estimated length of the transmission line is 2 miles.

G1043 will construct a 230 kV line from the BPA POI substation to its generation facility. The estimated length of the transmission line is 22 miles.

9.10 Vantage Substation

Table 9.10: POI Vantage Substation Facility Requirements

G#	BPA Station Work	BPA Non-Station Work	Contingent Facilities
G0760	New 230 kV Yard, 500 kV Terminal	SPB: new 500/230 kV transformer, 500 kV Yard conversion from ring to BAAH 230 kV substation tie-line	None
G0828	New 230 kV Yard, 230 kV Terminal	SPB: new 500/230 kV transformer, 500 kV Yard conversion from ring to BAAH 230 kV substation tie-line	TSEP: Schultz-Raver #3 and #4 500 kV new series capacitors and line upgrades TSEP: New Schultz-Olympia #1 500 kV Line
G0744 G0761	New 230 kV Yard, Shared 500 kV Terminal	SPB: new 500/230 kV transformer, 500 kV Yard conversion from ring to BAAH 230 kV substation tie-line	No contingent facilities for G0744 <u>For G0761:</u> TSEP: Schultz-Raver #3 and #4 500 kV new series capacitors and line upgrades

1. Develop a new 230 kV 4 breaker ring, breaker-and-half construction with associated disconnect switches, control, relaying, and communications equipment.
2. Reconfigure Vantage 500 kV yard from ring to BAAH.
3. Add a new 500 kV bay
4. Install a new 500/230 kV transformer
5. Add a substation tie-line connecting the new 230 kV yard to the existing 230 kV yard.
6. Installation of BPA-required C&C equipment at each customer’s collector site (RAS, Meters, relays, Control House space)
7. Minor development of C&C hardware at BPA’s POI substation.

G0760 will construct a 500 kV line from the BPA POI substation to its generation facility. The estimated length of the transmission line is 1 mile.

G0828 will construct a 230 kV line from the BPA POI substation to its generation facility. The estimated length of the transmission line is 1 mile.

G0744 and G0761 will construct a 500 kV line from the BPA POI substation to their generation facilities. The estimated length of the transmission line is 10 miles.



9.11 Wautoma Substation POI

Table 9.11: POI Wautoma Substation Facility Requirements

G#	BPA Station Work	BPA Non-Station Work	Contingent Facilities
G0688 G0732	New 230 kV yard	POI 500/230 kV transformer	None

1. Develop a new 230 kV yard, BAAH construction with associated disconnect switches, control, relaying, and communications equipment.
2. Install a new 500/230 kV transformer connecting the new 230 kV yard to the existing 500 kV yard.
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.

G0688 and G0732 will construct a 230 kV line from the BPA POI substation to their generation facilities. The estimated length of the transmission line is 14 miles.

9.12 Wautoma-Rock Creek 500 kV New Substation

Table 9.12: POI Wautoma-Rock Creek 500 kV New Substation Facility Requirements

G#	BPA Station Work	BPA Non-Station Work	Contingent Facilities
G0817	New 500 kV yard New 500 kV terminal	None	TSEP: Schultz-Raver #3 and #4 500 kV new series capacitors and line upgrades
G1037 G1038 G1040	New 500 kV yard New 500 kV terminal	None	TSEP: Schultz-Raver #3 and #4 500 kV new series capacitors and line upgrades TSEP: New Schultz-Olympia #1 500 kV Line TSEP: Rock Creek-John Day 500 kV Line Upgrade

1. Develop a new 500 kV 4 breaker ring, BAAH construction with associated disconnect switches, control, relaying, and communications equipment.
2. The Wautoma-Rock Creek 500 kV line will be looped into the new 500 kV yard splitting the line into two new lines.
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.

G0817 will construct a 500 kV line from the BPA POI substation to its generation facilities. The estimated length of the transmission line is 4 miles.

G1037, G1038, and G1040 will construct a 500 kV line from the BPA substation to their generation facilities. The estimated length of the transmission line is 10 to 12 miles.



9.13. Grand Coulee-Creston 115 kV New Substation

Table 9.13: POI Grand Coulee-Creston 115 kV New Substation Facility Requirements

G#	BPA Station Work	BPA Non-Station Work	Contingent Facilities
G0985	New 115 kV yard	None	TSEP: Schultz-Raver #3 and #4 500 kV new series capacitors and line upgrades TSEP: New Schultz-Olympia #1 500 kV Line TSEP: Rock Creek-John Day 500 kV Line Upgrade

1. Develop a new 115 kV 4 breaker ring, BAAH construction with associated disconnect switches, control, relaying, and communications equipment.
2. The Grand Coulee-Creston 115 kV line will be looped into the new 115 kV yard splitting the line into two new lines
3. Participate in a new North of Schultz single line loss/double line loss Remedial Action Scheme (NOSZ SLL/DLL RAS)
4. Installation of BPA-required C&C equipment at each customer’s collector site (RAS, Meters, relays, Control House space)
5. Significant development of C&C hardware to the BPA’s POI substation.

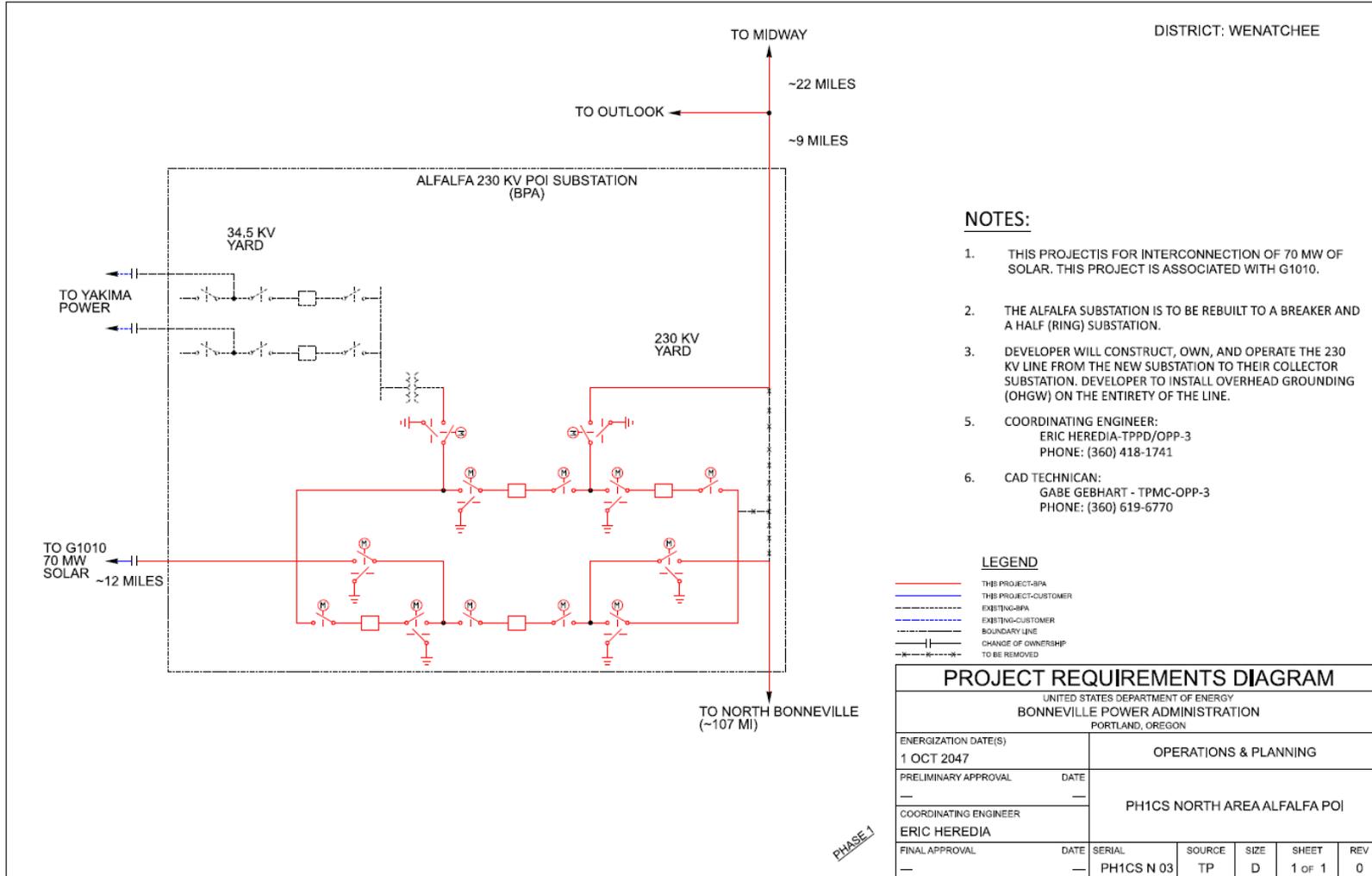
G0985 will construct a 115 kV line from the BPA POI substation to its generation facility. The estimated length of the transmission line is 5 miles.

The new 115 kV substation site location is the existing Wilbur Tap point on the Grand Coulee-Creston 115 kV line.



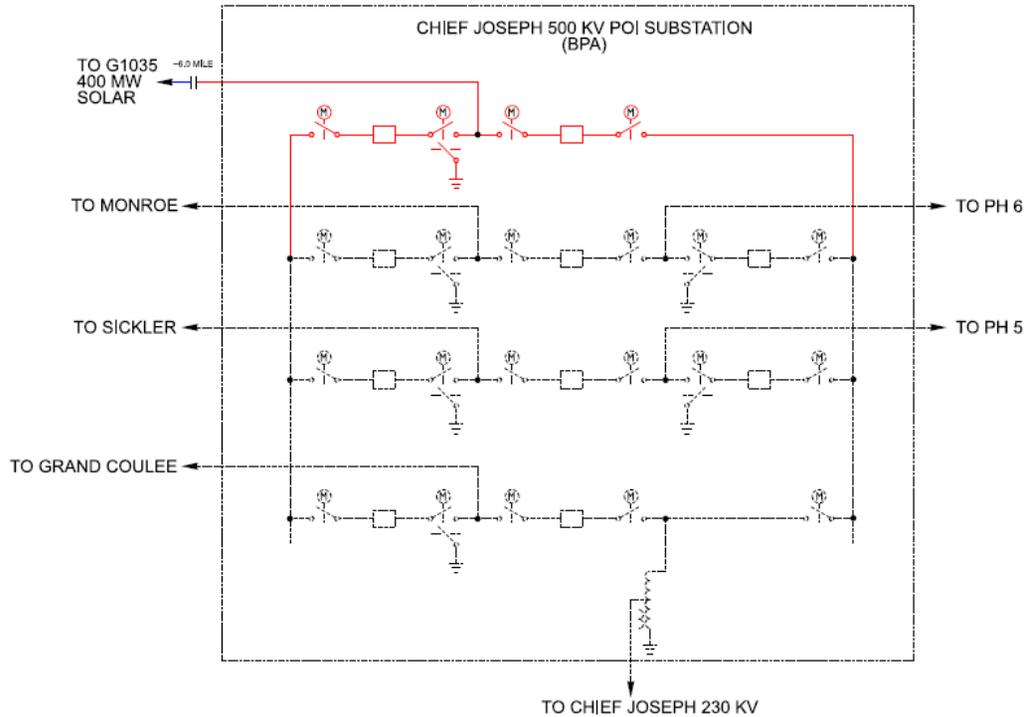
10 Project One-Line Drawings

10.1 Alfalfa Substation POI



10.2 Chief Joseph Substation POI

DISTRICT: WENATCHEE



NOTES:

1. THIS PROJECT IS FOR INTERCONNECTION OF 400 MW OF SOLAR. THIS PROJECT IS ASSOCIATED WITH G0840, G0853, AND G1016
2. A NEW 500 KV BAY AT CHIEF JOSEPH SUBSTATION IS TO BE CONSTRUCTED.
3. DEVELOPER WILL CONSTRUCT, OWN, AND OPERATE THE 500 KV LINE FROM THE NEW BAY AT CHIEF JOSEPH TO THEIR COLLECTOR SUBSTATION. DEVELOPER TO INSTALL OVERHEAD GROUNDING WIRE (OHGW) ON THE ENTIRETY OF THE LINE.
5. COORDINATING ENGINEER:
ERIC HEREDIA-TPPD/OPP-3
PHONE: (360) 418-1741
6. CAD TECHNICIAN:
GABE GEBHART - TPMC-OPP-3
PHONE: (360) 619-6770

PROJECT REQUIREMENTS DIAGRAM

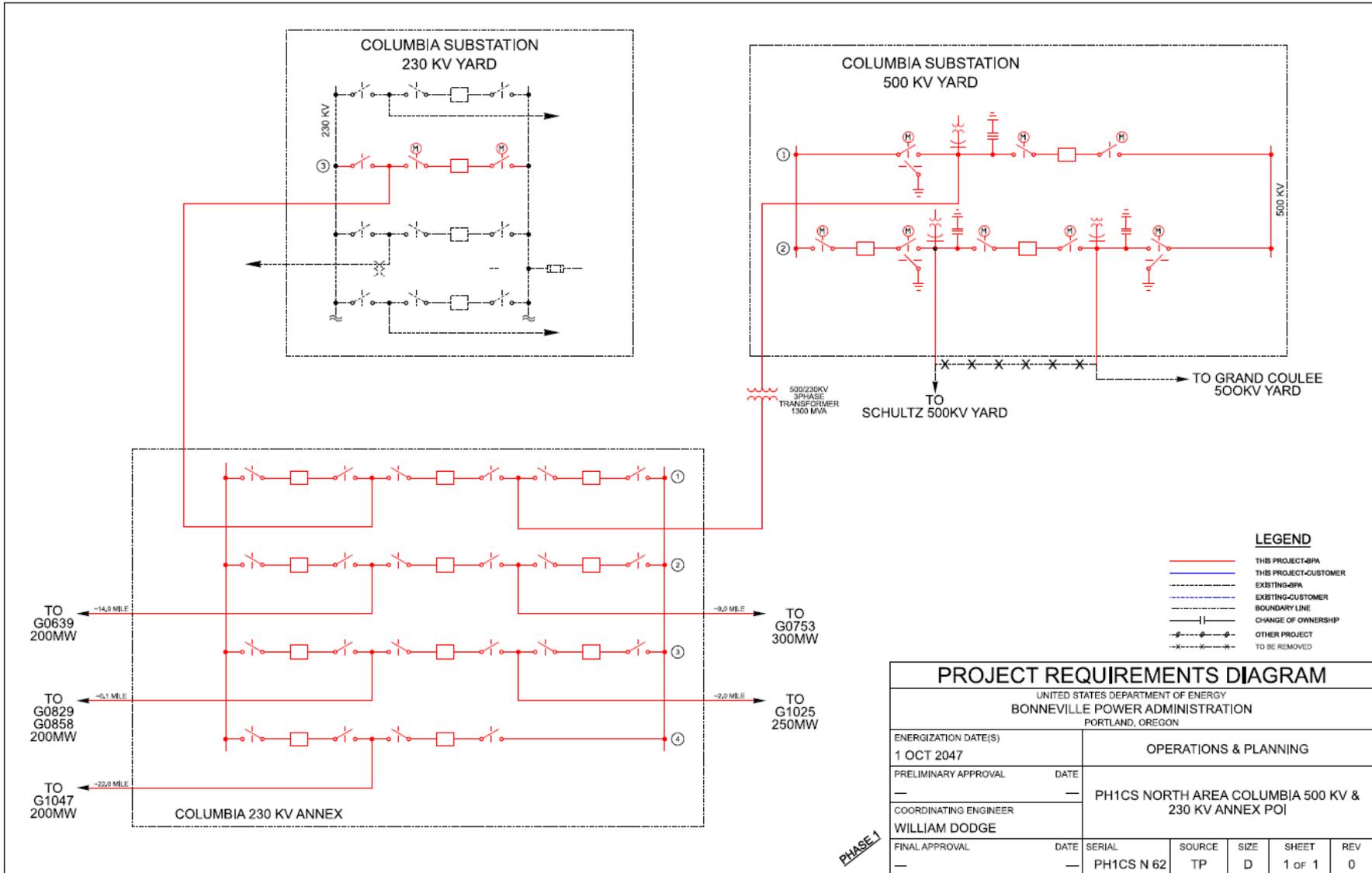
UNITED STATES DEPARTMENT OF ENERGY
BONNEVILLE POWER ADMINISTRATION
PORTLAND, OREGON

ENERGIZATION DATE(S)		OPERATIONS & PLANNING					
1 OCT 2047							
PRELIMINARY APPROVAL	DATE	PH1CS NORTH AREA CHIEF JOSEPH POI					
—	—						
COORDINATING ENGINEER							
ERIC HEREDIA							
FINAL APPROVAL	DATE	SERIAL	SOURCE	SIZE	SHEET	REV	
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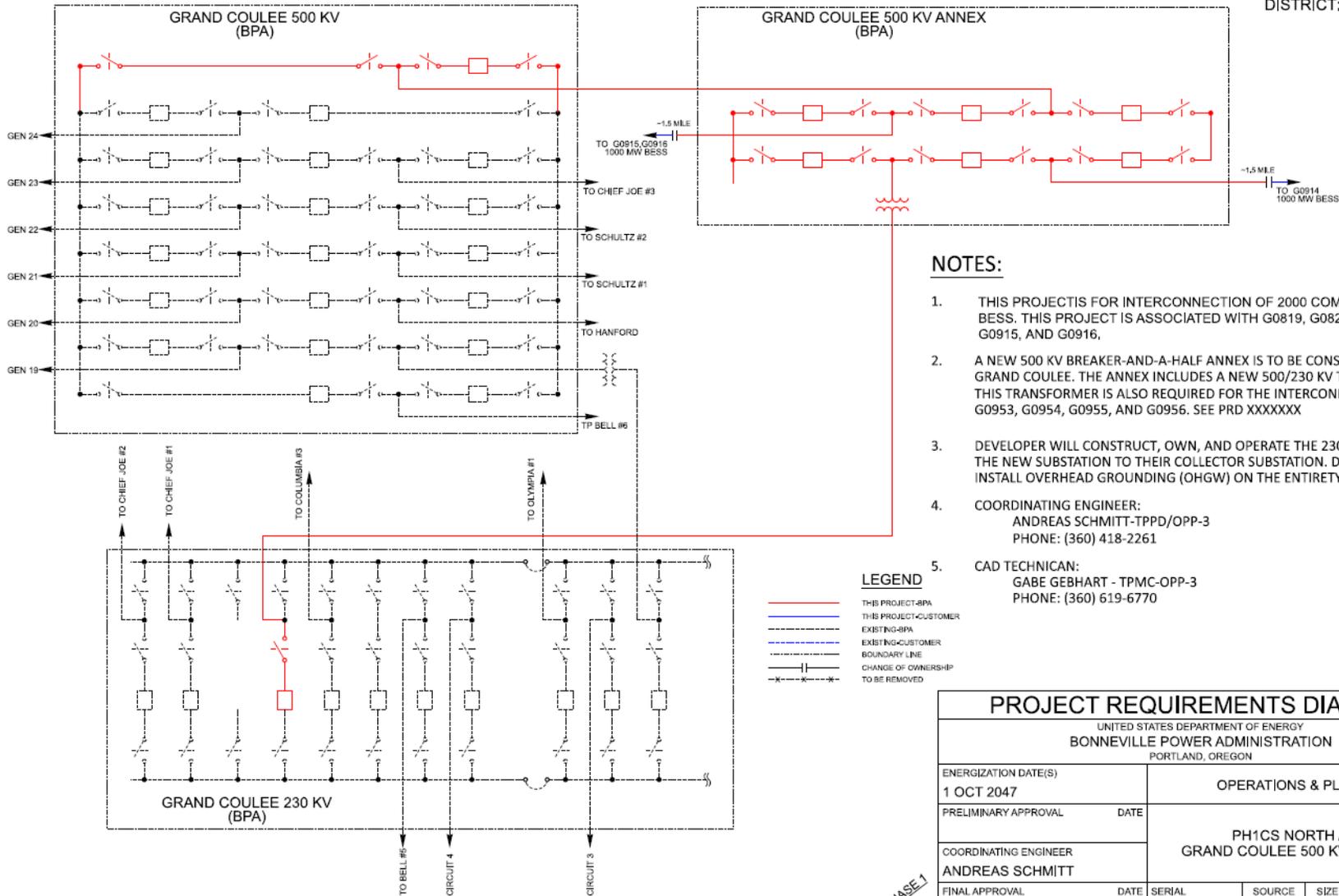


10.4 Columbia Substation POI



10.5 Grand Coulee Substation POI

DISTRICT: WENATCHEE



- NOTES:**
1. THIS PROJECT IS FOR INTERCONNECTION OF 2000 COMBINED MW OF BESS. THIS PROJECT IS ASSOCIATED WITH G0819, G0820, G0914, G0915, AND G0916.
 2. A NEW 500 KV BREAKER-AND-A-HALF ANNEX IS TO BE CONSTRUCTED AT GRAND COULEE. THE ANNEX INCLUDES A NEW 500/230 KV TRANSFORMER. THIS TRANSFORMER IS ALSO REQUIRED FOR THE INTERCONNECTION OF G0953, G0954, G0955, AND G0956. SEE PRD XXXXXX
 3. DEVELOPER WILL CONSTRUCT, OWN, AND OPERATE THE 230 KV LINE FROM THE NEW SUBSTATION TO THEIR COLLECTOR SUBSTATION. DEVELOPER TO INSTALL OVERHEAD GROUNDING (OHGW) ON THE ENTIRETY OF THE LINE.
 4. COORDINATING ENGINEER:
ANDREAS SCHMITT-TPPD/OPP-3
PHONE: (360) 418-2261
 5. CAD TECHNICIAN:
GABE GEBHART - TPMC-OPP-3
PHONE: (360) 619-6770

LEGEND

- THIS PROJECT-BPA
- - - THIS PROJECT-CUSTOMER
- EXISTING-BPA
- - - EXISTING-CUSTOMER
- BOUNDARY LINE
- CHANGE OF OWNERSHIP
- X- TO BE REMOVED

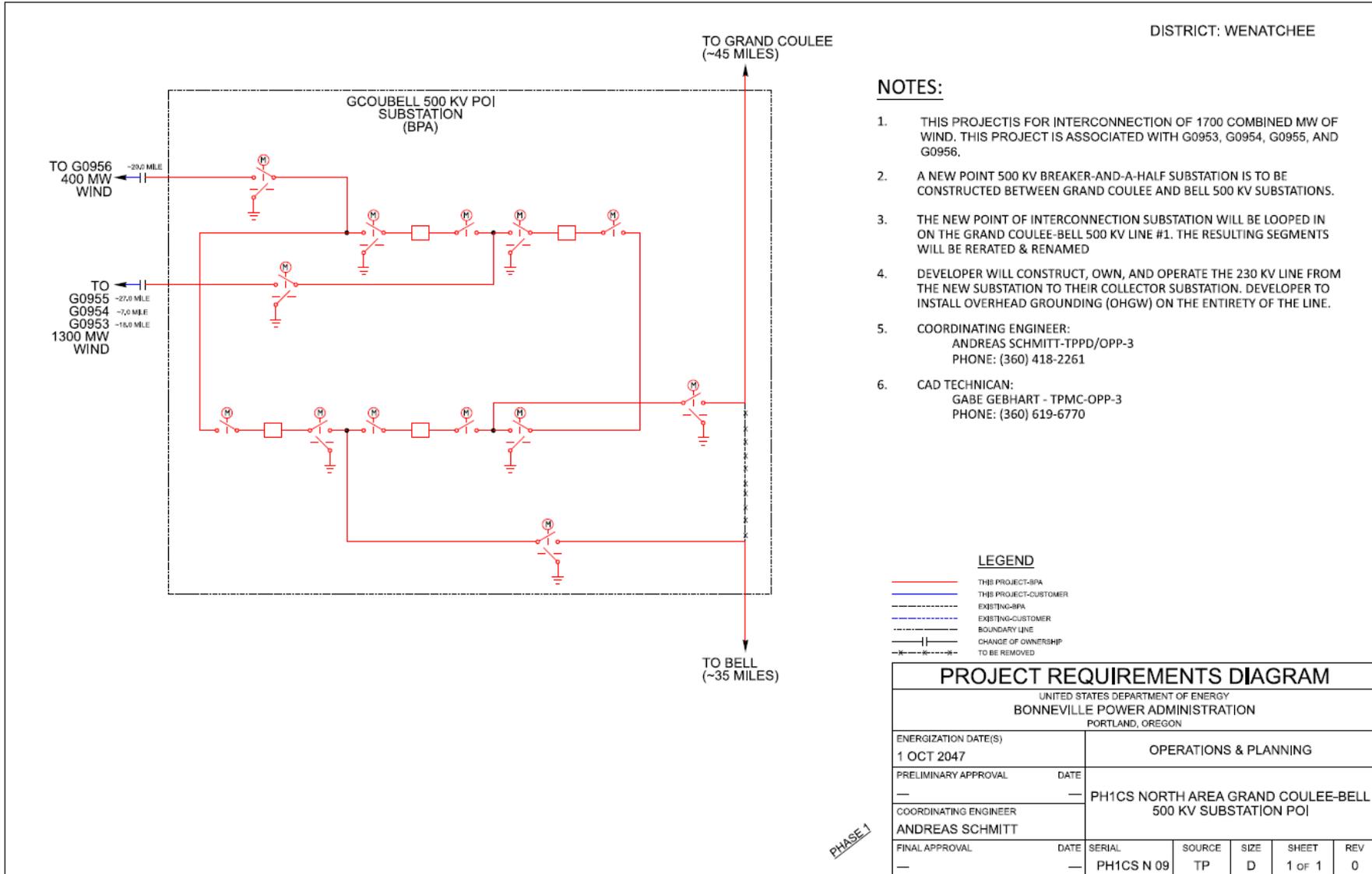
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ENERGIZATION DATE(S) 1 OCT 2047			OPERATIONS & PLANNING		
PRELIMINARY APPROVAL		DATE			
COORDINATING ENGINEER ANDREAS SCHMITT		PH1CS NORTH AREA GRAND COULEE 500 KV ANNEX POI			
FINAL APPROVAL		DATE		SERIAL	SOURCE
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PHASE 1



10.6 Grand Coulee-Bell 500 kV Line New Substation POI

DISTRICT: WENATCHEE



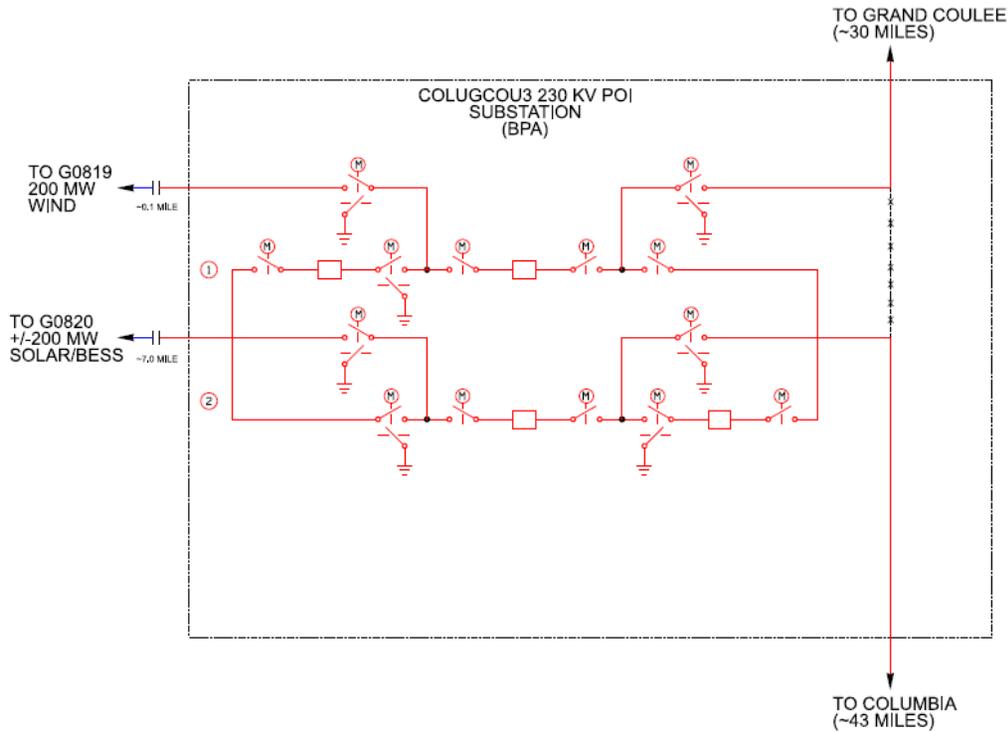
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ENERGIZATION DATE(S)	OPERATIONS & PLANNING					
1 OCT 2047						
PRELIMINARY APPROVAL	DATE	PH1CS NORTH AREA GRAND COULEE-BELL 500 KV SUBSTATION POI				
—	—					
COORDINATING ENGINEER						
ANDREAS SCHMITT						
FINAL APPROVAL	DATE	SERIAL	SOURCE	SIZE	SHEET	REV
—	—	PH1CS N 09	TP	D	1 OF 1	0



10.7 Grand Coulee-Columbia #3 230 kV New Substation POI

DISTRICT: WENATCHEE



NOTES:

1. THIS PROJECT IS FOR INTERCONNECTION OF 200 MW OF WIND AND +/- 200 MW OF SOLAR/BESS. THIS PROJECT IS ASSOCIATED WITH G0819 AND G0820.
2. A NEW 230 KV BREAKER-AND-A-HALF SUBSTATION WILL BE CONSTRUCTED BETWEEN GRAND COULEE AND COLUMBIA 230 KV SUBSTATION.
3. THE NEW POINT OF INTERCONNECTION SUBSTATION WILL BE LOOPED IN ON THE GRAND COULEE-COLUMBIA 230 KV LINE #3. THE RESULTING SEGMENTS WILL BE RERATED & RENAMED.
4. DEVELOPER WILL CONSTRUCT, OWN, AND OPERATE THE 230 KV LINE FROM THE NEW SUBSTATION TO THEIR COLLECTOR SUBSTATION. DEVELOPER TO INSTALL OVERHEAD GROUNDING (OHGW) ON THE ENTIRETY OF THE LINE.
5. COORDINATING ENGINEER:
ERIC HEREDIA-TPPD/OPP-3
PHONE: (360) 418-1741
6. CAD TECHNICIAN:
GABE GEBHART - TPMC-OPP-3
PHONE: (360) 619-6770

LEGEND

- THIS PROJECT-BPA
- THIS PROJECT-CUSTOMER
- - - EXISTING-BPA
- - - EXISTING-CUSTOMER
- - - BOUNDARY LINE
- CHANGE OF OWNERSHIP
- - - TO BE REMOVED

PROJECT REQUIREMENTS DIAGRAM

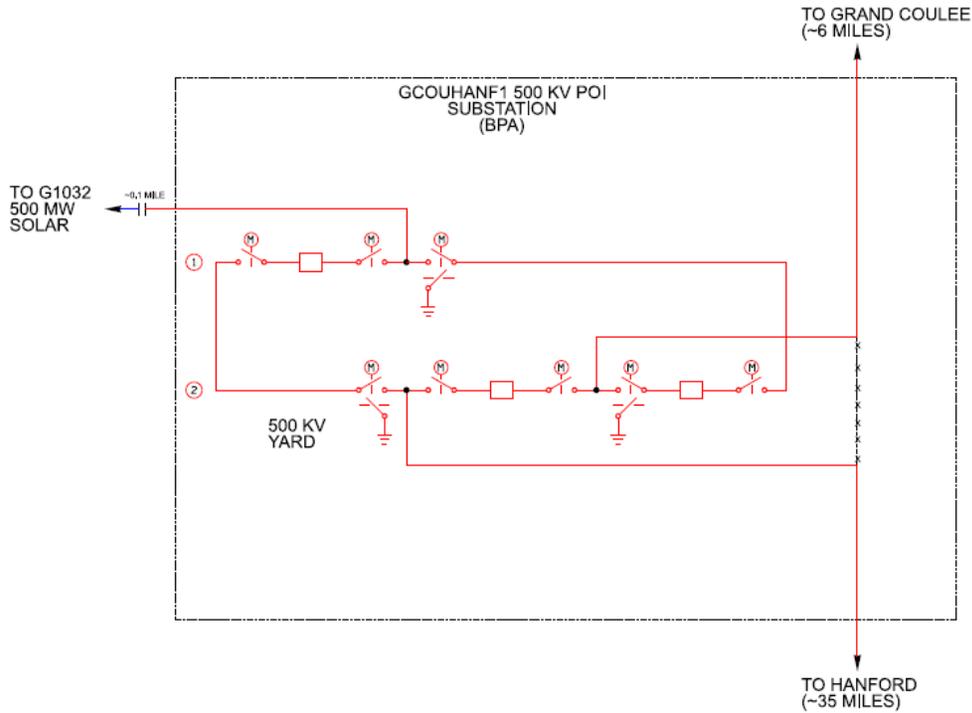
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ENERGIZATION DATE(S) 1 OCT 2047	OPERATIONS & PLANNING					
PRELIMINARY APPROVAL DATE	PH1CS NORTH AREA COLUGCOU3 230 KV POI					
COORDINATING ENGINEER ERIC HEREDIA						
FINAL APPROVAL DATE	SERIAL PH1CS N 05	SOURCE TP	SIZE D	SHEET 1 OF 1	REV 0	

PHASE 1



10.8 Grand Coulee-Hanford 500 kV New Substation POI

DISTRICT: WENATCHEE



NOTES:

1. THIS PROJECT IS FOR INTERCONNECTION OF 500 MW OF SOLAR, THIS PROJECT IS ASSOCIATED WITH G1032.
2. A NEW 500-230 KV BREAKER-AND-A-HALF SUBSTATION WILL BE CONSTRUCTED BETWEEN GRAND COULEE AND HANFORD 500 KV SUBSTATION.
3. THE NEW POINT OF INTERCONNECTION SUBSTATION WILL BE LOOPED IN ON THE GRAND COULEE-HANFORD 500 KV LINE #1. THE RESULTING SEGMENTS WILL BE RERATED & RENAMED.
4. DEVELOPER WILL CONSTRUCT, OWN, AND OPERATE THE 230 KV LINE FROM THE NEW SUBSTATION TO THEIR COLLECTOR SUBSTATION. DEVELOPER TO INSTALL OVERHEAD GROUNDING (OHGW) ON THE ENTIRETY OF THE LINE.
5. COORDINATING ENGINEER:
ERIC HEREDIA-TPPD/OPP-3
PHONE: (360) 418-1741
6. CAD TECHNICIAN:
GABE GEBHART - TPMC-OPP-3
PHONE: (360) 619-6770

LEGEND

- THIS PROJECT-BPA
- THIS PROJECT-CUSTOMER
- - - EXISTING-BPA
- - - EXISTING-CUSTOMER
- - - BOUNDARY LINE
- | | CHANGE OF OWNERSHIP
- x - x - x - TO BE REMOVED

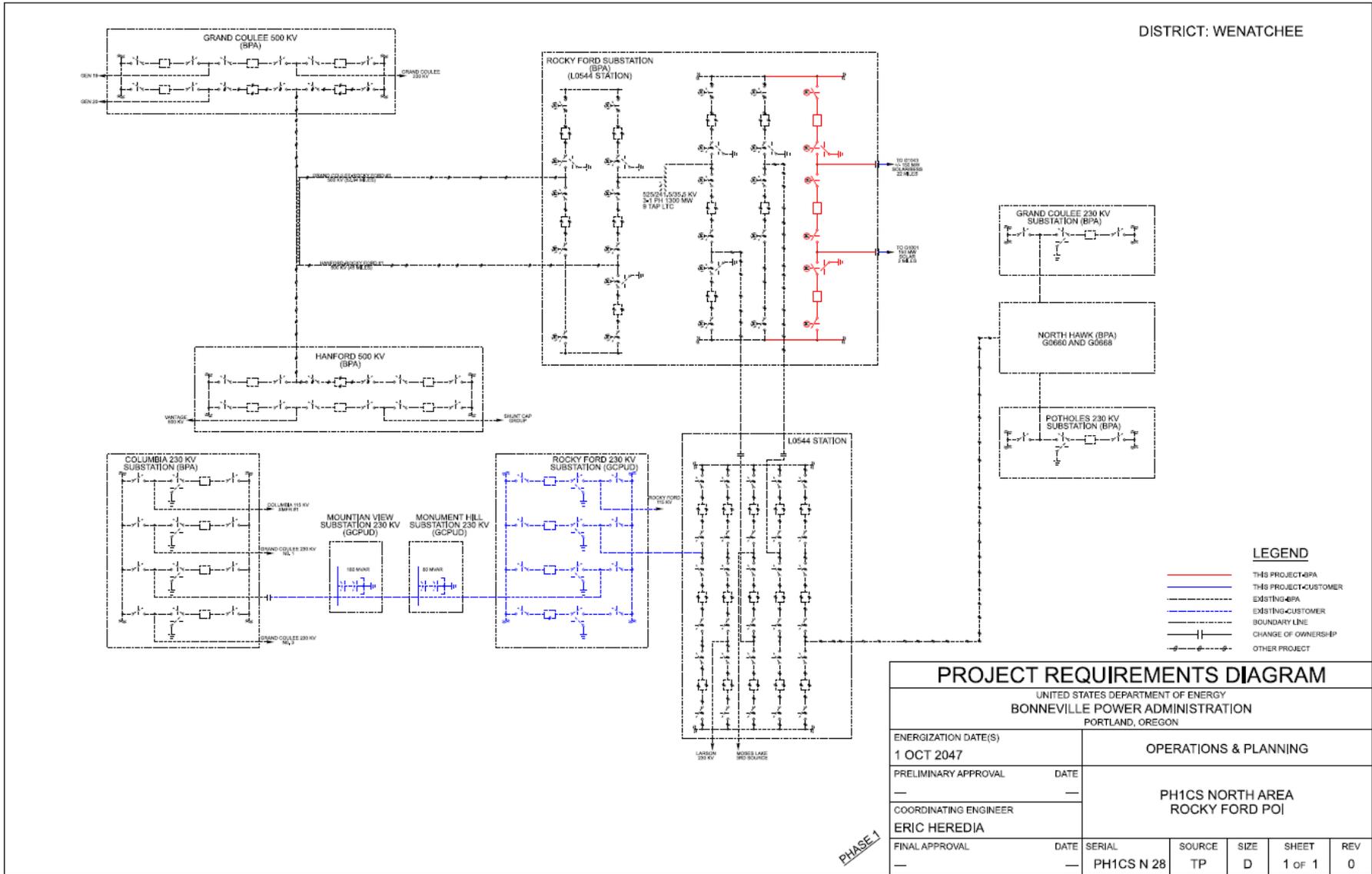
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ENERGIZATION DATE(S) 1 OCT 2047				OPERATIONS & PLANNING				
PRELIMINARY APPROVAL		DATE		PH1CS NORTH AREA GRAND COULEE- HANFORD 500 KV SUBSTATION POI				
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COORDINATING ENGINEER ERIC HEREDIA								
FINAL APPROVAL		DATE		SERIAL	SOURCE	SIZE	SHEET	REV
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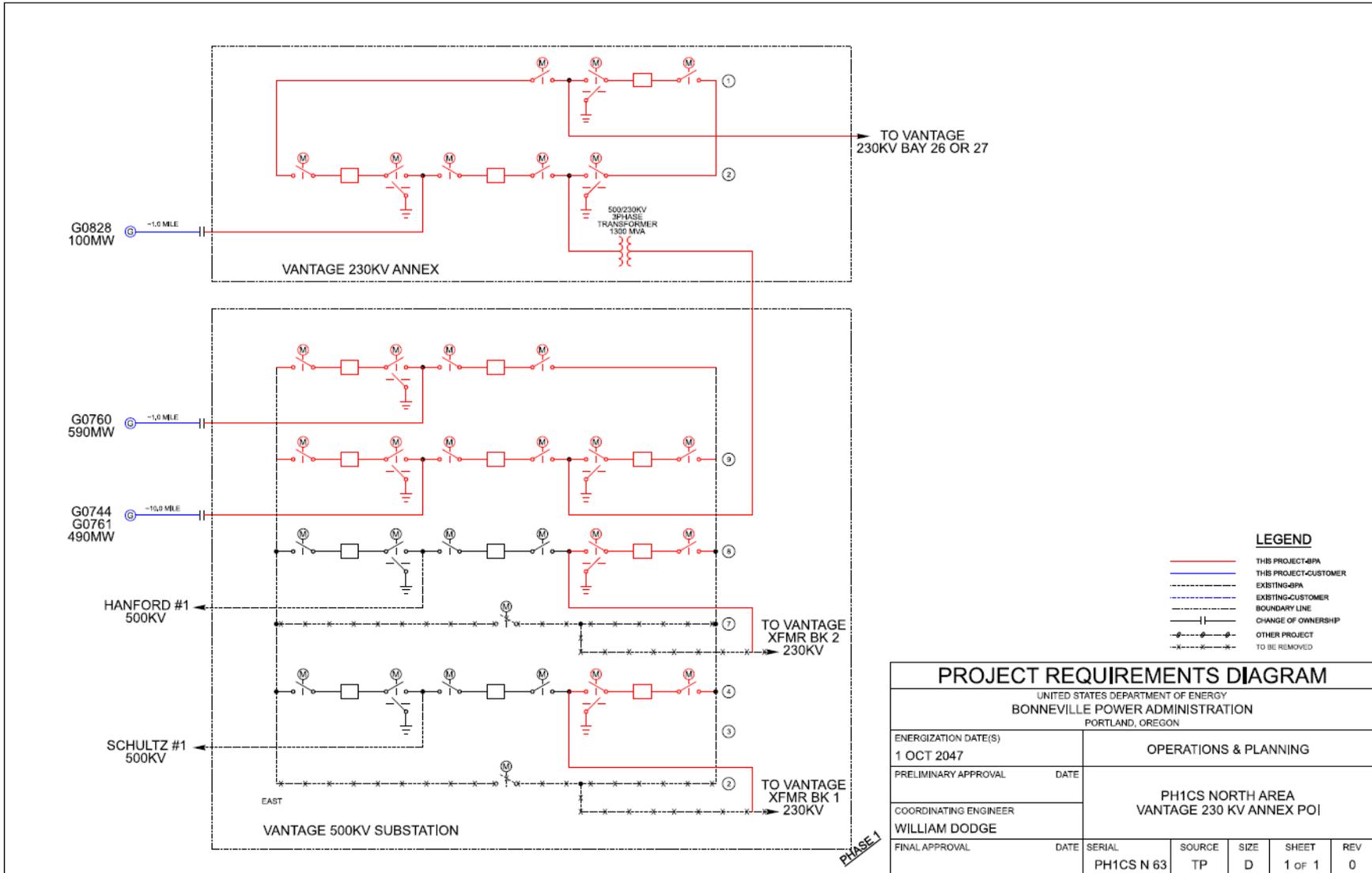
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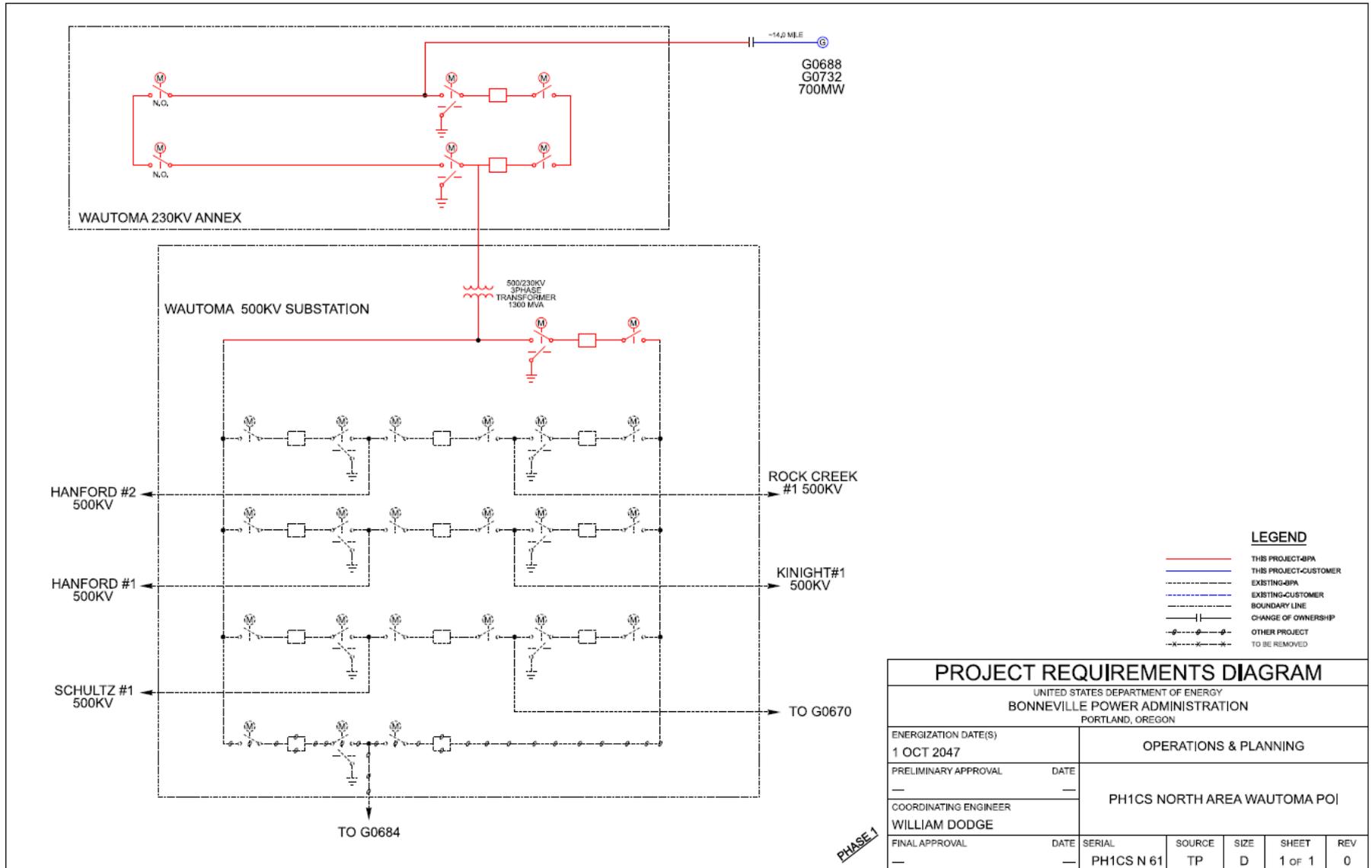
10.9 BPA Rocky Ford New Substation POI



10.10 Vantage Substation POI



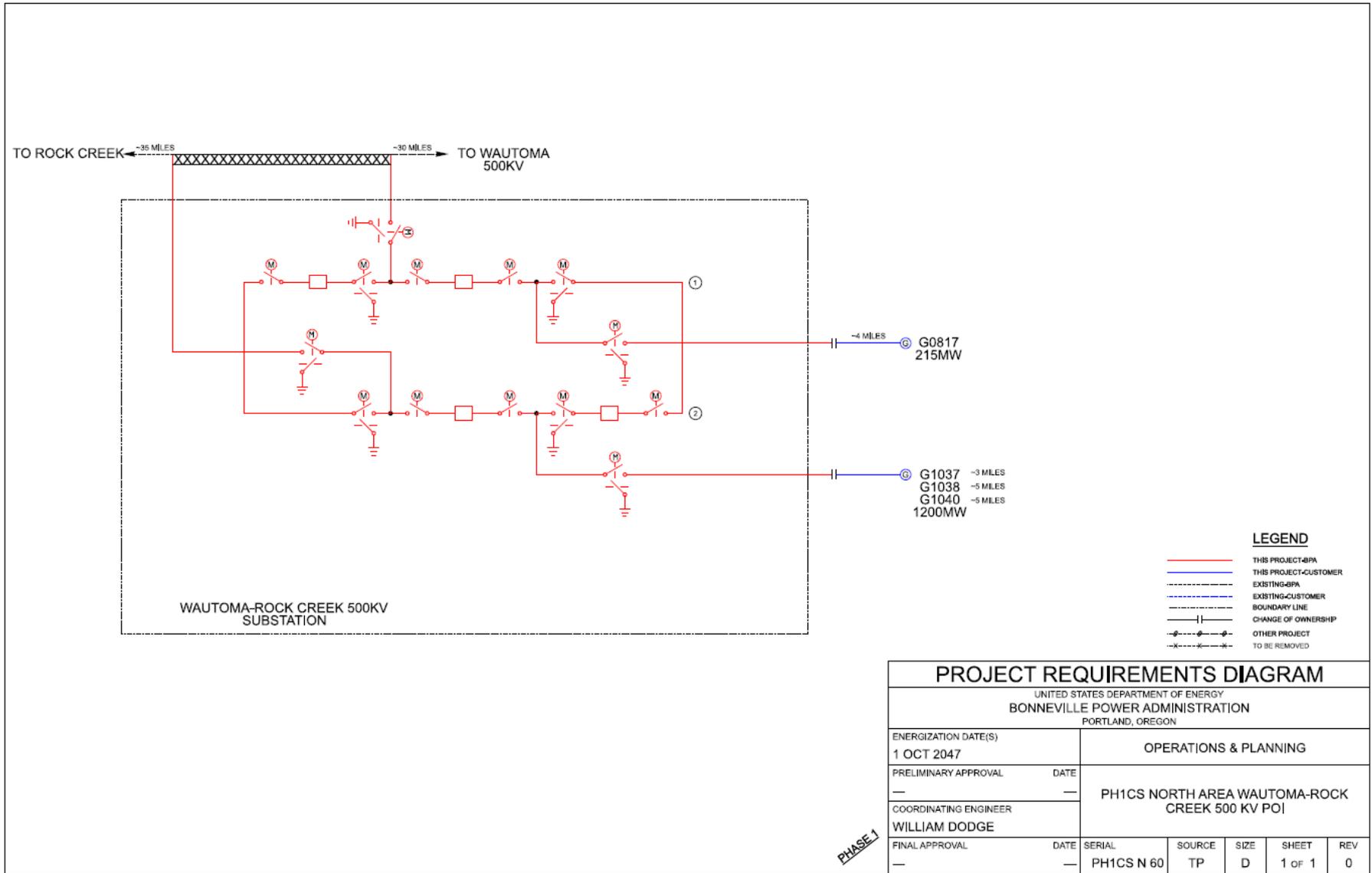
10.11 Wautoma Substation POI



PROJECT REQUIREMENTS DIAGRAM							
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ENERGIZATION DATE(S) 1 OCT 2047		OPERATIONS & PLANNING					
PRELIMINARY APPROVAL	DATE	PH1CS NORTH AREA WAUTOMA POI					
COORDINATING ENGINEER WILLIAM DODGE							
FINAL APPROVAL	DATE	SERIAL	SOURCE	SIZE	SHEET	REV	
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10.12 Wautoma-Rock Creek 500 kV Line New Substation POI



PHASE 1



11 Costs and Schedules

11.1 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.

11.2 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 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 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 10 of this report.

11.3 POI 1: Alfalfa 230 kV Substation

Table 11.1 POI 1 –Alfalfa 230 kV Station Cost Estimate

Estimate Summary									
Estimate #	Description		Quantity	Contract		BPA		Misc.	Total
				Labor	Material	Labor	Material		
	Alfalfa POI		-	-	-	-	-	-	-
ST-070-39-12	230kV New POI: 3x PCB, 3pos, 2x bay BAAH		1	\$18,348,000	\$12,624,000	\$4,830,000	\$0	\$118,000	\$35,920,000
ST-070-124-6	230kV Add: 1x bay 2pos BAAH		1	\$8,230,000	\$5,028,000	\$1,152,000	\$0	\$18,000	\$14,428,000
C&C	C&C POI Station		1	\$0	\$0	\$0	\$0	\$15,000,000	\$15,000,000
C&C	C&C Collector Station		1	\$0	\$0	\$0	\$0	\$5,000,000	\$5,000,000
Contingency %	40%		Subtotal:	\$26,578,000	\$17,652,000	\$5,982,000	\$0	\$20,136,000	\$70,348,000
Overhead %	Labor	Materials	Contingency:	\$10,631,200	\$7,060,800	\$2,392,800	\$0	\$8,054,400	\$28,139,200
	26%	9%	Overhead:	\$9,674,392	\$2,224,152	\$2,177,448	\$0	\$2,537,136	\$16,613,128
Grand Total:	<i>(rounded to two significant figures)</i>			\$47,000,000	\$27,000,000	\$10,600,000	\$0	\$31,000,000	\$115,000,000

Table 11.2 POI 1 – Alfalfa 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
G1010	70	New 230kV Substation w/ New Comms	100.00%	\$106M	N/A	N/A	N/A	Collector Station C&C and RAS	\$9M	\$115M



11.4 POI 2: Chief Joseph 500 kV Substation

Table 11.3 POI 2 – Chief Joseph 500 kV Station Cost Estimate

Estimate Summary									
Estimate #	Description		Quantity	Contract		BPA		Misc.	Total
				Labor	Material	Labor	Material		
	Chief Joe Substation Expansion		-	-	-	-	-	-	-
ST-070-65-10	500kV Add: 1x bay 2pos BAAH		0.5						
				\$5,854,000	\$4,807,000	\$905,000	\$0	\$29,000	\$11,595,000
C&C	C&C POI Station		1	\$0	\$0	\$0	\$0	\$5,000,000	\$5,000,000
C&C	C&C Collector Station		1	\$0	\$0	\$0	\$0	\$5,000,000	\$5,000,000
Contingency %	40%		Subtotal:	\$5,854,000	\$4,807,000	\$905,000	\$0	\$10,029,000	\$21,595,000
Overhead %	Labor	Materials	Contingency:	\$2,341,600	\$1,922,800	\$362,000	\$0	\$4,011,600	\$8,638,000
	26%	9%	Overhead:	\$2,130,856	\$605,682	\$329,420	\$0	\$1,263,654	\$4,329,612
Grand Total:	<i>(rounded to two significant figures)</i>			\$10,300,000	\$7,300,000	\$1,600,000	\$0	\$15,000,000	\$35,000,000

Table 11.4 POI 2 – Chief Joseph 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
G1035	400	Chief Joseph Expansion w/ Expanded Comms	100.00%	\$26M	N/A	N/A	N/A	Collector Station C&C and RAS	\$9M	\$35M



11.5 POI 3: Chief Joseph-Sickler 500 kV Line New Substation

Table 11.5 POI 3 – Chief Joseph-Sickler 500 kV Line Station Cost Estimate

Estimate Summary								
Estimate #	Description	Quantity	Contract		BPA		Misc.	Total
			Labor	Material	Labor	Material		
	Chief Joe - Sickler POI station work	-	-	-	-	-	-	-
ST-070-133-7	500kV New POI: 4x PCB, 3pos, 2x bay BAAH, w/180 MVAR Shunt Reactor	1	\$44,512,000	\$46,842,000	\$5,690,000	\$816,000	\$0	\$97,860,000
ST-070-39-12	230kV New POI: 3x PCB, 3pos, 2x bay BAAH	1	\$18,348,000	\$12,624,000	\$4,830,000	\$0	\$118,000	\$35,920,000
ST-070-124-6	230kV Add: 1x bay 2pos BAAH	0.5	\$4,115,000	\$2,514,000	\$576,000	\$0	\$9,000	\$7,214,000
C&C	C&C POI Station	1	\$0	\$0	\$0	\$0	\$5,000,000	\$5,000,000
C&C	C&C Collector Station	3	\$0	\$0	\$0	\$0	\$15,000,000	\$15,000,000
Contingency %	40%	Subtotal:	\$66,975,000	\$61,980,000	\$11,096,000	\$816,000	\$20,127,000	\$160,994,000
Overhead %	Labor 26% Materials 9%	Contingency:	\$26,790,000	\$24,792,000	\$4,438,400	\$326,400	\$8,050,800	\$64,397,600
		Overhead:	\$24,378,900	\$7,809,480	\$4,038,944	\$102,816	\$2,536,002	\$38,866,142
Grand Total: <i>(rounded to two significant figures)</i>			\$118,000,000	\$95,000,000	\$20,000,000	\$1,250,000	\$31,000,000	\$260,000,000

Table 11.6 POI 3 – Chief Joseph-Sickler 500 kV Line Non-Station Cost Estimate

Estimate Summary								
Estimate #	Description	Quantity	Contract		BPA		Misc.	Total
			Labor	Material	Labor	Material		
	Chief Joe - Sickler POI non-station work	-	-	-	-	-	-	-
ST-070-141-6	500kV: 1x 525/241 433 MVA bank (1ph)	3	\$24,306,000	\$28,137,000	\$4,176,000	\$6,384,000	\$0	\$63,003,000
ST-070-124-6	230kV Add: 1x bay 2pos BAAH	0.5	\$4,115,000	\$2,514,000	\$576,000	\$0	\$9,000	\$7,214,000
Contingency %	40%	Subtotal:	\$28,421,000	\$30,651,000	\$4,752,000	\$6,384,000	\$9,000	\$70,217,000
Overhead %	Labor 26% Materials 9%	Contingency:	\$11,368,400	\$12,260,400	\$1,900,800	\$2,553,600	\$3,600	\$28,086,800
		Overhead:	\$10,345,244	\$3,862,026	\$1,729,728	\$804,384	\$1,134	\$16,742,516
Grand Total: <i>(rounded to two significant figures)</i>			\$50,000,000	\$47,000,000	\$8,400,000	\$9,700,000	\$14,000	\$115,000,000

Table 11.7 POI 3 – Chief Joseph-Sickler 500 kV Line 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
G0840	300	New 500kV Substation, New 230kV Substation w/ New Comms	50.00%	\$233M	New 500/230kV Transformer	30.00%	\$115M	Collector Station C&C and RAS	\$9M	\$160M
G0853	300		0.00%			30.00%		Collector Station C&C and RAS	\$9M	\$44M
G1016	400		50.00%			40.00%		Collector Station C&C and RAS	\$9M	\$172M



11.6 POI 4: Columbia Substation POI

Table 11.8 POI 4 – Columbia 500 kV Station Cost Estimate

Estimate Summary		Station work						
Estimate #	Description	Quantity	Contract		BPA		Misc.	Total
			Labor	Material	Labor	Material		
ST-070-133-7	Columbia Substation Expansion 500kV New POI: 4x PCB, 3pos, 2x bay BAAH, w/180 MVAR Shunt Reactor	1	\$44,512,000	\$46,842,000	\$5,690,000	\$816,000	\$0	\$97,860,000
ST-070-39-12	230kV New POI: 3x PCB, 3pos, 2x bay BAAH	1	\$18,348,000	\$12,624,000	\$4,830,000	\$0	\$118,000	\$35,920,000
ST-070-124-6	230kV Add: 1x bay 2pos BAAH	2.5	\$20,575,000	\$12,570,000	\$2,880,000	\$0	\$45,000	\$36,070,000
C&C	C&C POI Station	1	\$0	\$0	\$0	\$0	\$5,000,000	\$5,000,000
C&C	C&C Collector Station	6	\$0	\$0	\$0	\$0	\$30,000,000	\$30,000,000
Contingency %	40%	Subtotal:	\$83,435,000	\$72,036,000	\$13,400,000	\$816,000	\$35,163,000	\$204,850,000
Overhead %	Labor: 26% Materials: 9%	Contingency:	\$33,374,000	\$28,814,400	\$5,360,000	\$326,400	\$14,065,200	\$81,940,000
		Overhead:	\$30,370,340	\$9,076,536	\$4,877,600	\$102,816	\$4,430,538	\$48,857,830
Grand Total:	<i>(rounded to two significant figures)</i>		\$150,000,000	\$110,000,000	\$24,000,000	\$1,250,000	\$54,000,000	\$340,000,000

Table 11.9 POI 4 – Columbia 500 kV Non-Station Cost Estimate

Estimate Summary		non-station work						
Estimate #	Description	Quantity	Contract		BPA		Misc.	Total
			Labor	Material	Labor	Material		
ST-070-141-6	Columbia Substation Expansion 500kV: 1x 525/241 433 MVA bank (1ph)	3	\$24,306,000	\$28,137,000	\$4,176,000	\$6,384,000	\$0	\$63,003,000
ST-070-124-6	230kV Add: 1x bay 2pos BAAH	0.5	\$4,115,000	\$2,514,000	\$576,000	\$0	\$9,000	\$7,214,000
Contingency %	40%	Subtotal:	\$28,421,000	\$30,651,000	\$4,752,000	\$6,384,000	\$9,000	\$70,217,000
Overhead %	Labor: 26% Materials: 9%	Contingency:	\$11,368,400	\$12,260,400	\$1,900,800	\$2,553,600	\$3,600	\$28,086,800
		Overhead:	\$10,345,244	\$3,862,026	\$1,729,728	\$804,384	\$1,134	\$16,742,516
Grand Total:	<i>(rounded to two significant figures)</i>		\$50,000,000	\$47,000,000	\$8,400,000	\$9,700,000	\$14,000	\$115,000,000

Table 11.10 POI 4 – Columbia 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
G0639	200	New 500kV Substation, New 230kV Substation w/ New Comms	20.00%	\$286M	New Columbia 500/230kV Transformer	19.05%	\$115M	Collector Station C&C and RAS	\$9M	\$88M
G0753	300		20.00%			28.57%		Collector Station C&C and RAS	\$9M	\$99M
G0829	20		20.00%			1.90%		Collector Station C&C and RAS	\$9M	\$68M
G0858	130		0.00%			12.38%		Collector Station C&C and RAS	\$9M	\$23M
G1025	250		20.00%			23.81%		Collector Station C&C and RAS	\$9M	\$94M
G1047	150		20.00%			14.29%		Collector Station C&C and RAS	\$9M	\$83M



11.7 POI 5: Grand Coulee 500 kV Annex Substation

Table 11.11 POI 5 – Grand Coulee 500 kV Annex Station Cost Estimate

Estimate Summary								
Estimate #	Description	Quantity	Contract		BPA		Misc.	Total
			Labor	Material	Labor	Material		
	Grand Coulee POI Station Work	-	-	-	-	-	-	-
ST-070-133-7	500kV New POI: 4x PCB, 3pos, 2x bay BAAH, w/180 MVAR Shunt Reactor	1	\$44,512,000	\$46,842,000	\$5,690,000	\$816,000	\$0	\$97,860,000
ST-070-65-10	500kV Add: 1x bay 2pos BAAH	1	\$11,708,000	\$9,614,000	\$1,810,000	\$0	\$58,000	\$23,190,000
C&C	C&C POI Station	1.5	\$0	\$0	\$0	\$0	\$7,500,000	\$7,500,000
C&C	C&C Collector Station	3	\$0	\$0	\$0	\$0	\$15,000,000	\$15,000,000
Contingency %	40%	Subtotal:	\$56,220,000	\$56,456,000	\$7,500,000	\$816,000	\$22,558,000	\$143,550,000
Overhead %	Labor 26% Materials 9%	Contingency:	\$22,488,000	\$22,582,400	\$3,000,000	\$326,400	\$9,023,200	\$57,420,000
		Overhead:	\$20,464,080	\$7,113,456	\$2,730,000	\$102,816	\$2,842,308	\$33,252,660
Grand Total:	<i>(rounded to two significant figures)</i>		\$99,000,000	\$86,000,000	\$13,000,000	\$1,250,000	\$34,000,000	\$230,000,000

Table 11.12 POI 5 – Grand Coulee 500 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
G0914	1000	New 500kV Substation, New 230kV Substation w/ New Comms	50.00%	\$203M	SPB1: New Grand Coulee 500/230kV Transformer	24.39%	\$130M	Collector Station C&C and RAS	\$9M	\$142M
G0915	500		50.00%			12.20%		Collector Station C&C and RAS	\$9M	\$126M
G0916	500		0.00%			12.20%		Collector Station C&C and RAS	\$9M	\$25M



11.8 POI 6: Grand Coulee-Bell 500 kV Line New Substation

Table 11.13 POI 6 – Grand Coulee - Bell 500 kV Station Cost Estimate

Estimate Summary								
Estimate #	Description	Quantity	Contract		BPA		Misc.	Total
			Labor	Material	Labor	Material		
	Grand Coulee - Bell POI	-	-	-	-	-	-	-
ST-070-133-7	500kV New POI: 4x PCB, 3pos, 2x bay BAAH, w/180 MVAR Shunt Reactor	1	\$44,512,000	\$46,842,000	\$5,690,000	\$816,000	\$0	\$97,860,000
ST-070-65-10	500kV Add: 1x bay 2pos BAAH	0.5	\$5,854,000	\$4,807,000	\$905,000	\$0	\$29,000	\$11,595,000
C&C	C&C POI Station	1	\$0	\$0	\$0	\$0	\$5,000,000	\$5,000,000
C&C	C&C Collector Station	4	\$0	\$0	\$0	\$0	\$20,000,000	\$20,000,000
Contingency %	40%	Subtotal:	\$50,366,000	\$51,649,000	\$6,595,000	\$816,000	\$25,029,000	\$134,455,000
Overhead %	Labor 26% Materials 9%	Contingency:	\$20,146,400	\$20,659,600	\$2,638,000	\$326,400	\$10,011,600	\$53,782,000
		Overhead:	\$18,333,224	\$6,507,774	\$2,400,580	\$102,816	\$3,153,654	\$30,498,048
Grand Total:	<i>(rounded to two significant figures)</i>		\$89,000,000	\$79,000,000	\$11,600,000	\$1,250,000	\$38,000,000	\$220,000,000

Table 11.14 POI 6 – Grand Coulee – Bell 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
G0953	600	New 500kV Substation w/ New Comms	50.00%	\$184M	SPB1: New Grand Coulee 500/230kV Transformer	14.63%	\$130M	Collector Station C&C and RAS	\$9M	\$120M
G0954	350		0.00%			8.54%		Collector Station C&C and RAS	\$9M	\$20M
G0955	350		0.00%			8.54%		Collector Station C&C and RAS	\$9M	\$20M
G0956	400		50.00%			9.76%		Collector Station C&C and RAS	\$9M	\$114M



11.9 POI 7: Grand Coulee-Columbia #3 230 kV New Substation

Table 11.15 POI 7 – Grand Coulee-Columbia #3 230 kV Station Cost Estimate

<i>Estimate Summary</i>												
Estimate #	Description		Quantity	Contract		BPA		Misc.	Total			
				Labor	Material	Labor	Material					
	Columbia - Grand Coulee POI		-	-	-	-	-	-	-			
ST-070-39-12	230kV New POI: 3x PCB, 3pos, 2x bay BAAH		1	\$18,348,000	\$12,624,000	\$4,830,000	\$0	\$118,000	\$35,920,000			
ST-070-124-6	230kV Add: 1x bay 2pos BAAH		0.5	\$4,115,000	\$2,514,000	\$576,000	\$0	\$9,000	\$7,214,000			
C&C	C&C POI Station		1	\$0	\$0	\$0	\$0	\$10,000,000	\$10,000,000			
C&C	C&C Collector Station		2	\$0	\$0	\$0	\$0	\$10,000,000	\$10,000,000			
Contingency %			40%	Subtotal:		\$22,463,000	\$15,138,000	\$5,406,000	\$0	\$20,127,000	\$63,134,000	
Overhead %			Labor	Materials	Contingency:		\$8,985,200	\$6,055,200	\$2,162,400	\$0	\$8,050,800	\$25,253,600
			26%	9%	Overhead:		\$8,176,532	\$1,907,388	\$1,967,784	\$0	\$2,536,002	\$14,587,706
Grand Total: <i>(rounded to two significant figures)</i>						\$40,000,000	\$23,000,000	\$9,500,000	\$0	\$31,000,000	\$103,000,000	

Table 11.16 POI 7 – Grand Coulee-Columbia #3 230 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
G0819	200	New 500kV Substation w/ New Comms	50.00%	\$85M	SPB1: New Grand Coulee 500/230kV Transformer	4.88%	\$130M	Collector Station C&C and RAS	\$9M	\$58M
G0820	200		50.00%			4.88%				



11.10 POI 8: Grand Coulee-Hanford 500 kV Line New Substation

Table 11.17 POI 8 – Grand Coulee-Hanford 500 kV Station Cost Estimate

Estimate Summary									
Estimate #	Description		Quantity	Contract		BPA		Misc.	Total
				Labor	Material	Labor	Material		
ST-070-133-7	Grand Coulee - Hanford POI		-	-	-	-	-	-	
	500kV New POI: 4x PCB, 3pos, 2x bay BAAH, w/180 MVAR Shunt Reactor		1	\$44,512,000	\$46,842,000	\$5,690,000	\$816,000	\$0	\$97,860,000
	C&C	C&C POI Station	1	\$0	\$0	\$0	\$0	\$15,000,000	\$15,000,000
	C&C	C&C Collector Station	1	\$0	\$0	\$0	\$0	\$5,000,000	\$5,000,000
Contingency %		40%	Subtotal:	\$44,512,000	\$46,842,000	\$5,690,000	\$816,000	\$20,000,000	\$117,860,000
Overhead %		Labor	Contingency:	\$17,804,800	\$18,736,800	\$2,276,000	\$326,400	\$8,000,000	\$47,144,000
		26%	Overhead:	\$16,202,368	\$5,902,092	\$2,071,160	\$102,816	\$2,520,000	\$26,798,436
Grand Total:		<i>(rounded to two significant figures)</i>		\$79,000,000	\$71,000,000	\$10,000,000	\$1,250,000	\$31,000,000	\$190,000,000

Table 11.18 POI 8 – Grand Coulee-Hanford 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
G1032	500	New 500kV Substation w/ New Comms	100.00%	\$181M	N/A	N/A	N/A	Collector Station C&C and RAS	\$9M	\$190M



11.11 POI 9: BPA Rocky Ford 230 kV New Substation

Table 11.19 POI 9 –BPA Rocky Ford 230 kV Station Cost Estimate

Estimate Summary									
Estimate #	Description		Quantity	Contract		BPA		Misc.	Total
				Labor	Material	Labor	Material		
	<u>Rocky Ford Expansion</u>		-	-	-	-	-	-	-
ST-070-124-6	230kV Add: 1x bay 2pos BAAH		1						
				\$8,230,000	\$5,028,000	\$1,152,000	\$0	\$18,000	\$14,428,000
C&C	C&C POI Station		1	\$0	\$0	\$0	\$0	\$5,000,000	\$5,000,000
C&C	C&C Collector Station		2	\$0	\$0	\$0	\$0	\$10,000,000	\$10,000,000
Contingency %	40%		Subtotal:	\$8,230,000	\$5,028,000	\$1,152,000	\$0	\$15,018,000	\$29,428,000
Overhead %	Labor	Materials	Contingency:	\$3,292,000	\$2,011,200	\$460,800	\$0	\$6,007,200	\$11,771,200
	26%	9%		Overhead:	\$2,995,720	\$633,528	\$419,328	\$0	\$1,892,268
Grand Total:	<i>(rounded to two significant figures)</i>			\$15,000,000	\$7,700,000	\$2,000,000	\$0	\$23,000,000	\$47,000,000

Table 11.20 POI 9 – BPA Rocky Ford 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
G1001	150	Rocky Ford 230kV Substation Expansion w/ Expanded Comms	50.00%	\$29M	N/A	N/A	N/A	Collector Station C&C and RAS	\$9M	\$24M
G1043	150		50.00%			N/A		Collector Station C&C and RAS	\$9M	\$24M



11.12 POI 10: Vantage Substation

Table 11.21 POI 10 – Vantage 500 kV Station Cost Estimate

Estimate Summary									
Estimate #	Description		Quantity	Contract		BPA		Misc.	Total
				Labor	Material	Labor	Material		
ST-070-65-10	Vantage 500 station work		-	-	-	-	-	-	-
	500kV Add: 1x bay 2pos BAAH		2.5	\$29,270,000	\$24,035,000	\$4,525,000	\$0	\$145,000	\$57,975,000
	C&C	C&C POI Station	1	\$0	\$0	\$0	\$0	\$5,000,000	\$5,000,000
	C&C	C&C Collector Station	4	\$0	\$0	\$0	\$0	\$20,000,000	\$20,000,000
Contingency %	40%		Subtotal:	\$29,270,000	\$24,035,000	\$4,525,000	\$0	\$25,145,000	\$82,975,000
Overhead %	Labor	Materials	Contingency:	\$11,708,000	\$9,614,000	\$1,810,000	\$0	\$10,058,000	\$33,190,000
	26%	9%	Overhead:	\$10,654,280	\$3,028,410	\$1,647,100	\$0	\$3,168,270	\$18,498,060
Grand Total:	<i>(rounded to two significant figures)</i>			\$52,000,000	\$37,000,000	\$8,000,000	\$0	\$38,000,000	\$130,000,000

Table 11.22 POI 10 – Vantage 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
G0744	200	Vantage 500kV Substation Expansion w/ Expanded Comms	50.00%	\$94M	SPB2: New Vantage 500/230kV Transformer	16.95%	\$180M	Collector Station C&C and RAS	\$9M	\$87M
G0760	590		50.00%			50.00%		Collector Station C&C and RAS	\$9M	\$146M
G0761	290		0.00%			24.58%		Collector Station C&C and RAS	\$9M	\$53M

Table 11.23 POI 10 – Vantage 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
G0828	100	N/A	N/A	N/A	SPB2: New Vantage 500/230kV Transformer	8.47%	\$180M	Collector Station C&C and RAS	\$9M	\$24M



11.13 POI 11: Wautoma 500 kV Substation POI

Table 11.24 POI 11 – Wautoma 500 kV Station Cost Estimate

Estimate Summary		station work						
Estimate #	Description	Quantity	Contract		BPA		Misc.	Total
			Labor	Material	Labor	Material		
	Wautoma Substation Expansion	-	-	-	-	-	-	-
ST-070-65-10	500kV Add: 1x bay 2pos BAAH	0.5	\$5,854,000	\$4,807,000	\$905,000	\$0	\$29,000	\$11,595,000
ST-070-39-12	230kV New POI: 3x PCB, 3pos, 2x bay BAAH	0.5	\$9,174,000	\$6,312,000	\$2,415,000	\$0	\$59,000	\$17,960,000
C&C	C&C POI Station	1	\$0	\$0	\$0	\$0	\$5,000,000	\$5,000,000
C&C	C&C Collector Station	2	\$0	\$0	\$0	\$0	\$10,000,000	\$10,000,000
Contingency %	40%	Subtotal:	\$15,028,000	\$11,119,000	\$3,320,000	\$0	\$15,088,000	\$44,555,000
Overhead %	Labor	Contingency:	\$6,011,200	\$4,447,600	\$1,328,000	\$0	\$6,035,200	\$17,822,000
	Materials	Overhead:	\$5,470,192	\$1,400,994	\$1,208,480	\$0	\$1,901,088	\$9,980,754
26%	9%	Grand Total:	\$27,000,000	\$17,000,000	\$5,900,000	\$0	\$23,000,000	\$72,000,000
<i>(rounded to two significant figures)</i>								

Table 11.25 POI 11 – Wautoma 500 kV Non-Station Cost Estimate

Estimate Summary		non-station work						
Estimate #	Description	Quantity	Contract		BPA		Misc.	Total
			Labor	Material	Labor	Material		
	Wautoma Substation Expansion	-	-	-	-	-	-	-
ST-070-65-10	500kV Add: 1x bay 2pos BAAH	0.5	\$5,854,000	\$4,807,000	\$905,000	\$0	\$29,000	\$11,595,000
ST-070-141-6	Transformer 1-PH 525/241.5 - 34.5 kV auto	3	\$24,306,000	\$28,137,000	\$4,176,000	\$6,384,000	\$0	\$63,003,000
ST-070-39-12	230kV New POI: 3x PCB, 3pos, 2x bay BAAH	0.5	\$9,174,000	\$6,312,000	\$2,415,000	\$0	\$59,000	\$17,960,000
Contingency %	40%	Subtotal:	\$39,334,000	\$39,256,000	\$7,496,000	\$6,384,000	\$88,000	\$92,558,000
Overhead %	Labor	Contingency:	\$15,733,600	\$15,702,400	\$2,998,400	\$2,553,600	\$35,200	\$37,023,200
	Materials	Overhead:	\$14,317,576	\$4,946,256	\$2,728,544	\$804,384	\$11,088	\$22,807,848
26%	9%	Grand Total:	\$69,000,000	\$60,000,000	\$13,000,000	\$9,700,000	\$134,000	\$150,000,000
<i>(rounded to two significant figures)</i>								

Table 11.26 POI 11 – Wautoma 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
G0688	500	New 230kV Substation w/ New	100.00%	\$54M	New 500/230kV Transformer	71.43%	\$150M	Collector Station	\$9M	\$170M
G0732	200	Comms	0.00%			28.57%		Collector Station		
								C&C and RAS		
								C&C and RAS		



11.14 POI 12: Wautoma-Rock Creek 500 kV Line New Substation

Table 11.27 POI 12 – Wautoma-Rock Creek 500 kV Line Station Cost Estimate

Estimate Summary									
Estimate #	Description		Quantity	Contract		BPA		Misc.	Total
				Labor	Material	Labor	Material		
	Wautoma - Rock Creek POI		-	-	-	-	-	-	
ST-070-133-7	500kV New POI: 4x PCB, 3pos, 2x bay BAAH, w/180 MVAR Shunt Reactor		1	\$44,512,000	\$46,842,000	\$5,690,000	\$816,000	\$0	\$97,860,000
ST-070-65-10	500kV Add: 1x bay 2pos BAAH		1	\$11,708,000	\$9,614,000	\$1,810,000	\$0	\$58,000	\$23,190,000
C&C	C&C POI Station		1	\$0	\$0	\$0	\$0	\$10,000,000	\$10,000,000
C&C	C&C Collector Station		4	\$0	\$0	\$0	\$0	\$20,000,000	\$20,000,000
Contingency %	40%		Subtotal:	\$56,220,000	\$56,456,000	\$7,500,000	\$816,000	\$30,058,000	\$151,050,000
Overhead %	Labor	Materials	Contingency:	\$22,488,000	\$22,582,400	\$3,000,000	\$326,400	\$12,023,200	\$60,420,000
	26%	9%	Overhead:	\$20,464,080	\$7,113,456	\$2,730,000	\$102,816	\$3,787,308	\$34,197,660
Grand Total:	<i>(rounded to two significant figures)</i>			\$99,000,000	\$86,000,000	\$13,000,000	\$1,250,000	\$46,000,000	\$250,000,000

Table 11.28 POI 12 – Wautoma-Rock Creek 500 kV Line 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
G0817	215	New 500kV Substation w/ New Comms	50.00%	\$214M	N/A	N/A	N/A	Collector Station C&Cand RAS	\$9M	\$116M
G1037	400		50.00%			N/A		Collector Station C&Cand RAS	\$9M	\$116M
G1038	400		0.00%			N/A		Collector Station C&Cand RAS	\$9M	\$9M
G1040	400		0.00%			N/A		Collector Station C&Cand RAS	\$9M	\$9M



11.15 POI 13: Grand Coulee-Creston 115 kV Line New Substation

Table 11.29 POI 13 – Grand Coulee-Creston 115 kV Line Station Cost Estimate

Estimate Summary									
Estimate #	Description		Quantity	Contract		BPA		Misc.	Total
				Labor	Material	Labor	Material		
	<u>Wilbur Tap POI</u>		-	-	-	-	-	-	
ST-070-28-13	115kV New POI: 3x PCB, 3pos Ring		1	\$16,460,000	\$9,152,000	\$3,354,000	\$0	\$96,000	\$29,062,000
ST-070-19-11	115kV POI: 1x PCB, 1pos MainAux Addition		1	\$2,180,000	\$1,402,000	\$522,000	\$0	\$12,000	\$4,116,000
C&C	C&C POI Station		1	\$0	\$0	\$0	\$0	\$15,000,000	\$15,000,000
C&C	C&C Collector Station		1	\$0	\$0	\$0	\$0	\$5,000,000	\$5,000,000
Contingency %	40%		Subtotal:	\$18,640,000	\$10,554,000	\$3,876,000	\$0	\$20,108,000	\$53,178,000
Overhead %	Labor	Materials	Contingency:	\$7,456,000	\$4,221,600	\$1,550,400	\$0	\$8,043,200	\$21,271,200
	26%	9%	Overhead:	\$6,784,960	\$1,329,804	\$1,410,864	\$0	\$2,533,608	\$12,059,236
Grand Total:	<i>(rounded to two significant figures)</i>			\$33,000,000	\$16,000,000	\$6,800,000	\$0	\$31,000,000	\$87,000,000

Table 11.30 POI 13 – Grand Coulee-Creston 115 kV Line 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
G0985	150	New 115kV Substation w/ New Comms	100.00%	\$78M	N/A	N/A	N/A	Collector Station C&C and RAS	\$9M	\$87M



11.16 SPB1: Grand Coulee 500/230 #2 Bank

Table 11.31 SPB1 – Grand Coulee 500/230 #2 Bank Cost Estimate

<i>Estimate Summary</i>									
Estimate #	Description		Quantity	Contract		BPA		Misc.	Total
				Labor	Material	Labor	Material		
	Grand Coulee Non-Station Work (500/230kV bank)		-	-	-	-	-	-	-
ST-070-65-10	500kV Add: 1x bay 2pos BAAH		0.5	\$5,854,000	\$4,807,000	\$905,000	\$0	\$29,000	\$11,595,000
ST-070-141-6	500kV: 1x 525/241 433 MVA bank (1ph)		3	\$24,306,000	\$28,137,000	\$4,176,000	\$6,384,000	\$0	\$63,003,000
ST-070-124-6	230kV Add: 1x bay 2pos BAAH		0.5	\$4,115,000	\$2,514,000	\$576,000	\$0	\$9,000	\$7,214,000
Contingency %	40%		Subtotal:	\$34,275,000	\$35,458,000	\$5,657,000	\$6,384,000	\$38,000	\$81,812,000
Overhead %	Labor	Materials	Contingency:	\$13,710,000	\$14,183,200	\$2,262,800	\$2,553,600	\$15,200	\$32,724,800
	26%	9%	Overhead:	\$12,476,100	\$4,467,708	\$2,059,148	\$804,384	\$4,788	\$19,812,128
Grand Total:	<i>(rounded to two significant figures)</i>			\$60,000,000	\$54,000,000	\$10,000,000	\$9,700,000	\$58,000	\$130,000,000

Table 11.32 SPB1 – Grand Coulee 500/230 #2 Bank Cost Allocation

Queue #	Enabled		Percent Allocation	Cost Allocation
	MW			
G0914	1000		24.390%	\$ 31,707,317
G0915	500		12.195%	\$ 15,853,659
G0916	500		12.195%	\$ 15,853,659
G0819	200		4.878%	\$ 6,341,463
G0820	200		4.878%	\$ 6,341,463
G0953	600		14.634%	\$ 19,024,390
G0954	350		8.537%	\$ 11,097,561
G0955	350		8.537%	\$ 11,097,561
G0956	400		9.756%	\$ 12,682,927
Total:	4100		100%	\$ 130,000,000



11.17 SPB2: Vantage 500/230 #3 Bank

Table 11.33 SPB2 – Vantage 500/230 #3 Bank Cost Estimate

<i>Estimate Summary</i>									
Estimate #	Description		Quantity	Contract		BPA		Misc.	Total
				Labor	Material	Labor	Material		
	<u>Vantage non-station work</u> (500/230 #3 bank, 230kV yard)		-	-	-	-	-	-	-
ST-070-65-10	500kV Add: 1x bay 2pos BAAH		0.5	\$5,854,000	\$4,807,000	\$905,000	\$0	\$29,000	\$11,595,000
ST-070-141-6	500kV: 1x 525/241 433 MVA bank (1ph)		3	\$24,306,000	\$28,137,000	\$4,176,000	\$6,384,000	\$0	\$63,003,000
ST-070-39-12	230kV New POI: 3x PCB, 3pos, 2x bay BAAH		1	\$18,348,000	\$12,624,000	\$4,830,000	\$0	\$118,000	\$35,920,000
Contingency %	40%		Subtotal:	\$48,508,000	\$45,568,000	\$9,911,000	\$6,384,000	\$147,000	\$110,518,000
Overhead %	Labor	Materials	Contingency:	\$19,403,200	\$18,227,200	\$3,964,400	\$2,553,600	\$58,800	\$44,207,200
	26%	9%	Overhead:	\$17,656,912	\$5,741,568	\$3,607,604	\$804,384	\$18,522	\$27,828,990
Grand Total:	<i>(rounded to two significant figures)</i>			\$86,000,000	\$70,000,000	\$17,000,000	\$9,700,000	\$220,000	\$180,000,000

Table 11.34 SPB2 – Vantage 500/230 #3 Bank Cost Allocation

Queue #	Enabled		Percent Allocation	Cost Allocation
	MW			
G0828	100		8.475%	\$ 15,254,237
G0744	200		16.949%	\$ 30,508,475
G0760	590		50.000%	\$ 90,000,000
G0761	290		24.576%	\$ 44,237,288
Total:	1180		100%	\$ 180,000,000

