

TRANSMISSION PLANNING

GENERATION INTERCONNECTION REPORT

2025 TRANSITION CLUSTER STUDY (TCS)

CLUSTER AREA: SOUTH #1, PHASE 1, Revision 0

25TCS CA-SO1 P1-0 Rev0

G0673	G0695	G1050
G0675	G0887	G1051
G0693	G0888	G1052
G0694	G0900	G1053
G0702	G0901	G1054
G0758	G0826	G1055
G0861	G0841	

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PREPARED BY
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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 level, project location, and requested Commercial Operation Date are also shown.

Cluster Area South 1 (SO1) is in Central and Southern Oregon, comprised of Interconnection Requests (IRs) in Crook, Harney, Jefferson and Lake and counties of Oregon state. SO1 includes 20 total IRs seeking combined 12,930 MW total generation Interconnection Service and total 10,980 MW of grid-charging.

Table 1.1: Participants in 2025 TCS PH1 CA Central Oregon

IR #	Gen Type	Studied POI	MW Requested (Generating)	MW Requested (Charging)	Plant Location (County, State)	Requested COD
G0673	Solar	Bonanza 230 kV	600	0	Crook, OR	4/3/2028
G0675	Pumped Hydro Storage, Biofuel, BESS	Bonanza 230 kV	600	-600	Crook, OR	4/3/2029
G0693	Pumped Hydro Storage, Biofuel, BESS	Bonanza 230 kV	100	-100	Crook, OR	1/1/2027
G0694	Solar, BESS	Bonanza 230 kV	100	-100	Crook, OR	1/1/2027
G0702	Solar, BESS	Bonanza 230 kV	600	-600	Harney, OR	1/1/2027
G0758	Solar, BESS	Bonanza 230 kV	600	-600	Jefferson, OR	1/1/2027
G0861	Wind Turbine	Bonanza 230 kV	500	0	Crook, OR	12/31/2027
G0695	Pumped Hydro Storage, BESS, Biofuel	Bonanza 500 kV	1200	-1200	Crook, OR	1/1/2027
G0887	Solar, BESS	Bonanza 500 kV	200	-200	Crook, OR	12/2/2030
G0888	Solar, BESS	Bonanza 500 kV	200	-200	Crook, OR	12/1/2030
G0900	Solar, BESS	Bonanza 500 kV	200	-200	Crook, OR	12/1/2030
G0901	Solar, BESS	Bonanza 500 kV	200	-200	Crook, OR	12/1/2030
G0826	Solar, BESS	Bonanza-NOB 500 kV	280	-280	Lake, OR	12/31/2027
G0841	Solar, BESS	Bonanza-NOB 500 kV	400	-200	Lake, OR	12/1/2028
G1050	Solar, BESS	Bonanza-NOB 500 kV	650	0	Harney, OR	12/1/2028
G1051	Solar, BESS	Bonanza-NOB 500 kV	1300	-1300	Harney, OR	12/2/2030
G1052	Solar, BESS	Bonanza-NOB 500 kV	1300	-1300	Harney, OR	12/2/2030
G1053	BESS	Bonanza-NOB 500 kV	1300	-1300	Harney, OR	12/1/2031
G1054	BESS	Bonanza-NOB 500 kV	1300	-1300	Lake, OR	12/1/2031
G1055	BESS	Bonanza-NOB 500 kV	1300	-1300	Harney, OR	12/1/2032

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



POI location requirements for each IR are summarized in Table 1.2.

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

Table 1.2: 2025 TCS PH1 CA Central Oregon Requirements

IR #	Studied POI	Total Scope	Total Cost	Contingent Facilities
G0673 G0693 G0694	BNZA 230 kV	1. 1x 230 kV shared gen-tie terminal (shared with senior G0643/G0669)	\$27M	1. Bonanza 230 & 500 kV Plan 2. LaPine Long Range Plan
G0675	BNZA 230 kV	1. 1x 230 kV gen-tie terminal (shared with G702)	\$14M	1. Bonanza 230 & 500 kV Plan 2. LaPine Long Range Plan
G0702		1. 1x 230 kV gen-tie terminal (shared with G675) 2. SPB1: G0657-CPJK 500 kV new line	\$65M	1. Bonanza 230 & 500 kV Plan 2. LaPine Long Range Plan 3. TSEP: North of Grizzly 500 kV 4. BNZA-LAPI #1 500 line 5. LAPI-G657 #2 500 line
G0758	BNZA 230 kV	1. 1x 230 kV gen-tie terminal 2. SPB1: G0657-CPJK 500 kV new line	\$70M	1. Bonanza 230 & 500 kV Plan 2. LaPine Long Range Plan 3. TSEP: North of Grizzly 500 kV 4. BNZA-LAPI #1 500 line 5. LAPI-G657 #2 500 line
G0861	BNZA 230 kV	1. 1x 230 kV gen-tie terminal 2. SPB1: G0657-CPJK 500 kV new line	\$61M	1. Bonanza 230 & 500 kV Plan 2. LaPine Long Range Plan 3. TSEP: North of Grizzly 500 kV 4. BNZA-LAPI #1 500 line 5. LAPI-G657 #2 500 line
G0695	BNZA 500 kV	1. 1x 500 kV gen-tie terminal 2. SPB1: G0657-CPJK 500 kV new line	\$99M	1. Bonanza 230 & 500 kV Plan 2. LaPine Long Range Plan 3. TSEP: North of Grizzly 500 kV 4. BNZA-LAPI #1 500 line 5. LAPI-G657 #2 500 line
G0887 G0888 G0900 G0901	BNZA 500 kV	1. 1x 500 kV shared gen-tie terminal 2. SPB1: G0657-CPJK 500 kV new line	\$112M	1. Bonanza 230 & 500 kV Plan 2. LaPine Long Range Plan 3. TSEP: North of Grizzly 500 kV 4. BNZA-LAPI #1 500 line 5. LAPI-G657 #2 500 line
G0826	BNZA-NOB 500 kV	1. New 500 kV substation, 1x 500 kV gen-tie terminal 2. Single circuit BNZA-NOB 500 kV line	\$845M	1. Bonanza 230 & 500 kV Plan 2. LaPine Long Range Plan
G0841	BNZA-NOB 500 kV	1. New 500 kV substation, 1x 500 kV gen-tie terminal 2. Double circuit BNZA -NOB 500 kV	\$833M	1. Bonanza 230 & 500 kV Plan 2. LaPine Long Range Plan
G1050	BNZA-NOB 500 kV	1. New 500 kV substation, 1x 500 kV gen-tie terminal 2. Double circuit BNZA -NOB 500 kV	\$624M	1. Bonanza 230 & 500 kV Plan 2. LaPine Long Range Plan
G1051	BNZA-NOB 500 kV	1. New 500 kV substation, 1x 500 kV gen-tie terminal 2. Double circuit BNZA -NOB 500 kV	\$649M	1. Bonanza 230 & 500 kV Plan 2. LaPine Long Range Plan 3. TSEP: North of Grizzly 500 kV Project



G1052	BNZA-NOB 500 kV	1. New 500 kV substation, 1x 500 kV gen-tie terminal 2. Double circuit BNZA -NOB 500 kV 3. BNZA -POI #3 500 kV 4. SPB1: G657-CPJK 500 kV new line	\$182M	1. Bonanza 230 & 500 kV Plan 2. LaPine Long Range Plan 3. TSEP: North of Grizzly 500 kV Project 4. BNZA-LAPI #1 500 line 5. LAPI-G657 #2 500 line
G1053	BNZA-NOB 500 kV	1. New 500 kV substation, 1x 500 kV gen-tie terminal 2. Double circuit BNZA -NOB 500 kV 3. BNZA -POI #3 500 kV 4. SPB1: G657-CPJK 500 kV new line	\$154M	1. Bonanza 230 & 500 kV Plan 2. LaPine Long Range Plan 3. TSEP: North of Grizzly 500 kV Project 4. BNZA-LAPI #1 500 line 5. LAPI-G657 #2 500 line
G1054	BNZA-NOB 500 kV	1. New 500 kV substation, 1x 500 kV gen-tie terminal 2. Double circuit BNZA -NOB 500 kV 3. BNZA -POI #3 500 kV 4. SPB1: G657-CPJK 500 kV new line	\$318M	1. Bonanza 230 & 500 kV Plan 2. LaPine Long Range Plan 3. TSEP: North of Grizzly 500 kV Project 4. BNZA-LAPI #1 500 line 5. LAPI-G657 #2 500 line
G1055	BNZA-NOB 500 kV	1. New 500 kV substation, 1x 500 kV gen-tie terminal 2. Double circuit BNZA -NOB 500 kV 3. BNZA -POI #3 500 kV 4. SPB1: G657-CPJK 500 kV new line	\$266M	1. Bonanza 230 & 500 kV Plan 2. LaPine Long Range Plan 3. TSEP: North of Grizzly 500 kV Project 4. BNZA-LAPI #1 500 line 5. LAPI-G657 #2 500 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 (BESS) grid charging. PowerWorld’s ATC Tool is used to conduct these injection limit tests.



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

The TCS PH1 assumes all Generating Facilities 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 4.2: Senior Queued IRs Assumed In-Service

Queue #	POI (owner)	MW Generating	MW Grid-Charging	Fuel Type
G0345	Boyd Hill 230 kV (Big Eddy-Maupin 230 kV)	201	0	Wind
G0501	Captain Jack 500 kV (BPA)	1100	0	PV
G0527	Fort Rock 115 kV; LaPine 115 kV (BPA)	105	0	PV
G0537	Brasada-Harney 115 kV line tap (BPA)	20	0	PV
G0539	Ponderosa 230 kV (BPA)	600	0	PV
G0570	Fort Rock 115 kV; LaPine 115 kV (BPA)	20	0	PV
G0571	Fort Rock 115 kV; LaPine 115 kV (BPA)	20	0	PV
G0572	Fort Rock 115 kV; LaPine 115 kV (BPA)	20	0	PV
G0640	Captain Jack 500 kV (BPA)	238	0	Wind
G0642	Ponderosa 230 (BPA)	600	0	BESS
G0643	Ponderosa 230 kV (430MW) & Bonanza 230 kV (170MW) (BPA)	600	-600	BESS
G0648	Captain Jack 500 kV (BPA)	0	-300	BESS
G0651	Fort Rock 500 kV (BPA)	400	0	PV
G0654	LaPine-Fort Rock 115 kV; LaPine 115 kV (BPA)	170	0	PV
G0655	LaPine-Fort Rock 115 kV; LaPine 115 kV (BPA)	200	0	PV
G0657	Lapine-Chiloquin #1 230 kV (BPA)	500	-500	PV + BESS
G0669	Bonanza 230 kV (BPA)	600	0	PV
G0722	Harney - Brasada 115 kV line (BPA)	75	0	PV
TCS-44	Ponderosa 115 substation (PAC)	80	0	PV + BESS
QF19-081	Round Butte 500 kV (PGE)	53	0	PV
TCS-53	Ponderosa 115 substation (PAC)	20	0	PV
TCS-54	Ponderosa 115 substation (PAC)	40	0	PV + BESS
21-098	Round Butte 500 kV (PGE)	250	0	PV + BESS
C3-035	CIO bus (PAC)	200	0	PV + BESS
C1-46	CIO bus (PAC)	198.75	0	PV + BESS
C3-041	Summer Lake 500 kV (PAC)	400	0	PV + BESS



Queue #	POI (owner)	MW Generating	MW Grid-Charging	Fuel Type
22-109	Round Butte 500 kV (PGE)	400	0	PV + BESS
C2-170	Summer Lake 500 kV (PAC)	199	0	BESS
C2-171	Summer Lake 500 kV (PAC)	199	0	BESS
C2-173	Summer Lake 500 kV (PAC)	199	0	PV + BESS
C2-180	Summer Lake 500 kV (PAC)	80	0	PV + BESS
C2-181	Summer Lake 500 kV (PAC)	80	0	PV + BESS
C2-182	Summer Lake 500 kV (PAC)	320	0	PV + BESS
C2-187	Summer Lake 500 kV (PAC)	320	0	PV + BESS
C2-208	Summer Lake 500 kV (PAC)	320	0	PV + BESS
C2-210	Summer Lake 500 kV (PAC)	80	0	PV + BESS
C2-04	Snow Goose 230 substation (PAC)	199.9	0	BESS
C2-140	Klamath Falls-Yamsay 230 kV line (PAC)	199	0	PV + BESS
C2-203	Klamath CoGen-Meridian 500 kV line (PAC)	400	0	PV + BESS
23-230	Round Butte 500 kV (PGE)	500	0	PV + BESS
C3-080	Corral 500 kV (PAC)	19.9	0	PV + BESS
C3-008	Corral 500 kV (PAC)	199.9	0	BESS
C1-44	Summer Lake 500 kV (PAC)	400	0	PV + BESS
C3-062	Corral 500 kV (PAC)	199	0	PV + BESS
C2-152	Summer Lake 500 kV (PAC)	320	0	PV + BESS
C3-081	Corral 500 kV (PAC)	19.9	0	PV
C3-011	Summer Lake 500 kV (PAC)	199.9	0	BESS
C2-09	Ponderosa 115 substation (PAC)	80	0	PV + BESS
C2-114	Corral 500 kV (PAC)	199	0	PV + BESS
C2-117	Corral 500 kV (PAC)	199	0	PV + BESS
C2-158	Corral 500 kV (PAC)	199	0	PV + BESS
C2-178	Corral 500 kV (PAC)	199	0	BESS
23-233	Round Butte 500 kV (PGE)	400	0	PV + BESS
23-234	Round Butte 500 kV (PGE)	400	0	PV + BESS
24-240	Round Butte 500 kV (PGE)	80	0	PV + BESS

Table 4.3: New Loads Assumed In-Service

Queue #	POI (owner)	MW Load
L0393	LaPine 115 kV Bus (BPA)	100
L0422	Ponderosa 230 kV (BPA)	220
L0448	PAC system near BPA Ponderosa (BPA)	120
L0513	Thielsen (BPA)	24
L0538	Harney-Brasada 115 kV line (BPA)	25
L0543	Bonanza 230 kV (BPA)	300
L0588	Bonanza 115 kV (BPA)	50
L0589	Bonanza 115 kV (BPA)	23

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

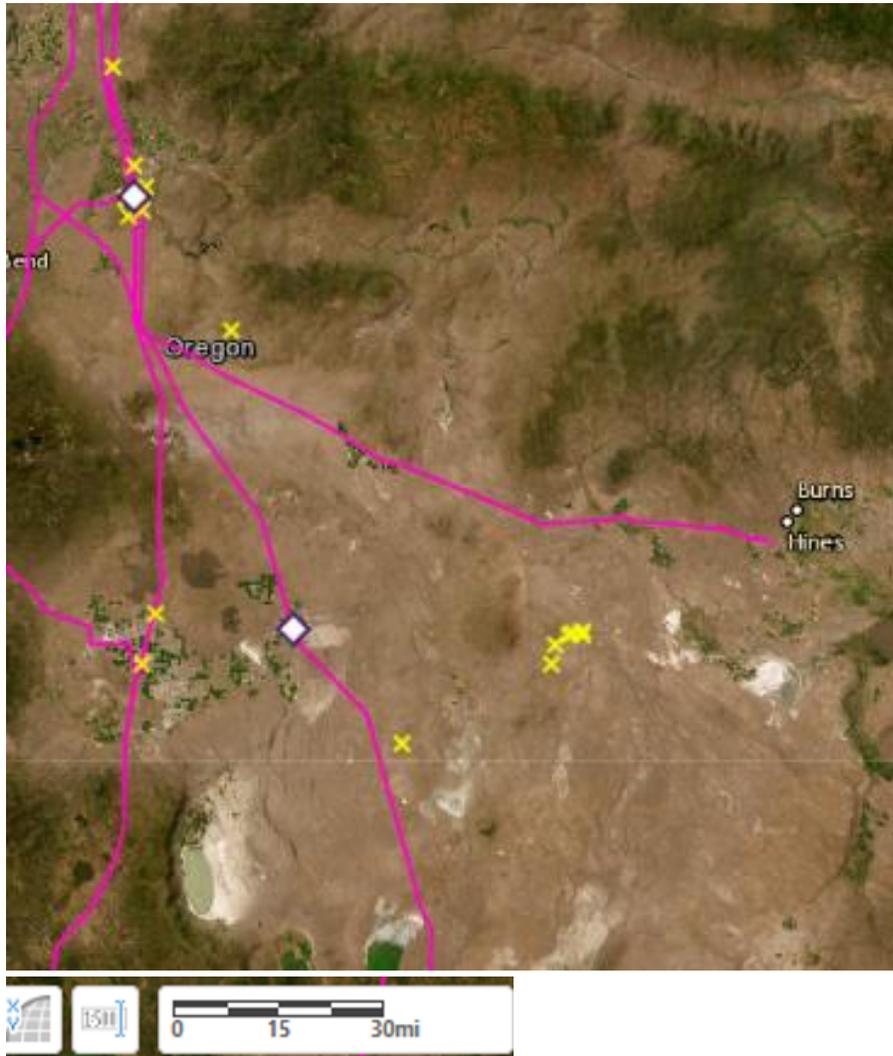


5 Study Methodology

5.1 Cluster Area Definition

The following maps illustrates the geographic coordinates for the IRs assessed in Cluster Area South 1.

Figure 1: Plant Coordinates (yellow) and POI locations (white)



5.2 Studied POIs

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

For requests in Harney and Lake county, the nearest BPA facility is the Pacific DC Intertie (PDCI) line. However, the PDCI is not feasible for interconnections. Therefore, requests in those counties are assumed to have a POI on the proposed Bonanza to Nevada-Oregon-Border (NOB) 500 kV line.

Table 5.2: Studied POI locations

IR #	Gen Type	MW Requested (Generating)	MW Requested (Charging)	Studied POI
G0673	Solar, BESS	600	0	Bonanza 230 kV
G0675	Battery, Biofuel, Pumped-Storage Hydro	600	-600	Bonanza 230 kV
G0693	Battery, Biofuel, Pumped-Storage Hydro	100	-100	Bonanza 230 kV
G0694	Solar, BESS	100	-100	Bonanza 230 kV
G0702	Solar, BESS	600	-600	Bonanza 230 kV
G0758	Solar, BESS	600	-600	Bonanza 230 kV
G0861	Wind Turbine	500	0	Bonanza 230 kV
G0695	Battery, Biofuel, Pumped-Storage Hydro	1200	-1200	Bonanza 500 kV
G0887	Solar, BESS	200	-200	Bonanza 500 kV
G0888	Solar, BESS	200	-200	Bonanza 500 kV
G0900	Solar, BESS	200	-200	Bonanza 500 kV
G0901	Solar, BESS	200	-200	Bonanza 500 kV
G0826	Solar, BESS	280	-280	Bonanza-NOB 500 kV
G0841	Solar, BESS	400	-200	Bonanza-NOB 500 kV
G1050	Solar, BESS	650	0	Bonanza-NOB 500 kV
G1051	Solar, BESS	1300	-1300	Bonanza-NOB 500 kV
G1052	Solar, BESS	1300	-1300	Bonanza-NOB 500 kV
G1053	BESS	1300	-1300	Bonanza-NOB 500 kV
G1054	BESS	1300	-1300	Bonanza-NOB 500 kV
G1055	BESS	1300	-1300	Bonanza-NOB 500 kV

5.3 Starting Base Cases

Following WECC Cases were used for CA South 1.

- 2026HS
- 2034HS

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

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



- Bonanza 500 kV and 230 kV Substation (BPA)
- LaPine Long Range Plan (BPA)
- Bonanza-LaPine #1 500 kV line
 - Construction will be to BPA 500 kV conductor and tower design specifications. Initial operation will be 230 kV.
 - Conversion to 500 kV operation will occur once a LaPine 500 kV Annex station is available to re-terminate. For purposes of this study, line is modeled as 500 kV connection between Bonanza and LaPine.
- Pilot Butte-Lapine 230 kV rebuild
- New LaPine-G0657POI #2 500 kV line

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 Topology Sensitivity Descriptions

Sensitivity studies with and without Contingent Facilities and proposed interconnection plans of service were performed to confirm those facilities are required.

- With and without Lapine 500 kV Annex substation (TCS PH1 requirement – Cluster Area South 2) and Bonanza-Lapine 500 kV Annex #1 transmission line (Contingent Facility)
- With and without G0657-Captain Jack 500 kV Annex transmission line (TCS PH1 requirement – Cluster Areas South 1 and South 2)
- With and without Bonanza-NOB 500 kV transmission lines (TCS PH1 requirement – Cluster Area South 1)
- With and without Bonanza-Grizzly #4 and Grizzly-Big Eddy 500 kV transmission lines (TSEP Contingent Facilities)

5.4 Phase 1 POI Injection Tests

Steady state contingency analysis was conducted at each POI increasing total generating or grid-charging amounts until a reliability limit was reached. The assumed source/sink pairs for these injection tests were as follows:

- Area 30 (PG&E) or BPA Upper Columbia generation were used to balance the MWs injected by generation or charging at Bonanza or Bonanza-NOB POIs.

Detailed findings of these injection tests can be found in the Results Section.

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.

Bonanza POI passed BPA's SCR strength test. This means that no plan of service elements are driven by the SCR for that POI.

Bonanza-NOB 500 kV POI fails the SCR tests for injections greater than 500 MW. To address this, additional transmission circuits to the POI are required as described in Section 7.



6 Contingent Facilities Assumed In-Service

6.1 Bonanza and Bonanza-NOB POIs

The following projects are assumed in-service for Bonanza and Bonanza-NOB POIs. They are deemed Contingent Facilities for this study and are required to be energized prior to IRs at Bonanza POI and Bonanza-NOB POI taking Interconnection Service.

Table 6.1: Bonanza POI and Bonanza-NOB POI Contingent Facilities

Project Name	Required POIs	Driver	Estimated Cost	Estimated I/S Date
customer Substations and gen-tie to BNZA 230	BONZ 230	G0643, G0669	N/A	N/A
Bonanza substation	BONZ 230, BONZ 500, BONZ-NOB 500	TSEP, LLIRs, Senior IRs	\$548M ¹	2033
Bonanza-LaPine #1 500 kV transmission line	BONZ 230, BONZ 500, BONZ-NOB 500	LLIRs, Senior IRs	\$150 ¹	2033
LaPine Long Range Plan	BONZ 230, BONZ 500, BONZ-NOB 500	TSEP, LLIRs, senior IRs	\$67M	2032
Mid-Oregon RAS Algorithm	BONZ 230, BONZ 500, BONZ-NOB 500	Senior IRs	N/A	N/A
LaPine-G0657 POI #2 transmission line (46mi)	BONZ 230, BONZ 500, BONZ-NOB 500	Senior IRs	\$300M ²	2035 ³
Pilot Butte – LaPine 230 kV #1 rebuild	BONZ 230, BONZ 500, BONZ-NOB 500	Senior IRs	\$83M ²	2035 ³
2023 TSEP: North of Grizzly (NOG) 500 kV <ul style="list-style-type: none"> • New BGED-GRIZ #1 500 kV line (99mi) • New GRIZ-BNZA #4 500 kV line (18mi) 	BONZ 230, BONZ 500, BONZ-NOB 500	TSEP	N/A ³	N/A ³

1. Scoping is ongoing for Bonanza and Bonanza-LaPine projects, and their estimates will be refined as scoping continues.
2. Estimates driven by the BPA interconnection request G657 are typical estimates.
3. Project design has not initiated. These dates are tentative.

The Bonanza Substation project is a 500/230 kV substation planned near the existing Ponderosa substation. It is required for many generator and load interconnections as well as transmission service requests in the Central Oregon area. Two 500/230 kV transformers are planned, and the substation will loop in two major 500 kV transmission lines in Central Oregon.

The Bonanza-LaPine #1 transmission line is to be constructed to a 500 kV design specification but initially operated at 230 kV. The line is approximately 50 miles in length. Several previous interconnections, both generation and load, require this project prior to energization. The LaPine Long Range Plan includes adding a 230/115 kV transformer, bus-sectionalizing breakers and shunt reactive devices to LaPine substation. These upgrades improve voltage performance and reduce the severity of some of the worst contingencies in the local area.



The Pilot Butte – LaPine #1 rebuild is a project to rebuild the existing transmission line to the highest capacity available BPA 230 kV standard conductor. The transmission line is approximately 30 miles long.

The LaPine-G0657 POI #2 transmission line is to be constructed to a 500 kV design specification but operated at 230 kV until the need arises. The transmission line will be approximately 46 miles in length.

The Mid-Oregon RAS is a local RAS involving generation in the Central Oregon Area.

TSEP North of Grizzly (NOG) 500 kV project is required for BPA TSRs between the Lower Columbia and South Cluster Areas and is comprised of the following new lines: Big Eddy-Grizzly 500 kV and Grizzly-Bonanza 500 kV. The project is still in pre-scoping. Estimated costs and schedule are not available at this time.

7 Technical Analysis & Study Results

7.1 Bonanza 500 kV and 230 kV POIs

TCS System Performance

Table 7.1: Results for Bonanza 500 kV and 230 kV POIs

POI MW Threshold	Affected IRs	Limiters (Element or Contingency)	Mitigation
0 to 1699	G0673, G0675, G0693, G0694, G0695 (Partial)	None	N/A
1700 to 2599	G0695 (Partial), G0702, G0758, G0861, G0887, G0888, G0900, G0901	Grizzly-Captain Jack 500 kV (TPL-001 P6)	Contingent Facility (Bonanza-LaPine #1 500 kV) Contingent Facility (LaPine-G657 #2 230 kV) SPB: New G657-Captain Jack 500 kV Annex line
2600 to 5100	G0702, G0758, G0861, G0887, G0888, G0900, G0901	John Day-Grizzly #1 and #2 500 kV (TPL-001 P6)	Contingent Facility (2023 TSEP NOG 500 kV)
-1200 to 0	G0673, G0675, G0693, G0694, G0695, G0702, G0758, G0861, G0887, G0888, G0900, G0901	Same as above thresholds for generation in opposite direction	Participation in new BPA AC-RAS Algorithms
- 1201 to -4000	G0695, G0702, G0758, G0861, G0887, G0888, G0900, G0901	Same as above thresholds for generation in opposite direction	Same as above thresholds for generating in opposite direction

Proposed Mitigations

The first 1700 MW of requests can be enabled without any new reinforcements. The first limit of 1701 MW is a result of a multiple element outage (NERC TPL-001 P6) causing BPA’s Grizzly – Captain Jack 500 kV line sections to overload beyond its rating. The proposed mitigation to address this overload includes the contingent facilities Bonanza 500 kV substation, Bonanza-LaPine #1 500 kV line, and LaPine-G0657POI #1 500 kV line; and a new G0657POI-Captain Jack 500 kV Annex transmission line. These upgrades are electrically parallel to the limiting element, offloading it during limiting contingencies:



- Contingent Facility: Lapine 500 kV Annex substation in breaker-and-a half configuration with three bays.
- Contingent Facility: Rebuilding Bonanza-LaPine #1 500 kV (50mi)
- Contingent Facility: New LaPine-G0657 POI #2 500 kV (46mi)
- New TCS Project: G0657-Captain Jack 500 kV Annex line (86mi)

The two subsequent limits of 2600 MW and 3220 MW are a result of a multiple element outage (NERC TPL-001 P6) causing BPA’s John Day-Grizzly #1 and #2 500 kV lines overload. The proposed mitigation to address these overloads is the Contingent Facility TSEP North of Grizzly 500 kV project: new Bonanza-Grizzly #1 500 kV (18 miles) and Grizzly-Big Eddy 500 kV (95 miles) transmission lines.

Participation in new BPA AC-RAS will be required for any grid charging between 0 and 1200 MW. Beyond 1200 MW, the same upgrades prescribed for generation are required for commensurate absolute MW amounts of grid-charging.

7.2 Bonanza-NOB POI

TCS System Performance

Table 7.2: Results for Bonanza-NOB POI

POI MW Threshold	Affected IRs	Limiters (Element or Contingency)	Mitigation
0	G0826, G0841, G1050, G1051, G1052, G1053, G1054, G1055	N/A	New BONZ-POI #1 500 kV line, New POI-NOB #1 500 kV line, New midline POI station
1 to 500	G0841 (partial), G1050, G1051, G1052, G1053, G1054, G1055	SCR strength < 3.0	New BONZ-POI #2 500 kV line and New POI-NOB #2 500 kV line
501 to 2000	G1051, G1052, G1053, G1054, G1055.	Grizzly-Captain Jack 500 kV (TPL-001 P6)	Contingent Facility (Bonanza-LaPine #1 500 kV) Contingent Facility (LaPine-G0657 #2 230 kV) SPB: New G0657-Captain Jack 500 kV Annex line
2001 to 2800	G1051, G1052, G1053, G1054, G1055	Grizzly-John Day # 2 500 kV (TPL-001 P6)	Contingent Facility (2023 TSEP NOG 500 kV)
2801 to 7830	G1053, G1054, G1055	SCR strength < 3.0, Bonanza-POI # 2 500 kV (TPL-001 P1)	New BONZ-POI #3 500 kV line
0 to -1200	G0826, G0841, G1050, G1051, G1052, G1053, G1054, G1055	Same as above thresholds for generation, in opposite direction	Participation in new BPA AC-RAS Algorithms
-1201 to -7630	G0826, G0841, G1050, G1051, G1052, G1053, G1054, G1055	Same as above thresholds for generation, in opposite direction	Same as above Thresholds for generating in opposite direction



Proposed Mitigations

The two 500 kV circuits to Bonanza and NOB stations are required to energize the new POI station.

The first limit of 500 MW occurs due to failed Short Circuit Ratio (SCR) strength test. The proposed mitigation is to construct another Bonanza-NOB #2 500 kV circuit in parallel.

The second limit of 2000 MW is a result of a multiple elements (P6) outage causing BPA's Grizzly – Captain Jack 500 kV line sections overload beyond their rating. The proposed mitigation to address this overload includes the contingent facilities Bonanza 500 kV substation, Bonanza-LaPine #1 500 kV line, and LaPine-G0657POI #2 500 kV line; and a new G0657POI-Captain Jack 500 kV Annex transmission line. These upgrades are electrically parallel to the limiting element, offloading it during limiting contingencies:

- Contingent Facility: Lapine 500 kV Annex substation in breaker-and-a half configuration with three bays.
- Contingent Facility: Bonanza-LaPine #1 500 kV line (50mi)
- Contingent Facility: New LaPine-G0657 POI #2 500 kV line (46mi)
- New TCS Project: G0657-Captain Jack 500 kV Annex (85mi)

The third limit of 2800 MW is a result of a multiple elements (P6) outage causing BPA's John Day-Grizzly #2 500 kV line overload beyond its rating. The proposed mitigation to address these overloads is the Contingent Facility TSEP North of Grizzly 500 kV project: new Bonanza-Grizzly #1 500 kV (18 miles) and Grizzly-Big Eddy 500 kV (95 miles) transmission lines.

The fourth limit of 5000 MW is a result of a single elements (P1) outage causing BPA's Bonanza-POI #2 500 kV line to overload beyond its rating and further exceed short circuit strength allowances. The proposed mitigation is to construct another Bonanza-NOB #3 500 kV (66 miles) circuit.

Participation in new BPA AC-RAS will be required for any grid charging between 0 and 1200 MW. Beyond 1200 MW, the same upgrades prescribed for generation are required for commensurate absolute MW amounts of grid-charging.



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	POIs
PAC	Bonanza 500 kV, Captain Jack Annex 500 kV	Bonanza 500 kV, Bonanza-NOB 500 kV
PGE	Bonanza 500 kV, Captain Jack Annex 500 kV	Bonanza 500 kV, Bonanza-NOB 500 kV



9 Interconnection Requirements

9.1 Bonanza POI

Table 9.1: Bonanza POI Facility requirements

G#	BPA Station Work	BPA Non-Station Work
G0673, G0693, G0694	None (G0643/G0669 shared gen-tie terminal)	Participation in BPA AC-RAS
G0675, G0702	1x 230 kV shared gen-tie Terminal	Participation in BPA AC-RAS
G0758	1x 230 kV gen-tie Terminal	1. SPB1: New G0657-CPJK 500 kV line (85mi) 2. Participation in BPA AC-RAS
G0861	1x 230 kV gen-tie Terminal	1. SPB1: New G0657-CPJK 500 kV line (85mi) 2. Participation in BPA AC-RAS
G0695	1x 500 kV gen-tie Terminal	1. SPB1: New G0657-CPJK 500 kV line (85mi) 2. Participation in BPA AC-RAS
G0887, G0888, G0900, G0901	1x 500 kV shared gen-tie Terminal	1. SPB1: New G0657-CPJK 500 kV line (85mi) 2. Participation in BPA AC-RAS

1. Install five 230 kV breakers in Bonanza 230 kV yard, 9 disconnect switches, and associated control, relaying, and communications equipment.
 - a. one PCB in bay 1
 - b. one PCB in bay 2
 - c. one PCB in bay 4
 - d. two PCBs in bay 7
2. Install two 500 kV breakers in Bonanza 500 kV yard, 2 disconnect switches, and associated control, relaying, and communications equipment.
 - a. One PCB in Bay 7
 - b. One PCB in Bay 9
3. Construct a new 500 kV transmission line between the G0657 POI substation and Captain Jack Annex substation approximately 85 miles long. This requirement is shared with BNZA-NOB POI substation IRs and others in CA South 2.
4. Construct 3 series capacitors and connect them into the Bonanza-LaPine Annex #1 (contingent facility), LaPine Annex-G0657 POI #1 (contingent facility), and G0657 POI-Captain Jack Annex #1 500 kV transmission lines. Location and specifications to be determined. This requirement is shared with BNZA-NOB POI substation IRs and others in CA South 2.
5. Participation in new and existing BPA AC-RAS algorithms near Bonanza, Grizzly and Captain Jack
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.
8. The Bonanza battery energy storage system must be grid-forming to meet the SCR requirement and per STD-N-000001-00-10. The customer is responsible for procuring the grid-forming BESS, and the costs and schedule for the grid-forming BESS are not included in cost and schedule estimates in this report.



The customers will construct 230 kV and 500 kV lines from the BPA POI station to their generation facilities. The customers will construct their generation facilities. Communications and relaying will be coordinated with BPA.

9.2 Bonanza-NOB POI

Table 9.2: Bonanza-NOB POI Facility requirements

G#	BPA Station Work	BPA Non-Station Work
G0826	New 500 kV station, 1x 500 kV terminal	1. Bonanza-POI 500 kV #1 line (66 miles single circuit) with new Bonanza Series capacitors 2. POI-NOB 500 kV #1 line (99 miles single circuit) with new NOB station series capacitors 4. Participation in BPA AC-RAS
G0841	New 500 kV station, 1x 500 kV terminal	1. Bonanza-POI 500 kV #1 line (66 miles single circuit) with new Bonanza Series capacitors 2. POI-NOB 500 kV #1 line (99 miles single circuit) with new NOB station series capacitors 3. SPB1 New G0657-CPJK 500 kV line (85mi) 4. Participation in BPA AC-RAS
G1050	New 500 kV station, 1x 500 kV terminal	
G1051	New 500 kV station, 1x 500 kV terminal	
G1052	New 500 kV station, 1x 500 kV terminal	
G1053	New 500 kV station, 1x 500 kV terminal	
G1054	New 500 kV station, 1x 500 kV terminal	
G1055	New 500 kV station, 1x 500 kV terminal	
G0841, G1050, G1051, G1052, G1053, G1054, G1055.	N/A (see above)	1. Bonanza-POI 500 kV #2 line (66 miles second circuit) with new Bonanza Series capacitors 2. POI-NOB 500 kV #2 line (99 miles second circuit) with new NOB station series capacitors.
G1053, G1054, G1055.	N/A (see above)	1. Bonanza-POI 500 kV #3 line (66 miles third circuit) with new Bonanza Series capacitors

G0826 is the only IR at the POI that fits under the 500 MW POI limit created by Single circuit connections from BONZ-POI 500 kV and POI-NOB 500 kV. All other IRs will require the second set of 500 kV circuits from BONZ-POI and POI-NOB.

1. Construct new seven-bay 500 kV substation in a breaker-and-half configuration. The substation will include twenty 500 kV breakers, 40 disconnect switches, and associated control, relaying, and communications equipment.
2. Construct 165 miles of double circuit 500 kV transmission line from Bonanza to POI to NOB and 66 miles of single circuit #3 500 kV transmission line from Bonanza to POI. The choice of conductor for the new line shall ensure capacity of at least 4550 MVA; 3-ACSR Deschutes or other equivalents conductor.
3. Construct five series capacitors:
 - a. Three at Bonanza end rated 2000 Amps and 460 MVAR and
 - b. Two at NOB end 2000 Amps and 460 MVAR.
4. Construct a new 500 kV transmission line between G657 POI substation and Captain Jack Annex substation approximately 85 miles long. This requirement is shared with BNZA-NOB POI substation IRs and others outside this report.
5. Construct 3 series capacitors and connect them into the Bonanza-LaPine Annex #1 (contingent facility), LaPine Annex-G0657 POI #1 (contingent facility), and G657 POI-Captain Jack Annex #1 transmission lines. Location and specifications to be determined. This requirement is shared with BNZA-NOB POI substation IRs and others outside this report.



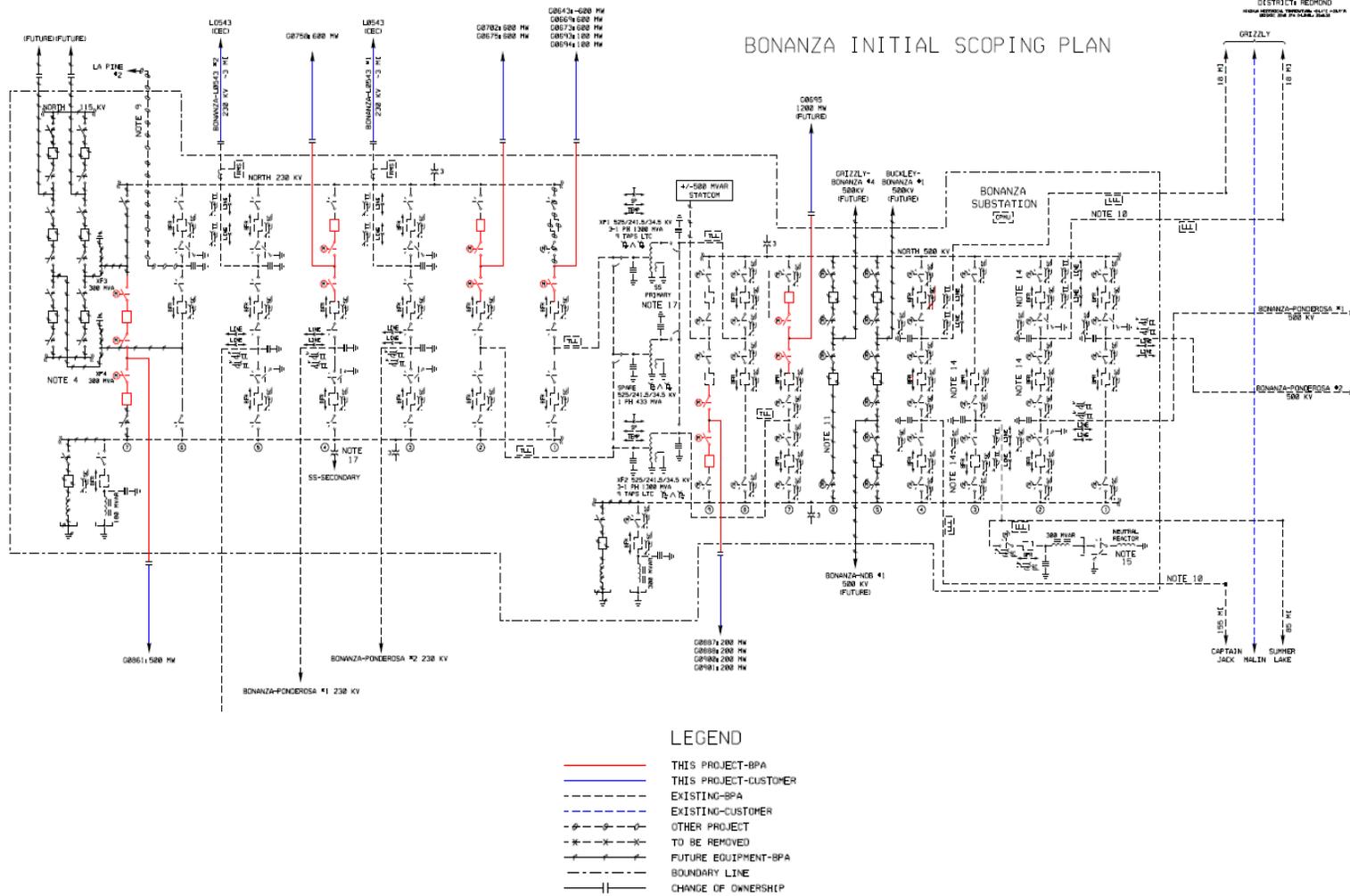
6. Participation in New and Existing BPA AC-RAS algorithms near Bonanza, Grizzly and Captain Jack
7. Installation of BPA-required C&C equipment at each customer's collector site (RAS, Meters, relays, Control House space).
8. Significant Development of C&C hardware at BPA's POI substation.
9. The Bonanza POI battery energy storage system must be grid-forming to meet the SCR requirement and per STD-N-000001-00-10. The customer is responsible for procuring the grid-forming BESS, and the costs and schedule for the grid-forming BESS are not included in cost and schedule estimates in this report.

The customers will construct 500 kV lines from the BPA POI station to their generation facilities. The customers will construct their generation facilities. Communications and relaying will be coordinated with BPA.



10 Project One-Line Drawings

10.1 Bonanza POI One Line



10.2 Bonanza-NOB POI One Line

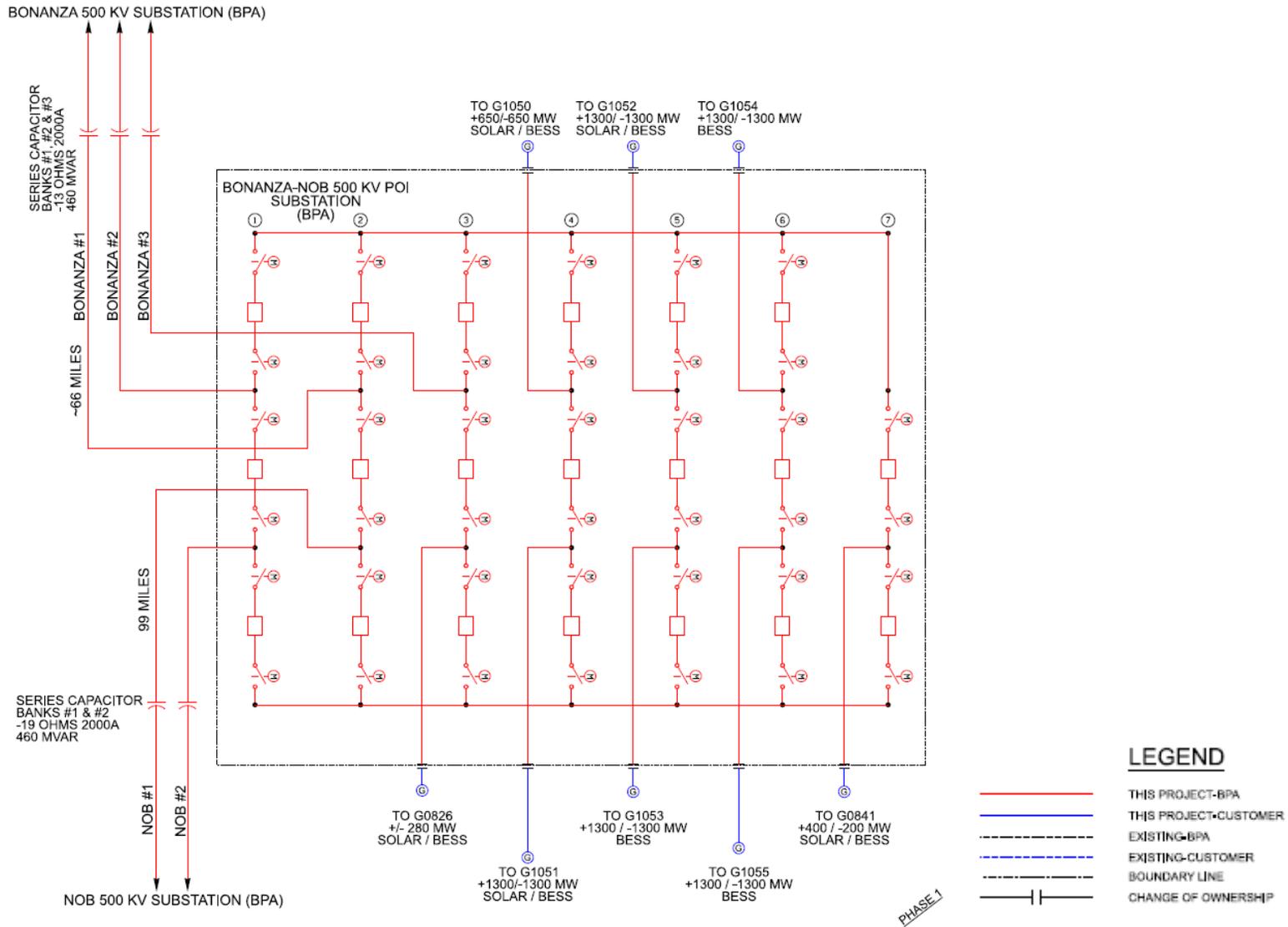
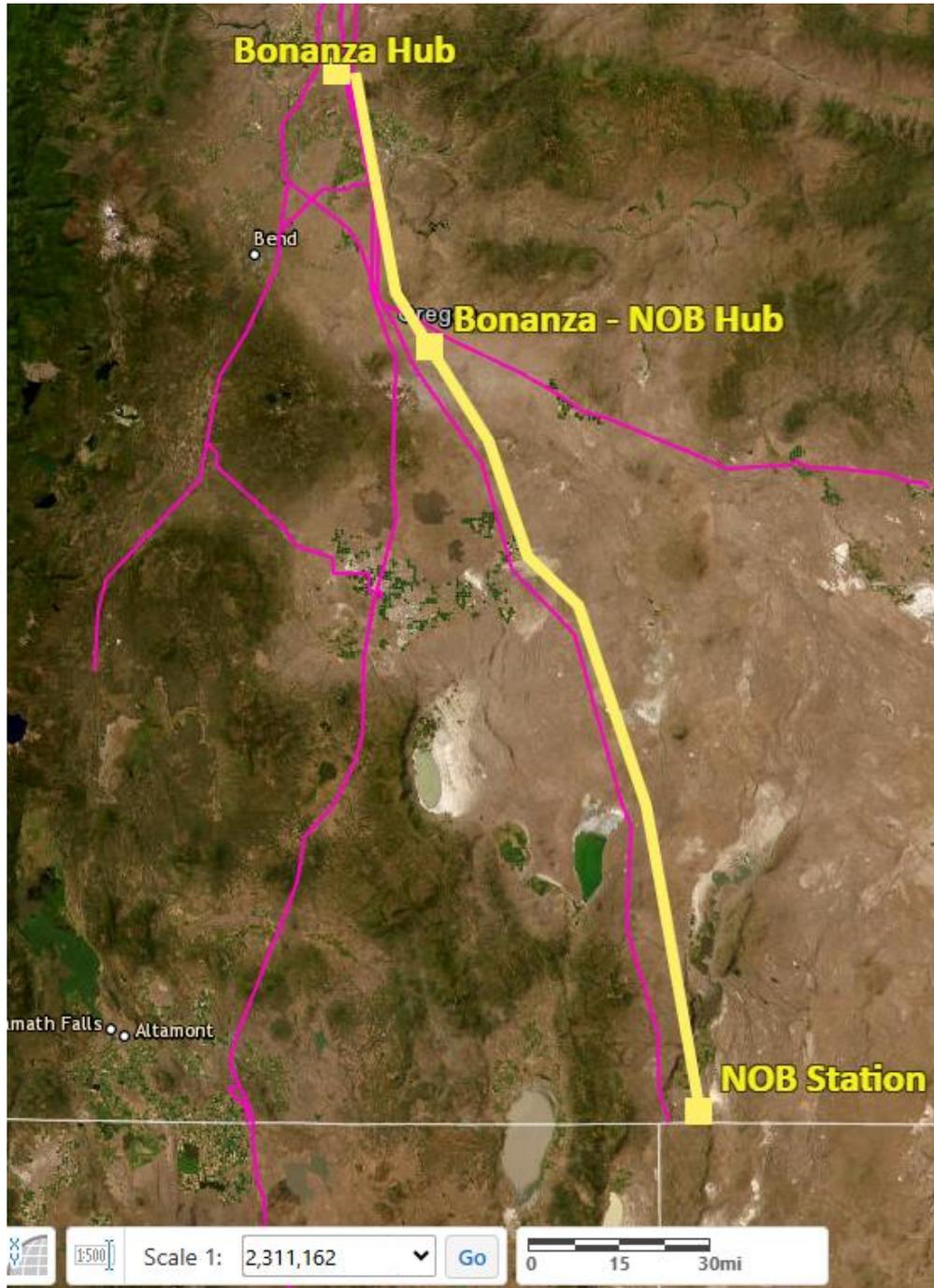


Figure 10.2: Estimated route for BZNA-POI-NOB 500 kV circuits



11 Costs and Schedules

11.1 Estimated Schedule

The schedule is dependent on,

- 1) The acquisition of long lead time equipment,
- 2) BPA 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-TS POI substation will be determined in an Interconnection Facilities Study. The TCS PH1 estimates C&C equipment scope and costs based on whether required upgrades fall into the following categories:

- 1) customer Station (\$5M): for BPA-required C&C equipment at 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: Bonanza 500

Table 11.1 POI 1 – Bonanza 500 kV Station Cost Estimate

Estimate Summary								
Estimate #	Description	Quantity	Contract		BPA		Misc.	Total
			Labor	Material	Labor	Material		
	Bonanza 500kV POI	-	-	-	-	-	-	-
ST-070-52-10	500kV Add: 1x PCB	2	\$3,876,000	\$3,216,000	\$964,000	\$0	\$20,000	\$8,076,000
C&C: Customer Site	C&C Placeholder per collector site	5	\$0	\$0	\$0	\$0	\$25,000,000	\$25,000,000
Contingency %	40%	Subtotal:	\$3,876,000	\$3,216,000	\$964,000	\$0	\$25,020,000	\$33,076,000
Overhead %	Labor	Contingency:	\$1,550,400	\$1,286,400	\$385,600	\$0	\$10,008,000	\$13,230,400
	Materials & Turnkey	Overhead:	\$488,376	\$1,170,624	\$350,896	\$0	\$9,107,280	\$11,117,176
Grand Total:	<i>(rounded to two significant figures)</i>		\$5,900,000	\$5,700,000	\$1,700,000	\$0	\$44,000,000	\$57,000,000

Table 11.2 POI 1 – Bonanza 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
G0695	1200	Bonanza 500kV Substation Expansion w/ Expanded Comms	50.00%	\$12M	SPB1: New G657-CPJK 500kV Line	9.89%	\$850M	Collector Station C&C and RAS	\$9M	\$99M
G0887	200		50.00%			2.20%		Collector Station C&C and RAS	\$9M	\$34M
G0888	200		0.00%			2.20%		Collector Station C&C and RAS	\$9M	\$28M
G0900	200		0.00%			2.20%		Collector Station C&C and RAS	\$9M	\$28M
G0901	200		0.00%			2.20%		Collector Station C&C and RAS	\$9M	\$28M



11.4 POI 2: Bonanza 230

Table 11.3 POI 2 – Bonanza 230 kV Station Cost Estimate

Estimate Summary								
Estimate #	Description	Quantity	Contract		BPA		Misc.	Total
			Labor	Material	Labor	Material		
	Bonanza 230kV POI	-	-	-	-	-	-	-
ST-070-53-12	230kV Add: 1x PCB	5	\$5,490,000	\$3,140,000	\$1,350,000	\$30,000	\$0	\$10,010,000
C&C: Customer Site	C&C Placeholder per collector site	7	\$0	\$0	\$0	\$0	\$35,000,000	\$35,000,000
Contingency %	40%	Subtotal:	\$5,490,000	\$3,140,000	\$1,350,000	\$30,000	\$35,000,000	\$45,010,000
Overhead %	Labor Materials & Turnkey	Contingency:	\$2,196,000	\$1,256,000	\$540,000	\$12,000	\$14,000,000	\$18,004,000
	26% 9%	Overhead:	\$691,740	\$1,142,960	\$491,400	\$3,780	\$12,740,000	\$15,069,880
Grand Total:	<i>(rounded to two significant figures)</i>		\$8,400,000	\$5,500,000	\$2,400,000	\$46,000	\$62,000,000	\$78,000,000

Table 11.4 POI 2 – Bonanza 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
G0673	600	Bonanza 230kV Substation Expansion w/ Expanded Comms	0.00%	\$15M	SPB1: New G657-CPJK 500kV Line	0.00%	\$850M	Collector Station C&C and RAS	\$9M	\$9M
G0675	600		33.33%			0.00%		Collector Station C&C and RAS	\$9M	\$14M
G0693	100		0.00%			0.00%		Collector Station C&C and RAS	\$9M	\$9M
G0694	100		0.00%			0.00%		Collector Station C&C and RAS	\$9M	\$9M
G0702	600		0.00%			6.70%		Collector Station C&C and RAS	\$9M	\$66M
G0758	600		33.33%			6.70%		Collector Station C&C and RAS	\$9M	\$71M
G0861	500		33.33%			5.59%		Collector Station C&C and RAS	\$9M	\$61M



11.5 POI 3: Bonanza-NOB 500 kV

Table 11.5 POI 3 – Bonanza-NOB 500 kV New POI Station Cost Estimate

Estimate Summary		Station Costs						
Estimate #	Description	Quantity	Contract		BPA		Misc.	Total
			Labor	Material	Labor	Material		
	Bonanza-NOB 500 kV POI	-	-	-	-	-	-	-
ST-070-133-7	500kV New POI: 4x PCB, 3pos, 2x bay BAAH	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 (@POI)	2	\$23,416,000	\$19,228,000	\$3,620,000	\$0	\$116,000	\$46,380,000
C&C	C&C Collector Site Placeholder	8	\$0	\$0	\$0	\$0	\$40,000,000	\$40,000,000
C&C	C&C BPA Site Placeholder	1	\$0	\$0	\$0	\$0	\$15,000,000	\$15,000,000
Contingency %	40%	Subtotal:	\$67,928,000	\$66,070,000	\$9,310,000	\$816,000	\$55,116,000	\$199,240,000
Overhead %	Labor 26% Materials & Turnkey 9%	Contingency:	\$0	\$0	\$0	\$0	\$22,000,000	\$22,000,000
		Overhead:	\$6,113,520	\$5,946,300	\$2,420,600	\$73,440	\$20,050,160	\$34,604,020
Grand Total:	<i>(rounded to two significant figures)</i>		\$74,000,000	\$72,000,000	\$12,000,000	\$890,000	\$97,000,000	\$260,000,000

Table 11.6 POI 3 – SPB: BONZ-POI-NOB #1 500 kV Line Non-Station Cost Estimate

Estimate Summary		Non-Station Costs						
Estimate #	Description	Quantity	Contract		BPA		Misc.	Total
			Labor	Material	Labor	Material		
	Bonanza-NOB 500 kV POI	-	-	-	-	-	-	-
ST-070-65-10	500kV Add: 1x bay 2pos BAAH (@BNZA, @POI, and @NOB)	2	\$23,416,000	\$19,228,000	\$3,620,000	\$0	\$116,000	\$46,380,000
LT-040-54-8	500kV: 1 mi, 3-Deschutes, SC all new tower	165	\$299,970,000	\$246,180,000	\$160,050,000	\$0	\$0	\$706,200,000
SB-8071-1-0	500kV: 1x series capacitor platform	2	\$0	\$0	\$0	\$0	\$96,376,000	\$96,376,000
C&C	C&C Misc. Placeholder (Fiber)	1	\$0	\$0	\$0	\$0	\$46,000,000	\$46,000,000
Contingency %	40%	Subtotal:	\$323,386,000	\$265,408,000	\$163,670,000	\$0	\$142,492,000	\$894,956,000
Overhead %	Labor 26% Materials & Turnkey 9%	Contingency:	\$119,988,000	\$98,472,000	\$64,020,000	\$0	\$56,950,400	\$339,430,400
		Overhead:	\$39,903,660	\$32,749,200	\$59,199,400	\$0	\$51,855,024	\$183,707,284
Grand Total:	<i>(rounded to two significant figures)</i>		\$480,000,000	\$400,000,000	\$290,000,000	\$0	\$250,000,000	\$1,400,000,000

Table 11.7 POI 3 – SPB: BONZ-POI-NOB #2 500 kV Line Non-Station Cost Estimate

Estimate Summary		SPB: BONZ-POI-NOB #2 500kV						
Estimate #	Description	Quantity	Contract		BPA		Misc.	Total
			Labor	Material	Labor	Material		
	SPB: BONZ-POI-NOB #2 500kV	-	-	-	-	-	-	-
ST-070-65-10	500kV Add: 1x bay 2pos BAAH (@BNZA, @POI, and @NOB)	2	\$23,416,000	\$19,228,000	\$3,620,000	\$0	\$116,000	\$46,380,000
LT-040-54-8	500kV: 1 mi, 3-Deschutes, SC all new tower	165	\$299,970,000	\$246,180,000	\$160,050,000	\$0	\$0	\$706,200,000
SB-8071-1-0	500kV: 1x series capacitor platform	2	\$0	\$0	\$0	\$0	\$96,376,000	\$96,376,000
Contingency %	40%	Subtotal:	\$323,386,000	\$265,408,000	\$163,670,000	\$0	\$96,492,000	\$848,956,000
Overhead %	Labor 26% Materials & Turnkey 9%	Contingency:	\$119,988,000	\$98,472,000	\$64,020,000	\$0	\$38,550,400	\$321,030,400
		Overhead:	\$39,903,660	\$32,749,200	\$59,199,400	\$0	\$35,111,024	\$166,963,284
Grand Total:	<i>(rounded to two significant figures)</i>		\$480,000,000	\$400,000,000	\$290,000,000	\$0	\$170,000,000	\$1,300,000,000

Table 11.8 POI 7 – BONZ-POI #3 500 kV Line Non-Station Cost Estimate

Estimate Summary		SPB: BONZ-POI #3 500kV						
Estimate #	Description	Quantity	Contract		BPA		Misc.	Total
			Labor	Material	Labor	Material		
	SPB: Bonanza-POI #3 500 kV	-	-	-	-	-	-	-
ST-070-65-10	500kV Add: 1x bay 2pos BAAH (@BNZA and @POI)	1	\$11,708,000	\$9,614,000	\$1,810,000	\$0	\$58,000	\$23,190,000
LT-040-54-8	500kV: 1 mi, 3-Deschutes, SC all new tower	66	\$119,988,000	\$98,472,000	\$64,020,000	\$0	\$0	\$282,480,000
SB-8071-1-0	500kV: 1x series capacitor platform	1	\$0	\$0	\$0	\$0	\$48,188,000	\$48,188,000
Contingency %	40%	Subtotal:	\$131,696,000	\$108,086,000	\$65,830,000	\$0	\$48,246,000	\$353,858,000
Overhead %	Labor 26% Materials & Turnkey 9%	Contingency:	\$47,995,200	\$39,388,800	\$25,608,000	\$0	\$19,275,200	\$132,267,200
		Overhead:	\$16,172,208	\$13,272,732	\$23,773,880	\$0	\$17,555,512	\$70,774,332
Grand Total:	<i>(rounded to two significant figures)</i>		\$200,000,000	\$160,000,000	\$115,000,000	\$0	\$85,000,000	\$560,000,000



Table 11.9 POI 3 – Bonanza-NOB 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	Additional Non-Station Cost (Table 11.9)	Non-Network Direct Assigned	Direct Assigned Cost	Cost Assignment
G0826	280	New 500kV Substation w/ New Comms	12.50%	\$188M	BONZ-POI-NOB #1 500kV Line	3.58%	\$1400M	\$0M	Collector Station C&C and RAS	\$9M	\$83M
G0841	400		12.50%			5.11%		\$156M	Collector Station C&C and RAS	\$9M	\$260M
G1050	650		12.50%			8.30%		\$563M	Collector Station C&C and RAS	\$9M	\$712M
G1051	1300		12.50%			16.60%		\$640M	Collector Station C&C and RAS	\$9M	\$905M
G1052	1300		12.50%			16.60%		\$123M	Collector Station C&C and RAS	\$9M	\$388M
G1053	1300		12.50%			16.60%		\$147M	Collector Station C&C and RAS	\$9M	\$412M
G1054	1300		12.50%			16.60%		\$257M	Collector Station C&C and RAS	\$9M	\$522M
G1055	1300		12.50%			16.60%		\$257M	Collector Station C&C and RAS	\$9M	\$522M

Table 11.10 POI 3 – Bonanza-NOB 500 kV Non-Station Cost Allocation

Queue #	Requested MW	MW Split	Plan of Service	MW Enabled	Non-Station Equipment Allocation	Non-Station Equipment Cost	Cost Assignment
G0826	280	280	None	500	N/A	N/A	\$0M
G0841	400	220			N/A		\$156M
G1050	650	180	BONZ-POI-NOB # 2 500kV Line	1500	12.00%	\$1300M	\$563M
G1051	1300	650			43.33%		\$640M
G1052	1300	670			44.67%		\$121M
G1053	1300	630	SPB1: New G657-CPJK 500kV Line	3000	6.92%	\$850M	\$145M
G1054	1300	1300	14.29%	\$257M			
G1055	1300	1070	BONZ-POI-NOB # 3 500kV Line	2830	11.76%	\$560M	\$145M
G1054	1300	230			8.13%		\$257M
G1055	1300	1300			45.94%		\$257M



11.6 SPB1: G657-Captain Jack Annex 500 kV line

G657-CPJK Project Costs to be allocated with IRs in Cluster Area South 2 report POIs (LaPine Annex, G0657 POI):

Table 11.11 SPB1 –G657-Captain Jack Annex 500 kV Line Cost Estimate

Estimate Summary								
Estimate #	Description	Quantity	Contract		BPA		Misc.	Total
			Labor	Material	Labor	Material		
	G657-CPJK 500 kV line	-	-	-	-	-	-	-
LT-040-54-8	500kV: 1 mi, 3-Deschutes, SC all new towers	85	\$154,530,000	\$126,820,000	\$82,450,000	\$0	\$0	\$363,800,000
SB-8071-1-0	500kV: series capacitor	3	\$49,155,000	\$8,136,000	\$13,350,000	\$73,830,000	\$93,000	\$144,564,000
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 Placeholder (new fiber)	1	\$0	\$0	\$0	\$0	\$11,800,000	\$11,800,000
Contingency %	40%	Subtotal:	\$215,393,000	\$144,570,000	\$97,610,000	\$73,830,000	\$11,951,000	\$543,354,000
Overhead %	Labor 26% Materials & Turnkey 9%	Contingency:	\$86,157,200	\$57,828,000	\$39,044,000	\$29,532,000	\$4,780,400	\$217,341,600
		Overhead:	\$27,139,518	\$18,215,820	\$35,530,040	\$9,302,580	\$3,107,260	\$93,295,218
Grand Total:	<i>(rounded to two significant figures)</i>		\$330,000,000	\$220,000,000	\$170,000,000	\$113,000,000	\$20,000,000	\$850,000,000

Table 11.12 SPB1 –G657-Captain Jack Annex 500 kV Line Cost Allocation

Queue #	Enabled MW	Percent Allocation	Cost Allocation
G0695	900	9.89%	\$ 84,065,934
G0702	600	6.59%	\$ 56,043,956
G0747*	200	2.20%	\$ 18,681,319
G0758	600	6.59%	\$ 56,043,956
G0861	500	5.49%	\$ 46,703,297
G0870*	500	5.49%	\$ 46,703,297
G0871*	500	5.49%	\$ 46,703,297
G0887	200	2.20%	\$ 18,681,319
G0888	200	2.20%	\$ 18,681,319
G0900	200	2.20%	\$ 18,681,319
G0901	200	2.20%	\$ 18,681,319
G0909*	200	2.20%	\$ 18,681,319
G0910*	200	2.20%	\$ 18,681,319
G0912*	200	2.20%	\$ 18,681,319
G1017*	250	2.75%	\$ 23,351,648
G1051	630	6.92%	\$ 58,846,154
G1052	1300	14.29%	\$ 121,428,571
G1053	1070	11.76%	\$ 99,945,055
G1056*	650	7.14%	\$ 60,714,286
Total:	9100	100%	\$ 850,000,000

* These requests were studied in Cluster Area South 2 (SO2)

