

TRANSMISSION PLANNING

GENERATION INTERCONNECTION REPORT

2025 TRANSITION CLUSTER STUDY (TCS)

CLUSTER AREA: SE IDAHO, PHASE 1, Revision 0

(25TCS CA-ID1 P1-0)

G0945

January 2026

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

Cluster Area Idaho 1 (ID1) is comprised of an Interconnection Request (IR) in Fremont County of Idaho state. It includes 1 total IR seeking 150 MW of Interconnection Service and 52 MW total of grid charging.

Table 1.1: 2025 TCS ID1 Participants

GI #	Gen Type	Studied POI	MW Requested (Generating)	MW Requested (Charging)	Plant Location (County, State)	Requested COD
G0945	Solar, BESS	Drummond 115 kV	150	52	Fremont, Idaho	Jun 2026

Studied POI locations and 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 ID1 Requirements

GI #	Studied POI	Total GI Scope	Total Cost	Contingent Facilities
G0945	Drummond 115 kV	Drummond 115kV Substation Expansion Goshen-Drummond 161kV line rebuild	\$145M	None

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.

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



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

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



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

All analysis presumes Energy Resource Interconnection Service (ERIS) only. BPA Planning presumes all IRs are not 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 were 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: 2025 TCS PH1 ID1 Senior Queued IRs Assumed In-Service

Queue #	POI (owner)	MW Generating	Fuel Type
C2-092	Antelope-Goshen 161 kV line (PacifiCorp)	206	Wind
C3-153	Antelope-Goshen 161 kV line (PacifiCorp)	199	Solar
C3-154	Antelope-Goshen 161 kV line (PacifiCorp)	199	Solar
C3-155	Antelope-Goshen 161 kV line (PacifiCorp)	199	Solar
C3-156	Antelope-Goshen 161 kV line (PacifiCorp)	100	Solar
C3-157	Antelope-Goshen 161 kV line (PacifiCorp)	100	Solar
C4-018	Antelope-Goshen 161 kV line (PacifiCorp)	300	Wind



4.3 Communications & Control Capability

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 illustrate the geographic coordinates for the IRs assessed in Cluster Area Idaho 1 (ID1).

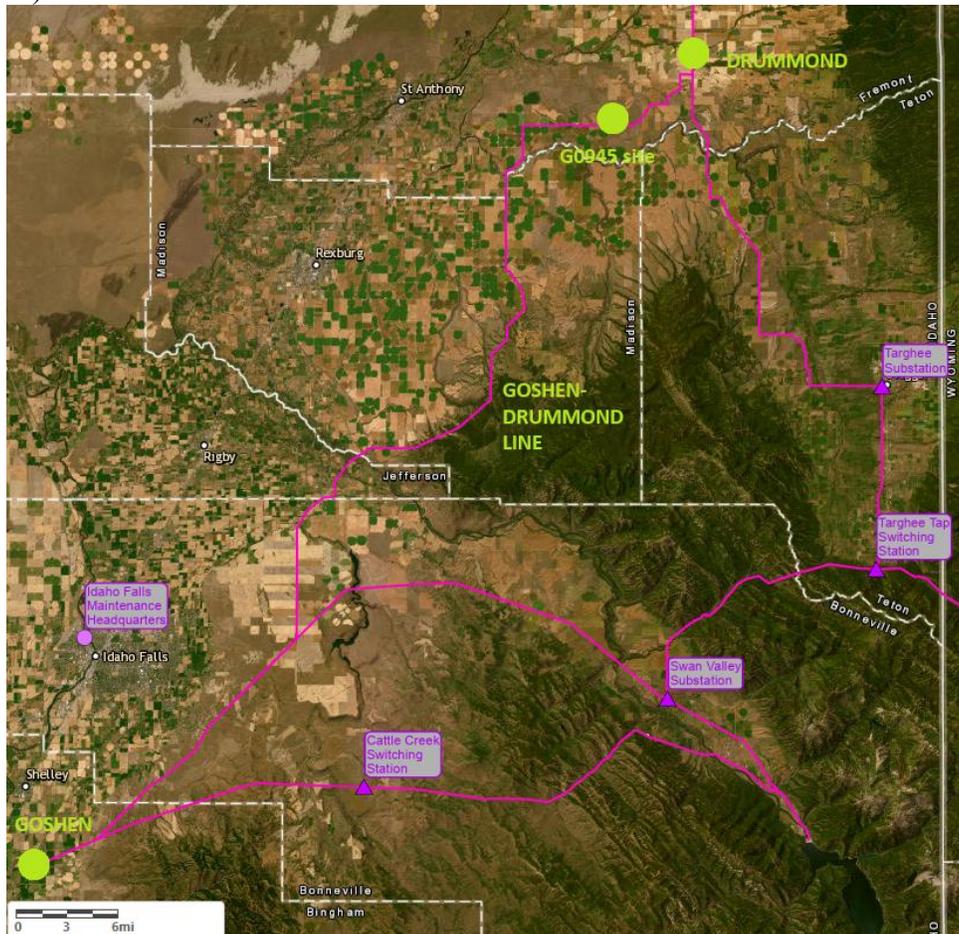


Figure 1 Map of the Cluster Area. Drummond substation is in the Northeast and Goshen substation in the Southwest.



5.2 Studied POIs

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

Table 5.2: 2025 TCS PH1 ID1 Studied POIs

GI #	Gen Type	Studied POI	MW Requested (Generating)	MW Requested (Charging)
G0945	Solar, BESS	Drummond 115 kV	150	52

5.3 Starting Base Cases

Following WECC Cases were used for ID1.

- 2026 Heavy Summer (HS)
- 2034 Heavy Summer (HS)

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. There were no applicable plans of service associated with senior-queued IRs.

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

In all studies, it was assumed that the senior queued generation facilities were either all generating or charging from the grid simultaneously.

Local load is relatively small in magnitude compared to the G0945 requested interconnection service level. A load sensitivity considered lightly loaded conditions during contingency scenarios while G0945 was in generation mode.

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:

- WECC base case Area 30 (PG&E) generation balanced G0945 MW.

Table 5.4: 2025 TCS PH1 ID1 ATC Source/Sink Nodes

Mode	Direction	Source	Sink
Generating	N->S	G0945 generator	Area 30 (PG&E) generation
Grid Charging	N->S	Area 30 (PG&E) generation	G0945 generator

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.

G0945’s generator interconnection service amount of 150 MW caused the SCR test to fail. The SCR ratio of 3 or greater can only be preserved with G0945’s generation limited to 100 MW. To achieve acceptable performance, the G0945 requested Battery Energy Storage System (BESS) must be grid-forming. Reductions in the MVA rating of the BESS component may require additional network lines to the POI or other increases to this plan of service, pending additional stability analyses in Phase Two Cluster Study of the Transition Cluster Study.

6 Contingent Facilities Assumed In-Service

6.1 Drummond 115 kV

No additional projects are assumed in-service for this area. This study identifies no Contingent Facilities required to be energized prior to G0945 taking Interconnection Service.

7 Technical Analysis & Study Results

7.1 Drummond 115 kV POI

TCS System Performance

Table 7.1: POI 1 Drummond 115 kV Substation Results

POI MW Threshold	Affected IRs	Limiter (Element or Contingency)	Mitigation
0-49 MW	G0945	(IPC) Blackfoot-Goshen 161 kV (TPL-001 P2)	IPC Affected System Study
		(FREC) Drummond-Targhee 115 kV (TPL-001 P1)	FREC Affected System Study
50 - 99 MW	G0945	(PACE) Kinsport-Goshen 345 kV (TPL-001 P7)	PACE Affected System Study
100 - 150 MW	G0945	Goshen-Drummond 161 kV (TPL-001 P1)	Remediate/rebuild 34 miles

Proposed Mitigations

The existing system near Goshen is nearly at capacity. Transmission system overloads because of the interconnection request were identified on multiple transmission system elements not owned by BPA. Therefore, the identified equipment owners may need to perform an Affected System Study.

One transmission element owned by BPA was identified to need a mitigation. This element is the Goshen-Drummond 161 kV transmission line. The plan of service and costs reflect a few important factors:

- There is risk of a thermal overload
- The line rating is limited by derated spans, cumulatively ~ 34 miles in length.
- The work required to remediate the spans has not been identified, so the worst case scenario of a rebuild of those spans is assumed for cost estimates in this report.



Expanding Drummond substation to accommodate another 115 kV termination (for the generation tie line) triggers a need to add a bus-sectionalizing breaker and a bus-tie breaker to Drummond 115 kV. Reterminations of existing equipment are necessary to make room for the bus-sectionalizing breaker and maximize reliability of electrical service. This substation work must be coordinated with Fall River Rural Electric Cooperative.

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.**

Table 11.1: 2025 TCS PH1 ID1 Affected System Impacts

Affected System	Elements Impacted	POI (G#)
Idaho Power Company (IPC)	Blackfoot-Goshen 161 kV	Drummond 115 kV (G0945)
Fall River Electric Co-Op (FREC)	Drummond-Targhee 115 kV	Drummond 115 kV (G0945)
PacifiCorp (PACE)	Kinsport-Goshen 345 kV	Drummond 115 kV (G0945)

9 Interconnection Requirements

9.1 Drummond 115 kV

Table 8.1: POI 1 Drummond 115kV Interconnection Requirements

G#	BPA Station Work	BPA Non-Station Work
G0945	115 kV Terminal, 115kV BSB addition, Line reterminations	reconductor/rebuild of ~34 miles of Goshen-Drummond 115 kV #1

1. Develop one 115 kV main-aux bay in the Drummond 115 kV yard (bay 9) for termination of the generation facility tie-line. This bay will include one 115 kV circuit breaker, 3 disconnect switches, and associated control, relaying, and communications equipment
2. Install one bus-sectionalizing breaker in Drummond 115 kV yard (between bays 4 and 6), including one 115 kV circuit breaker, 4 disconnect switches, and associated control, relaying, and communications equipment
3. Reterminate shunt capacitors from 115 kV bay 7 to a new bay 8. Bay 8 will include one 115 kV circuit breaker, 3 disconnect switches, and associated control, relaying, and communications equipment
4. Reterminate one 115/46 kV transformer from 115 kV bay 5 to bay 7.
5. Repurpose one 115 kV main-aux bay in the Drummond 115 kV yard for a bus-tie breaker (bay 5). The bay will include a 115 kV circuit breaker, two disconnect switches, and associated control, relaying, and communications equipment
6. A data PMU must be added to the Drummond 115 kV POI to take measurements from the POI voltage and frequency and generation tie line flow quantities.

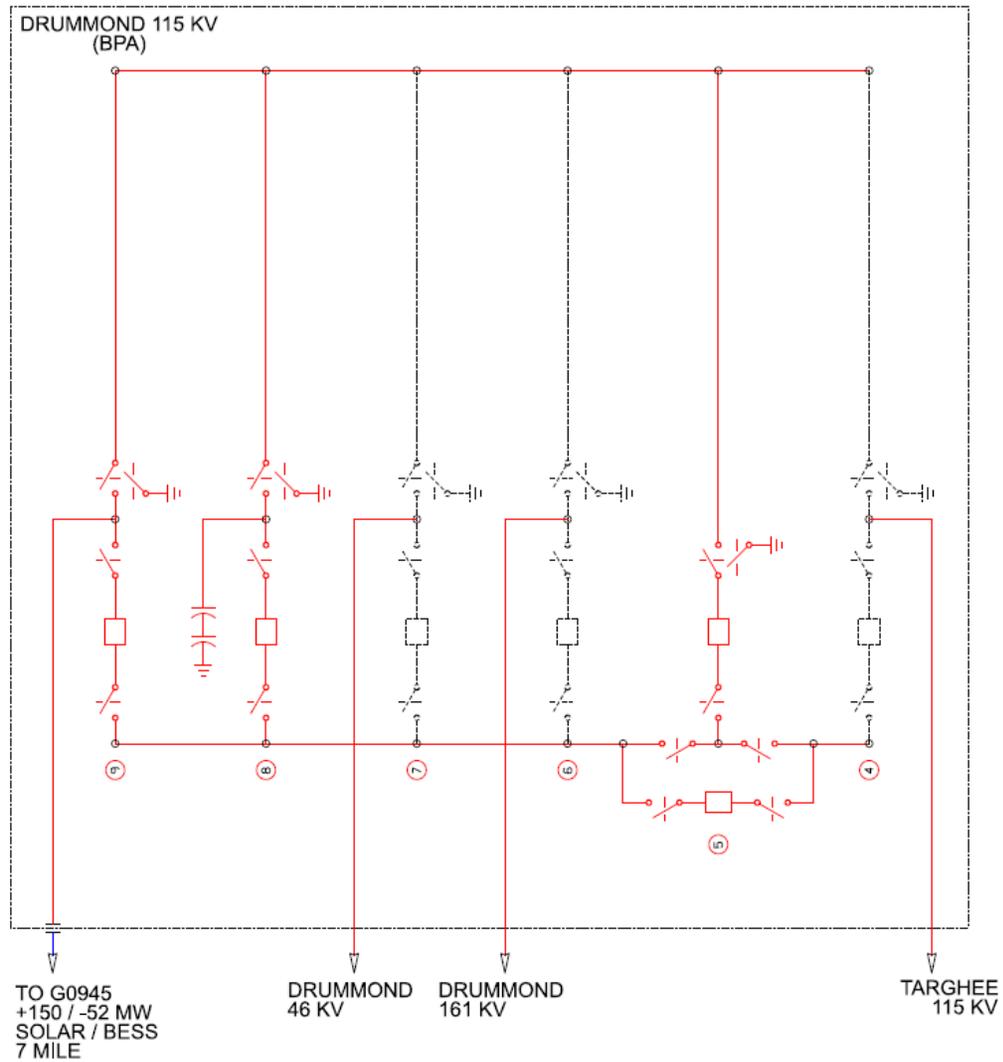


7. Transfer trip will be required on the G0945 generation facility tie-line.
8. The G0945 generation must have all equipment required to be added to BPA RAS.
9. The G0945 battery energy storage system must be grid-forming to meet the SCR requirement and per STD-N-000001-00-10. The customer is responsible 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.
10. Installation of BPA-required C&C equipment at each customer's collector site (RAS, Meters, relays, Control House space)
11. Significant Development of C&C hardware at BPA's POI substation.

The customer will construct a 115 kV line from the BPA POI station to its generating facility. The customer will construct its generating facility. Communications and relaying will be coordinated with BPA.



10 Project One-Line Drawings



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-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.

Costs associated with the G0945 requirement for the G0945 BESS to be grid-forming are not included.



11.3 POI 1: Drummond 115 kV

Table 11.1 POI 1 Drummond 115kV Station Cost Estimate

<i>Estimate Summary</i>								
Estimate #	Description	Quantity	Contract		BPA		Misc.	Total
			Labor	Material	Labor	Material		
	Drummond 115 kV POI	-	-	-	-	-	-	-
ST-070-19-11	115kV Add: 1x PCB, 1pos MainAux	2	\$4,486,000	\$2,681,668	\$1,119,424	\$30,400	\$0	\$8,317,492
ST-070-17-11	115kV: 1x Bus Sectionalizing Breaker Addition	1	\$2,776,000	\$1,432,000	\$644,000	\$0	\$16,000	\$4,868,000
C&C:Customer Site	C&C Placeholder per collector site	1	\$0	\$0	\$0	\$0	\$5,000,000	\$5,000,000
C&C: Large. BPA Site	C&C Placeholder at BPA station	1	\$0	\$0	\$0	\$0	\$15,000,000	\$15,000,000
Contingency %	40%	Subtotal:	\$7,262,000	\$4,113,668	\$1,763,424	\$30,400	\$20,016,000	\$33,185,492
Overhead %	Labor	Contingency:	\$2,904,800	\$1,645,467	\$705,370	\$12,160	\$2,006,400	\$7,274,197
	26%	Materials	Overhead:	\$915,012	\$518,322	\$641,886	\$3,830	\$5,725,824
Grand Total:	<i>(rounded to two significant figures)</i>		\$11,100,000	\$6,300,000	\$3,100,000	\$46,000	\$28,000,000	\$48,000,000

Table 11.2 POI 1 Drummond 115kV Non-Station Cost Estimate

<i>Estimate Summary</i>								
Estimate #	Description	Quantity	Contract		BPA		Misc.	Total
			Labor	Material	Labor	Material		
	Drummond 115 kV POI	-	-	-	-	-	-	-
LT-040-19-10	115kV: 1-mi, 1200A conductor, all new towers	34	\$37,604,000	\$18,496,000	\$6,596,000	\$0	\$0	\$62,696,000
Contingency %	40%	Subtotal:	\$37,604,000	\$18,496,000	\$6,596,000	\$0	\$0	\$62,696,000
Overhead %	Labor	Contingency:	\$15,041,600	\$7,398,400	\$2,638,400	\$0	\$0	\$25,078,400
	26%	Materials	Overhead:	\$4,738,104	\$2,330,496	\$2,400,944	\$0	\$9,469,544
Grand Total:	<i>(rounded to two significant figures)</i>		\$57,000,000	\$28,000,000	\$11,600,000	\$0	\$0	\$97,000,000

Table 11.3 POI 1 Drummond 115kV 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
G0945	150	Drummond 115kV Station Expansion w/ Comm Expansion	100%	\$39M	Goshen-Drummond 161kV Line Upgrade	100%	\$97M	Collector Station C&Cand RAS	\$9M	\$145M

