APPENDIX A CONNECTION ASSESSMENT

Connection Engineering Study Report for AUC Application

FortisAlberta Fincastle Area Upgrades

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Executive Summary

Project Overview

FortisAlberta Inc. (FortisAlberta), in its capacity as the legal owner of an electric distribution system (DFO), submitted a request for system access service to the Alberta Electric System Operator (AESO) to reliably serve load growth in and around the Municipal District of Taber.

The DFO's request for system access service includes a request for a Rate DTS, *Demand Transmission Service*, contract capacity increase of 6.8 MW, from 12.2 MW to 19.0 MW, for the system access service provided at the existing Fincastle 336S substation, and a request for transmission development (Project). Specifically, the DFO requested upgrades to the existing Fincastle 336S substation.

The scheduled in-service date (ISD) for the Project is June 1, 2019.

This report details the engineering studies conducted to assess the impact of the Project on the performance of the Alberta interconnected electric system (AIES).

Existing System

Geographically, the Project is located in the AESO planning area of Vauxhall (Area 52), which is part of the AESO South Planning Region. Vauxhall (Area 52) is surrounded by the AESO planning areas of Brooks (Area 47), Medicine Hat (Area 4), and Lethbridge (Area 54).

From a transmission system perspective, Vauxhall (Area 52) is served by a 138 kV transmission system and local generation. The Fincastle 336S substation connects to the AIES through two 138 kV transmission lines: one is transmission line 610L, which connects to the Taber 83S substation, which further connects to the Coaldale 245S substation in the Lethbridge planning area (Area 54) via 172L; and the other is 612L, which connects to the Burdett 368S substation, which further connects to the Bowmanton 244S substation in the Medicine Hat planning area (Area 4) via 879L. Fincastle 336S substation also provides a radial connection to the Conrad 135S substation via 607L, as well as the Taber Wind Farm 134S substation, which connects to 607L via the T-tap line 607AL.

The existing constraints in the South Planning Region are managed in accordance with Section 302.1 of the ISO rules, *Real Time Transmission Constraint Management.*

Study Summary

Study Area for the Project

The Study Area for the Project consists of Vauxhall (Area 52) and the tie lines connecting Vauxhall (Area 52) to the rest of the AIES, which includes the 138 kV transmission lines 763L, 795L, 172L and 879L. All transmission facilities within the Study Area were studied and monitored to assess the impact of the Project on the performance of the AIES, including any violations of the Reliability Criteria (as defined in Section 2.1.1).

Studies performed for the Project

Power flow studies were performed for the 2019 summer peak (SP) and 2019 winter peak (WP) pre- Project and post-Project scenarios. Voltage stability studies were performed for the 2019 SP post-Project scenario, as the 2019 SP scenario presents a higher study area and regional loads compared to 2019 WP.

Results of the Pre-Project Studies

No Reliability Criteria violations were observed under Category A or Category B conditions.

Connection Alternatives

The AESO, in consultation with the DFO and the legal owner of transmission facilities (TFO) examined two connection alternatives to meet the DFO's request for system access service:

Alternative 1: Upgrade the Fincastle 336S substation

Alternative 1 involves upgrading the existing Fincastle 336S substation, including adding one 138/25 kV transformer, two 138 kV circuit breakers, two 25 kV feeder circuit breakers and associated equipment. In addition, the DFO has advised that Alternative 1 would also require the addition of approximately 84 km of upgraded distribution feeders and 22 km of new distribution feeders.

Alternative 2: Upgrade the Fincastle 336S and Hull 257S substations

Alternative 2 involves upgrading the existing Fincastle 336S substation, including adding one 138/25 kV transformer, two 138 kV circuit breakers, two 25 kV feeder circuit breakers and associated equipment. In addition, Alternative 2 involves upgrading the existing Hull 257S substation, including adding one 138/25 kV transformer and associated equipment. In addition, the DFO has advised that Alternative 2 would also require the addition of approximately 84 km of upgraded distribution feeders and 20 km of new distribution feeders.

Connection Alternative Selected for Further Examination

Alternative 1 was selected for further examination. Alternative 2 would involve increased transmission development, and hence overall increased cost, compared to Alternative 1. Therefore, Alternative 2 was not selected for further study.

Results of the Post-Project Studies

No Reliability Criteria violations were observed under Category A or Category B conditions.

The voltage stability margin was met for all studied conditions.

Project Dependencies

The Project does not require the completion of any other AESO plans to expand or enhance the transmission system prior to connection.

Conclusions and Recommendations

Based on the study results, Alternative 1 is technically viable. The connection assessment did not identify any system performance issues in the pre-Project or post-Project scenarios. The connection of the project with the proposed alternative will not adversely affect the performance of the AIES.

It is recommended to proceed with the Project using Alternative 1 as the preferred option to respond to the DFO's request for system access service. Alternative 1 involves upgrading the existing Fincastle 336S substation, including adding one 138/25 kV transformer, two 138 kV circuit breakers, two 25 kV feeder circuit breakers and associated equipment.

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1. Introduction

This report details the engineering studies conducted to assess the impact of the Project (as defined below) on the performance of the Alberta interconnected electric system (AIES).

1.1. Project

1.1.1. Project Overview

FortisAlberta Inc. (FortisAlberta) in its capacity as the legal owner of an electric distribution system (DFO) submitted a system access service request to the Alberta Electric System Operator (AESO) to address the distribution system reliability concerns in the Fincastle area.

The DFO's request for system access service includes a request for a Rate DTS, *Demand Transmission Service*, contract capacity increase at the existing Fincastle 336S substation, and a request for transmission development (collectively, the Project). Specifically, the DFO requested upgrades to the existing Fincastle 336S substation. The Rate DTS increase is for 6.8 MW, from 12.2 MW to 19.0 MW, on June 1, 2019.

The scheduled in-service date (ISD) is June 1, 2019

1.1.2. Load Component

- The existing Rate DTS contract capacity for the system access service provided at the existing Fincastle 336S substation is 12.2 MW.
- The DFO requested a Rate DTS contract capacity of 19.0 MW on June 1, 2019.
- The Project load was studied assuming a 0.9 power factor (pf) lagging.

1.1.3. Generation Component

There is no generation component associated with the Project.

1.2. Study Scope

1.2.1. Study Objectives

The objectives of the study are as follows:

- Assess the impact of the Project on the performance of the AIES.

- Identify any violations of the relevant AESO criteria, standards or requirements, both pre-Project and post-Project.
- Recommend the preferred alternative and any mitigation measures required to address system performance concerns, if any, to enable the reliable connection of the Project to the AIES.

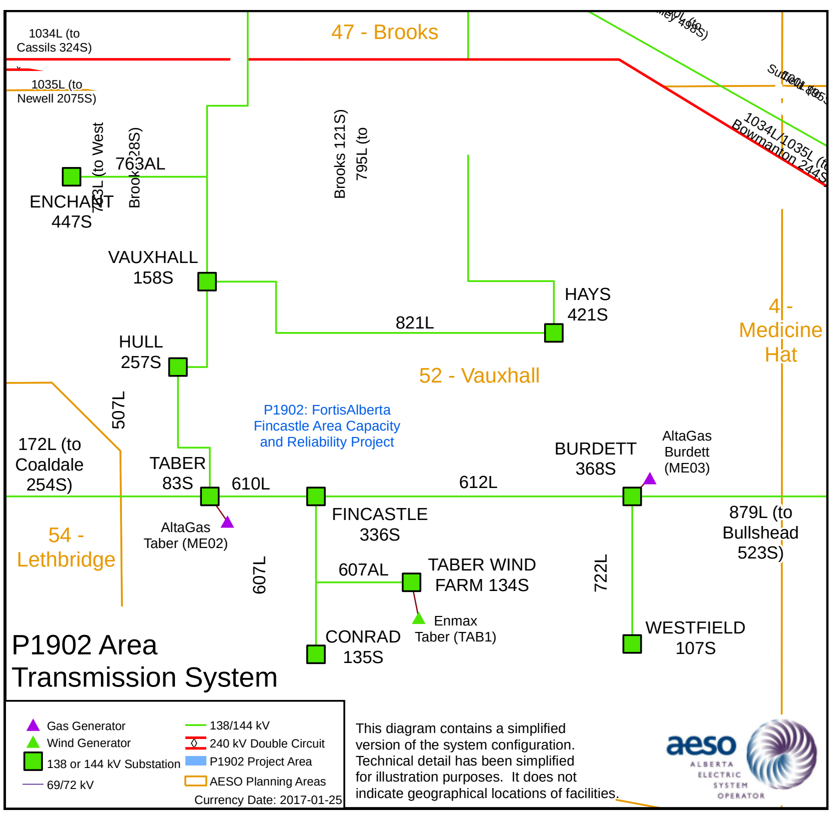
1.2.2. Study Area

1.2.2.1. Study Area Description

Geographically, the Project is located in the AESO planning area of Vauxhall (Area 52), which is part of the AESO South Planning Region. Vauxhall (Area 52) is surrounded by the AESO planning areas of Brooks (Area 47), Medicine Hat (Area 4), and Lethbridge (Area 54).

From a transmission system perspective, Vauxhall (Area 52) is served by a 144 kV transmission system and local generation. The Fincastle 336S substation connects to the AIES through two 138 kV transmission lines: one is transmission line 610L, which connects to the Taber 83S substation, which further connects to the Coaldale 245S substation in the Lethbridge planning area (Area 54) via 172L; and the other is 612L, which connects to the Burdett 368S substation, which further connects to the Bowmanton 244S substation in the Medicine Hat planning area (Area 4) via 879L. Fincastle 336S substation also provides a radial connection to the Conrad 135S substation via 607L, as well as the Taber Wind Farm 134S substation, which connects to 607L via the T-tap line 607AL. The existing transmission system in the Study Area is shown in Figure 1-1.

Figure 1-1: Study Area Transmission System



1.2.2.2. Existing Constraints

The existing constraints in the South Region are managed in accordance with procedures set out in Section 302.1 of the ISO rules, *Real Time Transmission Constraint Management* (TCM Rule).

1.2.2.3. AESO Long-Term Transmission Plans (LTP)

The *AESO 2017 Long-term Transmission Plan* (2017 LTP)[1] does not include any developments within the Vauxhall area, which is part of the South Region.

1.2.3. Studies Performed

The following studies were performed for the pre-Project scenarios:

- Power flow studies

The following studies were performed for the post-Project scenarios:

- Power flow studies
- Voltage stability studies

1.3. Report Overview

The Executive Summary provides a high-level summary of the study and its conclusions. Section 1 provides an introduction of the Project and provides a high-level description of the study scope. Section 2 describes the criteria, system data, and study assumptions used in the studies. Section 3 presents the study methodology used in the studies. Section 4 discusses the pre-Project studies results. Section 5 presents the connection alternatives that were examined and selected for further study. Section 6 presents the results of the post-Project studies. Section 7 identifies any dependencies the Project may have. Section 8 presents the conclusions and recommendations of this assessment.

[1] The 2017 LTP document is available on the AESO website.

2. Criteria, System Data, and Study Assumptions

2.1. Criteria, Standards, and Requirements

2.1.1. Transmission Planning Standards and Reliability Criteria

The Transmission Planning (TPL) Standards, which are included in the Alberta Reliability Standards, and the AESO's *Transmission Planning Criteria – Basis and Assumptions*[2] (Reliability Criteria) were applied to evaluate system performance under Category A system conditions (i.e., all elements in service) and following Category B contingencies (i.e., single element outage), prior to and following the studied alternatives. Below is a summary of Category A and Category B system conditions.

Category A, often referred to as the N-0 condition, represents a normal system with no contingencies and all facilities in service. Under this condition, the system must be able to supply all firm load and firm transfers to other areas. All equipment must operate within its applicable rating, voltages must be within their applicable range, and the system must be stable with no cascading outages.

Category B events, often referred to as an N-1 or N-G-1 with the most critical generator out of service, result in the loss of any single specified system element under specified fault conditions with normal clearing. These elements are a generator, a transmission circuit, a transformer, or a single pole of a DC transmission line. The acceptable impact on the system is the same as Category A. Planned or controlled interruptions of electric supply to radial customers or some local network customers, connected to or supplied by the faulted element or by the affected area, may occur in certain areas without impacting the overall reliability of the interconnected transmission systems. To prepare for the next contingency, system adjustments are permitted, including curtailments of contracted firm (non-recallable reserved) transmission service electric power transfers.

The TPL standards, TPL-001-AB-0 and TPL-002-AB-0 have referenced Applicable Ratings when specifying the required system performance under Category A and Category B events. For the purpose of applying the TPL standards to the studies documented in this report, Applicable Ratings are defined as follows:

- Seasonal continuous thermal rating of the line's loading limits.
- Highest specified loading limits for transformers.
- For Category A conditions: Voltage range under normal operating condition per AESO Information Document #2010-007RS *General Operating Practices – Voltage Control* (ID #2010-007RS). ID #2010-007RS relates to Section 304.4 of the ISO rules, *Maintaining Network Voltage*. For the busses not listed in ID#2010-007RS, Table 2-1 in the *Transmission Planning Criteria – Basis and Assumptions* applies.
- For Category B conditions: The extreme voltage range values per Table 2-1 in the *Transmission Planning Criteria – Basis and Assumptions.*

[2] Filed under a separate cover

- Desired post-contingency voltage change limits for three defined post event timeframes as provided in Table 1–1, below.

Table 1–1: Post-Contingency Voltage Deviations Guidelines for Low Voltage Busses

Parameter and Reference Point	Time Period		
	Post-Transient (Up to 30 sec.)	Post-Auto Control (30 sec. to 5 min.)	Post-Manual Control (Steady State)
Voltage deviation from steady state at POD low voltage bus	±10%	±7%	±5%

2.1.2. ISO Rules and Information Documents

ID# 2010-007RS was applied to establish pre-contingency voltage profiles in the Study Area.

The TCM Rule was followed in setting up the study scenarios and in assessing the impact of the Project. In addition, due regard was given to the AESO's *Connection Study Requirements* document and the AESO's *Generation and Load Interconnection Standard*.

2.2. Study Scenarios

The scheduled ISD of the Project is June 1, 2019. Therefore, the studies were performed using the 2019 summer peak (SP) and 2019 winter peak (WP) scenarios.

Table 1–2 provides a list of the study scenarios. The post-Project scenarios include the DFO-requested Rate DTS contract capacity increase of 6.8 MW. This connection assessment assumed a 0.9 lagging power factor for the Project load.

Table 1–2: List of the Connection Study Scenarios

Scenario	Year/Season Load	Pre-Project/Post-Project	Project Load (MW)	Total Fincastle 336S Substation Load (MW)	System Generation Dispatch Conditions
1	2019 WP	Pre-Project	0	12.2	Zero wind, Economic Coal
2	2019 SP	Pre-Project	0	12.2	Zero wind, Economic Coal
3	2019 WP	Post-project	6.8	19.0	Zero wind, Economic Coal
4	2019 SP	Post-Project	6.8	19.0	Zero wind, Economic Coal

2.3. Load and Generation Assumptions

2.3.1. Load Assumptions

The Study Area and Regional load forecasts used for the studies are shown in Table 1–3 and are based on the *AESO 2017 Long-term Outlook* (2017 LTO) at South Region peak. For the studies, when POD loads for the Alberta internal load (AIL) were modified to align with the load forecast from the 2017 LTO, the active power to reactive power ratio in the base case scenarios was maintained.

Table 1–3: Forecast Area Load (2017 LTO at South Region Peak)

AESO Planning Area or Region	Year/Season	Forecast Load (MW)
Vauxhall (Area 52)	2019 WP	156
	2019 SP	189
South Region*	2019 WP	1,359
	2019 SP	1,395

* South Region includes the following AESO planning areas 43, 44, 46, 45, 47, 52, 49, 53, 54, 55, 4, and 48.

2.3.2. Generation Assumptions

The generation assumptions for the studies are based on the 2017 LTO.

The local generating units and their dispatch levels for the studies are shown in Table 1–4.

The Burdett generating unit was identified as the critical generating unit and was considered to be offline to represent the N-G condition for all studies.

Table 1–4: Existing Local Generating Unit Assumptions in the Study Scenarios

Generating Facility Unit Name	Bus Number	AESO Planning Area	Pmax (MW)	Unit Net Generation[a] (MW)	
				2019 WP	2019 SP
Taylor	4670	55	14	0	0
Raymond	414	55	21	0	0
Irrican	450	55	7	0	0
Drywood	4226	55	6	0	0
Lethbridge Coaldale	4690	54	6	0	0
Chin Chute	407	54	15	0	0

Generating Facility Unit Name	Bus Number	AESO Planning Area	Pmax (MW)	Unit Net Generation[a] (MW)	
				2019 WP	2019 SP
Old Man River	2230	53	32	2.8	10.5
Taber	3272	52	8.5	0	0
Burdett	4269	52	7.4	N-G[b]	N-G

[a] "Unit Net Generation" refers to gross generating unit output (MW) less unit service load.

[b] "N-G" indicates the critical generating unit that is assumed by the AESO to be offline to test the N-G contingency condition.

2.3.3. Intertie Flow Assumptions

The Alberta-British Columbia, Alberta-Montana, and Alberta-Saskatchewan interties were set to zero in all the studied scenarios because the interties were expected to have negligible effects on study results.

2.3.4. High-Voltage Direct Current Power Order

The Western Alberta Transmission Line (WATL) and the Eastern Alberta Transmission Line (EATL) are high-voltage direct current (HVDC) transmission lines. The HVDC power order assumptions are shown in Table 1-5.

Table 1–5: HVDC Power Order by Scenario

Case No	Scenario	WATL (MW)	EATL (MW)
1	2019 WP Pre-Project	500 (N->S)[a]	250 (N->S)
2	2019 SP Pre-Project	575 (N->S)	out-of-service
3	2019 WP Post-Project	500 (N->S)	250 (N->S)
4	2019 SP Post-Project	575 (N->S)	out-of-service

[a] N -> S: HVDC flow direction is North to South

2.4. System Projects

No system projects were included in the study scenarios.

2.5. Connection Projects

No connection projects were included in the study scenarios.

2.6. Facility Ratings and Shunt Elements

The legal owner of transmission facilities (TFO) provided the thermal ratings for the transmission lines in the vicinity of the Study Area. The seasonal continuous ratings and the short-term emergency ratings for the key transmission lines in the Study Area are shown in Table 1–6.

Table 1–6: Key Transmission Line Ratings in the Study Area (MVA on 138 kV Base)

Line ID	Line Description	Voltage Class (kV)	Seasonal Continuous Rating (MVA)		Short-term Emergency Rating (MVA)	
			Summer	Winter	Summer	Winter
891L	Garden City 226S - 863L-Tap	138	120	145	132	160
725L	Coalbanks 111S - Brown 674S	138	116	146	128	161
172L	Hillridge 139S - Coaldale 254S	138	119	146	131	161
172L	Coaldale 254S - 172L Tap	138	119	146	131	161
172L	172L Tap - Taber 83S	138	119	146	131	161
507L	Taber 83S - Hull 257S	138	120	148	132	163
763L	Vauxhall 158S - Hull 257S	138	120	148	132	163
821L	Hays 421S - Vauxhall 158S	138	85	90	94	99
763L	West Brooks 28S - Vauxhall 158S	138	120	148	132	163
607L	Conrad 135S - Fincastle 336S	138	119	119	131	131
612L	Fincastle 336S - Burdett 368S	138	85	90	94	99
879L	Bullshead 523S - Burdett 368S	138	85	90	94	99

The TFO also provided the ratings for the existing transformers in the Study Area. The ratings of the key transformers in the Study Area are shown in Table 1–7.

Table 1–7: Summary of Key Transformer Ratings in the Study Area

Substation Name and Number	Transformer ID	Transformer Voltages (kV)	Rating (MVA)
Taber 83S	T1, T3	138/25 kV	42, 42
Fincastle 336S	T1	138/25 kV	25
Burdett 523S	T1, T2	138/25 kV	42, 42
Hull 257S	T1	138/25 kV	42
Vauxhall 158S	T1	138/25 kV	42
Westfield 107S	T1	138/25 kV	25

The details of shunt elements in the Study Area, as provided by the TFO, are shown in Table 1–8.

Table 1–8: Summary of Shunt Elements in the Study Area

Substation Name and Number	Voltage Class (kV)	Capacitors: Number of Switched Shunt Blocks	Capacitors: Total at Nominal Voltage (MVAr)	Capacitors: Status in Study (on or off) 2019 SP and 2019 WP (MVAr)	Reactors: Number of Switched Shunt Blocks	Reactors: Total at Nominal Voltage (MVAr)	Reactors: Status in Study (on or off) 2019 SP and 2019 WP (MVAr)
Taber 83S	138	1x24.46 1x24.50	48.96	Switched as required	-	-	-
Hays 421S	138	1x24.46	24.46		-	-	
Burdett 368S	138	1×24.46 1×24.50	48.96		-	-	

2.7. Voltage Profile Assumptions

ID # 2010-007RS is used to establish normal system (i.e. pre-contingency) voltage profiles for key area busses prior to commencing any studies. Table 2-1 of the *Transmission Planning Criteria – Basis and Assumptions* applies for all the busses not included in ID #2010-007RS. These voltages were used to set the voltage profile for the study base cases prior to power flow studies.

3. Study Methodology

The studies for this connection assessment were completed using PTI PSS/E version 33.

3.1. Connection Studies Carried Out

The studies that were carried out for this connection assessment were identified in Table 3–1.

Table 3–1: Summary of Studies Performed

Scenario		System Conditions	Power Flow	Voltage Stability
1	2019WP Pre-Project	Category A and Category B	X	
2	2019SP Pre-Project	Category A and Category B	X	
3	2019WP Post-Project	Category A and Category B	X	
4	2019SP Post-Project	Category A and Category B	X	*X*

3.2. Power Flow Studies

Pre-Project and post-Project power flow studies were performed to identify thermal and voltage criteria violations as per the Reliability Criteria, and any deviations from the limits listed in Table 1-1. The purpose of the power flow analysis is to quantify any incremental violations in the Study Area after the Project is connected. For the Category B power flow studies, the transformer taps and switched shunt reactive compensating devices such as shunt capacitors and reactors were locked and continuous shunt devices were enabled.

Point-of-delivery (POD) low voltage bus deviations were assessed for both the pre-Project and post-Project networks by first locking all tap changers and area shunt reactive compensating devices to identify any post transient voltage deviations above 10%. Second, tap changers were allowed to move while shunt reactive compensating devices remained locked to determine if any voltage deviations above 7% would occur in the area. Third, all the taps and shunt reactive compensating devices were allowed to adjust, and voltage deviations above 5%, if any, were reported.

3.2.1. Contingencies Studied

The power flow studies were performed for all Category B contingencies (138 kV facilities and above) within the Study Area. All transmission facilities in the Study Area were monitored for Reliability Criteria violations.

3.3. Voltage Stability Studies

The objective of the voltage stability studies is to determine the ability of the network to maintain voltage stability at all the busses in the system under normal and abnormal system conditions. The power-voltage (PV) curve represents voltage change as a result of increased power transfer between two systems. The incremental transfers are reported at the collapse point.

Voltage stability studies were performed for post-Project scenarios. For load connection projects, the load level modelled in post-Project scenarios is the same or higher than in pre-Project scenarios. Therefore, voltage stability studies for pre-Project scenarios would only be performed if the post-Project scenarios show voltage stability criteria violations. The 2019 SP scenario was selected as it includes a higher load level compared to 2019 WP.

The voltage stability analyses were performed according to the Western Electricity Coordinating Council (WECC) Voltage Stability Assessment Methodology. WECC voltage stability criteria states, for load areas, post-transient voltage stability is required for the area modelled at a minimum of 105% of the reference load level for Category A and Category B conditions. For this standard, the reference load level is the maximum established planned load.

Typically, voltage stability analysis is carried out assuming the worst case scenarios in terms of loading. The voltage stability analysis was performed by increasing load in the Study Area, and increasing the corresponding generation in the Wabamun planning area (Area 40).

3.3.1. Contingencies Studied

Contingency list for voltage stability analysis includes all 69 kV or above elements in the Study Area and all ties to surrounding planning areas. All transmission facilities in the Study Area were monitored for Reliability Criteria violations.

4. Pre-Project System Assessment

4.1. Pre-Project Power Flow Studies

The pre-Project power flow diagrams are provided in Attachment A.

4.1.1. Scenario 1 – 2019 WP Pre-Project

No Reliability Criteria violations were observed under Category A or Category B conditions.

4.1.2. Scenario 2 – 2019 SP Pre-Project

No Reliability Criteria violations were observed under Category A or Category B conditions.

5. Connection Alternatives

5.1. Overview

The AESO, in consultation with the DFO and the TFO, examined two connection alternatives to meet the DFO's request for system access service.

5.2. Connection Alternatives Examined

Below is a description of the developments associated with the transmission alternatives that were examined for the Project.

Alternative 1 – Upgrades at Fincastle 336S substation

Alternative 1 involves upgrading the existing Fincastle 336S substation, including adding one 138/25 kV transformer, two 138 kV circuit breakers, two 25 kV feeder circuit breakers and associated equipment. In addition, the DFO has advised that Alternative 1 would also require the addition of approximately 84 km of upgraded distribution feeders and 22 km of new distribution feeders.

Alternative 2 – Upgrades at Fincastle 336S and Hull 257S substations

Alternative 2 involves upgrading the existing Fincastle 336S substation, including adding one 138/25 kV transformer, two 138 kV circuit breakers, two 25 kV feeder circuit breakers and associated equipment. In addition, Alternative 2 involves upgrading the existing Hull 257S substation, including adding one 138/25 kV transformer and associated equipment. The DFO has advised that Alternative 2 would also require the addition of approximately 84 km of upgraded distribution feeders and 20 km of new distribution feeders.

5.2.1. Connection Alternatives Selected for Further Studies

Alternative 1 is considered technically feasible and was selected for further study. Post-project studies were conducted assuming a total load of 19 MW at the Fincastle 336S substation.

5.2.2. Connection Alternatives Not Selected for Further Studies

Alternative 1 was selected for further examination. Alternative 2 would involve increased transmission development, and hence overall increased cost, compared to Alternative 1. Therefore, Alternative 2 was not selected for further study.

6. Technical Analysis of the Connection Alternative

6.1. Power Flow Studies

The post-Project power flow diagrams are provided in Attachment B.

6.1.1. Scenario 3 – 2019 WP Post-Project

No Reliability Criteria violations were observed under Category A and Category B conditions.

6.1.2. Scenario 4 – 2019 SP Post-Project

No Reliability Criteria violations were observed under Category A and Category B conditions.

6.2. Post-Project Voltage Stability Studies

6.2.1. Scenario 4 – 2019 SP Post-Project

Voltage stability analysis was performed for the 2019 SP post-Project scenario. The reference load level for the Study Area is 189.0 MW. The minimum incremental load transfer for the Category B contingencies is 5.0% of the reference load or 9.45 MW (0.05 x 189.0 MW = 9.45 MW). Table 6–1 provides the voltage stability studies results under Category A conditions and for the five worst contingencies under Category B conditions. The voltage stability margin was met for all studied conditions.

Table 6–1: Voltage stability analysis results for the 2019 SP Post-Project Scenario

Contingency	From	To	Maximum incremental transfer (MW)	Meets 105% transfer criteria?
N-G-0	Category A Condition		165	Yes
Category B Conditions				
Taber 83S 138/25kV transformer (T1 or T3)			45	Yes
610L	Taber 83S	Fincastle 336S	45	Yes
172L	Taber 83S	Coaldale 254S	60	Yes
763L	Vauxhall 158S	West Brooks 28S	85	Yes
879L	Burdett 368S	Bowmanton 244S	95	Yes

7. Project Dependencies

The Project does not require the completion of any other AESO plans to expand or enhance the transmission system prior to connection.

8. Conclusion and Recommendations

Based on the study results, Alternative 1 is technically viable. The connection assessment did not identify any system performance issues in the pre-Project or post-Project scenarios. The connection of the project with the proposed alternative does not adversely affect the performance of the AIES.

It is recommended to proceed with the Project using Alternative 1 as the preferred option to respond to the DFO's request for system access service. Alternative 1 involves upgrading the Fincastle 366S substation, including adding one 138/25 kV transformer, two 138 kV circuit breakers, two 25 kV feeder circuit breakers[3] and associated equipment.

It is recommended that the 138/25 kV transformer at Fincastle 336S has a transformation capability of 25 MVA to match the transformation capability of the existing Fincastle 336S substation transformer. Adding a 25 MVA 138/25 kV transformer at Fincastle 336S substation will meet the DFO's requested DTS increase and the DFO's distribution system planning criteria for electrical load restoration.

[3] The 25 kV circuit breakers for transformer connection and for bus tie connection are not explicitly listed herein because they do not impact the selection of the preferred connection alternative. Contingencies associated with these 25-kV circuit breakers do not impact the conclusions and recommendations of the connection assessment.

While the AESO did not explicitly list these 25 kV circuit breakers in the connection alternative description, they were considered part of the equipment referred to as "…and associated equipment" provided in the description. All major transmission facilities, including these breakers, are identified in the AESO Functional Specification, "*FortisAlberta Fincastle Area Capacity and Reliability Project Functional Specification.*"