APPENDIX E DFO NEED FOR DEVELOPMENT REPORT

Need for Development

Fincastle Area

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Executive Summary

FortisAlberta Inc. (FortisAlberta) is requesting system access service to address the distribution system reliability concerns in the Fincastle area.

Load growth in the Fincastle area is producing a number of concerns related to the adequacy of the existing transmission and distribution facilities to meet the customer needs.

Load studies indicate that under the N-1 transformer contingency, unsupplied loads could exist at levels as high as:

- 10.7 MVA in 2015 at Westfield 107S substation, if left unaddressed, predicted to increase to 15.8 MVA by 2025.
- 4.2 MVA in 2015 at Hull 257S substation, if left unaddressed, predicted to increase to 17.8 MVA by 2025.
- 10.9 MVA in 2015 at Fincastle 336S substation, if left unaddressed, predicted to increase to 17.6 MVA by 2025.
- Predicted 6.5 MVA in 2016 at Taber 83S substation, if left unaddressed, predicted to increase to 15.1 MVA by 2025.
- Predicted 0.3 MVA in 2023 at Burdett 368S substation, if left unaddressed, predicted to increase to 1.1 MVA by 2025.

These exceed FortisAlberta planning criteria for electrical load restoration.

Potential solutions were assessed to address the reliability concerns at the Fincastle area. Based on information available to the distribution facilities owner (DFO), technical merit and distribution capital cost, FortisAlberta's preferred alternative includes the following transmission upgrades:

- Add one source transformer at Fincastle 336S substation;
- Add two feeder breakers at Fincastle 336S substation;
- Other associated upgrades as required.

The estimated transmission capital costs associated with FortisAlberta's preferred alternative will be provided by the Transmission Facility Owner (TFO), AltaLink Management Limited (AltaLink).

The estimated distribution capital costs associated with FortisAlberta's preferred alternative is $16.4 million (2018$, ±30%).

The requested In-Service Date (ISD) for the Fincastle 336S substation facility upgrades is November 1, 2018.

If FortisAlberta's preferred alternative is approved by the AUC, FortisAlberta will request an increase to the Demand Transmission Service (DTS) at the Fincastle 336S substation of 11.1 MW, resulting in a DTS of 23.3 MW.

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1 Project Description

1.1 Background

The Fincastle area is located between the City of Lethbridge and the City of Medicine Hat. The area extends north to highway 524 and south to highway 61.

The Fincastle area is served by Taber 83S, Westfield 107S, Hull 257S, Fincastle 336S, and Burdett 368S substations. The distribution service in the area consists mainly of industrial and farm loads.

The Taber 83S substation is located at LSD 02 SEC 18 TWP 10 RGE 16 W4, approximately 2 km north of the town of Taber. The substation has one 138/24.94 kV 25/33/42//46.6 MVA LTC source transformer and one 138/24.94 kV 25/33/42 MVA LTC source transformer supplying seven 25 kV distribution feeders. Taber 83S substation serves the town of Taber and the surrounding area. See Appendix-A Figure A-1 for a simplified sketch of the existing transmission substations and distribution systems in this area.

The Westfield 107S substation is located at LSD 04 SEC 30 TWP 08 RGE 11 W4, approximately 16 km south of the Burdett 368S substation. The substation has one 138/24.94 kV 15/20/25 MVA off-circuit tap changer (OCTC) source transformer paired with a 24.94 kV 15/20/25 MVA voltage regulator supplying four 25 kV distribution feeders. Westfield 107S substation serves the surrounding area. See Appendix-A Figure A-1 for a simplified sketch of the existing transmission substations and distribution systems in this area.

The Hull 257S substation is located at LSD 01 SEC 17 TWP 12 RGE 16 W4, approximately 21 km north of the town of Taber. The substation has one 138/26.5 kV 25/33/42 MVA LTC source transformer supplying four 25 kV distribution feeders. Hull 257S substation serves the surrounding area. See Appendix-A Figure A-1 for a simplified sketch of the existing transmission substations and distribution systems in this area.

The Fincastle 336S substation is located at LSD 04 SEC 15 TWP 10 RGE 15 W4, approximately 60 km east of the City of Lethbridge. The substation has one 138/24.94 kV 15/20/25 MVA off-circuit tap changer (OCTC) source transformer paired with a 24.94 kV 15/20/22.5 MVA voltage regulator supplying three 25 kV distribution feeders. Fincastle 336S substation serves the nearby ConAgra factory and the surrounding area. See Appendix-A Figure A-1 for a simplified sketch of the existing transmission substations and distribution systems in this area.

Burdett 368S substation is located at LSD 01 SEC 15 TWP 10 RGE 12 W4, approximately 31 km east of the Fincastle 336S substation. The substation has one 138/26.5 kV 25/33/42 MVA LTC source transformer supplying two 25 kV distribution feeders and one 130/24.94 kV 25/33/42 MVA LTC source transformer supplying four 25 kV distribution feeders. Burdett 368S substation serves the surrounding area. See Appendix-A Figure A-1 for a simplified sketch of the existing transmission substations and distribution systems in this area.

2 Criteria

The analysis of the existing system and alternative solutions in the Fincastle area has been conducted based upon the following criteria:

- The maximum normal loading of FortisAlberta 25 kV distribution feeders is 13.0 MVA.
- FortisAlberta planning criteria for electrical load restoration requires that adequate backup supply for contingency situations be available subject only to switching time. Backup capability refers to the ability to restore service after an interruption without necessarily first repairing the cause of the interruption.
- Transmission equipment must not be operated at load levels in excess of the equipment ratings.

3 Existing System Assessment

The existing substations and distribution systems in the Fincastle area are shown in Figure A-1 in Appendix A.

3.1 Load Forecast

Table 3-1 provides FortisAlberta historical and forecast peak load levels for the substations and feeders in the Fincastle area. The load forecast is based on historical data, expected development trends and contracted new loads. This load forecast was used to assess the existing system in this Need for Development document.

Table 3-1: FortisAlberta Load Forecast: Existing System

SUB No	Feeder	CAPACITY T/R	MVA	W or S	MVA LOADING - RECORDED 2011 Peak MVA	2012 Peak MVA	2013 Peak MVA	2014 Peak MVA	2015 Peak MVA	2015 PF	MVA LOADING - PREDICTED 2016 Peak MVA	2017 Peak MVA	2018 Peak MVA	2019 Peak MVA	2020 Peak MVA	2021 Peak MVA	2022 Peak MVA	2023 Peak MVA	2024 Peak MVA	2025 Peak MVA
083S	Taber	T1	25/33/ 42	S	**34.5**	**35.8**	**35.1**	**27.6**	**29.0**	91%	**35.6**	**36.0**	**36.3**	**36.7**	**37.1**	**37.4**	**37.8**	**38.2**	**38.6**	**39.0**
083S	15LE			S	8.8	6.7	9.9	10.3	10.1	90%	11.7	11.7	11.8	11.8	11.9	12.0	12.0	12.1	12.1	12.2
083S	313LN			S/W	11.8	12.7	12.5	10.8	12.1	92%	12.3	12.4	12.5	12.7	12.8	12.9	**13.0**	**13.2**	**13.3**	**13.4**
083S	383LW			S/W	8.9	8.9	8.9	6.0	6.1	89%	6.2	6.2	6.3	6.4	6.4	6.5	6.6	6.6	6.7	6.8
083S	437LW			S	7.0	8.4	7.0	6.6	7.6	89%	9.1	9.3	9.5	9.8	10.0	10.2	10.5	10.7	11.0	11.2
083S	Taber	T3	25/33/42// 46.6	S	**23.2**	**27.1**	**25.6**	**23.2**	**23.9**	93%	**30.8**	**31.1**	**31.4**	**31.7**	**32.0**	**32.3**	**32.7**	**33.0**	**33.3**	**33.6**
083S	194LS			S	8.9	8.9	9.2	9.2	9.0	92%	9.7	9.8	9.9	10.0	10.1	10.2	10.3	10.4	10.5	10.6
083S	263LE			S	6.9	8.8	7.3	8.0	8.9	94%	**13.4**	11.5	11.6	11.7	11.8	11.9	12.1	12.2	12.3	12.4
083S	493LW			S/W	9.6	11.1	11.7	8.3	7.3	92%	10.2	12.7	**13.1**	**13.5**	**13.9**	**14.3**	**14.7**	**15.2**	**15.6**	**16.1**
083S	Total Station			S	**56.8**	**61.1**	**58.4**	**49.1**	**49.6**	**91%**	**63.7**	**64.4**	**65.0**	**65.7**	**66.3**	**67.0**	**67.7**	**68.3**	**69.0**	**69.7**
107S	Westfield	T1	15/20/ 25																	
107S		VR1	15/20/ 25	S	**13.3**	**14.7**	**12.7**	**15.7**	**15.5**	91%	**18.8**	**19.0**	**19.2**	**19.3**	**19.5**	**19.7**	**19.9**	**20.1**	**20.3**	**20.5**
107S	110LS			W	1.4	1.3	1.4	1.3	1.6	100%	1.9	1.9	1.9	2.0	2.0	2.0	2.0	2.0	2.1	2.1
107S	2068L			S	1.9	2.0	2.1	2.0	2.2	96%	2.2	2.2	2.2	2.3	2.3	2.3	2.3	2.4	2.4	2.4
107S	456LE			S	3.1	3.3	3.4	4.6	3.5	88%	6.6	6.7	6.7	6.8	6.9	6.9	7.0	7.1	7.2	7.2
107S	457LW			S	8.4	8.5	7.7	9.1	9.1	87%	9.3	9.5	9.7	9.9	10.2	10.4	10.6	10.9	11.2	11.4
257S	Hull	T1	25/33/ 42	S			**0.0**	**17.8**	**18.9**	91%	**23.6**	**24.0**	**24.5**	**24.9**	**25.3**	**25.7**	**26.2**	**26.6**	**27.1**	**27.5**
257S	3523L			S			0.0	8.1	7.4	89%	9.5	9.7	9.9	10.1	10.3	10.5	10.7	10.9	11.1	11.4
257S	482L			S			0.0	4.2	4.7	95%	5.6	5.7	5.8	6.0	6.1	6.2	6.3	6.4	6.6	6.7
257S	5545L			S			0.0	3.7	4.0	89%	5.3	5.4	5.4	5.5	5.5	5.6	5.6	5.7	5.7	5.8
257S	6133L			S			0.0	3.0	3.4	89%	4.1	4.2	4.2	4.2	4.3	4.3	4.4	4.4	4.5	4.5
336S	Fincastle	T1	15/20/ 25																	
336S		VR1	15/20/ 22.5	S	**15.8**	**17.2**	**16.8**	**17.0**	**17.6**	85%	**17.9**	**18.0**	**18.2**	**18.4**	**18.6**	**18.8**	**19.0**	**19.2**	**19.4**	**19.5**
336S	2151L			S	7.6	8.5	8.3	8.6	9.2	86%	9.6	9.8	9.9	10.1	10.2	10.4	10.5	10.7	10.8	11.0
336S	2152L			S	4.8	4.8	4.8	4.8	4.7	81%	4.7	4.7	4.8	4.8	4.9	4.9	5.0	5.0	5.1	5.1
336S	2153L			S	4.5	4.7	4.3	4.3	4.3	87%	4.3	4.3	4.3	4.4	4.4	4.5	4.5	4.6	4.6	4.7
368S	Burdett	T2	25/33/ 42	S	**17.1**	**19.1**	**18.3**	**17.1**	**16.7**	91%	**19.6**	**20.7**	**21.8**	**22.0**	**22.2**	**22.4**	**22.6**	**22.9**	**23.1**	**23.3**
368S	314LE			S	8.1	9.9	9.4	10.3	9.7	90%	10.1	10.2	10.3	10.4	10.5	10.7	10.8	10.9	11.0	11.1
368S	468LE			S	9.0	9.5	8.9	7.3	7.9	92%	9.7	10.6	11.6	11.7	11.8	12.0	12.1	12.2	12.3	12.4
368S	Burdett	T1	25/33/ 42	S	**16.3**	**15.7**	**15.3**	**16.9**	**16.0**	88%	**20.3**	**20.5**	**20.7**	**20.9**	**21.1**	**21.3**	**21.5**	**21.7**	**22.0**	**22.2**
368S	15LW			S	10.8	10.5	10.7	10.3	10.8	86%	**13.1**	**13.2**	**13.3**	**13.5**	**13.6**	**13.7**	**13.9**	**14.0**	**14.1**	**14.3**
368S	382LW			S	5.7	5.6	5.3	7.0	6.3	89%	7.3	7.4	7.5	7.6	7.6	7.7	7.8	7.9	7.9	8.0
368S	Total Station			S	**33.3**	**34.3**	**32.0**	**33.4**	**31.5**	**89%**	**38.7**	**39.9**	**41.2**	**41.6**	**42.0**	**42.4**	**42.8**	**43.3**	**43.7**	**44.1**
Total Area Load					**119.2**	**127.3**	**119.9**	**133.0**	**133.1**		**162.7**	**165.4**	**168.0**	**169.9**	**171.7**	**173.6**	**175.6**	**177.5**	**179.5**	**181.4**

MW	Transfers	Year
2.0	From 83S-263LE to 83S-493LW	2017

83S Total Load:	49.6	63.7	64.4	65.0	65.7	66.4	67.0	67.7	68.4	69.0	69.7
N-1 Capacity:	42.0	42.0	42.0	42.0	42.0	42.0	42.0	42.0	42.0	42.0	42.0
Back up from 135S:	4.7	3.1	3.1	3.1	3.1	3.1	3.1	3.1	3.1	3.1	3.1
Back up from 254S:	3.2	4.3	4.4	4.6	4.1	3.6	3.1	2.6	2.1	1.6	1.1
Back up from 257S:	5.5	5.8	5.8	5.9	5.9	6.0	6.0	6.1	6.1	6.2	6.2
Back up from 336S:	2.2	2.0	2.1	2.1	2.1	2.1	2.1	2.1	2.1	2.1	2.1
N-1 Unsupplied Load:	**0.0**	**6.5**	**7.0**	**7.4**	**8.5**	**9.6**	**10.7**	**11.8**	**12.9**	**14.0**	**15.1**
107S Total Load:	15.5	18.8	19.0	19.2	19.3	19.5	19.7	19.9	20.1	20.3	20.5
N-1 Capacity:	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Back up from 404S:	1.6	1.9	1.9	1.9	1.9	2.0	2.0	2.0	2.0	2.0	2.0
Back up from 368S:	3.2	2.4	2.4	2.4	2.5	2.5	2.6	2.6	2.6	2.7	2.7
Back up from 336S:	0.0	2.6	2.7	2.7	2.3	2.0	1.6	1.2	0.8	0.4	0.0
N-1 Unsupplied Load:	**10.7**	**11.9**	**12.0**	**12.0**	**12.6**	**13.1**	**13.6**	**14.2**	**14.7**	**15.2**	**15.8**
257S Total Load:	18.9	23.6	24.0	24.5	24.9	25.3	25.7	26.2	26.6	27.1	27.5
N-1 Capacity:	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Back up from 83S:	6.0	5.7	5.8	4.6	3.9	3.3	2.6	2.0	1.3	0.7	0.0
Back up from 421S:	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Back up from 158S:	8.7	10.7	10.6	10.7	10.6	10.4	10.3	10.2	10.0	9.9	9.7
N-1 Unsupplied Load:	**4.2**	**7.2**	**7.7**	**9.1**	**10.4**	**11.6**	**12.8**	**14.0**	**15.3**	**16.5**	**17.8**
336S Total Load:	17.6	17.9	18.0	18.2	18.4	18.6	18.8	19.0	19.2	19.4	19.5
N-1 Capacity:	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Back up from 83S:	5.9	2.9	1.1	1.2	1.2	1.1	1.1	1.1	1.1	1.1	1.1
Back up from 368S:	0.9	0.6	0.8	0.8	0.8	0.8	0.8	0.9	0.9	0.9	0.9
N-1 Unsupplied Load:	**10.9**	**14.3**	**16.2**	**16.3**	**16.4**	**16.6**	**16.8**	**17.0**	**17.2**	**17.4**	**17.6**
368S Total Load:	31.5	38.7	39.9	41.2	41.6	42.0	42.4	42.9	43.3	43.7	44.1
N-1 Capacity:	42.0	42.0	42.0	42.0	42.0	42.0	42.0	42.0	42.0	42.0	42.0
Back up from 421S:	0.9	0.9	1.0	1.0	1.0	1.0	1.0	1.0	1.0	1.0	1.0
N-1 Unsupplied Load:	**0.0**	**0.0**	**0.0**	**0.0**	**0.0**	**0.0**	**0.0**	**0.0**	**0.3**	**0.7**	**1.1**

The Fincastle area was assessed with the following reliability concerns observed from Table 3-1:

- In 2015, a reliability concern exists at the Westfield 107S substation. The unsupplied load could exist at levels as high as 10.7 MVA. If left unaddressed, it is

predicted to increase to 15.8 MVA by 2025. This exceeds FortisAlberta planning criteria for electrical load restoration.

- In 2015, a reliability concern exists at the Hull 257S substation. The unsupplied load could exist at levels as high as 4.2 MVA. If left unaddressed, it is predicted to increase to 17.8 MVA by2025. This exceeds FortisAlberta planning criteria for electrical load restoration.
- In 2015, a reliability concern exists at the Fincastle 336S substation. The unsupplied load could exist at levels as high as 10.9 MVA. If left unaddressed, it is predicted to increase to 17.6 MVA by2025. This exceeds FortisAlberta planning criteria for electrical load restoration.
- In 2016, a reliability concern is predicted at the Taber 83S substation. The predicted unsupplied load could exist at levels as high as 6.5 MVA. If left unaddressed, it is predicted to increase to 15.1 MVA by 2025. This exceeds FortisAlberta planning criteria for electrical load restoration.
- In 2023, a reliability concern is predicted at the Burdett 368S substation. The predicted unsupplied load could exist at levels as high as 0.3 MVA. If left unaddressed, it is predicted to increase to 1.1 MVA by 2025. This exceeds FortisAlberta planning criteria for electrical load restoration.

The Fincastle area was assessed with the following capacity concerns observed from Table 3-1:

- In 2018, a capacity concern is predicted on the 25 kV feeder 83S-493LW.
- In 2022, a capacity concern is predicted on the 25 kV feeder 83S-313LN.

4 Alternative Analysis

A number of alternatives were considered and based on information available to FortisAlberta, technical merit and distribution capital cost, three alternatives are presented in this document. These three alternatives have either the least distribution system development or the lowest estimated distribution capital cost.

4.1 Alternative 1: Distribution Upgrades and Load Shifting

4.1.1 Description

This alternative involves upgrades limited to the distribution system. The following are distribution upgrades required at Taber 83S, Westfield 107S, Hull 257S, Fincastle 336S, and Burdett 368S substations. Additional distribution

upgrades referred to below include installations of voltage regulator banks, electronic OCRs, and switching cubicles.

Taber 83S substation has eight existing distribution feeder ties to adjacent substations. Three new distribution feeder ties need to be built and four existing distribution feeder ties need to be upgraded. In total, approximately 35 km of new distribution line needs to be built and 19 km of existing distribution line needs to be upgraded. Additional distribution upgrades are required.

Westfield 107S substation has three existing distribution feeder ties to adjacent substations. Two new distribution feeder ties need to be built and one existing distribution feeder tie needs to be upgraded. In total, approximately 35 km of new distribution line needs to be built and 16 km of existing distribution line needs to be upgraded. Additional distribution upgrades are required.

Hull 257S substation has five existing distribution feeder ties to adjacent substations. One new distribution feeder tie needs to be built. In total, approximately 2 km of new distribution line needs to be built. Additional distribution upgrades are required.

Fincastle 336S substation has four existing distribution feeder ties to adjacent substations. One existing distribution feeder tie needs to be upgraded. In total, approximately 16 km of existing distribution line needs to be upgraded. Additional distribution upgrades are required.

Burdett 368S substation has four existing distribution feeder ties to adjacent substations. Three new distribution feeder ties need to be built. One existing distribution feeder tie needs to be upgraded. In total, approximately 9 km of new distribution line needs to be built and 30 km of existing distribution line needs to be upgraded. Additional distribution upgrades are required.

Refer to Appendix B, Figure B-1 showing Alternative 1 system development.

4.1.2 Load Forecast

The load forecast resulting from this alternative is provided in Table 4-1.

Table 4-1: FortisAlberta Historic and Forecast Load: Alternative 1 – Distribution Upgrades and Load Shifting

				MVA LOADING - RECORDED						MVA LOADING - PREDICTED									
			W	2011	2012	2013	2014	2015		2016	2017	2018	2019	2020	2021	2022	2023	2024	2025
SUB No	Feeder	CAPACITY T/R MVA	or S	Peak MVA	Peak MVA	Peak MVA	Peak MVA	Peak MVA	PF	Peak MVA	Peak MVA	Peak MVA	Peak MVA	Peak MVA	Peak MVA	Peak MVA	Peak MVA	Peak MVA	Peak MVA
083S	Taber	T1 25/33/ 42	S	**34.5**	**35.8**	**35.1**	**27.6**	**29.0**	91%	**35.6**	**36.0**	**35.7**	**36.1**	**36.4**	**36.8**	**37.2**	**37.5**	**37.9**	**38.3**
083S	15LE		S	8.8	6.7	9.9	10.3	10.1	90%	11.7	11.7	11.8	11.8	11.9	12.0	12.0	12.1	12.1	12.2
083S	313LN		S/W	11.8	12.7	12.5	10.8	12.1	92%	12.3	12.4	11.9	12.0	12.1	12.3	12.4	12.5	12.6	12.8
083S	383LW		S/W	8.9	8.9	8.9	6.0	6.1	89%	6.2	6.2	6.3	6.4	6.4	6.5	6.6	6.6	6.7	6.8
083S	437LW		S	7.0	8.4	7.0	6.6	7.6	89%	9.1	9.3	9.5	9.8	10.0	10.2	10.5	10.7	11.0	11.2
083S	Taber	T3 25/33/42// 46.6	S	**23.2**	**27.1**	**25.6**	**23.2**	**23.9**	93%	**30.8**	**31.1**	**30.2**	**30.5**	**30.8**	**31.1**	**31.4**	**31.7**	**32.1**	**32.4**
083S	194LS		S	8.9	8.9	9.2	9.2	9.0	92%	9.7	9.8	12.0	12.1	12.2	12.4	12.5	12.6	12.7	12.9
083S	263LE		S	6.9	8.8	7.3	8.0	8.9	94%	**13.4**	11.5	11.6	11.7	11.8	11.9	12.1	12.2	12.3	12.4
083S	493LW		S/W	9.6	11.1	11.7	8.3	7.3	92%	10.2	12.7	9.8	10.1	10.4	10.7	11.1	11.4	11.7	12.1
083S	Total Station		S	**56.8**	**61.1**	**58.4**	**49.1**	**49.6**	91%	**63.7**	**64.4**	**63.3**	**63.9**	**64.5**	**65.2**	**65.8**	**66.5**	**67.2**	**67.8**
107S	Westfield	T1 15/20/ 25																	
107S		VR1 15/20/ 25	S	**13.3**	**14.7**	**12.7**	**15.7**	**15.5**	91%	**18.8**	**19.0**	**19.2**	**19.3**	**19.5**	**19.7**	**19.9**	**20.1**	**20.3**	**20.5**
107S	110LS		W	1.4	1.3	1.4	1.3	1.6	100%	1.9	1.9	1.9	2.0	2.0	2.0	2.0	2.0	2.1	2.1
107S	2068L		S	1.9	2.0	2.1	2.0	2.2	96%	2.2	2.2	2.2	2.3	2.3	2.3	2.3	2.4	2.4	2.4
107S	456LE		S	3.1	3.3	3.4	4.6	3.5	88%	6.6	6.7	6.7	6.8	6.9	6.9	7.0	7.1	7.2	7.2
107S	457LW		S	8.4	8.5	7.7	9.1	9.1	87%	9.3	9.5	9.7	9.9	10.2	10.4	10.6	10.9	11.2	11.4
257S	Hull	T1 25/33/ 42	S			**0.0**	**17.8**	**18.9**	91%	**23.6**	**24.0**	**25.1**	**25.5**	**25.9**	**26.4**	**26.8**	**27.3**	**27.8**	**28.2**
257S	3523L		S			0.0	8.1	7.4	89%	9.5	9.7	10.5	10.7	11.0	11.2	11.4	11.6	11.9	12.1
257S	482L		S			0.0	4.2	4.7	95%	5.6	5.7	5.8	6.0	6.1	6.2	6.3	6.4	6.6	6.7
257S	5545L		S			0.0	3.7	4.0	89%	5.3	5.4	5.4	5.5	5.5	5.6	5.6	5.7	5.7	5.8
257S	6133L		S			0.0	3.0	3.4	89%	4.1	4.2	4.2	4.2	4.3	4.3	4.4	4.4	4.5	4.5
336S	Fincastle	T1 15/20/ 25																	
336S		VR1 15/20/ 22.5	S	**15.8**	**17.2**	**16.8**	**17.0**	**17.6**	85%	**17.9**	**18.0**	**18.2**	**18.4**	**18.6**	**18.8**	**19.0**	**19.2**	**19.4**	**19.5**
336S	2151L		S	7.6	8.5	8.3	8.6	9.2	86%	9.6	9.8	9.9	10.1	10.2	10.4	10.5	10.7	10.8	11.0
336S	2152L		S	4.8	4.8	4.8	4.8	4.7	81%	4.7	4.7	4.8	4.8	4.9	4.9	5.0	5.0	5.1	5.1
336S	2153L		S	4.5	4.7	4.3	4.3	4.3	87%	4.3	4.3	4.3	4.4	4.4	4.5	4.5	4.6	4.6	4.7
368S	Burdett	T2 25/33/ 42	S	**17.1**	**19.1**	**18.3**	**17.1**	**16.7**	91%	**19.6**	**20.7**	**21.8**	**22.0**	**22.2**	**22.4**	**22.6**	**22.9**	**23.1**	**23.3**
368S	314LE		S	8.1	9.9	9.4	10.3	9.7	90%	10.1	10.2	10.3	10.4	10.5	10.7	10.8	10.9	11.0	11.1
368S	468LE		S	9.0	9.5	8.9	7.3	7.9	92%	9.7	10.6	11.6	11.7	11.8	12.0	12.1	12.2	12.3	12.4
368S	Burdett	T1 25/33/ 42	S	**16.3**	**15.7**	**15.3**	**16.9**	**16.0**	88%	**20.3**	**20.5**	**20.7**	**20.9**	**21.1**	**21.3**	**21.5**	**21.7**	**22.0**	**22.2**
368S	15LW		S	10.8	10.5	10.7	10.3	10.8	86%	**13.1**	**13.2**	10.6	10.7	10.8	10.9	11.1	11.2	11.3	11.4
368S	382LW		S	5.7	5.6	5.3	7.0	6.3	89%	7.3	7.4	10.1	10.2	10.3	10.4	10.5	10.6	10.7	10.8
368S	Total Station		S	**33.3**	**34.3**	**32.0**	**33.4**	**31.5**	89%	**38.7**	**39.9**	**41.2**	**41.6**	**42.0**	**42.4**	**42.8**	**43.3**	**43.7**	**44.1**
Total Area Load				**119.2**	**127.3**	**119.9**	**133.0**	**133.1**		**162.7**	**165.4**	**166.9**	**168.8**	**170.6**	**172.5**	**174.4**	**176.4**	**178.3**	**180.3**

MW	Transfers	Year
2.0	From 83S-263LE to 83S-493LW	2017
2.3	From 368S-15LW to 368S-382LW	2018
0.6	From 83S-313LN to 257S-3523L	2018
1.9	From 83S-493LW to 83S-194LS	2018
1.1	From 83S-493LW to 254S-413LE	2018

83S Total Load:	49.6	63.7	64.4	63.3	63.9	64.6	65.2	65.9	66.5	67.2	67.8
N-1 Capacity:	42.0	42.0	42.0	42.0	42.0	42.0	42.0	42.0	42.0	42.0	42.0
Back up from 135S:	4.7	3.1	3.1	9.4	9.7	10.0	10.3	10.7	11.0	11.3	11.6
Back up from 254S:	3.2	4.3	4.4	7.4	7.7	8.1	8.5	9.0	9.4	9.8	10.2
Back up from 257S:	5.5	5.8	5.8	9.4	9.4	9.4	9.5	9.5	9.6	9.6	9.7
Back up from 336S:	2.2	2.0	2.1	2.1	2.1	2.1	2.1	2.1	2.1	2.2	2.2
N-1 Unsupplied Load:	**0.0**	**6.5**	**7.0**	**0.0**	**0.0**	**0.0**	**0.0**	**0.0**	**0.0**	**0.0**	**0.0**
107S Total Load:	15.5	18.8	19.0	19.2	19.3	19.5	19.7	19.9	20.1	20.3	20.5
N-1 Capacity:	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Back up from 404S:	1.6	1.9	1.9	1.9	1.9	2.0	2.0	2.0	2.0	2.1	2.1
Back up from 368S:	3.2	2.4	2.4	6.9	7.1	7.3	7.5	7.7	7.9	8.1	8.3
Back up from 336S:	0.0	2.6	2.7	4.2	4.0	3.8	3.5	3.3	3.1	2.9	2.7
Back up from 135S:	0.0	0.0	0.0	7.6	8.1	8.6	9.1	9.7	10.2	10.8	11.3
N-1 Unsupplied Load:	**10.7**	**11.9**	**12.0**	**0.0**	**0.0**	**0.0**	**0.0**	**0.0**	**0.0**	**0.0**	**0.0**
257S Total Load:	18.9	23.6	24.0	25.1	25.5	25.9	26.4	26.8	27.3	27.8	28.2
N-1 Capacity:	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Back up from 83S:	6.0	5.7	5.8	13.0	13.2	13.4	13.6	13.8	14.0	14.2	14.4
Back up from 158S:	8.7	10.7	10.6	7.0	7.1	7.2	7.4	7.5	7.6	7.7	7.9
Back up from 421S:	0.0	0.0	0.0	5.5	5.6	5.6	5.7	5.7	5.8	5.8	5.9
N-1 Unsupplied Load:	**4.2**	**7.2**	**7.7**	**0.0**	**0.0**	**0.0**	**0.0**	**0.0**	**0.0**	**0.0**	**0.0**
336S Total Load:	17.6	17.9	18.0	18.4	18.4	18.6	18.8	19.0	19.2	19.4	19.5
N-1 Capacity:	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Back up from 83S:	5.9	2.9	1.1	9.1	9.2	9.5	9.9	10.3	10.6	11.0	11.4
Back up from 368S:	0.9	0.6	0.8	9.9	10.1	9.9	9.8	9.7	9.6	9.5	9.4
Back up from 107S:	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
N-1 Unsupplied Load:	**10.9**	**14.3**	**16.2**	**0.0**	**0.0**	**0.0**	**0.0**	**0.0**	**0.0**	**0.0**	**0.0**
368S Total Load:	31.5	38.7	39.9	41.6	41.6	42.0	42.4	42.8	43.2	43.6	44.1
N-1 Capacity:	42.0	42.0	42.0	42.0	42.0	42.0	42.0	42.0	42.0	42.0	42.0
Back up from 421S:	0.9	0.9	1.0	3.6	3.7	3.7	3.8	3.8	3.9	3.9	4.0
N-1 Unsupplied Load:	**0.0**	**0.0**	**0.0**	**0.0**	**0.0**	**0.0**	**0.0**	**0.0**	**0.0**	**0.0**	**0.0**

Note: Distribution Projects are shown in 2018 for illustrative purposes only

4.1.3 Cost Estimate

There is no transmission capital cost for this alternative.

The distribution capital cost for this alternative is estimated to be $27.6 million (2018$, ±30%).

4.2 Alternative 2: Upgrades at Fincastle 336S substation

4.2.1 Description

2018 transmission upgrades at the Fincastle 336S substation:

- Add one source transformer;
- Add two 25kV feeder breakers;
- Other associated upgrades as required.

Distribution upgrades are required at Taber 83S, Westfield 107S, Hull 257S, Fincastle 336S, and Burdett 368S substations. Additional distribution upgrades referred to below include installation of regulator banks, electronic OCRs, and switching cubicles.

Taber 83S substation has eight existing distribution feeder ties to adjacent substations. Four existing distribution feeder ties need to be upgraded. In total, approximately 14 km of existing distribution line needs to be upgraded. Additional distribution upgrades are required.

Westfield 107S substation has three existing distribution feeder ties to adjacent substations. One new distribution feeder tie needs to be built and two existing distribution feeder ties need to be upgraded. In total, approximately 11 km of new distribution line needs to be built and 21 km of existing distribution line needs to be upgraded. Additional distribution upgrades are required.

Hull 257S substation has five existing distribution feeder ties to adjacent substations. One new distribution feeder tie needs to be built. In total, approximately 2 km of new distribution line needs to be built. Additional distribution upgrades are required.

Fincastle 336S substation has four existing distribution feeder ties to adjacent substations. Two new distribution feeder ties need to be built and two existing distribution feeder ties need to be upgraded. In total, approximately 9 km of

new distribution line needs to be built and 24 km of existing distribution line needs to be upgraded. Additional distribution upgrades are required.

Burdett 368S substation has four existing distribution feeder ties to adjacent substations. Two existing distribution feeder ties need to be upgraded. In total, approximately 25 km of existing distribution line needs to be upgraded. Additional distribution upgrades are required.

Refer to Appendix C, Figure C-1 showing Alternative 2 system development.

All 25 kV overhead conductors, new and existing, exiting the substation and distribution feeder ties shall be 477 MCM. All underground feeder cables, new and existing, shall be 750 MCM. All transmission components on the secondary side of the 25 kV source transformers, new and existing, shall be sized to enable the feeders to simultaneously supply 26 MVA per feeder. All 25 kV feeder breakers shall be equipped with associated equipment to enable under-frequency load shedding.

Transmission facilities must be equipped with the appropriate equipment for interconnection with FortisAlberta's Automated Metering system. Provisions should be made for interconnecting the substation transformer neutrals with the distribution line neutrals as per the AltaLink standard.

All 138 kV and 25 kV buses shall have adequate switch points and protection to minimize frequency and duration of outages associated with the maintenance or failure of substation components upstream of the 25 kV bus. Failure of such upstream components must not result in a total substation outage.

4.2.2 Load Forecast

The load forecast resulting from this alternative is provided in Table 4-2.

Table 4-2: FortisAlberta Historic and Forecast Load: Alternative 2 – Upgrades at Fincastle 336S Substation

				MVA LOADING - RECORDER						MVA LOADING - PREDICTED									
SUB		CAPACITY	W	2011	2012	2013	2014	2015		2016	2017	2018	2019	2020	2021	2022	2023	2024	2025
No	Feeder	T/R MVA	or S	Peak MVA	Peak MVA	Peak MVA	Peak MVA	Peak MVA	PF	Peak MVA	Peak MVA	Peak MVA	Peak MVA	Peak MVA	Peak MVA	Peak MVA	Peak MVA	Peak MVA	Peak MVA
083S	Taber	T1 25/33/ 42	S	**34.5**	**35.8**	**35.1**	**27.6**	**29.0**	91%	**35.6**	**35.9**	**26.4**	**26.6**	**26.9**	**27.1**	**27.3**	**27.6**	**27.8**	**28.1**
083S	15LE		S	8.8	6.7	9.9	10.3	10.1	90%	11.7	11.7	6.8	6.8	6.8	6.9	6.9	7.0	7.0	7.0
083S	313LN		S/W	11.8	12.7	12.5	10.8	12.1	92%	12.3	12.4	7.6	7.7	7.8	7.9	7.9	8.0	8.1	8.2
083S	383LW		S/W	8.9	8.9	8.9	6.0	6.1	89%	6.2	6.2	6.3	6.4	6.4	6.5	6.6	6.6	6.7	6.8
083S	437LW		S	7.0	8.4	7.0	6.6	7.6	89%	9.1	9.3	9.5	9.8	10.0	10.2	10.5	10.7	11.0	11.2
083S	Taber	T3 25/33/42// 46.6	S	**23.2**	**27.1**	**25.6**	**23.2**	**23.9**	93%	**30.2**	**30.5**	**30.8**	**31.1**	**31.5**	**31.8**	**32.1**	**32.4**	**32.7**	**33.1**
083S	194LS		S	8.9	8.9	9.2	9.2	9.0	92%	9.7	9.8	9.9	12.0	12.1	12.2	12.4	12.5	12.6	12.7
083S	263LE		S	6.9	8.8	7.3	8.0	8.9	94%	**13.4**	11.5	11.6	11.7	11.8	11.9	12.1	12.2	12.3	12.4
083S	493LW		S/W	9.6	11.1	11.7	8.3	7.3	92%	9.7	12.1	12.5	10.9	11.2	11.6	11.9	12.3	12.6	13.0
083S	Total Station		S	**56.8**	**61.1**	**58.4**	**49.1**	**49.6**	91%	**63.2**	**63.8**	**54.9**	**55.4**	**56.0**	**56.5**	**57.1**	**57.6**	**58.1**	**58.7**
107S	Westfield	T1 15/20/ 25																	
107S		VR1 15/20/ 25	S	**13.3**	**14.7**	**12.7**	**15.7**	**15.5**	91%	**18.8**	**19.0**	**19.2**	**19.3**	**19.5**	**19.7**	**19.9**	**20.1**	**20.3**	**20.5**
107S	110LS		W	1.4	1.3	1.4	1.3	1.6	100%	1.9	1.9	1.9	2.0	2.0	2.0	2.0	2.0	2.1	2.1
107S	2068L		S	1.9	2.0	2.1	2.0	2.2	96%	2.2	2.2	2.2	2.3	2.3	2.3	2.3	2.4	2.4	2.4
107S	456LE		S	3.1	3.3	3.4	4.6	3.5	88%	6.6	6.7	6.7	6.8	6.9	6.9	7.0	7.1	7.2	7.2
107S	457LW		S	8.4	8.5	7.7	9.1	9.1	87%	9.3	9.5	9.7	9.9	10.2	10.4	10.6	10.9	11.2	11.4
257S	Hull	T1 25/33/ 42	S			**0.0**	**17.8**	**18.9**	91%	**23.6**	**24.0**	**24.4**	**24.8**	**25.2**	**25.6**	**26.0**	**26.6**	**27.1**	**27.5**
257S	3523L		S			0.0	8.1	7.4	89%	9.5	9.7	9.9	10.1	10.3	10.5	10.7	10.9	11.1	11.4
257S	482L		S			0.0	4.2	4.7	95%	5.6	5.7	5.8	6.0	6.1	6.2	6.3	6.4	6.6	6.7
257S	5545L		S			0.0	3.7	4.0	89%	5.3	5.4	5.4	5.5	5.5	5.6	5.6	5.9	6.0	6.0
257S	6133L		S			0.0	3.0	3.4	89%	4.1	4.2	4.2	4.2	4.3	4.3	4.4	4.4	4.5	4.5
336S	Fincastle	T1 15/20/ 25																	
336S		VR1 15/20/ 22.5	S	**15.8**	**17.2**	**16.8**	**17.0**	**17.6**	85%	**17.9**	**18.0**	**17.5**	**17.7**	**17.9**	**18.1**	**18.2**	**18.4**	**18.6**	**18.8**
336S	2151L		S	7.6	8.5	8.3	8.6	9.2	86%	9.6	9.8	9.2	9.3	9.5	9.6	9.8	9.9	10.1	10.2
336S	2152L		S	4.8	4.8	4.8	4.8	4.7	81%	4.7	4.7	4.8	4.8	4.9	4.9	5.0	5.0	5.1	5.1
336S	2153L		S	4.5	4.7	4.3	4.3	4.3	87%	4.3	4.3	4.3	4.4	4.4	4.5	4.5	4.6	4.6	4.7
336S	Fincastle	T2 NEW	S						88%			**12.5**	**12.6**	**12.7**	**12.8**	**12.9**	**13.0**	**13.1**	**13.3**
336S	NEW1		S						86%			5.8	5.8	5.9	5.9	6.0	6.0	6.1	6.2
336S	NEW2		S						91%			6.7	6.7	6.8	6.9	7.0	7.0	7.1	7.2
336S	Total Station		S							**17.9**	**18.0**	**30.1**	**30.3**	**30.6**	**30.9**	**31.2**	**31.5**	**31.7**	**32.0**
368S	Burdett	T2 25/33/ 42	S	**17.1**	**19.1**	**18.3**	**17.1**	**16.7**	91%	**19.6**	**20.7**	**21.8**	**22.0**	**22.2**	**22.4**	**22.6**	**22.9**	**23.1**	**23.3**
368S	314LE		S	8.1	9.9	9.4	10.3	9.7	90%	10.1	10.2	10.3	10.4	10.5	10.7	10.8	10.9	11.0	11.1
368S	468LE		S	9.0	9.5	8.9	7.3	7.9	92%	9.7	10.6	11.6	11.7	11.8	12.0	12.1	12.2	12.3	12.4
368S	Burdett	T1 25/33/ 42	S	**16.3**	**15.7**	**15.3**	**16.9**	**16.0**	88%	**20.3**	**20.5**	**18.8**	**18.9**	**19.1**	**19.3**	**19.5**	**19.7**	**19.9**	**20.1**
368S	15LW		S	10.8	10.5	10.7	10.3	10.8	86%	**13.1**	**13.2**	11.4	11.5	11.6	11.7	11.8	11.9	12.0	12.2
368S	382LW		S	5.7	5.6	5.3	7.0	6.3	89%	7.3	7.4	7.5	7.6	7.6	7.7	7.8	7.9	7.9	8.0
368S	Total Station		S	**33.3**	**34.3**	**32.0**	**33.4**	**31.5**	89%	**38.7**	**39.9**	**39.3**	**39.7**	**40.1**	**40.5**	**40.9**	**41.3**	**41.7**	**42.1**
Total Area Load				**119.2**	**127.3**	**119.9**	**133.0**	**133.1**		**162.2**	**164.8**	**167.8**	**169.6**	**171.4**	**173.2**	**175.1**	**177.1**	**179.0**	**180.9**

MW	Transfers	Year
2.0	From 83S-263LE to 83S-493LW	2017
4.3	From 83S-15LE to 336S-2151L	2018
0.2	From 83S-15LE to 135S-341LN	2018
4.5	From 83S-313LN to 336S-NEW2	2018
3.3	From 336S-2151L to 336S-NEW1	2018
1.7	From 368S-15LW to 336S-NEW1	2018
1.8	From 83S-493LW to 83S-194LS	2019
0.2	From 158S-320LS to 257S-5545L	2023

83S Total Load:	49.6	63.2	63.8	54.9	55.4	56.0	56.5	57.1	57.6	58.1	58.7
N-1 Capacity:	42.0	42.0	42.0	42.0	42.0	42.0	42.0	42.0	42.0	42.0	42.0
Back up from 135S:	4.7	3.1	3.1	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Back up from 254S:	3.2	4.3	4.4	4.7	4.7	4.9	5.0	5.2	5.4	5.6	5.7
Back up from 257S:	5.5	5.8	5.8	5.9	5.9	6.0	6.0	6.1	6.1	6.2	6.2
Back up from 336S:	2.2	2.0	2.1	7.5	7.5	7.7	8.0	8.2	8.4	8.6	8.9
N-1 Unsupplied Load:	0.0	**6.0**	**6.5**	**0.0**	**0.0**	**0.0**	**0.0**	**0.0**	**0.0**	**0.0**	**0.0**
107S Total Load:	15.5	18.8	19.0	19.2	19.3	19.5	19.7	19.9	20.1	20.3	20.5
N-1 Capacity:	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0
Back up from 404S:	1.6	1.9	1.9	1.9	1.9	2.0	2.0	2.0	2.0	2.0	2.1
Back up from 368S:	3.2	2.4	2.4	7.1	7.1	7.2	7.3	7.4	7.5	7.5	7.6
Back up from 336S:	0.0	2.6	2.7	10.2	10.2	10.4	10.5	10.7	10.8	11.0	11.2
Back up from 135S:	0.0	0.0	0.0	2.3	2.3	2.3	2.3	2.3	2.3	2.4	2.4
N-1 Unsupplied Load:	**10.7**	**11.9**	**12.0**	**0.0**	**0.0**	**0.0**	**0.0**	**0.0**	**0.0**	**0.0**	**0.0**
257S Total Load:	18.9	23.6	24.0	24.4	24.8	25.2	25.6	26.0	26.6	27.1	27.5
N-1 Capacity:	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Back up from 83S:	6.0	5.7	5.8	13.9	13.9	14.3	14.6	14.8	14.8	14.8	13.8
Back up from 421S:	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	5.8	5.9	6.0
Back up from 158S:	8.7	10.7	10.6	11.2	11.2	11.6	11.8	11.9	11.4	10.9	7.9
N-1 Unsupplied Load:	**4.2**	**7.2**	**7.6**	**0.0**	**0.0**	**0.0**	**0.0**	**0.0**	**0.0**	**0.0**	**0.0**
336S Total Load:	17.6	17.9	18.0	30.1	30.3	30.6	30.9	31.2	31.5	31.7	32.0
N-1 Capacity:	0.0	0.0	0.0	42.0	42.0	42.0	42.0	42.0	42.0	42.0	42.0
Back up from 83S:	5.9	2.9	1.1	9.6	9.7	9.9	10.1	10.3	10.4	10.6	10.8
Back up from 368S:	0.9	1.0	1.0	2.9	2.9	3.0	3.1	3.2	3.4	3.5	3.6
N-1 Unsupplied Load:	**10.9**	**13.9**	**16.0**	**0.0**	**0.0**	**0.0**	**0.0**	**0.0**	**0.0**	**0.0**	**0.0**
368S Total Load:	31.5	38.7	39.9	39.3	39.7	40.1	40.5	40.9	41.3	41.7	42.1
N-1 Capacity:	42.0	42.0	42.0	42.0	42.0	42.0	42.0	42.0	42.0	42.0	42.0
Back up from 336S:	0.0	0.0	0.0	7.1	7.1	7.1	7.2	7.3	7.4	7.4	7.5
Back up from 421S:	0.9	0.9	1.0	1.7	1.7	1.7	1.7	1.7	1.8	1.8	1.8
N-1 Unsupplied Load:	**0.0**	**0.0**	**0.0**	**0.0**	**0.0**	**0.0**	**0.0**	**0.0**	**0.0**	**0.0**	**0.0**

4.2.3 Cost Estimate

If Alternative 2 is selected, AltaLink will prepare a facility application for the requested transmission upgrades. This facility application will include an estimate of the transmission capital cost.

The distribution capital cost for this alternative is estimated to be $16.4 million (2018$, ±30%).

4.3 Alternative 3: Upgrades at Fincastle 336S and Hull 257S substations

4.3.1 Description

2018 transmission upgrades at the Fincastle 336S substation:

- Add one source transformer;
- Add two 25kV feeder breakers;
- Other associated upgrades as required.

2018 transmission upgrades at the Hull 257S substation:

- Add one source transformer;
- Other associated upgrades as required.

Distribution upgrades are required at Taber 83S, Westfield 107S, Fincastle 336S, and Burdett 368S substations. Additional distribution upgrades referred to below include installation of regulator banks, electronic OCRs, and switching cubicles.

Taber 83S substation has eight existing distribution feeder ties to adjacent substations. Four existing distribution feeder ties need to be upgraded. In total, approximately 14 km of existing distribution line needs to be upgraded. Additional distribution upgrades are required.

Westfield 107S substation has three existing distribution feeder ties to adjacent substations. One new distribution feeder tie needs to be built and two existing distribution feeder ties need to be upgraded. In total, approximately 11 km of new distribution line needs to be built and 21 km of existing distribution line needs to be upgraded. Additional distribution upgrades are required.

Hull 257S substation has five existing distribution feeder ties to adjacent substations.

Fincastle 336S substation has four existing distribution feeder ties to adjacent substations. Two new distribution feeder ties need to be built and two existing

distribution feeder ties need to be upgraded. In total, approximately 9 km of new distribution line needs to be built and 24 km of existing distribution line needs to be upgraded. Additional distribution upgrades are required.

Burdett 368S substation has four existing distribution feeder ties to adjacent substations. Two existing distribution feeder ties need to be upgraded. In total, approximately 25 km of existing distribution line needs to be upgraded. Additional distribution upgrades are required.

Refer to Appendix D, Figure D-1 showing Alternative 3 system development.

4.3.2 Load Forecast

The load forecast resulting from this alternative is provided in Table 4-3.

Table 4-3: FortisAlberta Historic and Forecast Load: Alternative 3 – Upgrades at Fincastle 336S Substation and Hull 257S Substation

				MVA LOADING - RECORDED						MVA LOADING - PREDICTED									
			W	2011	2012	2013	2014	2015		2016	2017	2018	2019	2020	2021	2022	2023	2024	2025
SUB No	Feeder	CAPACITY T/R MVA	or S	Peak MVA	Peak MVA	Peak MVA	Peak MVA	Peak MVA	PF	Peak MVA	Peak MVA	Peak MVA	Peak MVA	Peak MVA	Peak MVA	Peak MVA	Peak MVA	Peak MVA	Peak MVA
083S	Taber	T1 25/33/ 42	S	**34.5**	**35.8**	**35.1**	**27.6**	**29.0**	91%	**35.6**	**35.9**	**26.4**	**26.6**	**26.9**	**27.1**	**27.3**	**27.6**	**27.8**	**28.1**
083S	15LE		S	8.8	6.7	9.9	10.3	10.1	90%	11.7	11.7	6.8	6.8	6.8	6.9	6.9	7.0	7.0	7.0
083S	313LN		S/W	11.8	12.7	12.5	10.8	12.1	92%	12.3	12.4	7.6	7.7	7.8	7.9	7.9	8.0	8.1	8.2
083S	383LW		S/W	8.9	8.9	8.9	6.0	6.1	89%	6.2	6.2	6.3	6.4	6.4	6.5	6.6	6.6	6.7	6.8
083S	437LW		S	7.0	8.4	7.0	6.6	7.6	89%	9.1	9.3	9.5	9.8	10.0	10.2	10.5	10.7	11.0	11.2
083S	Taber	T3 25/33/42// 46.6	S	**23.2**	**27.1**	**25.6**	**23.2**	**23.9**	93%	**30.2**	**30.5**	**30.8**	**31.1**	**31.5**	**31.8**	**32.1**	**32.4**	**32.7**	**33.1**
083S	194LS		S	8.9	8.9	9.2	9.2	9.0	92%	9.7	9.8	9.9	12.0	12.1	12.2	12.4	12.5	12.6	12.7
083S	263LE		S	6.9	8.8	7.3	8.0	8.9	94%	13.4	11.5	11.6	11.7	11.8	11.9	12.1	12.2	12.3	12.4
083S	493LW		S/W	9.6	11.1	11.7	8.3	7.3	92%	9.7	12.1	12.5	10.9	11.2	11.6	11.9	12.3	12.6	13.0
083S	Total Station		S	**56.8**	**61.1**	**58.4**	**49.1**	**49.6**	91%	**63.2**	**63.8**	**54.9**	**55.4**	**56.0**	**56.5**	**57.1**	**57.6**	**58.1**	**58.7**
107S	Westfield	T1 15/20/ 25																	
107S		VR1 15/20/ 25	S	**13.3**	**14.7**	**12.7**	**15.7**	**15.5**	91%	**18.8**	**19.0**	**19.2**	**19.3**	**19.5**	**19.7**	**19.9**	**20.1**	**20.3**	**20.5**
107S	110LS		W	1.4	1.3	1.4	1.3	1.6	100%	1.9	1.9	1.9	2.0	2.0	2.0	2.0	2.0	2.1	2.1
107S	2068L		S	1.9	2.0	2.1	2.0	2.2	96%	2.2	2.2	2.2	2.3	2.3	2.3	2.3	2.4	2.4	2.4
107S	456LE		S	3.1	3.3	3.4	4.6	3.5	88%	6.6	6.7	6.7	6.8	6.9	6.9	7.0	7.1	7.2	7.2
107S	457LW		S	8.4	8.5	7.7	9.1	9.1	87%	9.3	9.5	9.7	9.9	10.2	10.4	10.6	10.9	11.2	11.4
257S	Hull	T1 25/33/ 42	S			**0.0**	**17.8**	**18.9**	91%	**23.6**	**24.0**	**15.0**	**15.3**	**15.5**	**15.8**	**16.0**	**16.3**	**16.5**	**16.8**
257S	3523L		S			0.0	8.1	7.4	89%	9.5	9.7	9.9	10.1	10.3	10.5	10.7	10.9	11.1	11.4
257S	482L		S			0.0	4.2	4.7	95%	5.6	5.7	5.8	6.0	6.1	6.2	6.3	6.4	6.6	6.7
257S	5545L		S			0.0	3.7	4.0	89%	5.3	5.4	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
257S	6133L		S			0.0	3.0	3.4	89%	4.1	4.2	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
257S	Hull	T2 NEW	S						91%			**9.4**	**9.5**	**9.6**	**9.7**	**9.8**	**9.9**	**10.0**	**10.0**
257S	5545L		S						89%			5.4	5.4	5.5	5.6	5.6	5.7	5.7	5.8
257S	6133L		S						89%			4.2	4.2	4.3	4.3	4.4	4.4	4.4	4.5
257S	Total Station		S							**23.6**	**24.0**	**24.4**	**24.7**	**25.1**	**25.4**	**25.8**	**26.1**	**26.5**	**26.8**
336S	Fincastle	T1 15/20/ 25																	
336S		VR1 15/20/ 22.5	S	**15.8**	**17.2**	**16.8**	**17.0**	**17.6**	85%	**17.9**	**18.0**	**17.5**	**17.7**	**17.9**	**18.1**	**18.2**	**18.4**	**18.6**	**18.8**
336S	2151L		S	7.6	8.5	8.3	8.6	9.2	86%	9.6	9.8	9.2	9.3	9.5	9.6	9.8	9.9	10.1	10.2
336S	2152L		S	4.8	4.8	4.8	4.8	4.7	81%	4.7	4.7	4.8	4.8	4.9	4.9	5.0	5.0	5.1	5.1
336S	2153L		S	4.5	4.7	4.3	4.3	4.3	87%	4.3	4.3	4.3	4.4	4.4	4.5	4.5	4.6	4.6	4.7
336S	Fincastle	T2 NEW	S						88%			**12.5**	**12.6**	**12.7**	**12.8**	**12.9**	**13.0**	**13.1**	**13.3**
336S	NEW1		S						86%			5.8	5.8	5.9	5.9	6.0	6.0	6.1	6.2
336S	NEW2		S						91%			6.7	6.7	6.8	6.9	7.0	7.0	7.1	7.2
368S	Total Station		S							**17.9**	**18.0**	**30.1**	**30.3**	**30.6**	**30.9**	**31.2**	**31.5**	**31.7**	**32.0**
368S	Burdett	T2 25/33/ 42	S	**17.1**	**19.1**	**18.3**	**17.1**	**16.7**	91%	**19.6**	**20.7**	**21.8**	**22.0**	**22.2**	**22.4**	**22.6**	**22.9**	**23.1**	**23.3**
368S	314LE		S	8.1	9.9	9.4	10.3	9.7	90%	10.1	10.2	10.3	10.4	10.5	10.7	10.8	10.9	11.0	11.1
368S	468LE		S	9.0	9.5	8.9	7.3	7.9	92%	9.7	10.6	11.6	11.7	11.8	12.0	12.1	12.2	12.3	12.4
368S	Burdett	T1 25/33/ 42	S	**16.3**	**15.7**	**15.3**	**16.9**	**16.0**	88%	**20.3**	**20.5**	**18.8**	**18.9**	**19.1**	**19.3**	**19.5**	**19.7**	**19.9**	**20.1**
368S	15LW		S	10.8	10.5	10.7	10.3	10.8	86%	13.1	13.2	11.4	11.5	11.6	11.7	11.8	11.9	12.0	12.2
368S	382LW		S	5.7	5.6	5.3	7.0	6.3	89%	7.3	7.4	7.5	7.6	7.6	7.7	7.8	7.9	7.9	8.0
368S	Total Station		S	**33.3**	**34.3**	**32.0**	**33.4**	**31.5**	89%	**38.7**	**39.9**	**39.3**	**39.7**	**40.1**	**40.5**	**40.9**	**41.3**	**41.7**	**42.1**
Total Area Load				**105.9**	**112.6**	**107.2**	**117.3**	**133.1**		**162.2**	**164.8**	**167.8**	**169.6**	**171.3**	**173.0**	**174.8**	**176.6**	**178.4**	**180.3**

MW	Transfers	Year
2.0	From 83S-263LE to 83S-493LW	2017
4.3	From 83S-15LE to 336S-2151L	2018
0.2	From 83S-15LE to 135S-341LN	2018
4.5	From 83S-313LN to 336S-NEW2	2018
3.3	From 336S-2151L to 336S-NEW1	2018
1.7	From 368S-15LW to 336S-NEW1	2018
4.8	From 257ST1 to 257ST2	2018
3.7	From 257ST1 to 257ST2	2018
1.8	From 83S-493LW to 83S-194LS	2019
0.2	From 158S-320LS to 257S-5545	2023

83S Total Load:	49.6	63.2	63.8	54.9	55.4	56.0	56.5	57.1	57.6	58.1	58.7
N-1 Capacity:	42.0	42.0	42.0	42.0	42.0	42.0	42.0	42.0	42.0	42.0	42.0
Back up from 135S:	4.7	3.1	3.1	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Back up from 254S:	3.2	4.3	4.4	4.7	4.8	5.0	5.1	5.3	5.4	5.6	5.7
Back up from 257S:	5.5	5.8	5.8	5.9	5.9	6.0	6.0	6.1	6.1	6.2	6.2
Back up from 336S:	2.2	2.0	2.1	7.5	7.7	7.9	8.1	8.3	8.5	8.7	8.9
N-1 Unsupplied Load:	**0.0**	**6.0**	**6.5**	**0.0**	**0.0**	**0.0**	**0.0**	**0.0**	**0.0**	**0.0**	**0.0**
107S Total Load:	15.5	18.8	19.0	19.2	19.3	19.5	19.7	19.9	20.1	20.3	20.5
N-1 Capacity:	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Back up from 404S:	1.6	1.9	1.9	1.9	2.0	2.0	2.0	2.0	2.0	2.0	2.1
Back up from 368S:	3.2	2.4	2.4	7.1	7.2	7.3	7.3	7.4	7.5	7.5	7.6
Back up from 135S:	0.0	0.0	0.0	2.3	2.3	2.3	2.3	2.3	2.3	2.4	2.4
Back up from 336S:	0.0	2.6	2.7	10.2	10.3	10.5	10.6	10.8	10.9	11.0	11.2
N-1 Unsupplied Load:	**10.7**	**11.9**	**12.0**	**0.0**	**0.0**	**0.0**	**0.0**	**0.0**	**0.0**	**0.0**	**0.0**
257S Total Load:	18.9	23.6	24.0	24.4	24.7	25.1	25.4	25.8	26.1	26.5	26.8
N-1 Capacity:	0.0	0.0	0.0	42.0	42.0	42.0	42.0	42.0	42.0	42.0	42.0
Back up from 83S:	6.0	5.7	5.8	9.9	10.1	10.3	10.5	10.7	10.9	11.1	11.3
Back up from 158S:	8.7	10.7	10.6	5.8	6.0	6.1	6.2	6.3	6.5	6.6	6.7
N-1 Unsupplied Load:	**4.2**	**7.2**	**7.6**	**0.0**	**0.0**	**0.0**	**0.0**	**0.0**	**0.0**	**0.0**	**0.0**
336S Total Load:	17.6	17.9	18.0	30.1	30.3	30.6	30.9	31.2	31.5	31.7	32.0
N-1 Capacity:	0.0	0.0	0.0	42.0	42.0	42.0	42.0	42.0	42.0	42.0	42.0
Back up from 83S:	5.9	2.9	1.1	9.6	9.8	10.0	10.1	10.3	10.5	10.6	10.8
Back up from 368S:	0.9	0.6	0.8	2.9	3.0	3.1	3.2	3.3	3.4	3.5	3.6
N-1 Unsupplied Load:	**10.9**	**14.3**	**16.2**	**0.0**	**0.0**	**0.0**	**0.0**	**0.0**	**0.0**	**0.0**	**0.0**
368S Total Load:	31.5	38.7	39.9	39.3	39.7	40.1	40.5	40.9	41.3	41.7	42.1
N-1 Capacity:	42.0	42.0	42.0	42.0	42.0	42.0	42.0	42.0	42.0	42.0	42.0
Back up from 336S:	0.0	0.0	0.0	7.1	7.1	7.2	7.2	7.3	7.4	7.4	7.5
Back up from 421S:	0.9	0.9	1.0	1.7	1.7	1.7	1.7	1.7	1.8	1.8	1.8
N-1 Unsupplied Load:	**0.0**	**0.0**	**0.0**	**0.0**	**0.0**	**0.0**	**0.0**	**0.0**	**0.0**	**0.0**	**0.0**

4.3.3 Cost Estimate

If Alternative 3 is selected, AltaLink will prepare a facility application for the requested transmission upgrades. This facility application will include an estimate of the transmission capital cost.

The distribution capital cost for this alternative is estimated to be $15.4 million (2018$, ±30%).

5 Alternatives Assessment

The following section presents the technical and economic analysis of the alternatives considered in this Need for Development.

5.1 Technical and Economic Analysis

5.1.1 Alternative 1 – Distribution Upgrades and Load Shifting

Extensive distribution upgrades can eliminate the reliability concerns at Taber 83S, Westfield 107S, Hull 257S, Fincastle 336S, and Burdett 368S substations, however, the distribution capital cost of this alternative is significantly higher than other alternatives.

5.1.2 Alternative 2 – Upgrades at the Fincastle 336S Substation

The addition of one source transformer and two additional breakers at Fincastle 336S substation, followed by associated distribution upgrades, can address the reliability concerns at Taber 83S, Westfield 107S, Hull 257S, Fincastle 336S, and Burdett 368S substations. This alternative has the second lowest distribution capital cost and is an acceptable technical solution.

The distribution capital costs of Alternative 2 is $1.0 million more than those of Alternative 3. The primary difference in transmission scope between Alternative 2 and Alternative 3, is the additional source transformer in Alternative 3. It is estimated that the total capital cost of an additional source transformer installation will be significantly greater than the $1.0 million difference in distribution capital cost. Considering the above, Alternative 2 is FortisAlberta's preferred alternative.

5.1.3 Alternative 3 – Upgrades at Fincastle 336S and Hull 257S substations

As per section 4.3.1, the described transmission and distribution upgrades would enable the provision of back-up support from both Hull 257S and Fincastle 336S. This alternative requires installation of a second source transformer at Hull 257S substation, a second source transformer at Fincastle

336S substation, two additional breakers at Fincastle 336S substation, and associated distribution upgrades. This alternative has the lowest distribution cost and is an acceptable technical solution.

While this alternative has the lowest distribution capital cost, the difference between this alternative and Alternative 2 is $1.0 million. In consideration of the transmission scope of Alternative 2 and Alternative 3, the main difference is the additional source transformer in Alternative 3. It is estimated that the total capital cost of an additional source transformer installation will be significantly greater than the $1.0 million difference in distribution capital cost. Considering the above, Alternative 3 is not FortisAlberta's preferred alternative.

6 Conclusion

After considering the alternatives to address the reliability concern at the Taber 83S, Westfield 107S, Hull 257S, Fincastle 336S, and Burdett 368S substations, FortisAlberta's preferred alternative is Alternative 2. FortisAlberta's preferred alternative includes transmission upgrades at the Fincastle 336S substation:

- Installation of one source transformer;
- Installation of two 25kV feeder breakers;
- Other associated upgrades as required.

An estimate for the transmission capital cost will be provided by the TFO, AltaLink.

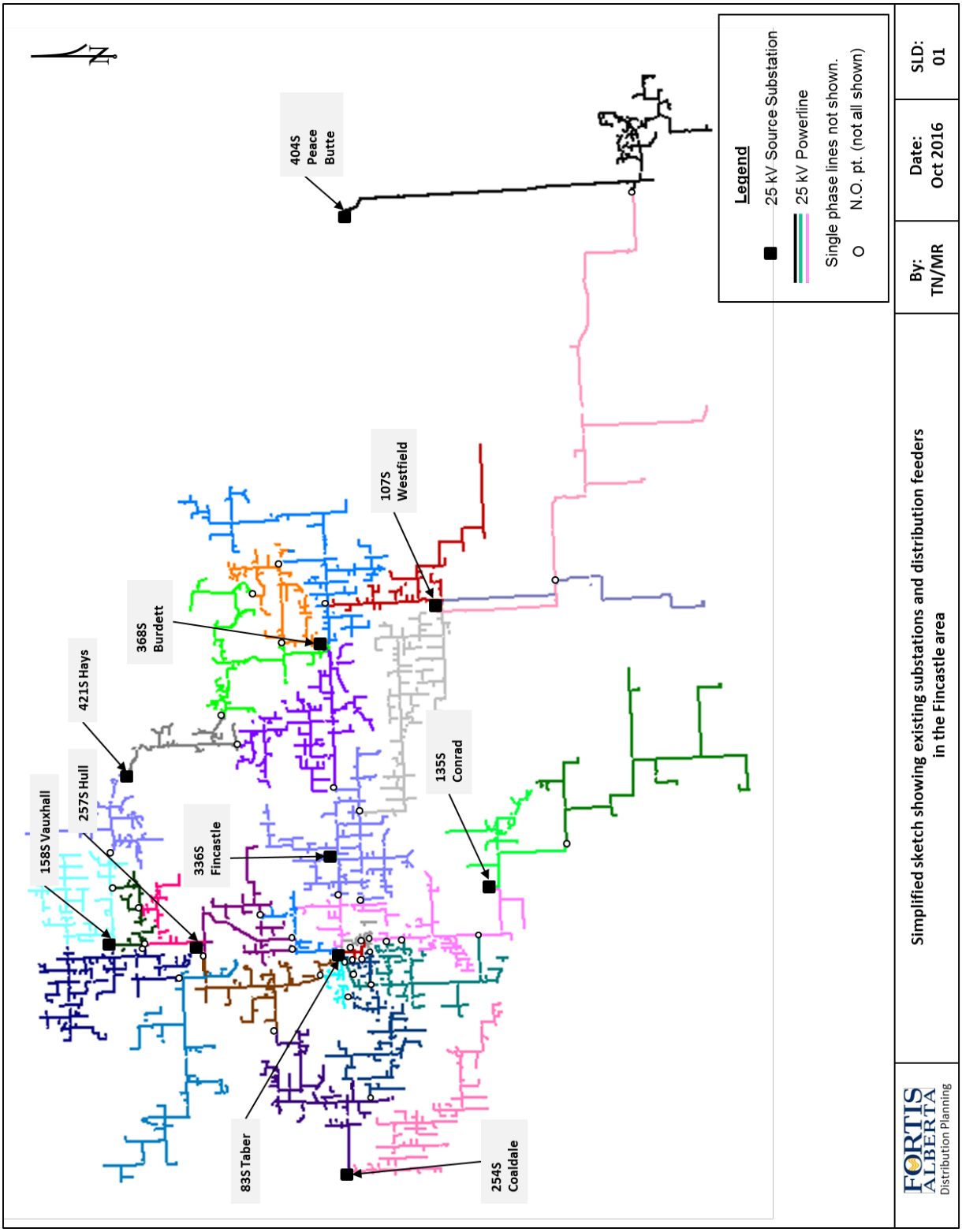
The estimated distribution capital cost associated with FortisAlberta's preferred alternative is $16.4 million (2018$, ±30%).

The requested ISD for FortisAlberta's preferred alternative is November 1, 2018.

If FortisAlberta's preferred alternative is approved by the AUC, FortisAlberta will request an increase to the Demand Transmission Service (DTS) at the Fincastle 336S substation of 11.1 MW, resulting in a DTS of 23.3 MW.

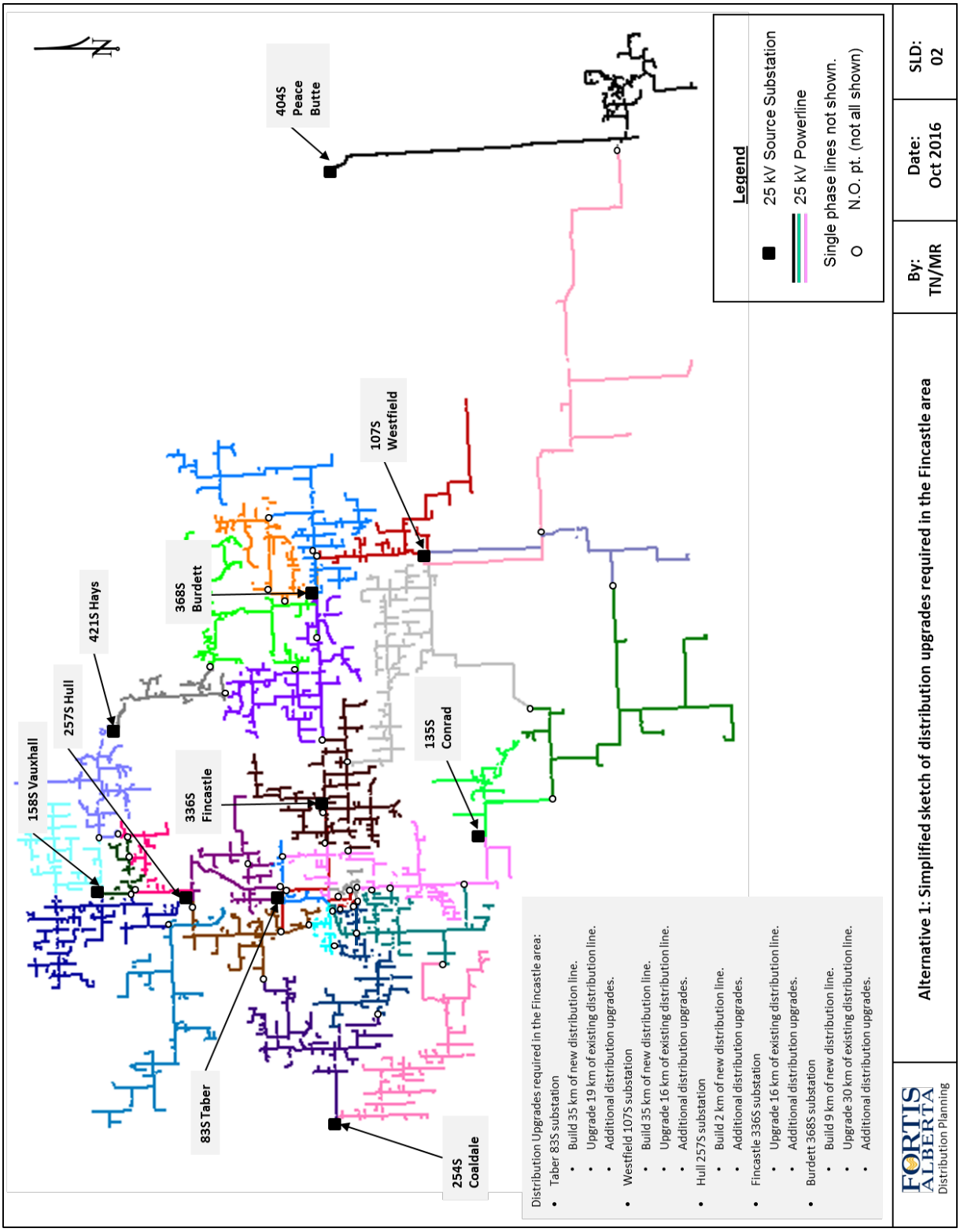
Appendix A – Existing System

Figure A-1: Existing System



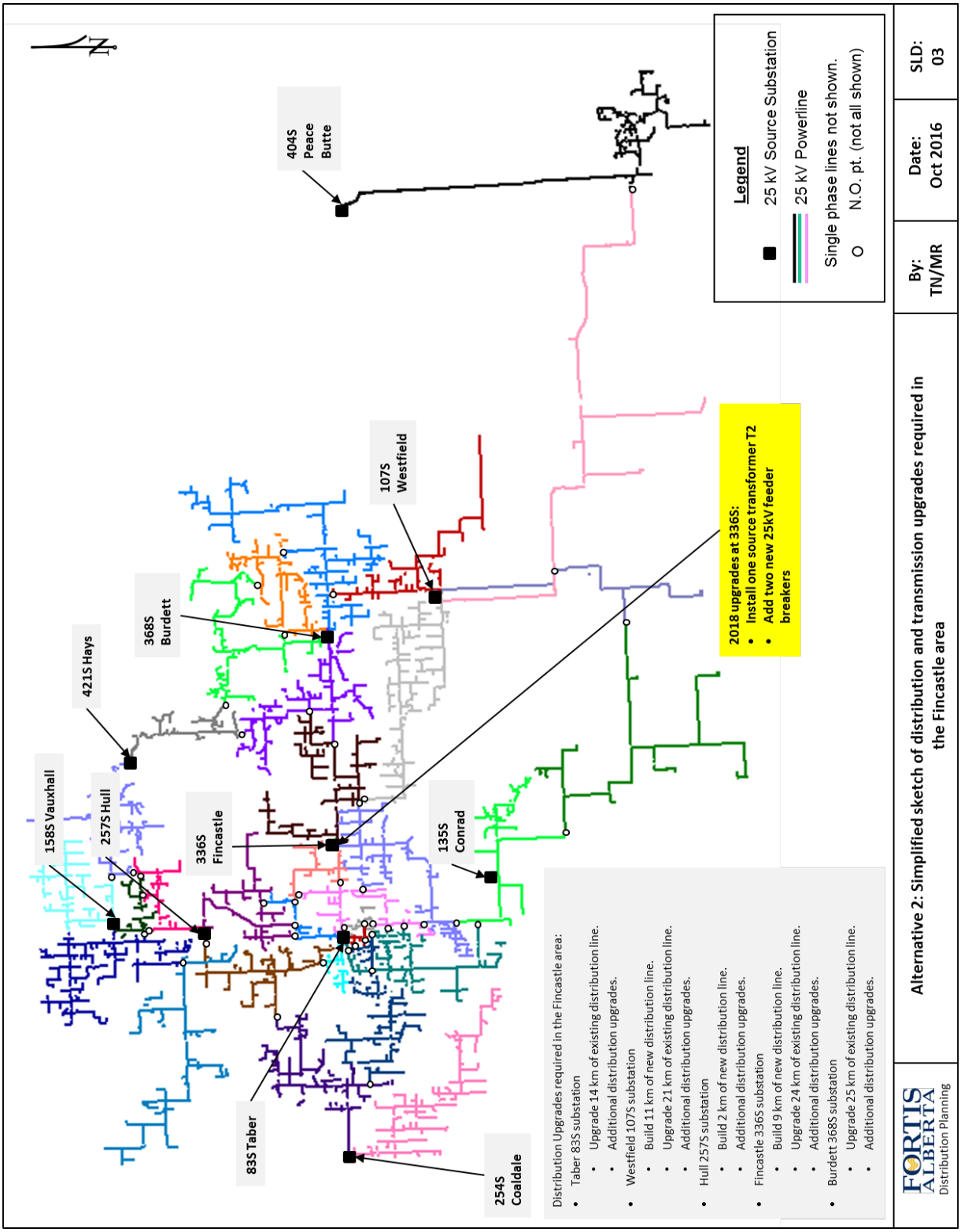
Appendix B – Alternative 1 – Distribution upgrades in the Fincastle area

Figure B-1: Alternative 1: Distribution upgrades in the Fincastle area



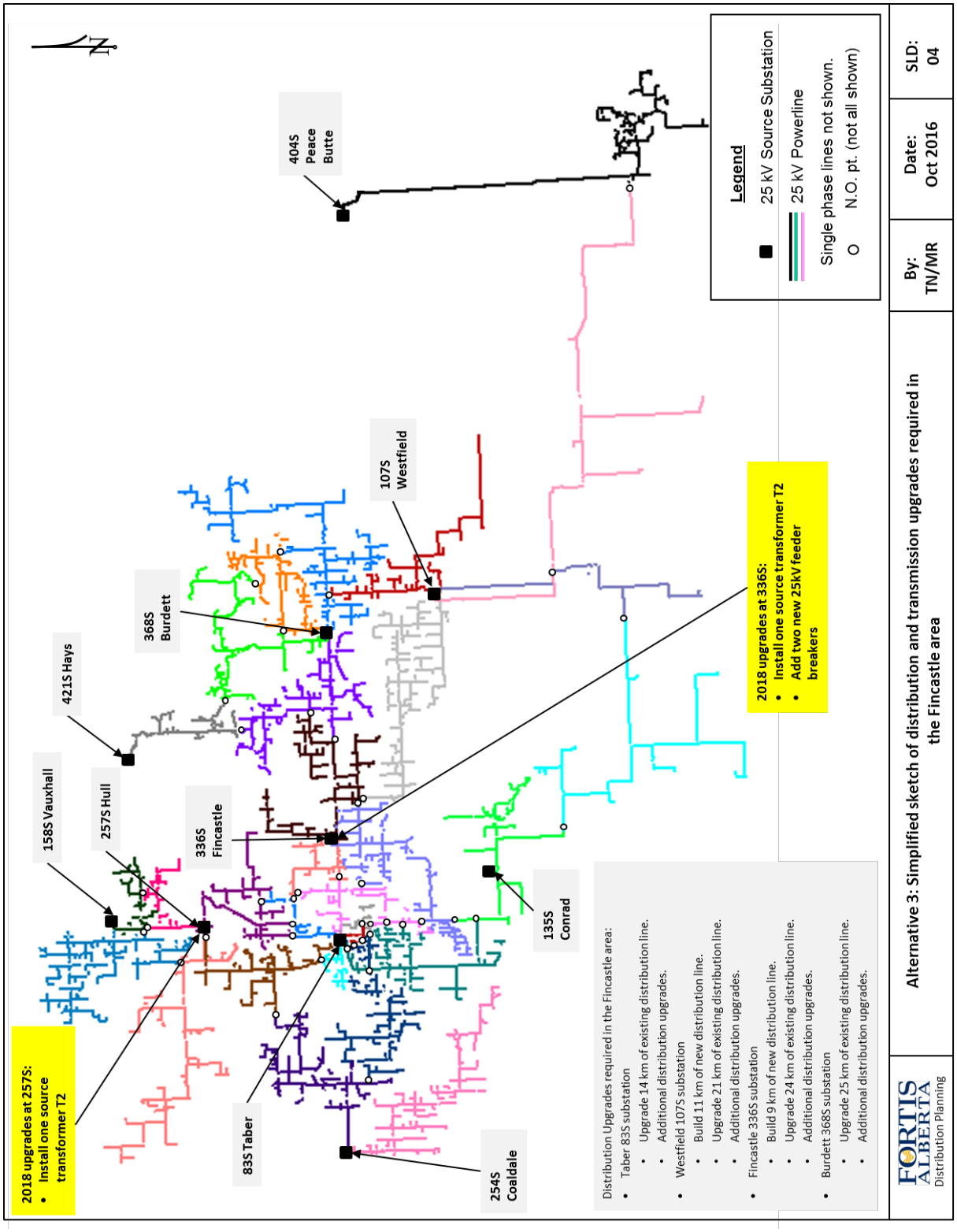
Appendix C - Alternative 2 – Upgrades at the Fincastle 336S substation

Figure C-1: Alternative 2: Upgrades at the Fincastle 336S Substation



Appendix D – Alternative 3 – Upgrades at the Fincastle 336S substation and Hull 257S substation

Figure D-1: Alternative 3: Upgrades at the Fincastle 336S Substation and the Hull 257S Substation



Date Issued: September 18, 2017

Updated Table 3-1 below includes 2016 peak load data forming part of the 5-year historical recorded peak load.

Table 3-1: FortisAlberta Historic and Forecast Load: Existing System

					MVA LOADING - RECORDED						MVA LOADING - PREDICTED									
SUB		CAPACITY		W or S	2012 Peak MVA	2013 Peak MVA	2014 Peak MVA	2015 Peak MVA	2016 Peak MVA	PF	2017 Peak MVA	2018 Peak MVA	2019 Peak MVA	2020 Peak MVA	2021 Peak MVA	2022 Peak MVA	2023 Peak MVA	2024 Peak MVA	2025 Peak MVA	2026 Peak MVA
No	Feeder	T/R	MVA																	
083S	Taber	T1	25/33/ 42	S	**35.8**	**35.1**	**27.6**	**29.0**	**28.0**	91%	**34.0**	**34.2**	**34.4**	**34.6**	**34.8**	**35.0**	**35.2**	**35.4**	**35.6**	**35.8**
083S	15LE			S/W	6.7	9.9	10.3	10.1	5.4	91%	10.2	10.2	10.3	10.3	10.4	10.4	10.5	10.5	10.6	10.6
083S	313LN			S/W	12.7	12.5	10.8	12.1	10.4	92%	12.9	**13.0**	**13.0**	**13.1**	**13.2**	**13.3**	**13.3**	**13.4**	**13.5**	**13.5**
083S	383LW			S/W	8.9	8.9	6.0	6.1	6.1	90%	6.3	6.4	6.4	6.5	6.5	6.6	6.7	6.8	6.8	6.9
083S	437LW			S	8.4	7.0	6.6	7.6	7.4	91%	8.4	8.4	8.4	8.5	8.5	8.6	8.6	8.6	8.7	8.7
083S	Taber	T3	/33/42// 46.6	S	**27.1**	**25.6**	**23.2**	**23.9**	**21.9**	94%	**28.4**	**29.3**	**30.3**	**31.2**	**32.2**	**32.6**	**32.9**	**33.2**	**33.6**	**33.9**
083S	194LS			S	8.9	9.2	9.2	9.0	8.4	93%	11.4	11.4	11.5	11.5	11.6	11.7	11.7	11.8	11.8	11.9
083S	263LE			S	8.8	7.3	8.0	8.9	7.9	92%	10.6	11.5	12.3	**13.1**	**13.9**	**14.1**	**14.2**	**14.3**	**14.5**	**14.6**
083S	493LW			S/W	11.1	11.7	8.3	7.3	7.7	92%	8.8	9.0	9.2	9.3	9.5	9.7	9.8	10.0	10.2	10.4
083S	Total Station			S	**61.1**	**58.4**	**49.1**	**49.6**	**48.1**	**93%**	**59.8**	**60.9**	**62.0**	**63.2**	**64.3**	**64.8**	**65.3**	**65.9**	**66.4**	**66.9**
107S	Westfield	T1	15/20/ 25																	
107S		VR1	15/20/ 25	S	**14.7**	**12.7**	**15.7**	**15.5**	**14.2**	90%	**16.4**	**16.7**	**17.0**	**17.4**	**17.7**	**18.0**	**18.4**	**18.8**	**19.1**	**19.5**
107S	110LS			W	1.3	1.4	1.3	1.6	1.7	100%	1.7	1.8	1.8	1.9	2.0	2.0	2.1	2.2	2.2	2.3
107S	2068L			S	2.0	2.1	2.0	2.2	1.9	96%	2.1	2.1	2.1	2.1	2.1	2.2	2.2	2.2	2.2	2.2
107S	456LE			S	3.3	3.4	4.6	3.5	3.1	90%	4.8	4.8	4.8	4.9	4.9	5.0	5.0	5.0	5.1	5.1
107S	457LW			S	8.5	7.7	9.1	9.1	8.9	87%	8.9	9.1	9.4	9.6	9.8	10.1	10.3	10.6	10.9	11.1
257S	Hull	T1	25/33/ 42	S			**17.8**	**18.9**	**18.7**	91%	**23.7**	**24.1**	**24.4**	**24.8**	**25.1**	**25.5**	**25.9**	**26.3**	**26.7**	**27.1**
257S	3523L			S			8.1	7.4	7.1	89%	8.8	9.0	9.1	9.3	9.5	9.6	9.8	10.0	10.1	10.3
257S	482L			S			4.2	4.7	7.6	92%	9.5	9.6	9.8	10.0	10.1	10.3	10.5	10.6	10.8	11.0
257S	5545L			S			3.7	4.0	3.7	89%	3.9	4.0	4.0	4.1	4.1	4.1	4.2	4.2	4.3	4.3
257S	6133L			S			3.0	3.4	3.4	91%	3.5	3.6	3.6	3.6	3.7	3.7	3.8	3.8	3.8	3.9
336S	Fincastle	T1	15/20/ 25																	
336S		VR1	15/20/ 22.5	S	**17.2**	**16.8**	**17.0**	**17.6**	**17.1**	85%	**17.9**	**18.2**	**18.4**	**18.7**	**19.0**	**19.3**	**19.6**	**19.9**	**20.2**	**20.5**
336S	2151L			S	8.5	8.3	8.6	9.2	8.6	87%	9.1	9.2	9.3	9.5	9.6	9.8	9.9	10.1	10.2	10.4
336S	2152L			S	4.8	4.8	4.8	4.7	4.6	81%	4.8	4.9	5.0	5.1	5.1	5.2	5.3	5.4	5.5	5.5
336S	2153L			S	4.7	4.3	4.3	4.3	4.6	87%	4.7	4.8	4.9	5.0	5.0	5.1	5.2	5.2	5.3	5.4
368S	Burdett	T2	25/33/ 42	S	**19.1**	**18.3**	**17.1**	**16.7**	**15.3**	92%	**17.9**	**18.8**	**19.6**	**20.5**	**21.4**	**21.8**	**22.2**	**22.6**	**23.1**	**23.5**
368S	314LE			S	9.9	9.4	10.3	9.7	8.9	99%	10.0	10.2	10.5	10.8	11.1	11.5	11.8	12.1	12.5	12.8
368S	468LE			S	9.5	8.9	7.3	7.9	7.5	93%	8.7	9.3	9.9	10.5	11.1	11.2	11.3	11.4	11.5	11.7
368S	Burdett	T1	25/33/ 42	S	**15.7**	**15.3**	**16.9**	**16.0**	**12.8**	88%	**18.0**	**18.1**	**18.2**	**18.3**	**18.3**	**18.4**	**18.5**	**18.6**	**18.7**	**18.8**
368S	15LW			S	10.5	10.7	10.3	10.8	8.7	87%	11.7	11.7	11.8	11.9	11.9	12.0	12.0	12.1	12.2	12.2
368S	382LW			S	5.6	5.3	7.0	6.3	4.2	90%	6.9	6.9	6.9	7.0	7.0	7.0	7.1	7.1	7.1	7.2
368S	Total Station			S	**34.3**	**32.0**	**33.4**	**31.5**	**26.3**	**91%**	**34.4**	**35.4**	**36.3**	**37.2**	**38.1**	**38.6**	**39.1**	**39.6**	**40.1**	**40.6**
				Total Area Load	**127.3**	**119.9**	**133.0**	**133.1**	**124.3**		**152.2**	**155.2**	**158.2**	**161.2**	**164.2**	**166.2**	**168.3**	**170.4**	**172.5**	**174.6**

Load additions of note:	**2017**	
83S-15LE	1.2	MVA
83S-194LS	0.1	MVA
83S-263LE	4.8	MVA
83S-437LW	1.0	MVA
83S-493LW	1.1	MVA
	2017	
107S-456LE	1.7	MVA

83S N-1 Contingency	**2016**	**2017**	**2018**	**2019**	**2020**	**2021**	**2022**	**2023**	**2024**	**2025**	**2026**
83S Total Load	48.1	59.8	60.9	62.0	63.2	64.3	64.8	65.3	65.9	66.4	66.9
N-1 Capacity:	42.0	42.0	42.0	42.0	42.0	42.0	42.0	42.0	42.0	42.0	42.0
Back up from 135S:	1.5	3.3	3.1	3.0	2.8	2.6	2.5	2.3	2.1	2.0	1.8
Back up from 254S:	3.4	3.1	3.0	3.0	3.0	2.9	2.9	2.9	2.8	2.8	2.8
Back up from 257S:	4.9	5.9	5.9	6.0	6.1	6.1	6.2	6.2	6.3	6.3	6.4
Back up from 336S:	2.0	1.8	1.8	1.8	1.8	1.8	1.8	1.8	1.9	1.9	1.9
N-1 Unsupplied Load:	**0.0**	**3.8**	**5.0**	**6.3**	**7.5**	**8.8**	**9.4**	**10.1**	**10.7**	**11.4**	**12.1**

	2017	
257S-482L	1.9	MVA
257S-3523L	1.7	MVA

	2017	
336S-2151L	0.5	MVA

	2017	
368S-15LW	2.6	MVA
368S-314LE	1.1	MVA
368S-382LW	2.0	MVA
368S-468LE	1.2	MVA

Transfers	2017	
From 83S-263LE to 83S-194L	1.9	MW

107S N-1 Contingency	2016	2017	2018	2019	2020	2021	2022	2023	2024	2025	2026
107S Total Load:	14.2	16.4	16.7	17.0	17.4	17.7	18.0	18.4	18.8	19.1	19.5
N-1 Capacity:	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Back up from 404S:	2.0	2.0	2.0	2.1	2.1	2.1	2.1	2.2	2.2	2.2	2.3
Back up from 368S:	3.5	3.2	3.2	3.3	3.3	3.4	3.4	3.5	3.5	3.5	3.6
Back up from 336S:	0.0	4.9	4.7	4.5	4.3	4.1	3.9	3.7	3.5	3.3	3.1
N-1 Unsupplied Load:	**8.7**	**6.3**	**6.7**	**7.2**	**7.7**	**8.1**	**8.6**	**9.1**	**9.6**	**10.1**	**10.6**

257S N-1 Contingency	2016	2017	2018	2019	2020	2021	2022	2023	2024	2025	2026
257S Total Load:	18.7	23.7	24.1	24.4	24.8	25.1	25.5	25.9	26.3	26.7	27.1
N-1 Capacity:	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Back up from 83S:	6.2	4.4	4.4	4.3	4.3	4.3	4.2	4.2	4.2	4.1	4.1
Back up from 158S:	8.9	10.3	10.0	9.8	9.5	9.3	9.0	8.8	8.6	8.3	8.1
Back up from 254S:	1.7	1.0	1.0	0.9	0.9	0.9	0.8	0.8	0.7	0.7	0.6
N-1 Unsupplied Load:	**1.9**	**8.0**	**8.7**	**9.4**	**10.1**	**10.7**	**11.4**	**12.1**	**12.8**	**13.6**	**14.3**

336S N-1 Contingency	2016	2017	2018	2019	2020	2021	2022	2023	2024	2025	2026
336S Total Load:	17.1	17.9	18.2	18.4	18.7	19.0	19.3	19.6	19.9	20.2	20.5
N-1 Capacity:	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Back up from 83S:	8.1	3.6	3.6	3.6	3.7	3.7	3.7	3.7	3.7	3.7	3.8
Back up from 107S:	0.0	3.3	3.0	2.7	2.3	2.0	1.7	1.4	1.0	0.7	0.4
Back up from 368S:	0.8	0.4	0.4	0.5	0.5	0.5	0.5	0.5	0.5	0.5	0.5
N-1 Unsupplied Load:	**8.2**	**10.6**	**11.1**	**11.7**	**12.3**	**12.8**	**13.4**	**14.0**	**14.6**	**15.2**	**15.8**

368S N-1 Contingency	2016	2017	2018	2019	2020	2021	2022	2023	2024	2025	2026
368S Total Load:	26.3	34.4	35.4	36.3	37.2	38.1	38.6	39.1	39.6	40.1	40.6
N-1 Capacity:	42.0	42.0	42.0	42.0	42.0	42.0	42.0	42.0	42.0	42.0	42.0
Back up from 421S:	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
N-1 Unsupplied Load:	**0.0**	**0.0**	**0.0**	**0.0**	**0.0**	**0.0**	**0.0**	**0.0**	**0.0**	**0.0**	**0.0**

The Fincastle area was assessed with the following reliability concerns observed from Table 3-1:

- In 2016, a reliability concern exists at the Westfield 107S substation. The unsupplied load could exist at levels as high as 8.7 MVA. If left unaddressed, it is predicted to increase to 10.6 MVA by 2026. This exceeds FortisAlberta planning criteria for electrical load restoration.

- In 2016, a reliability concern exists at the Hull 257S substation. The unsupplied load could exist at levels as high as 1.9 MVA. If left unaddressed, it is predicted to increase to 14.3 MVA by 2026. This exceeds FortisAlberta planning criteria for electrical load restoration.

- In 2016, a reliability concern exists at the Fincastle 336S substation. The unsupplied load could exist at levels as high as 8.2 MVA. If left unaddressed, it is predicted to increase to 15.8 MVA by 2026. This exceeds FortisAlberta planning criteria for electrical load restoration.

- In 2017, a reliability concern is predicted at the Taber 83S substation. The predicted unsupplied load could exist at levels as high as 3.8 MVA. If left unaddressed, it is predicted to increase to 12.1 MVA by 2026. This exceeds FortisAlberta planning criteria for electrical load restoration.

The Fincastle area was assessed with the following capacity concerns observed from Table 3-1:

- In 2018, a capacity concern is predicted on the 25 kV feeder 83S-313LN.
- In 2020, a capacity concern is predicted on the 25 kV feeder 83S-263LE.

Resulting from the updated Table 3-1, the following statements are changes to the Need for Development (NFD) document dated December 6, 2016:

1. The previous predicted reliability concern at the Burdett 368S substation in 2023 is no longer predicted in the updated planning horizon, 2017 through 2026.
2. The assessment of Alternative 1 remains to be valid as previously presented in the NFD document.
3. The assessment of Alternative 2 remains to be valid and the FortisAlberta preferred alternative as previously presented in the NFD document.
4. The assessment of Alternative 3 remains to be valid as previously presented in the NFD document.
5. A review of the Rate Demand Transmission Service (DTS) increase request has determined that the previously requested Rate DTS increase at Fincastle 336S substation Point of Delivery (POD) requires adjustment to 6.8 MW, resulting in a Rate DTS of 19 MW.

FortisAlberta Historic and Forecast Load: Existing System –
Substations near the Fincastle development area (as per AESO's requirement for NID12)

					MVA LOADING - RECORDED						MVA LOADING - PREDICTED									
				W	2012	2013	2014	2015	2016		2017	2018	2019	2020	2021	2022	2023	2024	2025	2026
SUB		CAPACITY		or	Peak	Peak	Peak	Peak	Peak	PF	Peak	Peak	Peak	Peak	Peak	Peak	Peak	Peak	Peak	Peak
No	Feeder	T/R	MVA	S	MVA	MVA	MVA	MVA	MVA		MVA	MVA	MVA	MVA	MVA	MVA	MVA	MVA	MVA	MVA
135S	Conrad	T1	20/27// 30																	
135S		VR1	15/20/ 25	S/W	**14.3**	**13.7**	**13.5**	**12.3**	**12.8**	**95%**	**16.3**	**16.4**	**16.5**	**16.6**	**16.7**	**16.8**	**16.9**	**17.0**	**17.1**	**17.2**
135S	342L			S/W	5.4	5.4	5.4	5.3	4.6	96%	6.4	6.4	6.5	6.5	6.5	6.6	6.6	6.6	6.7	6.7
135S	341LN			S/W	8.4	7.5	7.6	6.8	7.6	91%	9.1	9.1	9.2	9.2	9.3	9.3	9.4	9.4	9.5	9.5
135S	466LE			S/W	1.1	1.3	1.3	1.3	1.5	100%	1.5	1.5	1.6	1.6	1.6	1.6	1.7	1.7	1.7	1.8
158S	Vauxhall	T2	25/33/ 42	S	**30.9**	**30.5**	**28.7**	**23.8**	**19.9**	**86%**	**22.0**	**22.2**	**22.4**	**22.6**	**22.8**	**23.0**	**23.2**	**23.5**	**23.7**	**23.9**
158S	102LE			S	7.3	7.4	8.6	4.3	4.5	85%	4.5	4.6	4.6	4.7	4.7	4.8	4.8	4.9	4.9	5.0
158S	116LW			S	7.3	8.5	11.2	10.8	8.2	84%	8.6	8.7	8.8	8.9	9.0	9.0	9.1	9.2	9.3	9.4
158S	320LS			S	6.6	7.1	3.4	3.4	3.6	89%	5.2	5.3	5.3	5.3	5.4	5.4	5.5	5.5	5.5	5.6
158S	322LN			S	10.8	9.4	7.9	9.5	5.1	86%	5.3	5.3	5.4	5.4	5.5	5.5	5.6	5.6	5.7	5.7
254S	Coaldale	T1	25/33/ 42	S	**23.1**	**16.5**	**17.8**	**21.0**	**18.9**	**91%**	**21.6**	**22.2**	**22.9**	**23.7**	**24.2**	**24.7**	**25.3**	**25.8**	**26.4**	**27.0**
254S	407LN			S	10.4	9.8	9.6	11.6	8.7	91%	8.8	9.0	9.3	9.6	9.8	10.1	10.4	10.7	11.0	11.3
254S	411L1			S	6.8	3.8	3.6	3.7	4.4	96%	4.9	5.2	5.5	5.8	5.9	6.0	6.2	6.3	6.4	6.5
254S	443LS			S	6.9	4.4	5.6	6.3	7.4	87%	9.0	9.2	9.4	9.5	9.7	9.9	10.1	10.2	10.4	10.6
254S	Coaldale	T2	25/33/ 42	S	**24.4**	**22.6**	**21.5**	**22.0**	**22.6**	**86%**	**23.9**	**24.3**	**24.4**	**24.8**	**25.0**	**25.3**	**25.5**	**25.8**	**26.2**	**26.4**
254S	413LE			S	8.0	7.6	7.4	6.7	7.5	85%	8.2	8.3	8.4	8.5	8.6	8.7	8.7	8.8	8.9	9.0
254S	414LW			S	8.9	7.4	7.6	8.6	7.9	86%	8.1	8.2	8.2	8.3	8.3	8.3	8.4	8.4	8.5	8.5
254S	2162L			S	7.9	7.9	7.4	7.5	7.9	86%	8.3	8.5	8.6	8.8	8.9	9.1	9.2	9.4	9.6	9.7
254S	Total Station			S	**46.2**	**38.5**	**37.1**	**42.5**	**39.9**	**89%**	**44.6**	**45.5**	**46.4**	**47.4**	**48.2**	**49.0**	**49.8**	**50.6**	**51.5**	**52.3**
404S	Peace Butte	T2	15/20/ 25	W	**3.2**	**3.1**	**2.7**	**2.3**	**2.0**	**100%**	**2.5**	**2.5**	**2.5**	**2.5**	**2.5**	**2.6**	**2.6**	**2.6**	**2.6**	**2.6**
404S	140L			W	3.2	3.1	2.7	2.3	2.0	100%	2.5	2.5	2.5	2.5	2.5	2.6	2.6	2.6	2.6	2.6
421S	Hays	T1	25/33/ 42	S/W	**35.6**	**37.0**	**37.0**	**22.4**	**19.4**	**90%**	**23.0**	**23.1**	**23.3**	**23.4**	**23.5**	**23.6**	**23.7**	**23.8**	**24.0**	**24.1**
421S	102LN			S	10.4	11.2	10.1	6.3	5.4	92%	6.2	6.3	6.3	6.3	6.4	6.4	6.4	6.5	6.5	6.5
421S	128LN			S	6.8	7.4	7.5	6.5	6.0	89%	7.4	7.4	7.5	7.5	7.6	7.6	7.6	7.7	7.7	7.8
421S	346LS			S	10.3	9.7	10.0	9.8	9.0	90%	10.1	10.1	10.2	10.2	10.3	10.3	10.4	10.4	10.5	10.5
421S	467LE				10.4	11.2	10.5			93%										
421S	Hays	T2	25/33/ 42	S/W			**4.4**	**18.0**	**15.9**	**90%**	**17.2**	**17.3**	**17.3**	**17.4**	**17.5**	**17.6**	**17.6**	**17.7**	**17.8**	**17.9**
421S	467LE			S/W				10.8	8.1	93%	9.7	9.8	9.8	9.8	9.9	9.9	10.0	10.0	10.0	10.1
421S	6100L			S/W			2.2	6.3	5.9	92%	6.1	6.1	6.1	6.2	6.2	6.2	6.3	6.3	6.3	6.4
421S	5700L			S			2.7	2.4	2.4	92%	2.5	2.5	2.5	2.5	2.5	2.5	2.5	2.6	2.6	2.6
421S	Total Station			S/W	**35.6**	**37.0**	**38.9**	**38.9**	**34.6**	**91%**	**39.4**	**39.6**	**39.8**	**40.0**	**40.1**	**40.3**	**40.5**	**40.7**	**40.9**	**41.1**