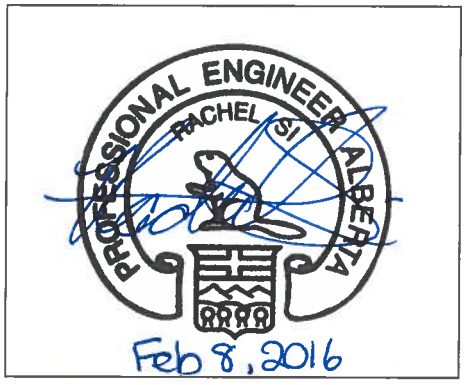
APPENDIX E DFO DISTRIBUTION DEFICIENCY REPORT

ATCO Electric | Distribution Division

Distribution Deficiency Report

Bohn 931S Transformer Addition



ATCO Electric Ltd.
APEGA Permit to Practice # P12277

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February 8, 2016

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Revision History:

R0	Original SASR Submission	Andrey Kuznetsov	June 5, 2014
R1	Edited to include AESO's comments	Rachel Si	January 21, 2016
R2	Edited to include AESO's second round of comments	Rachel Si	February 3, 2016
R3	Minor Revision	Rachel Si	February 8, 2016

1 Executive Summary

Bohn 931S is located approximately 105 km southeast of the Fort McMurray Urban Service Area and has a single 15/20/25 MVA 144 – 4.16 kV transformer. ATCO Electric Distribution Division (AE DFO) has received a request for a 7 MW load increase at a customer site adjacent to the substation. This customer site, located at LSD1-12-79-6-W4M, is currently being served by Bohn 931S. The customer has requested a separate source to serve this load increase for increased reliability.

Other than Bohn 931S, there are no other PODs in the vicinity of the customer site technically capable of supplying the requested load addition. Due to the customer's request for a load increase and reliability with a second transformer at Bohn 931S, the following alternative was assessed and preferred:

Alternative 1 Install a second transformer at Bohn 931S

The requested in-service date (ISD) for this development is February 1, 2017.

2 Customer Request

AE DFO has received a 7 MW load increase request from a customer at LSD1-12-79-6-W4M. This customer is expanding their existing pump station facilities, which connects to Bohn 931S.

The new customer load includes three new motor/pump sets to increase the flowrate at the pump station facilities. The customer's operational requirements stipulate that a maximum of four motor/pump sets can be connected to one feeder. At minimum, a dedicated 4.16 kV breaker to serve the new load is required.

Although the transformer that currently serves the customer facility has enough spare capacity available to connect a new dedicated 4.16 kV breaker, the customer has asked that the new dedicated breaker be connected to a second transformer to improve the reliability of electrical service to the facility. The facility requires increased reliability as it needs to operate continuously. A second transformer ensures that the facility will continue to operate should there be an outage to one of the transformers.

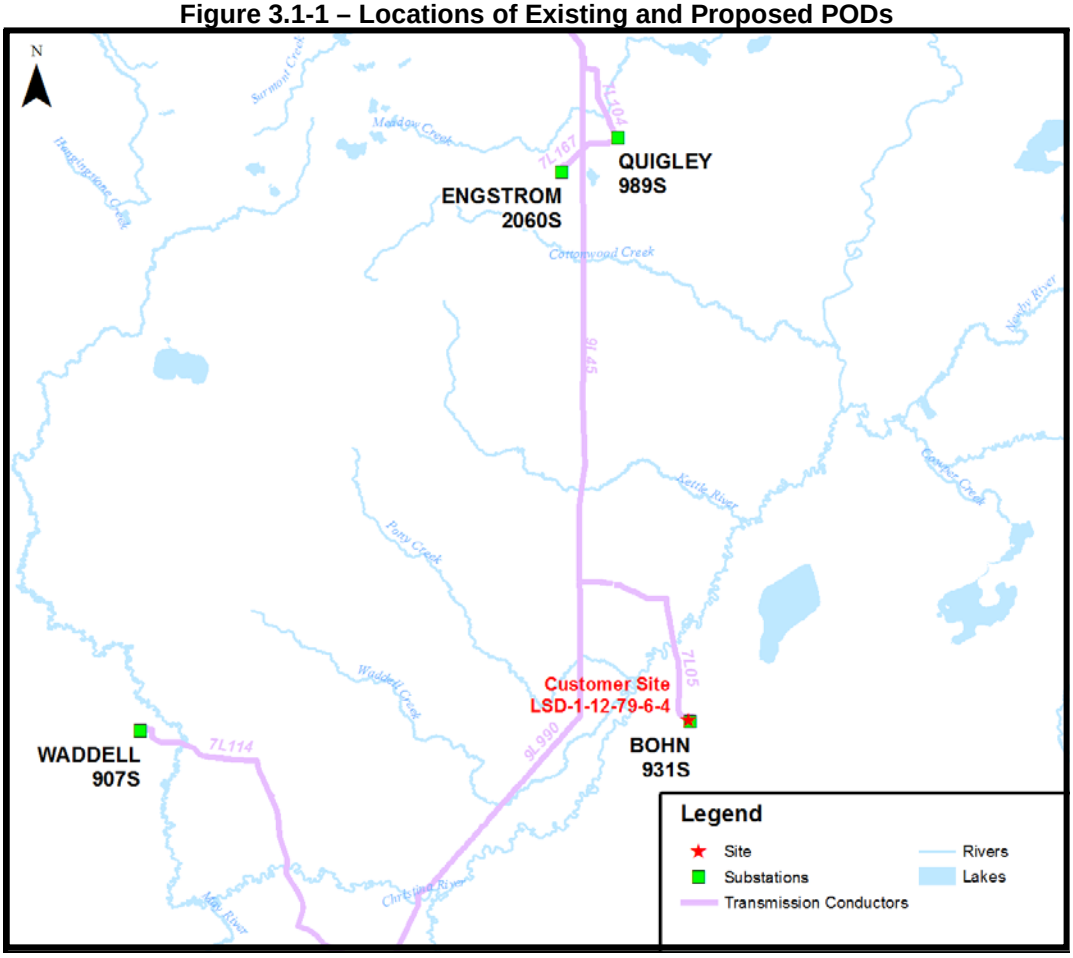
The requested ISD to connect this load increase is February 1, 2017.

3 Existing Distribution and Transmission Systems

3.1 Existing System

Figure 3.1-1 shows the existing PODs in the Transmission system near the load request. Switching substations that do not have a distribution voltage connection point are not included. The closest PODs to the customer facility are Waddell 907S, Engstrom 2060S, and Quigley 989S and they have a straight-line distance of 40 km, 43 km, and 45 km respectively to the customer facility. Bohn 931S is directly connected to the customer's facility.

Figure 3.1-1 – Locations of Existing and Proposed PODs



ATCO Electric's Distribution Planning Guideline for adding 25 kV breakers recommends mainline circuit lengths be 60 km or less. The actual main line lengths from Engstrom 2060S, Quigley 989S, and Waddell 907S would exceed 60 km when topographical requirements are taken into account. At these lengths, minimum acceptable voltage levels (0.97 V_{pu}) cannot be obtained at the customer facility. Serving the load with these PODs was not further considered.

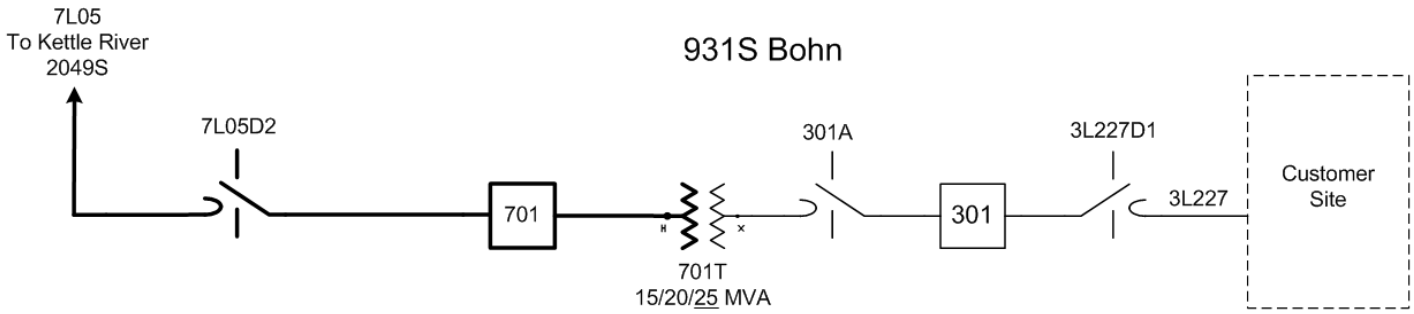
3.2 **Bohn 931S**

Bohn 931S is located 105 km south of the Fort McMurray Urban Service Area and exclusively serves the customer's pump station facilities. It consists of one 15/20/25 MVA 144 – 4.16 kV transformer.

Table A1, in Appendix A, shows the load forecast for Bohn 931S with existing customer loading and forecasts.

Figure 3.2-1 shows the simplified single-line diagram (SLD) for Bohn 931S.

Figure 3.2-1 – Simplified SLD of Bohn 931S



4 Need for Development

The need for development at Bohn 931S is driven by the customer's request for increased reliability of electrical service at this facility and to configure the POD in a split-bus configuration to match their facility design. This way, electrical service from one transformer can be quickly routed to serve the entire facility should the other transformer be out of service.

5 Transmission-Based alternative

Due to the location of the customer site and the customer's request, one alternative was considered:

Alternative 1 Install a second transformer at Bohn 931S

Alternative 1: Install a second transformer at Bohn 931S
This alternative involves installing a second transformer at Bohn 931S. The existing load will continue to be served from the existing transformer, 701T. The requested load addition will be served from the new transformer, to be called 702T.

The assumed transmission development may include:

- Install one (1) 144 kV – 4.16 kV transformer with sufficient capacity to serve a total of 7 MW for customer's load request at Bohn 931S;
- Install associated bus, protection, and control facilities at Bohn 931S;

Figure 5.1-1 shows the SLD for Bohn 931S after the requested upgrades are completed.

Figure 5.1-1 – SLD of Bohn 931S after Requested Upgrades in Alternative 1

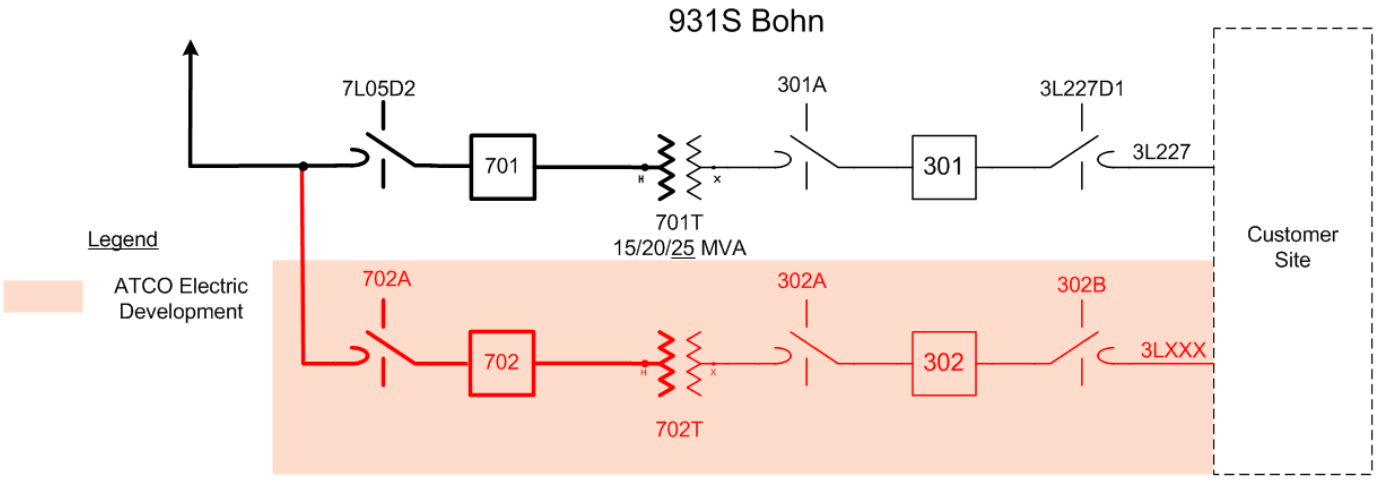


Table A2, in Appendix A, shows the load forecast for Bohn 931S resulting from this alternative.

Installing a second transformer at Bohn 931S will achieve the increased reliability of electrical service at the customer's facility that the customer requires. This will ensure continuous electrical service to the facility when a substation transformer is out of service.

As Bohn 931S is directly connected to the customer's site, no distribution development is required in this alternative.

6 Recommendation

AE DFO suggests a second transformer be installed at Bohn 931S for the following reasons:

- To achieve the customer's reliability requirements at their pump station facility
- To address the customer's requested load increase; and
- There is no distribution development required.

The requested ISD for this upgrade is February 1, 2017.

Appendix A – Load Forecasts

Table A1 – Bohn 931S Current Load Forecast Without Requested Load Addition

				Recorded					Predicted									
				Peak MW	Peak MW	Peak MW	Peak MW	Peak MW	Peak MW	Peak MW	Peak MW	Peak MW	Peak MW	Peak MW	Peak MW	Peak MW	Peak MW	Peak MW
Sub No.	Feeder	Capacity	PF	2010	2011	2012	2013	2014	2015	2016	2017	2018	2019	2020	2021	2022	2023	2024
931S	**701T Total**	701T	88%					**11.8**	**12.0**	**12.0**	**12.0**	**12.0**	**12.0**	**12.0**	**12.0**	**12.0**	**12.0**	**12.0**
	3L227	15/20/25 MVA	88%					11.8	12.0	12.0	12.0	12.0	12.0	12.0	12.0	12.0	12.0	12.0
931S	**Total Station**							**11.8**	**12.0**	**12.0**	**12.0**	**12.0**	**12.0**	**12.0**	**12.0**	**12.0**	**12.0**	**12.0**

Table A2 – Bohn 931S Load Forecast After Load Addition for Alternative 1

				Recorded					Predicted									
				Peak MW	Peak MW	Peak MW	Peak MW	Peak MW	Peak MW	Peak MW	Peak MW	Peak MW	Peak MW	Peak MW	Peak MW	Peak MW	Peak MW	Peak MW
Sub No.	Feeder	Capacity	PF	2010	2011	2012	2013	2014	2015	2016	2017	2018	2019	2020	2021	2022	2023	2024
931S	**701T Total**	701T	88%					**11.8**	**12.0**	**12.0**	**12.0**	**12.0**	**12.0**	**12.0**	**12.0**	**12.0**	**12.0**	**12.0**
	3L227	15/20/25 MVA	88%					11.8	12.0	12.0	12.0	12.0	12.0	12.0	12.0	12.0	12.0	12.0
	702T Total	702T	90%								**7.0**	**7.0**	**7.0**	**7.0**	**7.0**	**7.0**	**7.0**	**7.0**
	3LNEW		90%								7.0	7.0	7.0	7.0	7.0	7.0	7.0	7.0
931S	**Total Station**							**11.8**	**12.0**	**12.0**	**19.0**	**19.0**	**19.0**	**19.0**	**19.0**	**19.0**	**19.0**	**19.0**