ATCO Electric
YUKON

2023-2024 General Rate Application (GRA)

McIntyre Subdivision Replacement Project Update

2016-2017 Business Case #01

Executive Summary

1. This is a multi-phase project to replace the existing end-of-life underground electrical infrastructure serving the McIntyre Subdivision in Whitehorse. This project commenced in 2013 and is scheduled to be completed in 2025. The original forecast for Stage 1 was approved as part of the 2013-2015 General Rate Application (GRA) in Board Order 2014-06. Further stages were approved in the 2016-2017 GRA in Board Order 2017-01 with direction to provide an updated business case in AEY's next GRA.

Background

2. The existing electrical system was installed circa 1977 and was one of the first underground high voltage cable installations in the City of Whitehorse.

3. The electrical infrastructure is now at its end of life. As described in Business Case #22 in the 2013-2015 GRA, deficiencies include:

- Extended unplanned outages caused by failing high voltage cables;
- Transformers and switch cubicles that cannot be operated safely;
- Cable switch points that cannot be operated at all;
- Equipment that can't be operated effectively due to installation of direct buried cables; and
- Physical deterioration of metal equipment and streetlights.

4. The first stage of the project, which took place from 2013-2015, had a significant change in scope. The original scope was to install a new 25 kV underground electrical system in close proximity to the existing 35 kV system. The two separate underground systems would continue to operate in parallel as various streets and areas of the subdivision were converted to the new system. As streets throughout the subdivision were converted to the new system, the old system would be decommissioned and abandoned in place.

5. The new project scope included:

- Installation of a temporary 25 kV shadow overhead line complete with transformers and streetlights to serve the subdivision;
- De-energization and decommissioning of the old 35kV underground system;
- Installation, commissioning and energization of the new 25 kV underground system;
- Removal of the old 35 kV cables where appropriate and electrical equipment; and
- Replacement of streetlights to the roadway lighting standard.

6. The objective of the project is to replace the existing end of useful life underground electrical system. This will include new high and low voltage cables, transformers, high voltage switch cubicles and streetlights. It will also include the eventual removal of the temporary 25 kV overhead line.

Project Schedule and Cost

7. The schedule and cost updates are broken out into three groups: 2016-2017 Test Period, 2018-2022, and 2023 until project completion (2025).

Table 1: Project Update for 2016-2017
($000)

Year	Approved	Actual	Variance	Variance (%)	Scope
2016	740	748	8	1%	Hanna and McCandless
2017	1,186	1,035	(151)	-13%	McClennan, South Murphy, O'Brien & McCrimmon
	1,926	**1,783**	**(143)**	**-7%**	**2016 – 2017 Total Costs**

8. The 2017 scope included removing the overhead line on Hanna and McCandless. All the planned civil work was completed but the electrical installation and overhead powerline salvage was delayed to Q1 2018, which resulted in underspending in 2017.

Table 2: Project Update for 2018-2022
($000)

Year	2016/17 GRA Business Case[1]	Scope Change Estimate	Actuals	Project Variance	Project Variance (%)	Scope Completed
2018	600	478	405	(73)	-15%	Civil for McClimon, North Murphy, McIntyre Drive portion, Potlatch and Macaulay.
2019	750	239	141	(98)	-41%	Electrical for McClimon, North Murphy, McIntyre Drive, Potlatch & Macaulay.
2020	400	0	(91)	N/A	N/A	Covid resulted in no construction this year
2021			1,368			Civil for McIntyre Drive underground from Kwanlin Dün First Nation (KDFN) Nursing Station to Hamilton Blvd. Some electrical near Hamilton Blvd.
2022			285			McIntyre Drive electrical from KDFN Nursing Station to KDFN Gas Station
			2,108			**2018 – 2022 Total Costs**

9. For the project scope in 2018-2020, the design and estimates were changed from what was submitted in the 2016/17 GRA. This was a result of the hands-on experience of completing project work in 2016 and 2017, adjusting to contractor availability and the pandemic of 2020.

10. In 2018, AEY completed the electrical scope planned for 2017 including the salvage of the overhead line. The 2018 civil construction scope was completed as planned for McClimon, North Murphy, McIntyre Drive portion, Potlatch and Macaulay areas. The electrical scope for these locations was then moved into the 2019 project scope.

11. In 2019, AEY completed a small area of the electrical and overhead line salvage as crews focused on new extensions and system projects in other areas.

[1] 2016-2017 AEY GRA Appendix #8 Page 3 Table 1

12. In 2020, the project was put on hold due to resource constraints as a result of COVID-19. There were some material returns and removal costs and retirements.

13. In 2021, construction continued on McIntyre Drive with both civil and electrical contractors working on the project. Digging conditions continued to be challenging with sloughing during excavation and the close proximity of underground infrastructure.

14. In 2022, AEY completed 50% of the electrical installation on north McIntyre drive.

15. The cost estimates to complete the project, listed in Table 3 below have been updated with current scope, civil conditions, and market rates for materials and contractors.

Table 3: Forecast to Complete Project
($000)

Year	Estimated	Scope
2023	521	Complete electrical installation on McIntyre Drive from KDFN Nursing Station to KDFN Gas Station
2024	1399	McIntyre Drive underground from KDFN Nursing Station to Hamilton Roundabout
2025	50	McIntyre Drive temporary overhead salvage

Table 4: Overall Project Cost Performance
($000)

Period	Project Costs
2013-2015 Actuals	1,453
2016-2017 Actuals	1,783
2018-2020 Actuals	455
2021-2022 Actuals	1,653
Total Actuals	**5,344**
2023-2025 Estimate	1,970
Estimated Project Total	**7,314**

Evaluation of Viable Alternatives

Alternative 1

Leave the overhead distribution line in place and remove the existing 35 kV infrastructure. This changes the construction standard for the KDFN community with no corresponding benefit, as the existing underground system would be converted to overhead.

Alternative 2

Explore the benefits of utilizing some of the overhead system in coordination with some of the new underground electrical infrastructure. This would result in a hybrid system as it would be a combination of overhead and underground. This alternative did not receive KDFN approval.

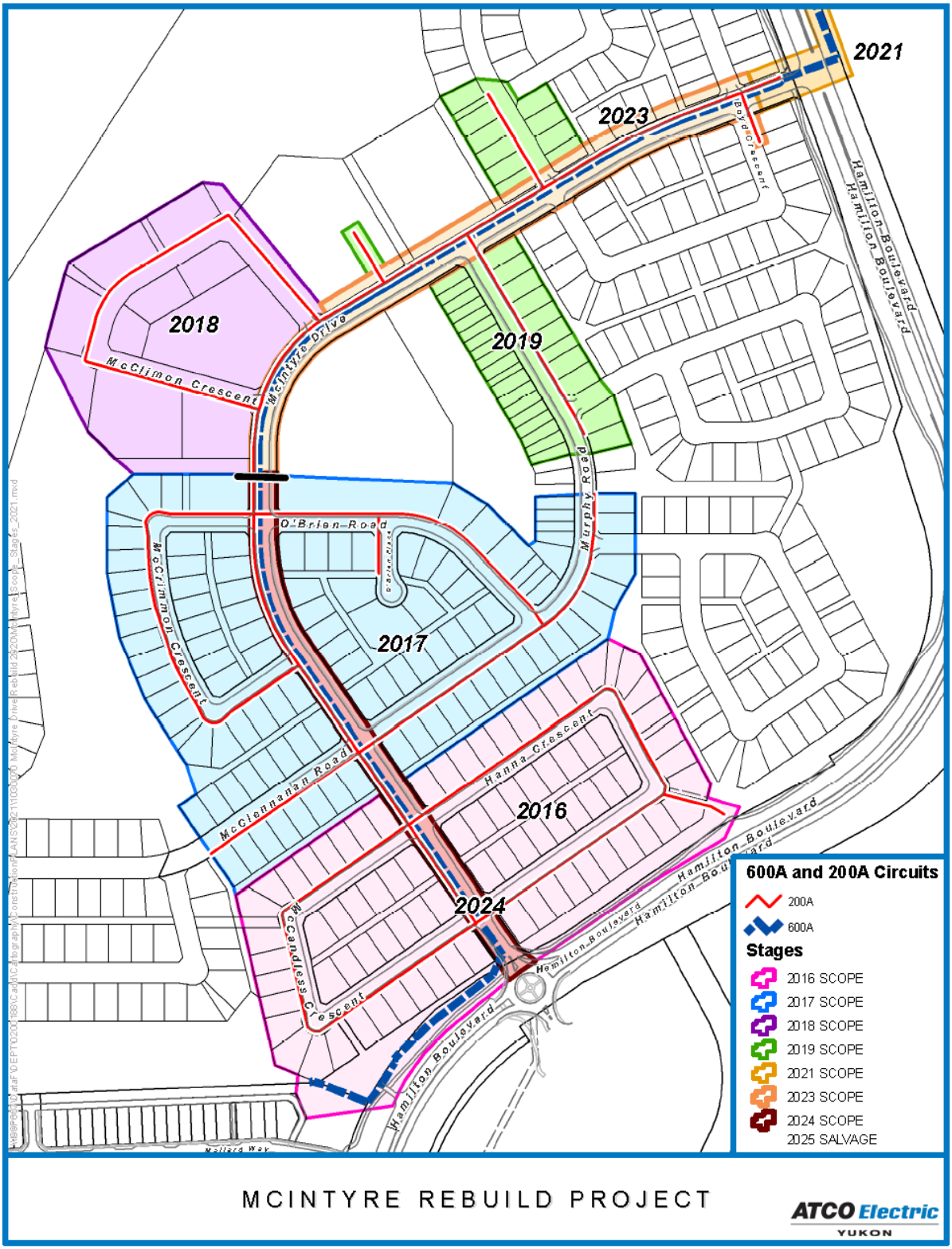
Alternative 3

Continue with the McIntyre Subdivision Replacement with the scope approved in the 2016-2017 GRA, ground conditions have been worse than originally estimated and have resulted in increased costs.

Recommendation

16. In order to provide safe, reliable service to the subdivision that meets current industry standards, Alternative 3 is recommended to continue upgrading the underground electrical system in the McIntyre subdivision along McIntyre Drive.

Appendix A: Project Completion Phasing



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2023-2024 General Rate Application (GRA)

Replace Ditch #1 Spillway

2016-2017 Business Case #02

Executive Summary

1. The Ditch #1 Spillway, west of Fish Lake Road, Whitehorse, has been damaged by ice loading and soil erosion resulting in the water flows bypassing the spillway at an uncontrolled rate. The structure has been assessed by an engineering consultant and a complete rebuild and removal is required, with a new structure design to account for the ice and new non-frost susceptible fill to be installed. The costs of structural upgrade will be borne by AEY, while the costs of a like-for-like upgrade will be covered by insurance.

Background

2. The Ditch #1 Spillway is a 12.5 m long, 1.5 m in diameter corrugated metal pipe culvert buried in the embankment dike of the Ditch #1 canal. Its location is shown in Appendix A. Spillway #1 was constructed between September 2010 and June 2011 to replace an existing culvert that was in place for approximately 30-years. It was constructed in November 2010. In June 2011, construction defects were identified and repaired in November 2011.

3. In January 2015, reduced flows were recorded at the Hydro-plant #1, which is fed from the Ditch #1 canal. Staff observed that a significant portion of the water was flowing through the Ditch #1 embankment, not passing through the culvert. The water was flowing beside or underneath the spillway as the culvert was blocked with ice. A temporary repair was put in place in January 2015 and use of the spillway was terminated in March 2015 until permanent repairs could be completed. An image of the temporarily repaired spillway is shown in Appendix B. Yukon Environment issued a Directive (Spill #2015-45) on April 9, 2015, indicating that AEY needed to issue an engineered plan by June 15, 2015, as the breach violates the design described of Ditch #1 Spillway Control in Water License HY12-065.

4. The damage was assessed in two engineering consultant reports. The cause of the failure has been determined as lateral loading from ice build-up as well as the use of frost-susceptible soil fill allowing for the creation of voids surrounding the culvert due to the blockage. Remediation will require a complete rebuild of the spillway and the

surrounding fill. A like-for-like rebuild is not recommended as this will likely not address the ice loading issue.

5. A new structure has been designed with additional loading constraints and non-frost susceptible fill will be used surrounding the spillway. The upgraded structure (betterment) costs will be borne by AEY, while like-for-like costs will be borne by insurance less a $100,000 deductible.

Project Description

6. Design and construct a new upgraded spillway structure including the installation of non-frost susceptible fill around the structure to replace the failed structure including the complete removal and disposal of the old structure and surrounding fill.

7. Design to be completed by a third-party consultant, construction to be performed by a qualified contractor, and quality control to be provided by the consultant. Project Management to be overseen by AEY.

Project Schedule & Cost

Table 1: Project Schedule & Cost
($000)

Project	ISD	Actual
Spillway rebuild	2016	262

8. The project took 12 weeks to complete and cost $262,000, net of the insurance proceeds.

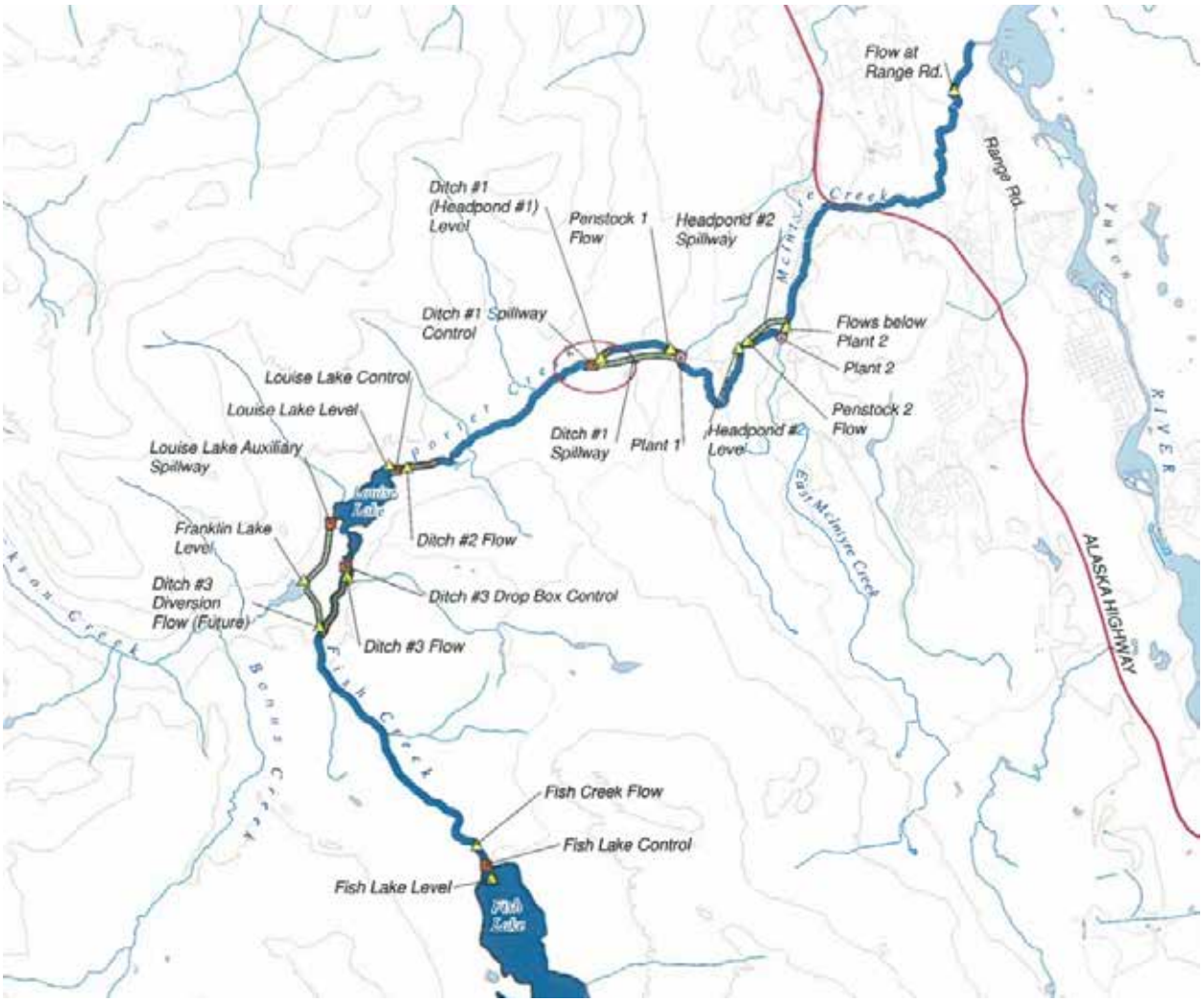
Evaluation of Viable Alternatives

9. As this was a ditch failure and the rebuild was required in order to comply with Water License HY12-065, no viable alternatives were available.

Appendices

Appendix A Location of Ditch #1 Spillway
Appendix B Picture of Temporarily Repaired Spillway

Appendix A: Location of Ditch #1 Spillway



Appendix B: Picture of Temporarily Repaired Spillway

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2023-2024 General Rate Application (GRA)

400 Amp Regulators at Logan Substation

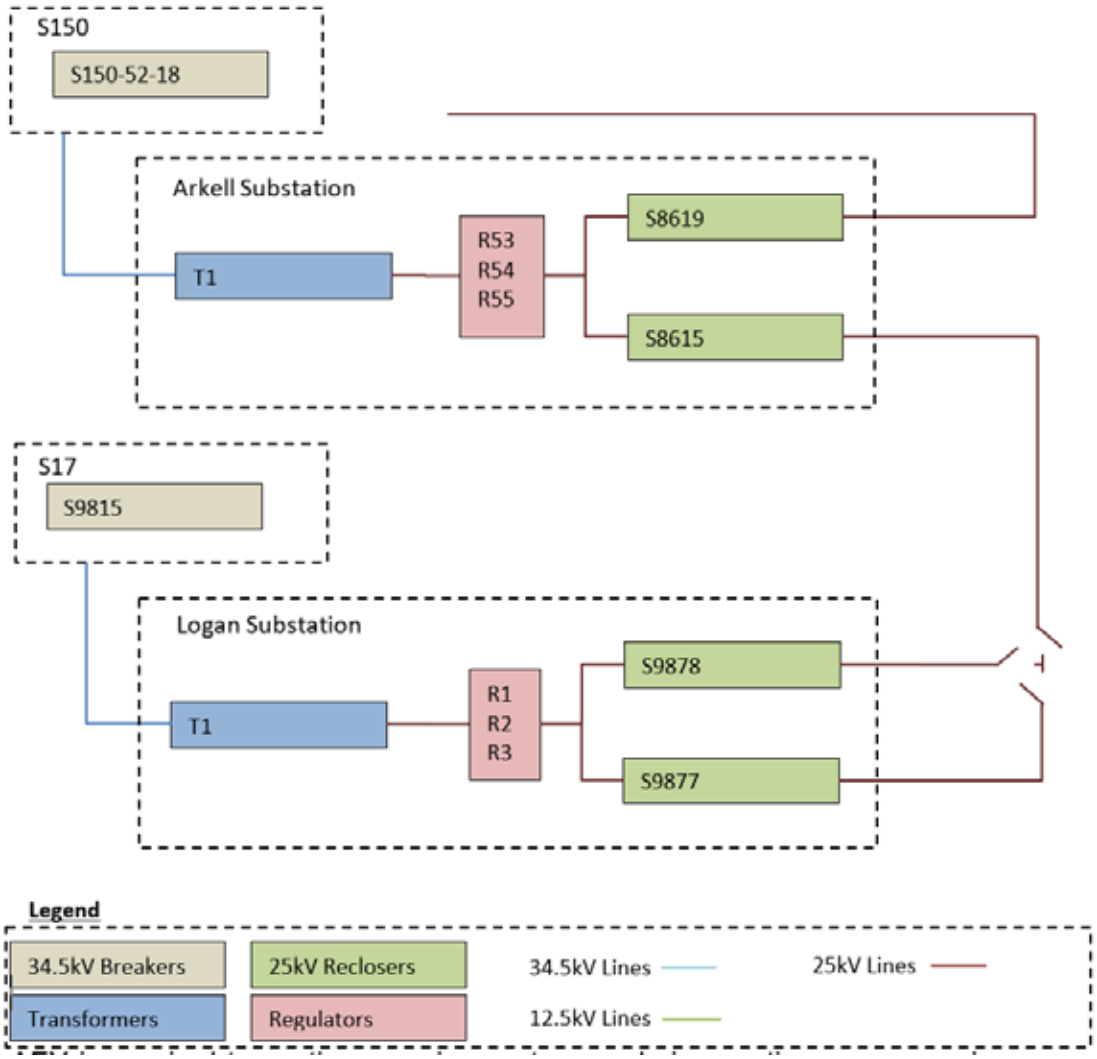
2016-2017 Business Case #03

Executive Summary

1. During a power loss of Arkell substation, Logan substation is not equipped to provide reliable backup power to customers served by both Arkell and Logan at the same time. AEY is proposing to upgrade the 200 A regulators to 400 A regulators to address this issue.

Background

Figure 1: Whitehorse North 25 kV System During Normal Operation



2. AEY is required to continue serving customers during contingency scenarios, e.g., the loss of a Substation. Arkell has an open connection with Logan through its 25 kV recloser S8615. This connection provides the opportunity for these two

substations to feed each other's load if one of the substations loses power. These types of connections are essential in an electrical system so that backup power can be fed to customers affected by the loss of power at a substation. For this backup scenario to be effective, Arkell and Logan must have enough individual capacity to support the total load of both substations at once; Logan fails to abide by this.

3. The regulators at Logan substation are rated for 200 A and if Arkell substation were to lose power, the Logan regulators would be overloaded when taking on Arkell's load while also still supplying power to Logan substation customers.

Table 1: Load vs Capacity Comparison

Combined Logan and Arkell 2017 Load	Logan Regulator Capacity
~10,000 kVA	8660 kVA

Project Description

4. The existing 200A regulators (R1/R2/R3) at Logan Substation will be upgraded to 400 A regulators.

Project Schedule

Table 2: Costs and Schedule ($000)

	Cost	Target In-Service Date
Install 400 A Regulators at Logan Substation	174	Q4 2017

Business Drivers and Benefits

5. During the loss of power at the Arkell Substation, Logan substation takes on the load from Arkell so that customers can continue using electricity. This load transfer from Arkell to Logan is greater than what the Logan regulators are rated for, which will cause an overloading condition.

6. Upgrading the Logan regulators will ensure that AEY can continue to safely and reliably provide power to customers during an emergency, i.e., the loss of power at the Arkell substation.

Evaluation of Viable Alternatives

Alternative 1: Upgrade Logan Regulators

7. Upgrade the existing regulators at Logan substation to 400A regulators. This alternative directly addresses the issue of overloaded regulators and provides additional headroom for future load growth.

Alternative 2: Add New Substation

8. This alternative addresses the overload condition by either transferring the Arkell load onto a new appropriately sized substation or distributing the Arkell load onto the new substation and Logan substation. This would ensure that the Logan regulators would not be overloaded due to the added capacity of a new substation. Costs for this alternative are expected to exceed $500,000.

Alternative 3: Status Quo

9. The status quo alternative will leave the Logan substation operating as is. In the event of an overload condition during a loss of power at Arkell contingency feed, new regulators will have to be installed before returning the system to its normal operating condition.

Recommendation

10. Alternative 1 is the recommended solution. It is both cost effective and immediately solves the overload conditions during contingency feed.

11. Although Alternative 2 provides the greatest capacity increase, adding a new substation is significantly more costly when compared to Alternative 1. Alternative 3 does not provide a long-term solution to the issue and is not consistent with AEY's duty to provide safe and reliable service to customers.