7. Recommendations

TMG Consulting
Where Business and Technology Intersect

TMG's Recommendation

- What is the answer to the question posed to TMG: "Should the current ATCO legacy CIS from both a Gas and Electric perspective be retained or replaced?".

TMG's recommendation is to REPLACE the current CIS from both a Gas and Electric perspective. TMG is making this recommendation based on our analysis of the interviews, the assessment of business considerations, and technical considerations, our replacement model, along with our vast experience assessing legacy CIS solutions for similar utilities over the past 28 years.

- If the decision was to replace, a second question was asked of TMG: "Based upon an analysis of alternative replacement scenarios, which is the optimum scenario for ATCO to consider?".

TMG conducted an analysis of 6 replacement scenarios. Based on this analysis TMG recommends that ATCO Gas and Electric consider replacement of the current CIS with a new SaaS CIS product solution as the first place or optimum solution. TMG's analysis utilized data from TMG's extensive industry project database, as well as, the direct experience of our consultants who have worked on various CIS projects for over 30 years.

TMG Replacement Considerations

Based upon TMG's experience and our review of the current CIS, the following items should be viewed as primary drivers for replacement and are inline with what TMG has experienced with similar utilities who have decided to replace their legacy CIS.

1. A strategic and essential foundational initiative in support of company business, technical, and customer based strategies and initiatives.
2. Implementation of newer application technologies and a platform which resolves issues associated with an older legacy billing system e.g. loss of expertise, better integration, improved security, improved reporting and analytics, scalability, etc..
3. Addresses the need for cybersecurity to accommodate operating in a digital environment, and digital customer communication channels with the need to protect critical and important customer information.
4. Replacement of a technical foundation which may adversely impact the company's current and future revenue stream in support of both business operations, and impacts to the customer life-cycle and level of service.
5. A solution which supports staff in providing customers with exceptional levels of service, customer transformation, and applying new technologies and multiple channels of communication and interaction.
6. Provide users with a new and efficient browser based user interface, with new capabilities, documentation, and help. This will enable new users to learn the system quicker and be more effective in meeting job responsibilities and serving customers.
7. The ability to apply regular product releases to provide new customer capabilities in a timely fashion – following a close to zero modification approach. No need for enhancements that take to much time, cost to much, and are risky – those days are over.

TMG Optimum Solution Considerations

Why proceed with the optimum or first place solution which is a new SaaS CIS product solution? TMG believes the following are primary considerations for pursuing this solution and are very much inline with other utilities who are pursuing this same solution.

1. Annual operating costs decrease significantly.
2. Mitigation of risks associated with the application, the platform, and the business.
3. It will enable customer transformation, improved services, and digital communication channels.
4. Utilizes the existing investment in the Oracle CIS/MDM licenses with the ability to capitalize the subscription fees during implementation months.
5. Support for the current revenue stream and future revenue streams associated with new offerings for products, programs, and services.
6. Will adhere to a product roadmap to take advantage of new releases from hundreds of other utilities on a regular basis.
7. Provides cybersecurity to protect critical and important customer information.
8. Supports the vision and strategy of a public SaaS subscription platform and integration to other primary applications.
9. The solution would seem favorable to Regulators, Executives/Board Members, Technical Personnel, Business Users and Customers.

TMG Proposed Next Steps

- The following are the recommended next steps.
  1. Review and update this analysis as required.
  2. Confirm the decision to replace.
  3. Confirm the decision to replace with a new SaaS product solution.
  4. Socialize the results with stakeholders.
  5. Incorporate results into the business case.


Thank you
ctrl
end

Scorecard Summary - N60 CIS Implementation

				Bidder 1	Bidder 2	Bidder 3	Bidder 4	Bidder 5
				2.99	**3.23**	**3.17**	**2.60**	**3.53**
Evaluation Category		**Assigned Weight**	**Category Weight**					
Commercial Criteria			**45.00%**	**2.78**	**3.25**	**3.66**	**3.16**	**3.72**
	Agreement with Contract Terms	**5.00%**		3.00	2.00	2.00	2.00	3.00
	Pricing	**40.00%**		2.75	3.41	3.87	3.31	3.81
Technical Criteria			**55.00%**	**3.16**	**3.21**	**2.76**	**2.14**	**3.38**
	Proponent Qualifications	**10%**		3.13	2.73	2.53	2.17	3.17
	Business Requirements	**15%**		3.78	4.84	4.24	3.80	3.78
	Implemention Environment	**10%**		3.18	2.73	1.45	0.91	3.34
	Timeline & Staffing	**10%**		2.31	2.31	2.50	1.19	3.00
	Implementation Services	**10%**		3.10	2.60	2.35	1.80	3.41

ATCO Electric YUKON

September 28, 2023 AEY-UCG-085

ATCO Electric Yukon (AEY)
2023-2024 General Rate Application (GRA)

Information Responses Round 1 to:
The Yukon Utilities Consumers' Group (UCG)
Received: September 6, 2023

AEY-UCG-085

Reference: Genset Major Overhauls, BC#23; Costs from 2017-2022 $3.5 million plus Test Year costs of $375,000 in 2023 and $515,000 in 2024.

Request:

(a) Why the extreme differences in cost to overhaul gensets, for example Old Crow-2, 71K and Old Crow 1, $465K).

(b) Provide procurement tenders with bids included.

(c) Provide who salvaged each genset replaced and how much did ATCO get for each of these units?

Response:

(a) The differences in cost to overhaul gensets can be due to the scope of work and the location of the genset, among other factors. For example, Old Crow 2 was a long block replacement because of a failure; please refer to AEY-YUB-046(b) Attachment 1 for a project description. Old Crow 1 is a larger engine than Old Crow 2 and required multiple flights for people and parts, due to the size/weight of materials and the COVID restrictions at the time in the community. Generally, Old Crow overhauls are more expensive than elsewhere due to its remote location. Overhauls costs can also be higher (i.e., variable) due to found work on inspection and disassembly.

(b) There is no tender information because AEY has a Master Services Agreement with a large distributor and service company for provision of parts and qualified technicians on overhauls. This distributor has warranty and inventory and quality assurance facilities, in addition to a large resource pool.

(c) For the overhauls described in Business Case #23, there is no salvage since this work is maintenance of existing equipment. AEY receives some credit from the supplier, based upon their capacity to remanufacture and resell certain parts that are replaced due to age or condition. This cost is included in the project invoicing.

ATCO Electric YUKON

September 28, 2023 AEY-UCG-086

ATCO Electric Yukon (AEY)
2023-2024 General Rate Application (GRA)

Information Responses Round 1 to:
The Yukon Utilities Consumers' Group (UCG)
Received: September 6, 2023

AEY-UCG-086

Reference: Asset Management Program, BC#24; Cost 2023-$305K, 2024-$901K, Total $1.206 million.

Request:

(a) Provide procurement tenders for AMA Assessment with the amounts of bids included.

(b) Provide examples of operational efficiencies/cost effectiveness of this new program.

Response:

(a) Four bids were received for the Asset Management Program development scope:

Table 1: Bids Received for Asset Management Program Development RFP

Bidder 1	Bidder 2	Bidder 3	Bidder 4
$49,910	$135,168	$48,950	$48,600

The evaluation was scored in five categories: 1) project requirements & understanding; 2) key personnel & roles; 3) previous experience on similar projects; 4) project execution methodology and ability to meet schedule; and 5) manhour and cost estimate.

(b) The program benefits are extensively articulated within the report by METSCO (Table 2-1 of the appendix in Business Case #24). Please refer to the response to AEY-YUB-068(a).

ATCO Electric YUKON

September 28, 2023 AEY-UCG-087

ATCO Electric Yukon (AEY)
2023-2024 General Rate Application (GRA)

Information Responses Round 1 to:
The Yukon Utilities Consumers' Group (UCG)
Received: September 6, 2023

AEY-UCG-087

Reference: New Substations-Mayo Road and Whistle Bend, BC #25; Costs: Mayo Rd.- $2.554million and Whistle Bend- $2.781 million.

Request:

(a) Provide engineering qualifications of what work was to be done for each project and what were the economic analyses identifying the business drivers and cost/benefits, including the preliminary engineering estimate of costs. Provide engineers report.

Response:

(a) Please refer to the response to AEY-UCG-066(a). Please also refer to AEY-UCG-087(a) Attachment 1 - Whitehorse North 25 kV System Study Rev 2.0.

ATCO Electric
YUKON

Whitehorse North 25kV System Improvement

Technical Appendix

	Name	Signature	Date
Prepared by:	Ryan Grams		2019-10-01
Reviewed by:	John Williams		
Reviewed by:			
Reviewed by:			

Revision History

Revision	Date	Editor	Comments
R1.0		Ryan Grams	Document Created
R2.0	2023-02-06	Alex Deans	Updated numbers with most recent load forecast. Removed options for Laberge reg upgrades as they are now 400A. Typo fixes.

Table of Contents

1. Problem Statement

The Whitehorse North 25kV system has significant load growth expected over the next 5 years. At present, there is a contingency scenario that cannot be adequately addressed. As the load grows, substation regulator capacities will be exceeded, rural customer voltages will drop below acceptable levels and the number of failed contingency scenarios will increase. The projected load growth must be planned for and accommodations implemented to ensure continued safe and reliable operation of the Whitehorse power system.

2. Background

Load growth continuously pushes a power system closer to its capacity limits. This leads to electrical equipment being operated past its capacity, which compromises the safety and reliability of the network.

To understand the problem statement in more detail we can consider how the North 25kV System is configured, how the load has grown in the past, how we expect it to grow in the future, and at what point the load is higher than the system's capacity.

2.1 System Configuration

During normal operation the North 25kV System is supplied power from a single transmission substation source (S164), through two sub-transmission substations (Laberge Substation and Whistlebend Substation), and out to both urban and rural customers in the northern Whitehorse area and along the North Klondike and Alaska highways. At each voltage level, there are interconnection points between parallel feeds, allowing for a variety of potential system configurations.

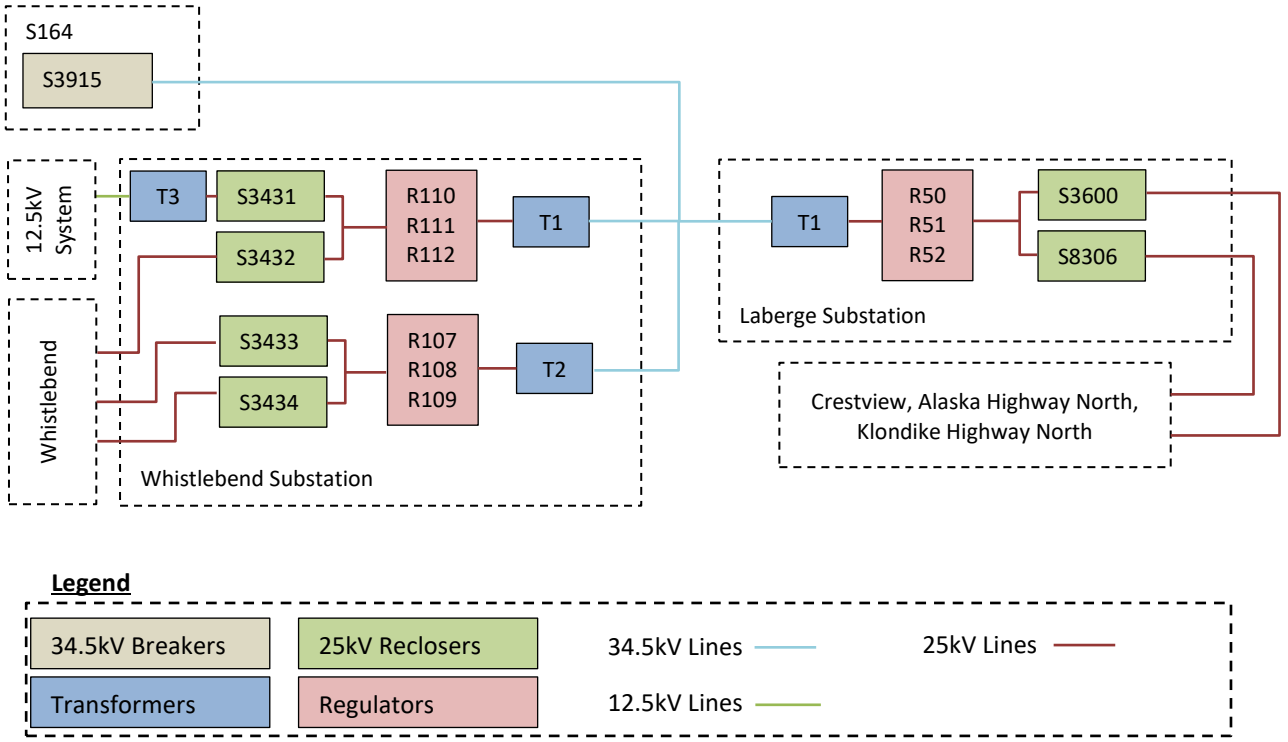


Figure 1 - Whitehorse North 25kV System During Normal Operation

2.2 Forecasted Load Growth

Currently the Whistlebend subdivision is undergoing extensive construction and is expected to complete Stage 7 by the end of 2025. Using historical SCADA data from Whistlebend substation, year-over-year load increase was modeled at 11.26%. Historical Laberge substation SCADA data proved a 2.06% year-over-year load increase along the North Alaska Highway, North Klondike Highway and Crestview.

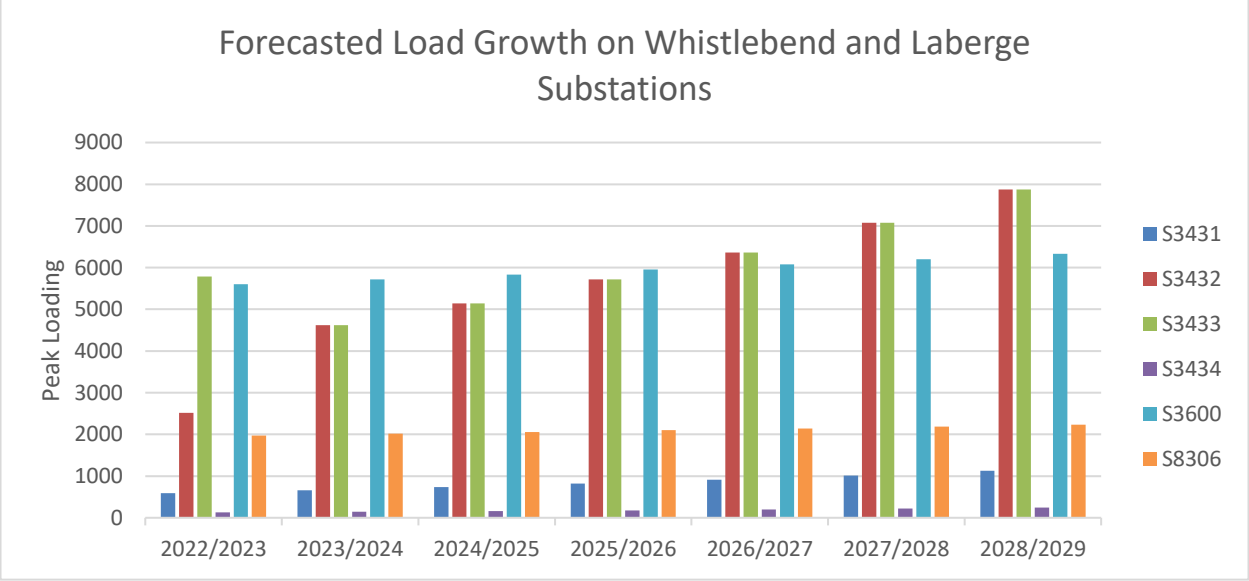


Figure 2 - Forecast Load Growth for Whistlebend and Laberge Substations until the 2028/2029 winter.

* Load growth for Whistlebend Subdivision is forecast to be redistributed evenly over reclosers S3432 and S3433 in future years, instead of only loading S3433 as is the present arrangement.

3. Evaluation Criteria

3.1 Regular Operation

No components of the system should have load exceeding their nameplate rating during peak load conditions.

To ensure safe operation and maintain the expected lifespan of the electrical system, it is important to operate equipment within nameplate ratings at all times. Power transformers are an exception to this rule, as they can be operated above their nameplate apparent power ratings depending on ambient temperature and duration of overload. This overloading will be evaluated further in Section 5.4.

Specific to the Whitehorse North 25kV system, the major system limitations that require adequate planning are as follows:

- Whistlebend Substation max loading of 10MVA on each of the 34.5/25kV transformers
- Laberge Substation max loading of 10MVA on 34.5/25kV transformer
- S164 Substation max loading of 28MVA on 138/34.5kV transformer
- 266 MCM sub-transmission line (6L16, 6L17) max loading of 38 MVA at 0^{o}C (28MVA at 40^{o}C)

During normal operation:

- *Maximum 25kV bus voltage at transmission POD substations -> 1.04 p.u.*
- *Minimum primary voltage at urban residential customers with multiple customer secondaries -> 0.97 p.u.*
- *Minimum voltage at all other points on distribution feeders -> 0.95 p.u.*

To provide safe and reliable power to ATCO Electric Yukon's (AEY) customers and to prevent unnecessary damage to customer electrical equipment, the system per-unit voltage must remain within the limits defined in AEY's standards.

3.2 Load Addition

Substations and main feeders should have sufficient reserve capacity.

Reserve capacity allows routine load additions/growth and provides lead time for system upgrade projects to take place before critical thresholds are exceeded. Sufficient reserve capacity is assessed by looking at the peak loading and forecasted load growth for each feeder within the planning period window.

The Whitehorse North 25kV System has significant load growth planned in the next 6 years largely due to the development of the Whistlebend subdivision. Based on historical SCADA data within that area, the Whistlebend subdivision growth will be forecast at 11.26% growth per year, while Laberge's load growth averages 2.06% per year.

3.3 Contingency

The peak load on major equipment (e.g. transformers, regulators, reclosers) in systems that warrant loop connections should be able to be transferred to another power source.

Contingency planning is required to maintain service to customers during planned or unplanned outages resulting from maintenance work, system faults, or equipment failures. When a portion of the system needs to be removed from service, any downstream load will lose power unless the removed section can be isolated and downstream customers transferred to an alternate source.

For this to be a viable tool for maintaining system reliability, the alternate source must be able to handle the load addition in a worst-case scenario. This would typically be the loss of major equipment such as transformers, regulators, or reclosers during peak load. For low customer-density areas or in rural areas, the system is typically composed of radial feeds. Radial networks do not have a loop connection with a normally-open point, therefore the outage scenario is managed through alternative methods including generation or quick repair times.

In the Whitehorse North 25kV system, contingency situations are mainly addressed through interconnection points between parallel sources on both the 34.5kV subtransmission lines and the 25kV distribution lines. The following contingency situations require additional attention as they address scenarios that if not properly planned, could result in an outage to a large group of customers:

- Loss of 34.5kV source to Laberge and Whistlebend substations (sub-transmission line 6L17)
- Loss of a single 34.5/25kV transformer in North 25kV System
- Loss of 34.5kV primary bus at Whistlebend substation
- Loss of a single 25kV breaker at Whistlebend substation

3.4 Power Restoration

Critical loads should be restored as quickly as possible (includes residential and commercial customers). All loads should be restored within 24 hours.

The responsibility of an electrical utility is to operate a safe and reliable electrical system. Following outages, safe power restoration is a priority.

When planning for system restoration, Cold Load Pick-Up (CLPU), a phenomenon that occurs during restoration from extended outages, must also be considered. When restoring from prolonged outages, the system diversity factor drops to nearly 1 and the system can experience

2-5 times the regular load for a period of minutes to hours. Based on historical data, typically 200% of regular load for several minutes is assumed.

4. Technical Review

Using the evaluation criteria listed above, for the Whitehorse North 25kV system we have the following:

4.1 Regular Operation

- *No system components are currently overloaded*
- *Whistlebend Substation 34.5/25kV transformers are not expected to be overloaded in the next 6 years*
- *Laberge Substation 34.5/25kV transformer is not expected to be overloaded in the next 6 years. Regulators R50, R51 and R52 are expected to overload in 2024.*
- *S164 Substation 138/34.5kV transformer is not expected to be overloaded in the next 6 years*
- *The subtransmission line 6L17 sourcing both Laberge and Whistlebend substations is not expected to be overloaded in the next 6 years*
- *Customer voltage is currently within the acceptable band for all customers on the North 25kV System. Rural customers up the Alaska Highway and Klondike Highway North are expected to be outside of acceptable voltage as early as 2021. Voltage levels are not the focus of this study and other system upgrades/reconfiguration will occur as necessary to maintain mandatory voltage levels.*

Currently no system components are overloaded, but the Laberge Substation Regulators are expected to overload in the next 6 years. Below are modelled forecasts for system loading for the 6-year planning period.

	Equipment / System Area	Critical Ratings	Present Status (2023)	Future Status (2029)
Whistlebend Substation	Transformer T1	34.5/25kV 10MVA	31% Loaded	90% Loaded*
	Transformer T2	34.5/25kV 10MVA	59% Loaded	81% Loaded*
	Transformer T3	25/12.5kV 5MVA	12% Loaded	23% Loaded
	Reclosers: S3431, S3432, S3433, S3434	27kV 630A each	4%, 16%, 37%, 1% Loaded	7%, 50%, 50%, 2% Loaded*
	Regulators: R110, R111, R112	400A each	18%, 18%, 18% Loaded	53%, 52%, 51% Loaded

	Regulators: R107, R108, R109	400A each	34%, 35%, 34% Loaded	46%, 48%, 47% Loaded
Laberge Substation	Transformer T1	34.5/25kV 10MVA	76% Loaded	86% Loaded
	Reclosers: S3600, S8306	38kV 630A, 400A (per phase)	36%, 20% Loaded	40%, 22% Loaded
	Regulators: R50, R51, R52	400A each	38%, 47%, 47% Loaded	43%, 53%, 53%
S164	Transformer T1	138/34.5kV 28MVA**	59% Loaded	92% Loaded

Table 1 - Whitehorse North 25kV System Peak Loading

*Future 25kV load on Whistlebend Substation redistributed evenly across S3432, S3433
**Assuming that S164 is operating in OFAF mode. If Transformer T1 is unable to operate at the nameplate rating of 28MVA, the transformer will require upgrades and/or replacement in coming years. This asset is owned by YEC, therefore any upgrades required are outside of the scope of this study.

Note: Additional substation apparatus (Gang Switches, Buses, etc.) were not included in Table 1 as their rating greatly exceeds that of the other equipment and will not be the limiting factor for substation capacity.

4.2 Load Addition

As shown in section 4.1, the majority of the equipment in the Whitehorse North 25kV system is lightly loaded and has the available capacity to grow at expected rates

4.3 Contingency

- *There currently is a significant contingency scenario that cannot be adequately addressed:*
    - *Loss of the 34.5kV primary overhead (O/H) bus at Whistlebend substation will result in a contingency situation where peak loading on all of the Whitehorse North 25kV System cannot be picked up by Laberge alone.*

For the loss of any major equipment within the electrical distribution system, AEY requires that there be a plan in place on how to restore power to as many customers as possible. Ideally, this means the peak load of any piece of equipment can be transferred to an alternative feeder/breaker/source in order to re-energize the customers without the failed equipment.

For the North 25kV System, the following cases are being considered as potential issues both presently and within the 6-year planning window:

Contingency Scenario	Description	Present Status (2023)	Future Status
Loss of 6L17	6L17 is the normal source of 34.5kV to both Whistlebend and Laberge substations from S164. A loss of this line will require both distribution substations to be transferred to 6L16 (loading limit of 38MVA) and source from T1 at S170 (loading limit of 47MVA).	Overload – Current peak loading of 16.6MVA on North 25kV System. S170 and S150 do not have the capacity to receive this transfer.	Overload – Current peak loading of 16.6MVA on North 25kV System. S170 and S150 do not have the capacity to receive this transfer.
Loss of single 34.5/25kV transformer	Between Whistlebend and Laberge Substations, there are 3 x 10MVA transformers for 34.5/25kV. Assuming adequate switching to distribute load among remaining 2 transformers, overall load cannot exceed 20MVA.	OK – Current peak loading of 16.6MVA.	Overload - Capacity reached in 2029. Expected peak loading of 25.7MVA on North 25kV System.
Loss of 34.5kV primary bus at Whistlebend	The loss of the primary bus at Whistlebend will prevent any 25kV sourcing from this substation. All load will have to be transferred to T1 at Laberge Substation (10MVA rating).	Overload – Currently at peak load, the North 25kV system requires more capacity than T1 at Laberge can supply.	
Loss of 25kV breaker at Whistlebend	The loss of a single 25kV breaker at Whistlebend or Laberge would require all load to be transferred to the remaining breakers on the North 25kV system.	Ok	Ok

Table 2 - North 25kV System Contingency Analysis

OK – All equipment will be within manufacturer recommended equipment ratings if this contingency scenario occurs at a time when all feeders are exhibiting peak loading.

4.4 Power Restoration

Within the Whitehorse North 25kV system, there are rural, urban and critical customers (e.g. Whistlebend Place). To restore the system within the 4-hour goal associated with these customer types, both Whistlebend and Crestview subdivisions have been designed with loop connections. This allows for switching operations to isolate the faulted section of line and alternative feeds to energize the remaining portion of the loop while the faulted section is repaired.

The system has been designed with discrete sections of large load (e.g. subdivisions) to have independent feeders. This minimizes the system strain of Cold-Load Pick-Up, by allowing separate feeders to be placed back on-line individually and therefore control the system diversity factor.

5. Potential Solutions

5.1 Solutions Considered

As identified above the main issues facing the North 25kV System over the upcoming 6-year period are:

- Contingency Scenario 1: Loss of a single 34.5/25kV transformer
- Contingency Scenario 2: Loss of the 34.5kV primary bus at Whistlebend Substation

To address these issues, the following potential solutions have been considered:

1) New 25kV Substation & System Reconfiguration
2) Status Quo

As part of system maintenance and compliance with voltage regulations, the AEY system will require voltage regulators or system upgrades on both the Alaska Highway North and Klondike Highway North in the upcoming years to counteract the unacceptable voltage levels expected to begin in 2021. The following 3 options assume these upgrades will be conducted independently of the solution selected and are not the focus of this study.

5.2 - OPTION 1: New 25kV Substation & System Reconfiguration

Building a new substation for the 25kV North System would directly resolve Contingency Scenarios 1 and 2, by providing additional reserve capacity to assist with system reconfiguration during outages. In 2029, the total peak loading on S164 is estimated to be 25.7MVA. In Contingency Scenario 2, the only remaining transformer is T1 at Laberge, with a rating of 10MVA. This results in 15.7MVA of power that needs to be alternatively sourced by a new substation. At minimum the new substation should be designed to continuously provide at least 15.7MVA without overloading any equipment.

5.4 - OPTION 2: Status Quo

Without making any changes to the North 25kV system and with load growth continuing at the expected rates, equipment will be overloaded in the near future. Assuming that peak loading only occurs in winter months (with temperatures at or below 0˚C), power transformers can be steadily overloaded at 1.22 p.u. of their nameplate rating and can be emergency overloaded up to 1.31 p.u. for less than 8 hours before the loading must drop below 0.90 p.u.

Utilizing these seasonal equipment ratings, the North 25kV System will be able to handle Contingency Scenario 1 up until 2027. In 2027, the peak loading on the North 25kV System is anticipated to be ~23.8MVA. This load cannot be carried by two operational transformers.

Additionally, anytime equipment operates outside of nameplate rating, there is the potential for decreased lifespan and increased maintenance requirements on these assets. Deferring system improvements, may result in increased service and asset replacement costs going forward.

This option covers Contingency Scenario 1 up until 2027 and does not cover Contingency Scenario 2.

6. Recommendation

In typical electrical design, it is advantageous to source power as close as possible to the load-centre it will serve as this method minimizes voltage drop and resistive losses. Therefore, it is recommended that AEY proceeds with Option 1: New 25kV Substation and System Reconfiguration. As most of the future load growth is expected to be located in Whistlebend and up the Klondike Highway North, it would be beneficial to construct a new substation in the area between these locations, with independent feeders and dedicated 10MVA transformers for each area. This in turn will not only solve capacity and contingency issues, it will also alleviate some of the low-voltage concerns and minimize the number of regulator additions/upgrades required in the coming years.

As it does not address all of the Contingency Scenarios presented and has the potential to shorten the lifespan of existing equipment, it is not recommended to proceed with Option 2.

September 28, 2023 AEY-UCG-088

ATCO Electric Yukon (AEY)
2023-2024 General Rate Application (GRA)

Information Responses Round 1 to:
The Yukon Utilities Consumers' Group (UCG)
Received: September 6, 2023

AEY-UCG-088

Reference: Annual Right-0f-Way (ROW) Widening, BC#26; Costs 2023- $520,000 and 2024- $528,000.

Request:

(a) Provide 5year capital brushing plan with YUB permissions/ orders.

(b) Provide AEYs brushing coordinator and vegetation management consultant and at what cost per year.

(c) Provide report from this consultant giving economic analysis identifying business drivers and cost/benefit analysis including preliminary estimate of cost for each year.

Response:

(a) Please refer to AEY-UCG-088(a) Attachment 1 for the AEY five-year brushing plan. YUB permissions were not required for this project.

(b) The AEY brushing coordinator has annual costs, as this function is performed by an AEY employee from March to November. The costs for this employee include capital bushing costs as well as Operations and Maintenance (O&M). The costs listed below for 2022 represent the seasonal average costs per year. The vegetation management consultant is contracted through ATCO Electric Forestry. This consultant was the successful vendor from the competitive Patrol / Consent tender. This consultant was utilized to create a brushing inventory of the AEY overhead power system, suggest work plans by year and area, as well as obtain brushing permissions from customers. These services were obtained in 2019 and 2022 and were an O&M cost.

Table 1: Brushing Coordination and Vegetation Management Costs

Costs	2019	2022	Total
Contract Services – Vegetation Management	87,581	93,597	181,17
AEY – Brushing Coordinator		40,692	

(c) The consultant was coordinated through ATCO Electric Forestry to leverage their existing contract. The vegetation management consultant provided AEY with the following reports:

- Patrol Reports.
- Work Plans; and
- Landowner Notification of Vegetation Control.

These reports identify areas of the system, what brushing activities are required, when activities should be conducted, and customer permissions needed.

Business Drivers

These reports supplement the five-year brushing plan. This plan improves the reliability and safety of the power system.

Cost Benefit

Completion of these reports aids the direction of the five-year plan. Ensuring that costs are distributed in the correct areas of the power system at the proper intervals.

The brushing inventory is complete for the Whitehorse area. There are no plans to contract the vegetation management consultant during the 2023-2024 Test Period.

ATCO Electric
YUKON

Vegetation Management 2023-2027 Forecast

The Following is our tentative Brushing plan for 2023-2027 seasons.

Dates: Weather Dependent our brushing program will start in March and Finish up November.

Summary: Brush/Mow/Slash and widen where required for license of occupation and easement requirements. Cut and stack all merchantable wood in 4ft lengths along the ROW/Easement for public consumption. Chip and spray non-merchantable wood products back on ROW/Easements. Burn non salvageable wood when permitted or conditions allow in the following areas:

AEY Vegetation Management Plan 2023

1. Haines Junction
2. Alaska Highway North/Alaska Highway North 5L645
3. Watson Lake – HWY #5 Km 0 to Km 22.1
4. Carcross/6L18 South Klondike Highway – Support YTG Highway Brushing Contracts/HROW Widening KM 115 to 157.8
5. Ross River – Town Site and Tower Line to Jackfish Lake
6. Whitehorse (Riverdale, Porter Creek, Hillcrest) – Customer Lots
7. Carmack's – Mainline and Customer Taps

AEY Vegetation Management Plan 2024

1. Tagish – (Reid Rd and Sub roads off Reid Rd)
2. Whitehorse – (Crestview, Downtown) – Customer Lots, Mainline

3. Marsh Lake – Customer Lots
4. Watson Lake - Townsite
5. Alaska Highway South – (Mary Lake, Wolf Creek)
6. South Klondike Highway – HROW Widening KM 115 to KM 157
7. Teslin – Cottage Lots

100 – 1100 Front Street, Whitehorse, YT Y1A 3T4 • tel: 867-633-7000 or 1-800-661-0513 • fax: 867-668-6692

ATCO Electric
YUKON

Dates: Weather Dependent our brushing program will start in March and Finish up November.

Summary: Brush/Mow/Slash and widen where required for license of occupation and easement requirements. Cut and stack all merchantable wood in 4ft lengths along the ROW/Easement for public consumption. Chip and spray non-merchantable wood products back on ROW/Easements. Burn non salvageable wood when permitted or conditions allow in the following areas:

AEY Vegetation Management Plan 2025

1. Destruction Bay – Town Site to Burwash
2. Beaver Creek – Town Site
3. Watson Lake – Robert Cambell Cottage Lots
4. Whitehorse – COW Feeders, Riverdale, Crestview, Mt Sima, MT McIntyre, Fish Lake.
5. South Klondike Highway – Customer Taps
6. Alaska Highway South – HROW Widening KM1249 To KM1277
7. Minto – Tower Line

AEY Vegetation Management Plan 2026

1. Pelly/Stewart – Town Sites
2. Old Crow – Ongoing Hot spotting
3. Watson Lake – Upper Liard
4. #1 Alaska Highway South - HROW Widening KM 1296 To KM 1341
5. Whitehorse - (Takhini Hot Spring Rd Customer Taps)
6. South Klondike Highway - Robinson Subdivision – Main Line and Customer Taps

AEY Vegetation Management Plan 2027

1. Watson Lake – Lower Post
2. Whitehorse – (Riverdale, McCrae)
3. North Klondike Highway – Grizzly Valley, Customer Taps off Main line
4. #1 Alaska Highway South – Customer Taps off Mainline Whitehorse to Jakes Corner
5. Haines Junction – (Pine Lake, Town Site)
6. Teslin – (Town Site, Morley Bay 5L16)

ATCO Electric YUKON

September 28, 2023 AEY-UCG-089

ATCO Electric Yukon (AEY)
2023-2024 General Rate Application (GRA)

Information Responses Round 1 to:
The Yukon Utilities Consumers' Group (UCG)
Received: September 6, 2023

AEY-UCG-089

Reference: Fleet Replacement 2023, BC#27; Costs $697,000

Request:

(a) Give Atco Fleet and 3rd party vendor tenders with purchase costs from each.

(b) Will AEY sell the six used trucks? How will these tendered and how much is estimated to be recouped? How will this be deducted in this accounting process? Explain.

Response:

(a) Vehicle purchases and upfitting are completed through contracted vendors that have been awarded through a competitive RFP process lead by ATCO Fleet Services and ATCO Strategic Sourcing Teams. These vendors are typically awarded tenders for a period of three years. If vehicles can be sourced locally, bids are requested from vendors. Due to availability, only two of the 2023 units for fleet replacements have purchase orders. Note: Unit numbers in red in Table 1: Purchased Fleet 2023 represent the updated unit numbers in AEY Fleet spreadsheet. Units YT180 and YT177 have chassis on order and will require upfitting at a later date. Please refer to AEY-UCG-089(a) Attachments 1-4 for copies of purchase documents.

Table 1: Purchased Fleet 2023

Unit	Description	Year Purchased	Purchase Cost ($)	PO – Chassis only ($)
YT160-YT175 (Replaces YT116)	LD Service Body	2023	110,000	
YT161-YT178 (Fleet Add)	Technologist Truck	2023	160,000	
YT162-YT180 (Fleet Add)	Generation Truck	2023	160,000	82,771
YT163-YT176 (Replaces YT117)	LD Service Body	2023	110,000	
YT164-YT177 (Replaces YT099)	LD Service Body	2023	110,000	74,645
Units under $100,000	Various[1]	2023	47,000	
Total			**697,000**	

(b) Unit YT099 was sold by public bid action in 2022. Units 116 and 117 are still in AEY's possession and will be sold by public bid. When a vehicle is sold, the historical costs are retired and removed from rate base, which includes the credit from the net proceeds received from the sale. Note: The km for units YT116, YT117 and YT099 were incorrectly entered into BC # 27. The actual kms are noted – Table 2: Retired/Sold Fleet Vehicles below in red.

Table 2: Retired/Sold Fleet Vehicles

Unit	Description	Year Purchased	Kilometers	Sale Proceeds	Retirements
YT116	LD Service Body	2013	245,537 (170,705)		
YT117	LD Service Body	2013	237,000 (230,840)		
YT099	LD Service Body	2010	248,748 (246,478)	9,850	(53,875)

[1] Category includes items such as trailers, snowmobiles, and all-terrain vehicles. These units are evaluated for replacement using the lifecycle criteria evaluation after seven-years of service or 200,000 km.

Request for Goods / Services Form (RGS)

This form is to request goods and/or services where the annual spend or individual project spend is over $50K and/or of medium or high complexity/visibility. Quotes for goods/services or Request for Information (RFI) for less than $50k can be obtained by the originator.

Form submission and inquiries to be directed as follows:

- Non-work releases to EGBUProcurement@atco.com.
- Work releases to AEContractAdmin@atco.com.

ORIGINATOR TO COMPLETE			
1. Project Information: Project Name & Location.	Purchase of 2023 3500 Crew Cab Long Box Fleet Truck - Fleet replacement for 099 1088202 Unit 099 Replacement – 1 ton Service body - 2023 Dodge 3500 Big Horn crew cab 4x4 120k – Unit 177		
	Project #: 1088202	Task Code:	
2. CEAR:	Not Required	3. Contract Administrator (CA)	Not Required
4. Business Division:	North of 60 (N60)	5. Estimated total or annual value ($CAD):	$ 74,645.00
6. Project Type:	Non-Direct Assigned	7. Pricing Schedule(s):	☑ Attached; or ☐ To be provided later
8. Work Recurrence:	One time purchase / individual proje	9. Pricing Method:	Lump Sum
10. Services / Delivery Date(s):	Start Date: June 28, 2023 Completion / Delivery Date(s): December 15, 2023	11. Allowable Expenses: List items & budget identified by ATCO for the Project.	N/A
12. Work Specification Details:	12.1 Work package (specifications, drawings, maps, etc) — Select from drop down As per Londonderry Dodge quote provided 12.2 Permits required by contractor/supplier — Yes ☐ No ☐ 12.3 Site specific orientation requirements — Yes ☐ No ☐ 12.4 Forest Fire Fighting Expense Insurance Waiver — Yes ☐ No ☐		
13. HSE Document(s):	Prime Contractor: Contractor If contractor is identified as prime, a prime contractor agreement is required		
14. Pre-Bid Meeting:	Yes ☐ No ☑	15. Site Visit:	Yes ☐ No ☑

Request for Goods / Services Form (RGS)

16. Recommended Supplier(s) or Contractor(s) and contact information (contact name, email, phone number, address) to be provided. For MSAs, only Contractor names to be provided. Contractors are required to be Avetta approved prior to award.

PETER SMALL SR
LONDONDERRY DODGE CHRYSLER JEEP LTD.
13333 FORT ROAD NW
EDMONTON, AB T5A 1C3

Lowest cost

17. Evaluation Criteria: Yes ☑ No ☐

Dodge is standard for ATCO Fleet purchase. AEY RECIEVES FLEET PRICING

18. Single or Sole Source Justification: this section is to be used when company bidding standards are not followed for Non-AESO Transmission Direct Assigned Projects (REF form to be completed for AESO Transmission Direct Assigned Projects that do not follow the procurement guideline). Select the applicable reason(s) for the supplier/contractor selection in 18.1. Provide supporting information in 18.2.

Company Bidding Standards	
Bid Value	Minimum Number of Bids (Written Response)
UP TO AND INCLUDING $50,000	1 Bid
OVER $50,000 AND UP TO AND INCLUDING $100,000	2 Bids
OVER $100,000	3 Bids

18.1 Select the applicable reason(s) for the supplier/contractor selection.

Purchases <$50K for non-AESO and <$10K for AESO can be perfomed (no SSJ required)

18.2 Provide supporting information.

QUOTE PROVIDED THROUGH FLEET COMMON SERVICES

Request for Goods / Services Form (RGS)

19. Submitted by:

Signature: Matthew Gibson Digitally signed by Matthew Gibson DN: cn=Matthew Gibson, o=ATCO ELectric Yukon, ou=Construction, email=Matthew.Gibson@atco.com, c=CA Date: 2023.06.29 12:10:52 -07'00'

Name: Matthew Gibson

Date: June 28, 2023

Reviewed by Project Manager (if applicable):

Signature:_____

Name:_____

Date:_____

Approved by:

Signature:_____

Name:_____

Date:_____

Approved by:

Signature:_____

Name:_____

Date:_____

The form is to be approved by Supervisor/Manager. When using Single source, Signatures on this form to follow Delegation of Authority (DOA)

LONDONDERRY DODGE CHRYSLER JEEP LTD.
13333 FORT ROAD NW
EDMONTON, AB T5A1C3

Priced Order Confirmation (POC)

Date Printed:	2023-02-13 12:58 PM	**VIN:**		**Quantity:**	3
Estimated Ship Date:		**VON:**	58354801	**Status:**	BA - Pending order
Date Ordered:	2023-02-13 12:58 PM	**Ordered By:**	S14342F	**FAN 1:**	A0391 ATCO LTD
				FAN 2:	
				Bid Number:	

2023 - 3500 CREW L/Box (GAS)

Sold to:	**Ship to:**	**PO Number:**
LONDONDERRY DODGE CHRYSLER JEEP LTD. (C8150)	LONDONDERRY DODGE CHRYSLER JEEP LTD. (C8150)	
13333 FORT ROAD NW	13333 FORT ROAD NW	
EDMONTON, AB T5A1C3	EDMONTON, AB T5A1C3	

Vehicle: **2023 3500 BIG HORN CREW CAB 4X4 (169 IN WB 8 FT 0 IN Box) (D28H92)**

	Sales Code	Description	MSRP(CAD)	FWP(CAD)
Model:	D28H92	3500 BIG HORN CREW CAB 4X4 (169 IN WB 8 FT 0 IN Box)	69,745	63,773
Package:	2GZ	Customer Preferred Package 2GZ	0	0
	ESB	6.4L HEMI(R) V8 engine w/ FuelSaver	0	0
	DFX	8-speed automatic transmission	0	0
Paint/Seat/Trim:	PW7	Bright White	0	0
	APA	Monotone paint	0	0
	*M9	Premium cloth front 40/20/40 bench	0	0
	-X8	Black w/ Diesel Grey seats	0	0
Options:	AHD	Heavy-Duty Snowplow Prep Group	325	286
	XCH	2 additional key fobs	200	176
	A73	Level B Equipment Group	6,195	5,452
	XXS	Upfitter electronic module (VSIM)	200	176
	CKJ	Black vinyl floor covering	0	0
	DMF	4.10 rear axle ratio	195	172
	ADB	Protection Group	0	0
	LHL	IP-mounted auxiliary switches	200	176
	NFC	189-litre (50-gallon) fuel tank	740	651
	LNC	Clearance lamps	100	88
	AD6	Premium Lighting Group	800	704
	MWH	Rear wheelhouse liners	0	0
	RC3	9 Alpine(R) speakers with subwoofer	450	396
	4FT		0	0
	5N6	Easy Order	0	0
	4EA	Sold Vehicle	0	0
	125	Zone 25-Canada-Alberta	0	0
Non Equipment:	4FN	Fleet Commercial Sale	0	0
Discounts:	YGE	5 Additional Gallons of Gas	0	0
Destination Fees:			2,095	2,095
		Total Price:	81,245	74,145

+200 Fuel
+300. mil up.
$74,645.00

Order Type:	Fleet	**PSP Month/Week:**	
Scheduling Priority:	1-Sold Order	**Build Priority:**	99

Note: This is not an invoice. The prices and equipment shown on this priced order confirmation are tentative and subject to change or correction without prior notice. No claims against the content listed or prices quoted will be accepted. Refer to the vehicle invoice for final vehicle content and pricing. Orders are accepted only when the vehicle is shipped by the factory.

Request for Goods / Services Form (RGS)

This form is to request goods and/or services where the annual spend or individual project spend is over $50K and/or of medium or high complexity/visibility. Quotes for goods/services or Request for Information (RFI) for less than $50k can be obtained by the originator.

Form submission and inquiries to be directed as follows:

- Non-work releases to EGBUProcurement@atco.com.
- Work releases to AEContractAdmin@atco.com.

ORIGINATOR TO COMPLETE			
1. Project Information: Project Name & Location.	Purchase of 2023 5500 Crew Cab Fleet Truck - Fleet addition 1088204 2 ton 2023 Dodge 5500 crew cab and chassis Tech Truck – Unit 180		
	Project #: 1088204	Task Code:	
2. CEAR:	Not Required	3. Contract Administrator (CA)	Not Required
4. Business Division:	North of 60 (N60)	5. Estimated total or annual value ($CAD):	$ 82,771.00
6. Project Type:	Non-Direct Assigned	7. Pricing Schedule(s):	☑ Attached; or ☐ To be provided later
8. Work Recurrence:	One time purchase / individual proje	9. Pricing Method:	Lump Sum
10. Services / Delivery Date(s):	Start Date: June 28, 2023 Completion / Delivery Date(s): December 15, 2023	11. Allowable Expenses: List items & budget identified by ATCO for the Project.	N/A
12. Work Specification Details:	12.1 Work package (specifications, drawings, maps, etc) — Select from drop down As per Londonderry Dodge quote provided 12.2 Permits required by contractor/supplier — Yes ☐ No ☐ 12.3 Site specific orientation requirements — Yes ☐ No ☐ 12.4 Forest Fire Fighting Expense Insurance Waiver — Yes ☐ No ☐		
13. HSE Document(s):	Prime Contractor: Contractor If contractor is identified as prime, a prime contractor agreement is required		
14. Pre-Bid Meeting:	Yes ☐ No ☑	15. Site Visit:	Yes ☐ No ☑

Request for Goods / Services Form (RGS)

16. Recommended Supplier(s) or Contractor(s) and contact information (contact name, email, phone number, address) to be provided. For MSAs, only Contractor names to be provided. Contractors are required to be Avetta approved prior to award.

PETER SMALL SR
LONDONDERRY DODGE CHRYSLER JEEP LTD.
13333 FORT ROAD NW
EDMONTON, AB T5A 1C3

Lowest cost

17. Evaluation Criteria: Yes ☑ No ☐

Dodge is standard for ATCO Fleet purchase. AEY RECIEVES FLEET PRICING

18. Single or Sole Source Justification: this section is to be used when company bidding standards are not followed for Non-AESO Transmission Direct Assigned Projects (REF form to be completed for AESO Transmission Direct Assigned Projects that do not follow the procurement guideline). Select the applicable reason(s) for the supplier/contractor selection in 18.1. Provide supporting information in 18.2.

Company Bidding Standards	
Bid Value	Minimum Number of Bids (Written Response)
UP TO AND INCLUDING $50,000	1 Bid
OVER $50,000 AND UP TO AND INCLUDING $100,000	2 Bids
OVER $100,000	3 Bids

18.1 Select the applicable reason(s) for the supplier/contractor selection.

Purchases <$50K for non-AESO and <$10K for AESO can be perfomed (no SSJ required)

18.2 Provide supporting information.

QUOTE PROVIDED THROUGH FLEET COMMON SERVICES

Request for Goods / Services Form (RGS)

19. Submitted by:

Signature: Matthew Gibson
Digitally signed by Matthew Gibson
DN: cn=Matthew Gibson, o=ATCO ELectric Yukon, ou=Construction, email=Matthew.Gibson@atco.com, c=CA
Date: 2023.06.29 12:13:47 -07'00'

Name: Matthew Gibson

Date: June 28, 2023

Reviewed by Project Manager (if applicable):

Signature:_____

Name:_____

Date:_____

Approved by:

Signature:_____

Name:_____

Date:_____

Approved by:

Signature:_____

Name:_____

Date:_____

The form is to be approved by Supervisor/Manager. When using Single source, Signatures on this form to follow Delegation of Authority (DOA)

LONDONDERRY DODGE CHRYSLER JEEP LTD.
13333 FORT ROAD NW
EDMONTON, AB T5A1C3

Priced Order Confirmation (POC)

Date Printed:	2023-02-13 12:55 PM	**VIN:**		**Quantity:**	2
Estimated Ship Date:		**VON:**	58354601	**Status:**	BA - Pending order
Date Ordered:	2023-02-13 12:55 PM	**Ordered By:**	S14342F	**FAN 1:**	A0391 ATCO LTD
				FAN 2:	

2023 - 5500 Crew. D

Bid Number:

Sold to:
LONDONDERRY DODGE CHRYSLER JEEP LTD. (C8150)
13333 FORT ROAD NW
EDMONTON, AB T5A1C3

Ship to:
LONDONDERRY DODGE CHRYSLER JEEP LTD. (C8150)
13333 FORT ROAD NW
EDMONTON, AB T5A1C3

PO Number:

Vehicle: **2023 5500 CREW CAB CHASSIS (197.4 IN WB - CA of 84 IN) (DP0L94)**

	Sales Code	Description	MSRP(CAD)	FWP(CAD)
Model:	DP0L94	5500 CREW CAB CHASSIS (197.4 IN WB - CA of 84 IN)	68,295	62,488
Package:	2YG	Customer Preferred Package 2YG	2,845	2,504
	ETN	6.7L Cummins(R) I-6 turbo diesel eng	6,950	6,116
	DF2	6-speed AISIN(R) heavy-duty automatic	2,500	2,200
Paint/Seat/Trim:	PW7	Bright White	0	0
	APA	Monotone paint	0	0
	*M9	Premium cloth front 40/20/40 bench	725	638
	-X8	Black w/ Diesel Grey seats	0	0
Options:	AD6	Premium Lighting Group	700	616
	AHD	Heavy-Duty Snowplow Prep Group	525	462
	AHQ	Max Tow Package	895	788
	A62	Big Horn(R) Level 1 Equipment Group	1,495	1,316
	CKW	Add Black vinyl floor covering	0	0
	DK3	Elec shift-on-the-fly transfer case	295	260
	GFA	Rear window defroster	225	198
	LAY	LED taillamps	100	88
	LBN	Power take off prep	395	348
	LSA	Security alarm	225	198
	UED	Uconnect(R) 5 with 8.4-in display	700	616
	XAC	ParkView(R) Rear Back-Up Camera	475	418
	XAG	Park-Sense(R) Front & Rear Park Assist	550	484
	XBM	Remote start system	395	348
	XCH	2 additional key fobs	200	176
	XF6	Voltage monitoring auto idle-up sys	300	264
	XHC	Trailer brake control	375	330
	XNR	Manual DPF regeneration	250	220
	4FT		0	0
	5N6	Easy Order	0	0
	4EA	Sold Vehicle	0	0
	125	Zone 25-Canada-Alberta	0	0
Non Equipment:	4FN	Fleet Commercial Sale	0	0
Destination Fees:			2,095	2,095
		Total Price:	91,510	83,171

$82,771.00 + TAX.

+300 mkup
+200 fuel
$83,671.00
-900.00

Note: This is not an invoice. The prices and equipment shown on this priced order confirmation are tentative and subject to change or correction without prior notice. No claims against the content listed or prices quoted will be accepted. Refer to the vehicle invoice for final vehicle content and pricing. Orders are accepted only when the vehicle is shipped by the factory.

ATCO Electric YUKON

September 28, 2023 AEY-UCG-090

ATCO Electric Yukon (AEY)
2023-2024 General Rate Application (GRA)

Information Responses Round 1 to:
The Yukon Utilities Consumers' Group (UCG)
Received: September 6, 2023

AEY-UCG-090

Reference: Fleet Replacement 2024, BC#28; Costs $766,000

Request:

(a) Give Atco Fleet and 3rd party vendor tenders with purchase costs from each.

(b) Will AEY sell the six used trucks? How will these tendered and how much is estimated to be recouped? How will this be deducted from costs in this accounting process? Explain.

Response:

(a) The fleet to be purchased in 2024 has not yet been sent to ATCO fleet for tender.

(b) The fleet listed below in Table 1: Fleet Replaced will be sold by public bid auction. When a vehicle is sold, the historical costs are retired and removed from rate base, which includes the credit from the net proceeds received from the sale.

Table 1: Fleet Replaced

Unit	Description	Year Purchased	Kilometers
YT109	MD Ram 3500 Flat	2012	206,620
YT125	Teletruck Forklift	2014	1,838 hrs
YT129	MD Ram 3500 Flat	2014	114,800
YT133	MD Ram 2500 SB	2015	145,687
YT135	MD ram 2500 Flat	2015	174,972

ATCO Electric YUKON

September 28, 2023 AEY-UCG-091

ATCO Electric Yukon (AEY)
2023-2024 General Rate Application (GRA)

Information Responses Round 1 to:
The Yukon Utilities Consumers' Group (UCG)
Received: September 6, 2023

AEY-UCG-091

Reference: Old Crow Voltage Improvement, BC#29; Costs $1,174 million

Request:

(a) Provide engineering qualifications of what work was to be done for this project and what were the economic analyses identifying the business drivers and cost/benefits, including the preliminary engineering estimate of costs. Provide engineers report.

Response:

(a) Please refer to the response to AEY-UCG-066(a) and AEY-YUB-060 Attachment 2.

ATCO Electric YUKON

September 28, 2023 AEY-UCG-092

ATCO Electric Yukon (AEY)
2023-2024 General Rate Application (GRA)

Information Responses Round 1 to:
The Yukon Utilities Consumers' Group (UCG)
Received: September 6, 2023

AEY-UCG-092

Reference: 6L19 Voltage Improvement, BC#30; Costs $949,000

Request:

(a) Provide engineering qualifications of what work was to be done for each project and what were the economic analyses identifying the business drivers and cost/benefits, including the preliminary engineering estimate of costs. Provide engineers report.

(b) Is this expected to decrease line loss. Explain, giving examples of savings from this project.

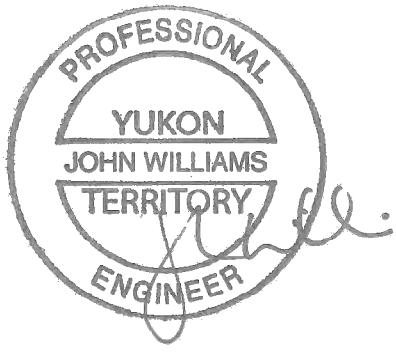
Response:

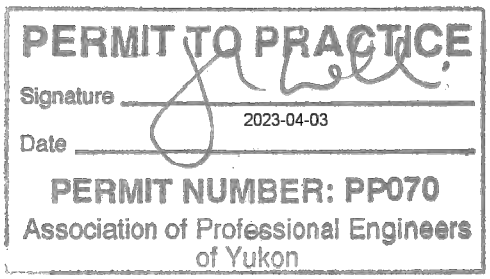
(a) Please refer to the response to AEY-UCG-066(a) and AEY-UCG-092(a) Attachment 1.

(b) This is not expected to decrease line loss as there is no change in conducting material.

6L11 and 6L19 Low Voltage

Technical Study





Revision History

Revision	Date	Editor	Comments
R1	2023-03-20	Alex Deans	First Draft

Executive Summary

Voltages below ATCO standard have been measured on the 35kV system south of Whitehorse. This study is to identify possible solutions that alleviate the low voltage conditions on 6L11 and 6L19.

Problem Definition

Issues along the 35kV system south of Whitehorse include low voltage conditions at Teslin; Robinson; and customers fed off the 35kV system and the Lewes River regulators being tapped to their maximum limit for extended periods of time.

Low voltage conditions on a typical transmission line would not be an issue since the voltage can be stepped up at the distribution sub-stations, but, since the sub-transmission system feeds customers as well, the voltage on the sub transmission system will need to adhere to ATCO distribution voltage standards.

As can be seen in Figure 1, low voltage issues on the sub-transmission line are passing through to the distribution networks along 6L19. South McLintock, New Constabulary, Teslin Lake, and Teslin distribution networks. Refer to Table 1 for a summary of the voltages along 6L19 and the distribution networks fed off this line.

It should be noted that the issues on 6L18, seen in Figure 1, will be addressed in a future study. This is because, since the issues on 6L19 are worse and more widespread, the solution to the issues on 6L19 will likely affect, and lessen, the voltage issues on 6L18.

Model Validation

Voltage data and load data is available for December 2022 at the load side of the Teslin Substation regulator and at S150 respectively. This time frame was chosen as the peak load at S150 occurred on Dec 20, 2022. This data was used to validate the CYME models used in this study and was done so following this method:

1. Adjust the CYME loading percentage until the load at S150 matches the SCADA data at S150
2. Set S150 source voltage in CYME to SCADA's voltage at that given time
3. Compare CYME voltages against SCADA voltages retrieved from the load side of the Teslin substation regulator

Table 1 - CYME Model Validation Table

Timestamp	CYME Load Percentage	Teslin Field Voltage (kV)	Teslin CYME Voltage (kV)	Percent Error
12/20/2022 12:15:00 AM	88.0%	25.179	24.892	1.14%
12/20/2022 1:00:00 AM	87.2%	25.154	24.946	0.83%
12/20/2022 1:15:00 AM	89.0%	25.012	24.669	1.37%
12/20/2022 4:15:00 AM	91.0%	24.886	24.415	1.90%
12/20/2022 4:30:00 AM	92.3%	24.901	24.319	2.34%
12/20/2022 4:45:00 AM	92.9%	24.892	24.261	2.53%
12/20/2022 5:45:00 AM	94.5%	24.739	23.940	3.23%
12/20/2022 6:15:00 AM	98.1%	24.838	23.412	5.74%
12/20/2022 6:30:00 AM	99.0%	24.774	23.263	6.10%
12/20/2022 7:15:00 AM	97.0%	25.209	23.453	6.96%
12/20/2022 10:15:00 AM	103.7%	24.708	22.432	9.21%
12/20/2022 11:15:00 AM	102.0%	24.963	22.658	9.23%
12/20/2022 12:00:00 PM	100.0%	25.095	22.893	8.77%

As seen in Table 1 and Figure 1, the CYME model voltages align within 3.23% of the field data until the CYME model is loaded more than 94.5%. Once the model is more heavily loaded, the error increases substantially and is believed to be attributed to CYME's inability to model extreme voltage drop conditions (<0.9pu) accurately. For the remainder of the study, we cannot fully confirm if the CYME voltages that fall below 0.90pu are completely accurate; however, we do know that the voltages do not meet ATCO standards and must be addressed.

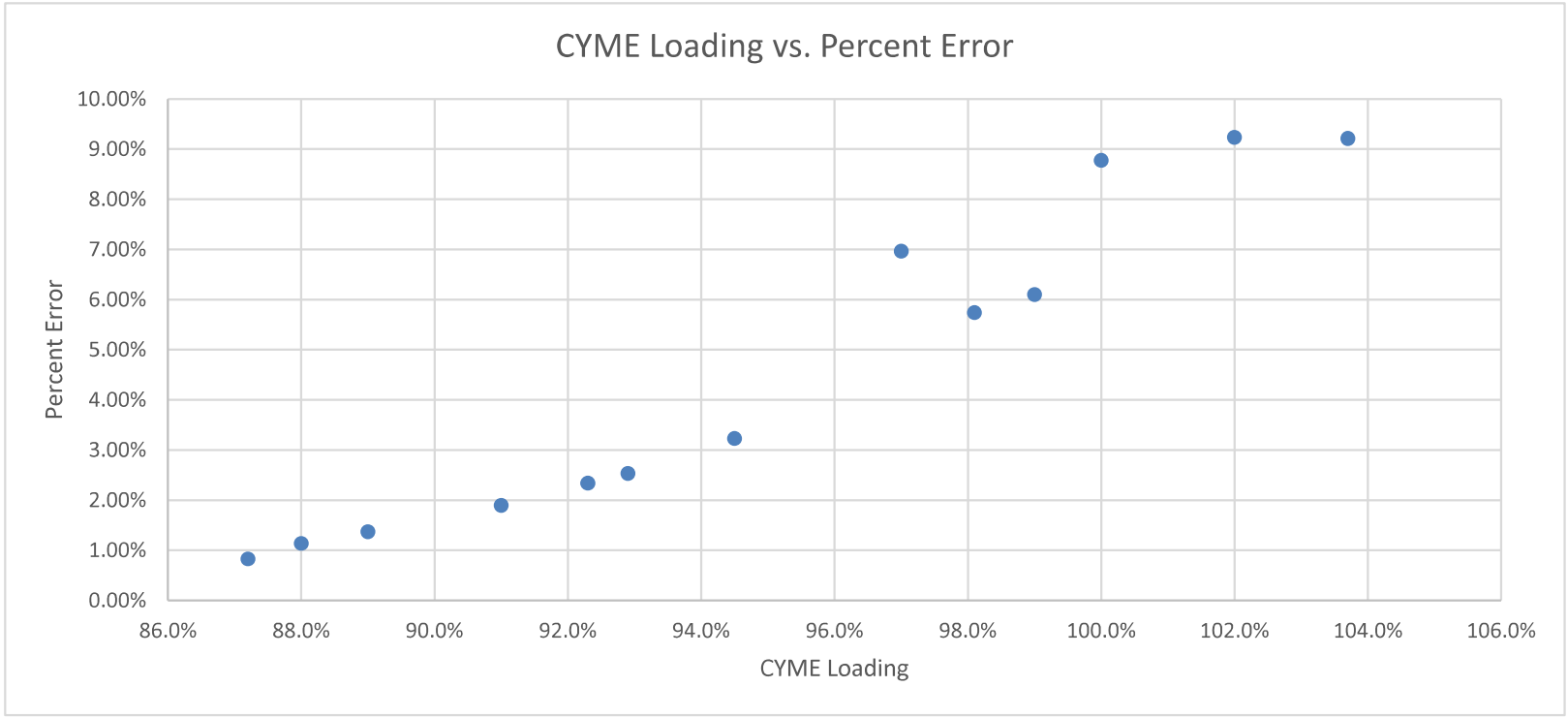


Figure 1 - Voltage Validation Scatter Plot

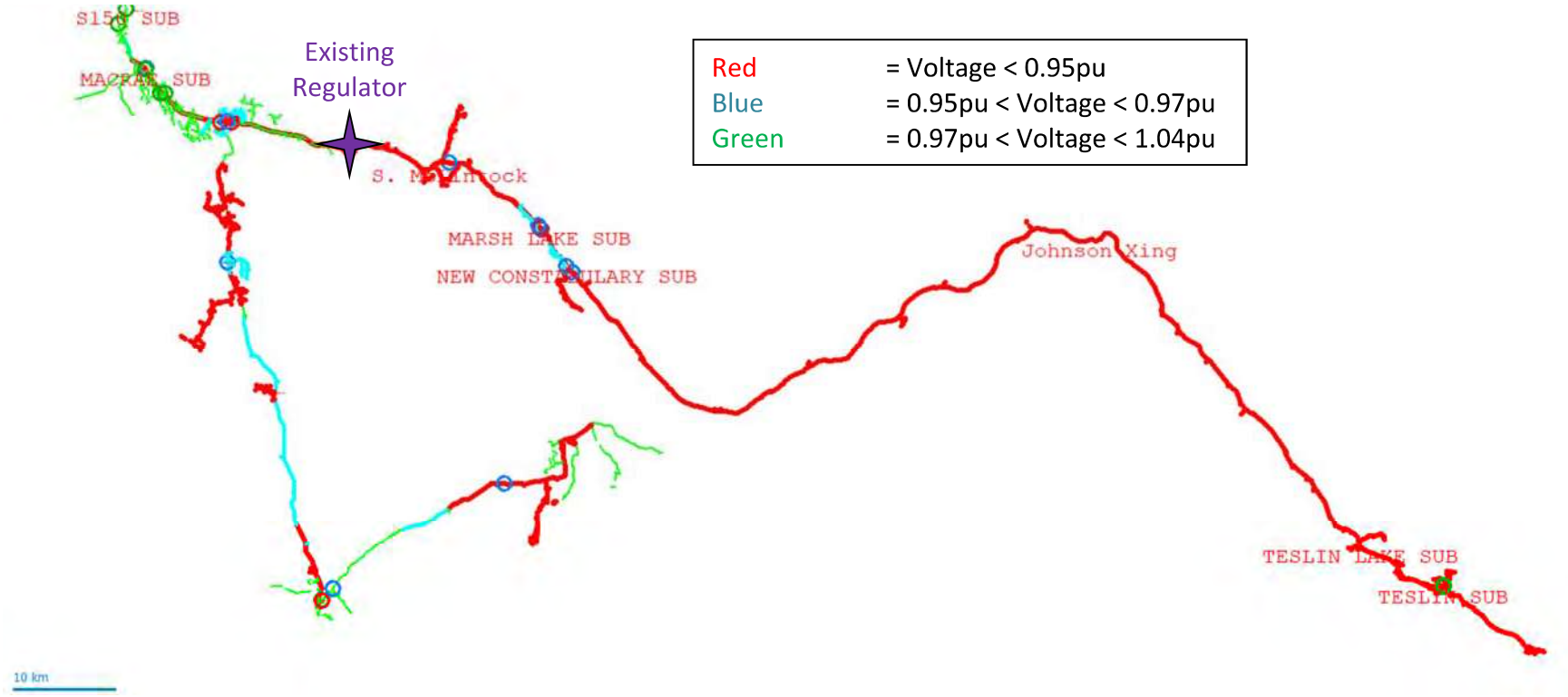


Figure 2 - Existing Voltages on 6L11 and 6L19

Table 2 - Existing 6L19 Voltage and Current Summary

Location	Va (pu)	Vb (pu)	Vc (pu)	Ia (A)	Ib (A)	Ic (A)
McRae Sub (35kV)	0.945	0.946	0.944	220.3	219.5	225.5
5L649 EOL	1.019	1.019	1.018	-	-	-
5L631 EOL	-	-	0.949	-	-	-
South McLintock Sub (35kV)	0.932	0.946	0.934	54.7	45.0	64.0
5L611 EOL	-	-	0.926	-	-	-
Marsh Lake Sub (35kV)	0.909	0.927	0.917	53.3	33.1	53.6
5L612 EOL	0.958	-	-	-	-	-
New Constabulary Sub (35kV)	0.902	0.919	0.912	40.5	33.2	40.3
5L615 EOL	0.855	-	-	-	-	-
Johnson Crossing Sub (35kV)	0.851	0.843	0.861	23.0	31.8	23.0
Teslin Lake Sub (35kV)	0.819	0.796	0.828	22.4	29.6	22.5
4L301 EOL	-	0.802	-	-	-	-
Teslin Sub (35kV)	0.812	0.787	0.821	20.7	24.4	19.2
5L613 EOL	0.879	-	-	-	-	-
5L614 EOL	-	0.868	-	-	-	-
Worst Voltage on 6L19	0.815	0.791	0.824	-	-	-
Carcross Cutoff	-	-	-	121.2	108.2	118.0

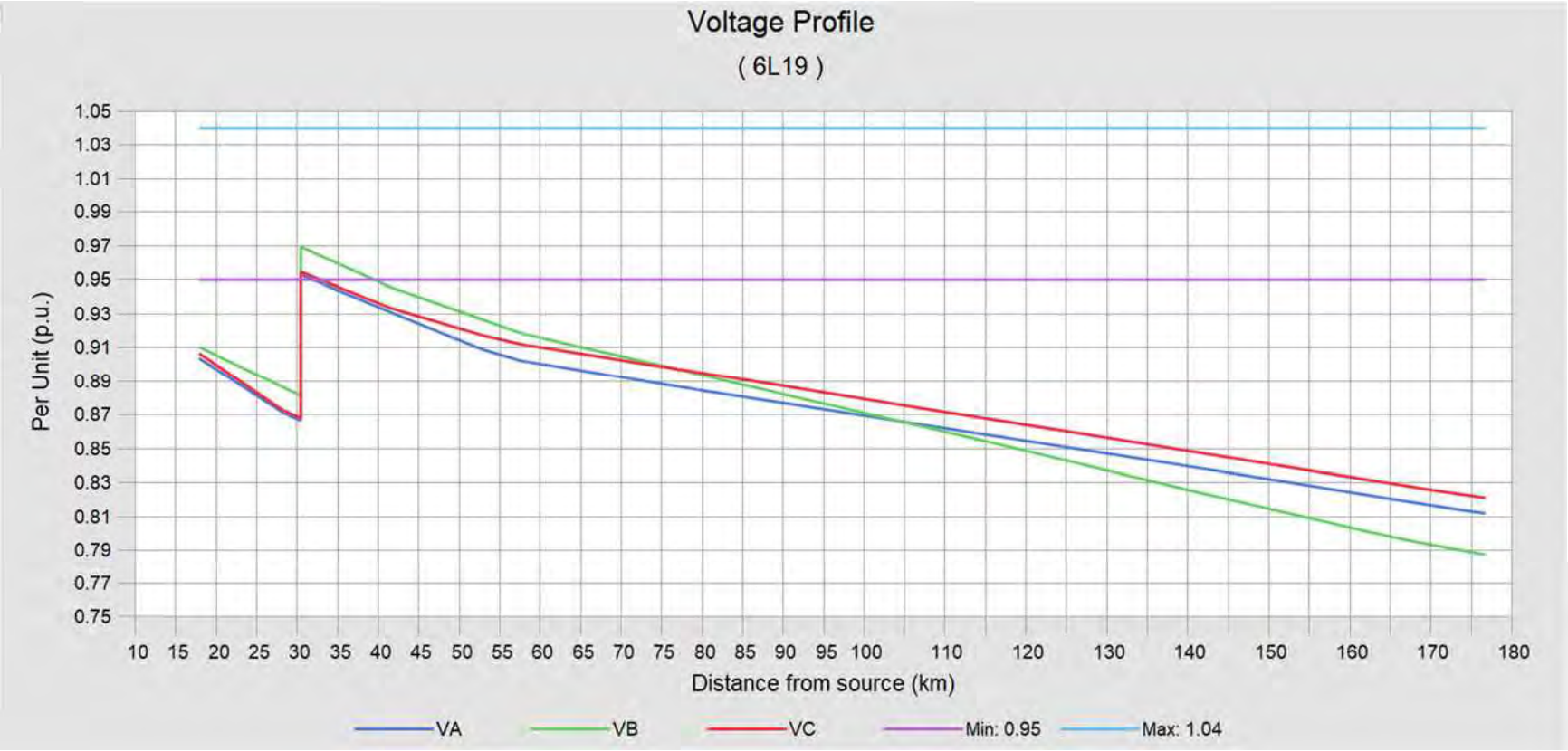


Figure 3 - Existing 6L19 Voltage Profile

Alternatives Considered

The ways to address low voltages on 6L19 include reconductoring, installing regulators, and adjusting the source voltage at S150. Many combinations of these choices are possible and were investigated; however, in the interest of being concise only the following cases were considered:

1. Install Two New Regulators on 6L11 and 6L19
2. Reconductor 6L11 and 6L19
3. Reconductor 6L11 and Install a New Regulator on 6L19
4. Boost S150 Voltage, Reconductor 6L11, Install Regulator on 6L19
5. Boost S150 Voltage, Relocate Two Reg Banks, and Install Regulator on 6L11
6. Scenario 4 THELP: Install Regulator on 6L11, Install Regulator on 6L19

Loading Assumptions
Load within the CYME models was adjusted to be equivalent to the most recent Winter 2022/2023 YEC S150 (52-22 feeder) SCADA data (~12.7MW). Load growth is calculated to be 4.62% per year, therefore the load on the system was increased by $(1.0462)^5 = 25.3\%$ to simulate a 5-year future load. This 25.3% increase equates to ~16.0MW

- Existing CYME Model Loading = 108%
- 2028 CYME Model Loading = 128.4%

Alternative 1- Install Two New Regulators on 6L11 and 6L19

This alternative explores installing two new 3-phase regulator banks, one 400A bank on 6L11 and one 100A bank on 6L19. The additions of two regulator banks will mean there are four inline regulators between S150 and any distribution substation with a regulator along 6L19. This could pose the risk of overvoltage conditions during a load shedding event.

The location for the first regulator will be on 6L11 upstream of Macrae where voltage begins to dip below 0.95pu (between Miles Canyon Rd and Mt. Sima Rd). Once this regulator is installed, the model will be run, and the second regulator will be placed where the voltage drops below 0.97 on 6L19 (Squan Lake).

The two load shed events that have the risk for the highest voltage are the loss of Teslin sub and the opening of the Judas Creek recloser. During the loss of Teslin sub, the maximum voltage at the new 6L19 regulator is 1.164pu. This is below the long line rural maximum voltage of 1.167pu. During the opening of the Judas Creek recloser, the worst-case voltage will occur on 5L613 in Teslin with a voltage of 1.099pu. This is also within the acceptable range for over voltage.

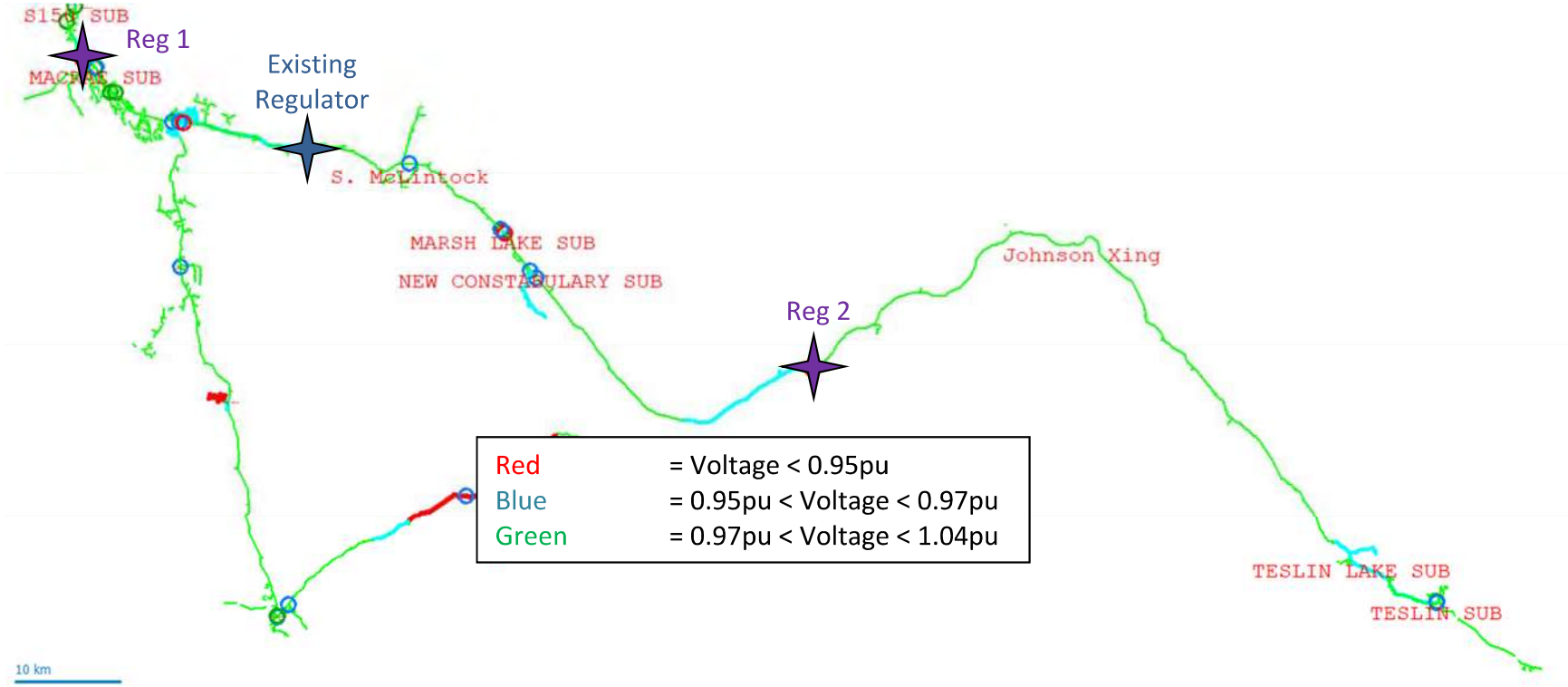


Figure 4 - Alternative 1 Voltage Conditions

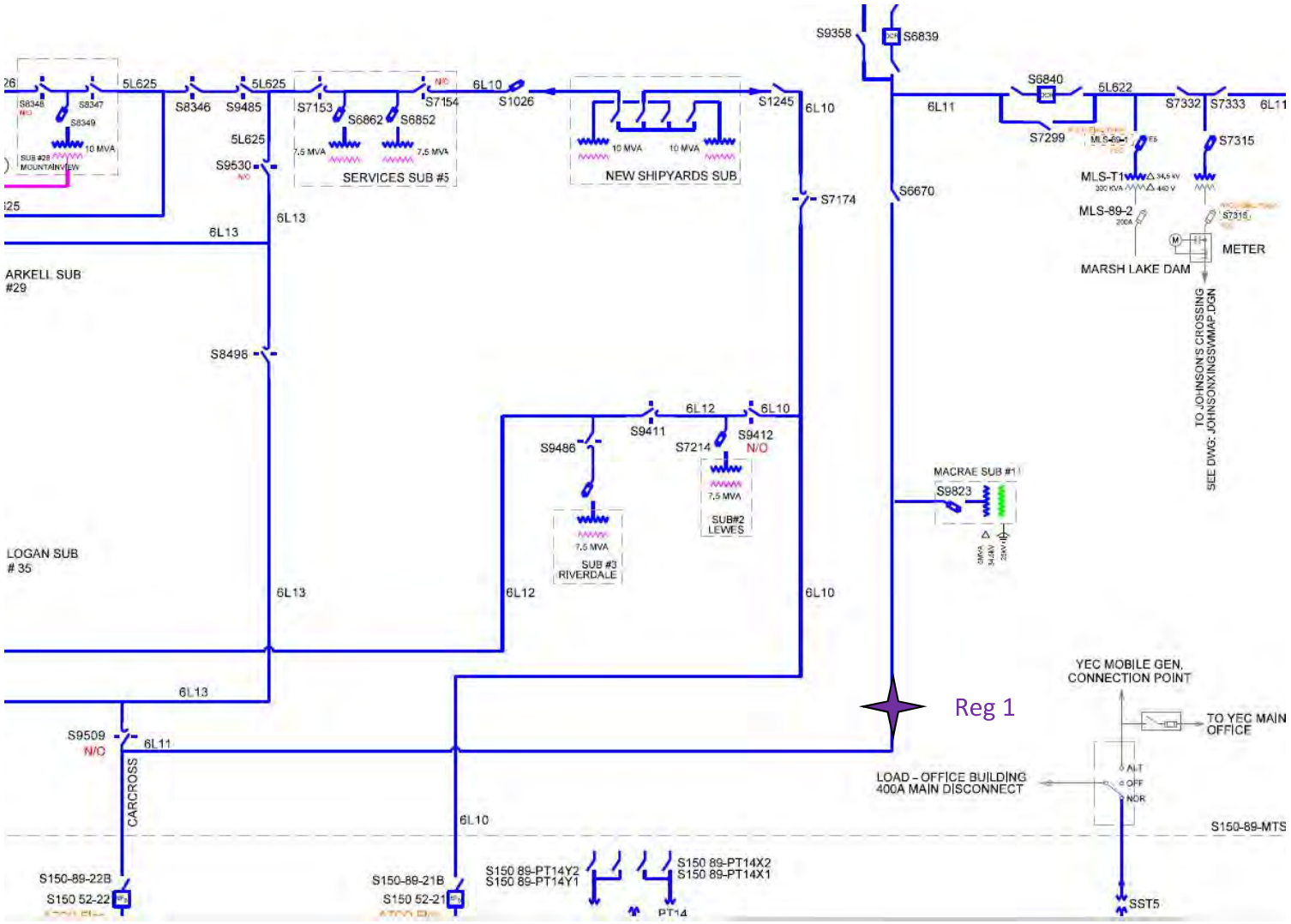


Figure 5 – Alternative 1 Regulator 1 Location SLD

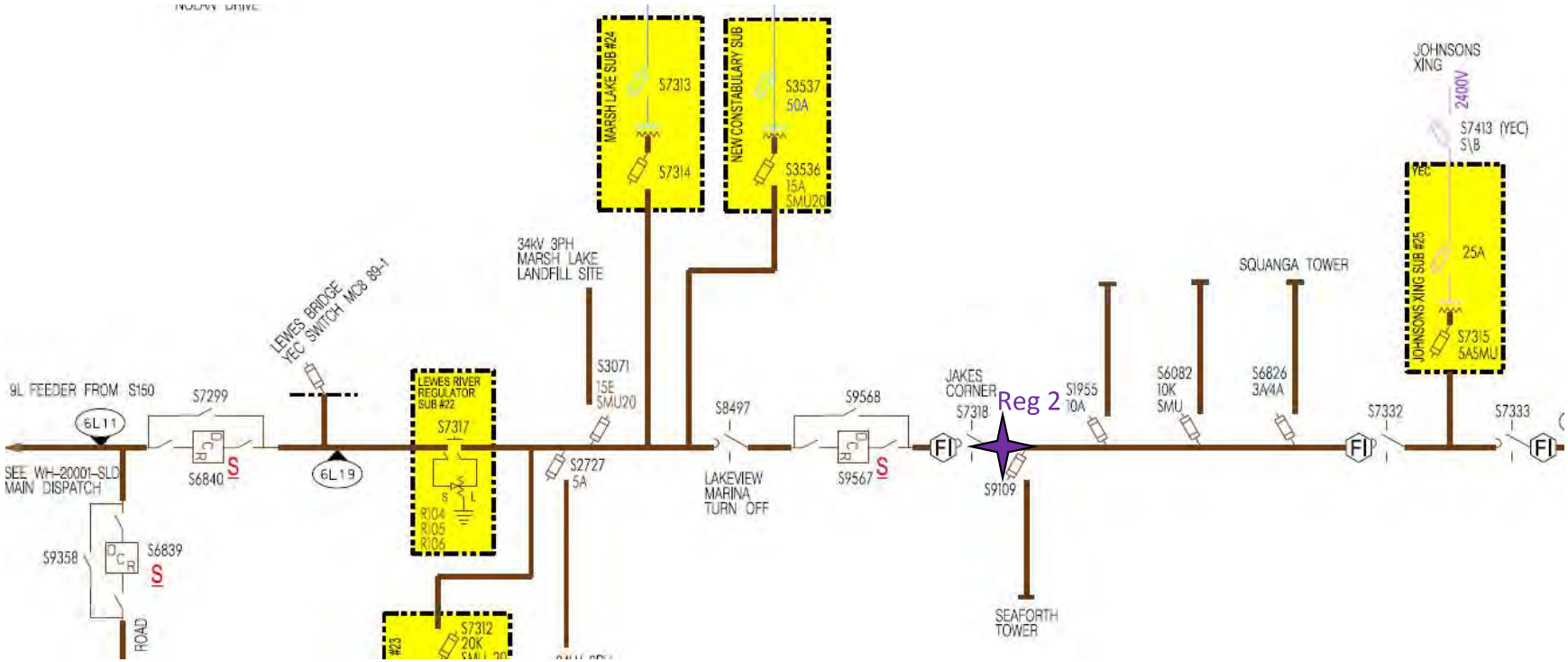


Figure 6 - Alternative 1 Regulator 2 Location SLD

Table 3 - Alternative 1 Voltage Summary

Location	Va	Vb	Vc
McRae Sub (35kV)	1.025	1.027	1.025
5L649 EOL	1.033	1.027	1.032
5L631 EOL	-	-	0.964
South McLintock Sub (35kV)	1.017	1.013	1.020
5L611 EOL	-	-	1.003
Marsh Lake Sub (35kV)	0.998	0.996	1.007
5L612 EOL	0.995	-	-
New Constabulary Sub (35kV)	0.995	0.990	1.003
5L615 EOL	0.952	-	-
Johnson Crossing Sub (35kV)	1.019	1.006	1.018
Teslin Lake Sub (35kV)	0.994	0.969	0.993
4L301 EOL	-	0.972	-
Teslin Sub (35kV)	0.988	0.962	0.987
5L613 EOL	1.027	-	-
5L614 EOL	-	1.021	-
Worst Customer Voltage on 6L19	0.958	0.973	0.960

Table 4 - Alternative 1 Voltage Summary 2028

Location	Va	Vb	Vc
McRae Sub (35kV)	1.023	1.025	1.022
5L649 EOL	1.026	1.026	1.031
5L631 EOL	-	-	0.949
South McLintock Sub (35kV)	1.007	1.007	1.009
5L611 EOL	-	-	0.992
Marsh Lake Sub (35kV)	0.983	0.986	0.992
5L612 EOL	0.994	-	-
New Constabulary Sub (35kV)	0.976	0.977	0.986
5L615 EOL	0.924	-	-
Johnson Crossing Sub (35kV)	1.013	0.993	1.013
Teslin Lake Sub (35kV)	0.981	0.947	0.981
4L301 EOL	-	0.954	-
Teslin Sub (35kV)	0.974	0.938	0.974
5L613 EOL	1.026	-	-
5L614 EOL	-	1.017	-
Worst Customer Voltage on 6L19	0.938	0.955	0.939

Alternative 2 - Reconductor 6L11 and 6L19

This alternative explores reconductoring the entirety of 6L11 and 6L19 with 477 ACSR (158km in total). Anything less than this results in voltage below 0.95pu on 6L19 close to Teslin during existing conditions which impacts 35kV customers.

This amount of reconductoring will be very expensive, so the following alternatives explore a combination of reconductoring and installing voltage supporting equipment.

This alternative allows for future a regulator addition along the lines of other alternatives in this study which would greatly increase system capacity and further improve voltages in the Teslin area.

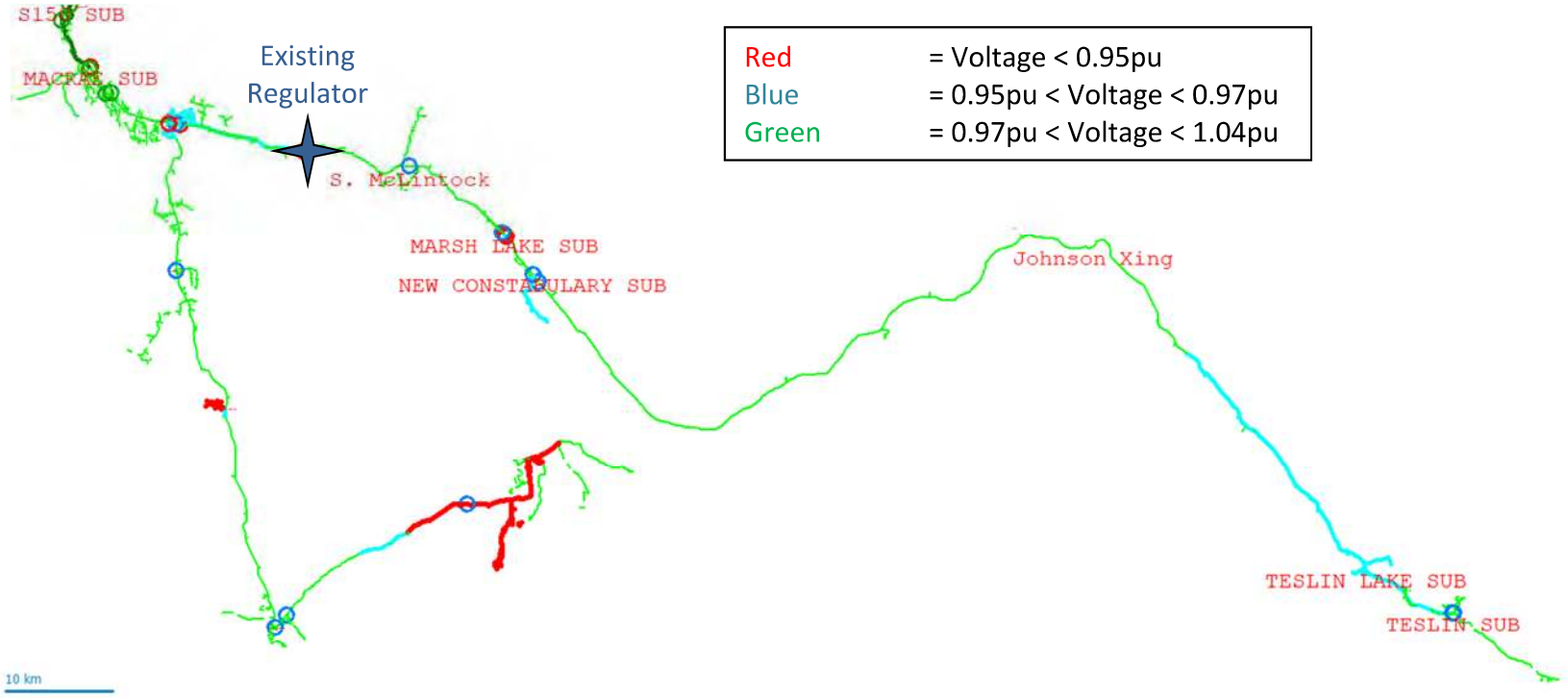


Figure 7 – Alternative 2 Voltage Conditions