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NEWFOUNDLAND POWER
A FORTIS COMPANY

DELIVERED BY HAND

January 30, 2019

Board of Commissioners
of Public Utilities
P.O. Box 21040
120 Torbay Road
St. John's, NL A1A 5B2

Attention: G. Cheryl Blundon
Director of Corporate Services
and Board Secretary

Ladies & Gentlemen:

Re: Approval of Capital Expenditures Supplemental to Newfoundland Power Inc.'s (the "Company") 2019 Capital Budget Application

The Application

Please find enclosed the original and nine (9) copies of an application (the "Application") for approval of capital expenditures supplemental to Newfoundland Power's approved 2019 capital budget. The proposed capital expenditures are in relation to the addition of a substation transformer at the Company's Pepperrell Substation ("PEP Substation") and the construction of a 3-phase distribution feeder line from PEP Substation.

Pepperell Substation Load Growth

In May 2018, the Company received a request for two 3-phase services from Canopy Growth Corporation ("Canopy"). These two electrical services are required to provide power to the new cannabis production facility being constructed by Canopy on Eastland Drive in the St. John's east end area.

Based on the request from Canopy, an updated system load forecast for the St. John's east end planning area was completed. The results of this forecast indicated that PEP Substation, which includes substation transformer PEP-T1, would become overloaded if no capital improvements are undertaken. To address this substation overload, it is proposed that the transformer capacity of PEP Substation be increased

Canopy's request for service has indicated they plan to reach their peak load by year-end 2019. Therefore, the increase of the transformer capacity at PEP Substation must be completed in 2019

Newfoundland Power Inc.
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to prevent the forecasted substation overload. Schedule C to the Application includes a report titled *2019 Pepperrell Load Growth Project* which provides details on the proposal to address the PEP Substation overload including justification for the items to be included in this Application.

Process Matters

The Application is filed in accordance with the revised Capital Budget Application Guidelines issued in October 2007 (the "Guidelines"), in particular, part *B.1. Application for Approval of Supplemental Capital Expenditures*. The Guidelines provide for approval of a supplemental capital expenditure where a utility determines that a capital expenditure which was not anticipated and included in the annual capital budget is necessary in the year and should not be delayed until the following year. The capital expenditures associated with the Pepperrell power transformer addition were not anticipated at the time of preparation of the Company's 2019 Capital Budget Application. It is necessary to proceed with this project in 2019 and delaying until 2020 is not feasible.

The Schedules to the Application are presented in a manner consistent with the Company's annual capital budget filings. Schedule A summarizes the capital expenditures by asset class. Schedule B provides project descriptions and details on project expenditures as prescribed by the Guidelines. Schedule C is a report titled *2019 Pepperrell Load Growth Project* which provides full details of the requirement to add the substation transformer.

Concluding

A draft of the Order requested is enclosed for the Board's convenience. If there are any questions in relation to this matter, please contact the undersigned at the direct number noted below.

Yours very truly,

Kelly C. Hopkins
Corporate Counsel

Enclosure

c. Geoff Young
Newfoundland and Labrador Hydro

Dennis Browne, QC
Browne Fitzgerald Morgan & Avis

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IN THE MATTER OF the *Public Utilities Act*, (the "Act"); and

IN THE MATTER OF an Application by Newfoundland Power Inc. (the "Applicant") for approval to proceed with the construction and purchase of certain improvements and additions to its property pursuant to Section 41(3) of the Act.
.

TO: The Board of Commissioners of Public Utilities (the "Board")

THE APPLICATION OF Newfoundland Power Inc. (the "Applicant") **SAYS THAT:**

A. Introductory

1. The Applicant is a corporation duly organized and existing under the laws of the Province of Newfoundland and Labrador, is a public utility within the meaning of the Act, and is subject to the provisions of the *Electrical Power Control Act, 1994.*

2. The Applicant operates transmission lines, distribution lines and substations to deliver electricity to customers throughout its service territory on the island portion of the Province of Newfoundland and Labrador.

3. The Application proposes total 2019 capital expenditures of $2,642,000 as summarized in Schedule A.

B. Pepperrell Substation Load Growth

4. The Applicant's Pepperrell Substation ("PEP Substation") is a 12.5 kV distribution substation located at the intersection of The Boulevard and East White Hills Road. There is one substation transformer located in the PEP Substation: PEP-T1. PEP-T1 is a 25.0 MVA, 66/12.47 kV transformer. The transformer is used to convert a transmission level voltage of 66 kV to a distribution level voltage of 12.47 kV to supply power to customers. There is a total of 4 distribution feeders originating from the PEP Substation serving approximately 3,250 customers.

5. In May 2018, the Applicant received a request for two 3-phase services from Canopy Growth Corporation ("Canopy"). These two electrical services are required to provide power to the new cannabis production facility being constructed by Canopy on Eastland Drive in the St. John's east end area.

6. Based on this request from Canopy, an updated system load forecast for the St. John's east end planning area was completed. The results of this forecast indicated that PEP

Substation, which includes substation transformer PEP-T1, would become overloaded if no capital improvements are undertaken. To address this substation overload, it is proposed that the transformer capacity of PEP Substation be increased.

7. The most cost-effective option for continuing to provide safe, reliable electric service to the customers served by the PEP Substation is to add a second transformer and an additional distribution feeder at a cost of $2,642,000. Schedule B contains a formal description of the project.

8. Schedule C to this Application is a report titled *2019 Pepperrell Load Growth Project* which details the results of the St. John's East End Planning Study that recommends the addition of a power transformer at PEP Substation and the construction of a new distribution feeder PEP-05. The report provides estimates of the expenditures necessary to add the transformer and construct the distribution feeder.

C. Justification and Relief Requested

9. The Applicant submits that the proposed expenditures for 2019 as described in paragraph 7 are necessary to provide service and facilities which are reasonably safe and adequate and just and reasonable, all as required pursuant to Section 37 of the Act.

10. Communications with respect to this Application should be sent to Kelly Hopkins, Counsel for the Applicant.

11. **THE APPLICANT REQUESTS** that the Board approve:

(i) pursuant to Section 41(3) of the Act, the capital expenditures associated with the purchase and construction of the improvements and additions to the Applicant's property as set out in this Application.

DATED at St. John's, Newfoundland and Labrador, this 30th day of January, 2019.

NEWFOUNDLAND POWER INC.

Kelly C. Hopkins
Counsel for the Applicant
Newfoundland Power Inc.
P.O. Box 8910
55 Kenmount Road
St. John's, NL A1B 3P6

Telephone: (709) 737-5364
Telecopier: (709) 737-2974

2019 CAPITAL BUDGET SUPPLEMENTAL

Asset Class	**Budget (000s)**
1. Substations	$2,492
2. Distribution	$150
Total	**$ 2,642**

2019 CAPITAL PROJECTS (BY ASSET CLASS)

Capital Projects	Budget (000s)	Description[1]
1. Substations		
Pepperrell Substation Transformer Addition	$ 2,334	2
Pepperrell Substation Feeder Termination	158	4
Total Substations	**$ 2,492**	
2. Distribution		
New Pepperrell-05 Feeder	$ 150	7
Total Distribution	**$ 150**	
Total Supplemental Capital Expenditure	**$ 2,642**	

[1] Project descriptions can be found in Schedule B at the page indicated.

SUBSTATIONS

Project Title: **Pepperrell Substation Transformer Addition**

Project Cost: **$2,334,000**

Project Description

This Substations project includes the installation of a new 66/12.5 kV 25 MVA substation transformer at Pepperrell Substation ("PEP Substation") to accommodate load growth in the St. John's east end planning area.[1]

The Company examined 3 alternatives to determine the least cost alternative to address the forecasted overload conditions in the St. John's east end planning area. These alternatives were evaluated using economic and sensitivity analyses to determine the least cost alternative to address the overload conditions of the St. John's east end area over a 20 year load forecast period.

The least cost alternative involves installing a new 25 MVA substation transformer, PEP-T2 in parallel with the existing substation transformer, PEP-T1, at PEP Substation and the construction of a new distribution feeder, PEP-05.

Justification

An updated system load forecast for the St. John's east end planning area was completed following a request for service from a large commercial customer. The results of this forecast identified PEP Substation, which includes substation transformer PEP-T1, to become overloaded if no capital improvements are undertaken. To address this substation overload, it is proposed that the transformer capacity of PEP Substation be increased and a new distribution feeder PEP-05 be constructed.

The least cost alternative that meets all of the technical criteria requires the installation of a new 25 MVA substation transformer at PEP Substation to work in parallel with the existing 25 MVA substation transformer.

This project was not included in the 2019 Capital Budget Application as the customer request was received in May 2018, with the subsequent engineering work carrying on through 2018. Therefore, the project was not ready to be included in the 2019 annual capital budget application filed in July 2018. As the customer requires service before the end of 2019, the project cannot wait for inclusion in the 2020 annual capital budget application.

[1] The St. John's east end planning area comprises those neighborhoods in the east end of the City of St. John's and surrounding communities served by Pepperrell, Kings Bridge and Virginia Waters' substations.

Projected Expenditures

Table 1 provides a breakdown of the proposed expenditures for 2019 and a projection of expenditures through 2023.

Table 1
Project Cost
(000s)

Cost Category	2019	2020	2021 - 2023	Total
Material	$2,072	-	-	$2,072
Labour – Internal	30	-	-	30
Labour – Contract	-	-	-	-
Engineering	193	-	-	193
Other	39	-	-	39
Total	**$2,334**	**$0**	**$0**	**$2,334**

Costing Methodology

The budget estimate for this project is based on an engineering cost estimate of the required work.

To ensure this project is completed at the lowest possible cost consistent with safe and reliable service, all material has been obtained through competitive tendering.

Future Commitments

This is not a multi-year project.

Project Title: **Pepperrell Substation Feeder Termination**

Project Cost: **$158,000**

Project Description

This Substations project is required to provide substation equipment necessary for the addition of a new distribution feeder at Pepperrell Substation ("PEP Substation"). The project involves the termination of a new 12.5 kV feeder PEP-05 at PEP Substation.

Justification

An updated system load forecast for the St. John's east end planning area was completed following a request for service from a large commercial customer. The results of this forecast identified PEP Substation, which includes substation transformer PEP-T1, to become overloaded if no capital improvements are undertaken. To address this substation overload, it is proposed that the transformer capacity of PEP Substation be increased and a new distribution feeder PEP-05 be constructed.

This project was not included in the 2019 Capital Budget Application as the customer request was received in May 2018, with the subsequent engineering work carrying on through 2018. Therefore, the project was not ready to be included in the 2019 annual capital budget application filed in July 2018. As the customer requires service before the end of 2019, the project cannot wait for inclusion in the 2020 annual capital budget application.

Projected Expenditures

Table 1 provides a breakdown of the proposed expenditures for 2019 and a projection of expenditures through 2023.

Table 1
Projected Expenditures
(000s)

Cost Category	2019	2020	2021 - 2023	Total
Material	$132	-	-	$132
Labour – Internal	6	-	-	6
Labour – Contract	-	-	-	-
Engineering	17	-	-	17
Other	3	-	-	3
Total	**$158**	**$0**	**$0**	**$158**

Costing Methodology

The budget estimate for this project is based on engineering estimates.

To ensure this project is completed at the lowest possible cost consistent with safe and reliable service, all material and contract labour will be obtained through competitive tendering.

Future Commitments

This is not a multi-year project.

DISTRIBUTION

Project Title: **New Pepperrell-05 Feeder**

Project Cost: **$150,000**

Project Description

This Distribution project is required to provide substation equipment necessary for the addition of a new distribution feeder at Pepperrell Substation ("PEP Substation"). The project involves the construction of a new 12.5 kV feeder PEP-05 at PEP Substation.

Justification

An updated system load forecast for the St. John's east end planning area was completed following a request for service from a large commercial customer. The results of this forecast identified PEP Substation, which includes substation transformer PEP-T1, to become overloaded if no capital improvements are undertaken. To address this substation overload, it is proposed that the transformer capacity of PEP Substation be increased and a new distribution feeder PEP-05 be constructed.

This project was not included in the 2019 Capital Budget Application as the customer request was received in May 2018, with the subsequent engineering work carrying on through 2018. Therefore, the project was not ready to be included in the 2019 annual capital budget application filed in July 2018. As the customer requires service before the end of 2019, the project cannot wait for inclusion in the 2020 annual capital budget application.

Projected Expenditures

Table 1 provides a breakdown of the proposed expenditures for 2019 and a projection of expenditures through 2023.

Table 1
Project Cost
(000s)

Cost Category	2019	2020	2021 - 2023	Total
Material	$38	-	-	$38
Labour – Internal	30	-	-	30
Labour – Contract	51	-	-	51
Engineering	8	-	-	8
Other	23	-	-	23
Total	**$150**	**$0**	**$0**	**$150**

Costing Methodology

The budget estimate for this project is based on an engineering cost estimate of the required work.

To ensure this project is completed at the lowest possible cost consistent with safe and reliable service, all material has been obtained through competitive tendering.

Future Commitments

This is not a multi-year project.

Capital Budget Supplemental

2019 Pepperrell Load Growth Project

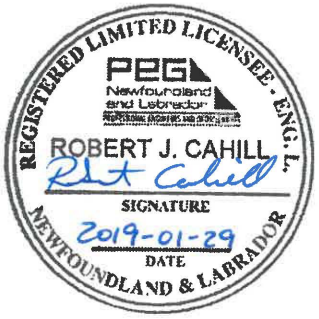
January 2019

Prepared by:

Jacob Rodgers, B. Eng.

Approved by:

Robert Cahill, Eng. L.



NEWFOUNDLAND POWER
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1.0 Introduction

As load increases on an electrical system, individual components can become overloaded. The focus of Newfoundland Power's system planning is to avoid or minimize component overloading through cost effective upgrades to the system. In the case of substation transformers, an engineering study is completed to identify and evaluate technical alternatives in advance of the overloads.[1] These technical alternatives are fully examined, cost estimates are prepared, and an economic analysis is performed to identify the least cost alternative.

In general, the alternatives for addressing an overload condition on a substation transformer involve the following:

(i) Transferring the customer load from one existing substation transformer to another. The other substation transformer may or may not be in the same substation.

(ii) Paralleling substation transformers together. In substations that have more than one substation transformer, the substation transformers may be able to be connected in parallel so that they can share the load between them.

(iii) Replacing an existing substation transformer with a substation transformer of a higher capacity rating.

(iv) Installing an additional substation transformer to allow the transferring of customer load from the overloaded substation transformer(s) onto the additional substation transformer.

In May 2018, Newfoundland Power ("the Company") received a request for two 3-phase services from Canopy Growth Corporation ("Canopy"). These two electrical services are required to provide power to the new cannabis production facility being constructed by Canopy on Eastland Drive in the St. John's east end area.

Based on this request for 3-phase service from Canopy, an updated system load forecast for the St. John's east end planning area has been completed. The results of this forecast identified Pepperrell ("PEP") Substation, which includes substation transformer PEP-T1, to become overloaded if no capital improvements are undertaken. To address this substation overload, it is proposed that the transformer capacity of PEP Substation be increased.[2]

[1] A substation transformer converts electricity from transmission level voltages (typically between 66 kV and 138 kV) to distribution level voltages (typically between 4 kV and 25 kV).

[2] The Contribution in Aid of Construction (CIAC) calculation based on the *CIAC Policy for General Service Customers* has been completed and based on the customer's expected load and Newfoundland Power's expected revenue from the customer, there is no contribution required from the customer for the increase of capacity at PEP Substation.

Canopy's request for service has indicated they plan to reach their peak load by year-end 2019. Therefore the increase of the transformer capacity at PEP Substation must be completed in 2019 to prevent the forecasted substation overload.

This report provides details on the proposal to address the PEP Substation overload including the justification for the items to be included in this 2019 Capital Budget Supplement.

2.0 Project Scope ($2,642,000)

An engineering study has been completed on the distribution system upgrades required to meet the electrical demands in the St. John's east end planning area. This 12.5 kV distribution system includes customers supplied by King's Bridge ("KBR") substation, PEP Substation, and Virginia Waters ("VIR") substation. This study is presented in Attachment A to this report.

The study in Attachment A examined 3 alternatives to determine the least cost alternative to address the forecasted overload conditions in the St. John's east end planning area. These alternatives were evaluated using economic and sensitivity analyses to determine the least cost alternative to address the overload conditions of the St. John's east end area over a 20 year load forecast period.

The least cost alternative involves installing a new 25 MVA substation transformer, PEP-T2 in parallel with the existing substation transformer, PEP-T1, at PEP Substation and the construction of a new distribution feeder, PEP-05.[3]

3.0 Project Cost

Table 1 shows the total estimated 2019 project capital costs for the project.

Table 1
2019 Project Costs
($000's)

Cost Category	PEP Substation Transformer Installation[4]	Substation Feeder Termination	Distribution Feeder Construction	Total
Material	2,072	132	38	2242
Labour – Internal	30	6	30	66
Labour – Contract	0	0	51	51
Engineering	193	17	8	218
Other	39	3	23	65
Total	**2,334**	**158**	**150**	**2,642**

[3] The 2019 Substation Refurbishment and Modernization ("R&M project") project approved in Order No. P.U. 35 (2018) included the refurbishment of PEP Substation. The installation of the new PEP-T2 transformer and PEP-05 feeder termination will be completed in conjunction with the approved R&M project. Coordinating the 2 projects provides approximately $50,000 in project management efficiencies.

[4] The cost of $2,334,000 is for the associated installation costs of PEP-T2 transformer only.

4.0 Project Schedule

The proposed project construction schedule for the PEP Load Growth Project is outlined in Table 2 below.

Table 2
Proposed PEP Load Growth Project Schedule

Date	Milestone
March 29, 2019	Award of substation construction and equipment procurement contracts.
May 6, 2019	Commencement of PEP-05 distribution line construction.
August 30, 2019	Completion of PEP-05 distribution line construction.
November 15, 2019	Completion of substation construction contract.
November 29, 2019	Completion of substation construction commissioning activities and in-service date.

5.0 Conclusion

The Company is experiencing load growth in the St. John's east end service area including Canopy's construction of their cannabis production facility which is expected to reach its maximum power requirements by year-end 2019. As a result, the available substation transformer capacity is insufficient to meet the load forecast and equipment overloads are expected to occur.

Part B of the Capital Budget Application Guidelines requires that the utility must provide evidence:

i. why the project was not anticipated and included in the annual capital budget application for the year; and

ii. why the project cannot wait until next year and be included in the annual capital budget application.

The request from Canopy was received in May 2018, with the subsequent engineering work carrying on through 2018. Therefore the project was not ready to be included in the 2019 annual capital budget application which was filed in July 2018. The customer requires service before the end of 2019, therefore the project cannot wait for inclusion in the 2020 annual capital budget application.

It is recommended that the project identified as being a part of the least cost alternative in Section 2 be undertaken in 2019 to address the capacity issue in the St. John's east end planning area. The recommended project is:

- The installation of a new 25 MVA PEP-T2 transformer placed in parallel with the existing 25 MVA PEP-T1.

- The construction of a new distribution feeder PEP-05.

This project is estimated to cost $2,642,000 in 2019.

Attachment A
St. John's East End Planning Study

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1.0 Introduction

Canopy Growth Corporation ("Canopy") is constructing a cannabis production facility in the White Hills in east end St. John's area on Eastland Drive. The purpose of this study is to determine the least cost alternative that best meets the electrical demands of the St. John's east end area including the 4 MVA demand of Canopy's cannabis production facility.[1] The St. John's east end area consists of the King's Bridge ("KBR") Substation, Pepperrell ("PEP") Substation, and Virginia Waters ("VIR") Substation.

In May 2018, Newfoundland Power ("the Company") received a request from Canopy for two 3-phase services for their cannabis production facility. In discussion with Canopy and considering project costs, timelines and load requirements, the Company has developed 3 alternatives to serve the cannabis production facility.

In the winter of 2019, the existing substation transformer at PEP is expected to experience a peak load of 28.2 MVA. The current capacity of PEP-T1 is 25 MVA. As a result, the load forecast indicates that PEP-T1 will be overloaded in 2019.

Load growth on this transformer is primarily the result of commercial developments in the East White Hills Road area including the addition of Canopy's cannabis production facility on Eastland Drive.[2]

This report identifies the most appropriate project(s) required to avoid the 2019 forecasted overload by determining the least cost expansion plan required to meet a 20 year load forecast.

2.0 Description of Existing System

2.1 King's Bridge Substation

KBR Substation is located near the intersection of Kings Bridge Road and Empire Avenue. There are 2 substation transformers located in the substation: KBR-T3 and KBR-T4.[3] KBR-T3 and KBR-T4 are both 25.0 MVA, 66/12.47 kV transformers. The parallel combination of these 2 transformers is used to convert a transmission level voltage of 66 kV to a distribution level voltage of 12.47 kV to supply power to customers.

There is total of 6 distribution feeders originating from the KBR Substation serving approximately 5,640 customers. A map of the KBR Substation service area and a breakdown of the customers served by each distribution feeder are shown in Appendix A.

There are only 2 tie points between KBR Substation and PEP Substation which limit the potential to transfer load between the 2 substations.

---

1 Canopy has indicated future potential expansion would increase the demand to 6 MVA.

2 Planning studies completed prior to the Canopy request for service had not identified the requirement for an additional transformer in the St. John's east end planning area in the current 5-year planning horizon.

3 KBR-T1 and KBR-T2 transformers were decommissioned in 2017 as part of the *Trunk Feeders - KBR Substation Distribution Feeder Refurbishment* project.

2.2 Pepperrell Substation

PEP Substation is located at the intersection of The Boulevard and East White Hills Road. There is one substation transformer located in the substation: PEP-T1. PEP-T1 is a 25.0 MVA, 66/12.47 kV transformer. The transformer is used to convert a transmission level voltage of 66 kV to a distribution level voltage of 12.47 kV to supply power to customers.

There is total of 4 distribution feeders originating from the PEP Substation serving approximately 3,250 customers. A map of the PEP Substation service area and a breakdown of the customers served by each distribution feeder are shown in Appendix B.

2.3 Virginia Waters Substation

VIR Substation is located at the intersection of Stavanger Drive and Snow's Lane. There are 3 power transformers in the substation: VIR-T1, VIR-T2, and VIR-T3, all of which are 25 MVA, 66/12.47 kV transformers. These transformers are used to convert a transmission level voltage of 66 kV to a distribution level voltage of 12.47 kV to supply power to customers.

There is a total of 8 distribution feeders originating from the VIR Substation serving approximately 7,310 customers. A map of the VIR Substation service area and a breakdown of the customers served by each distribution feeder are shown in Appendix C.

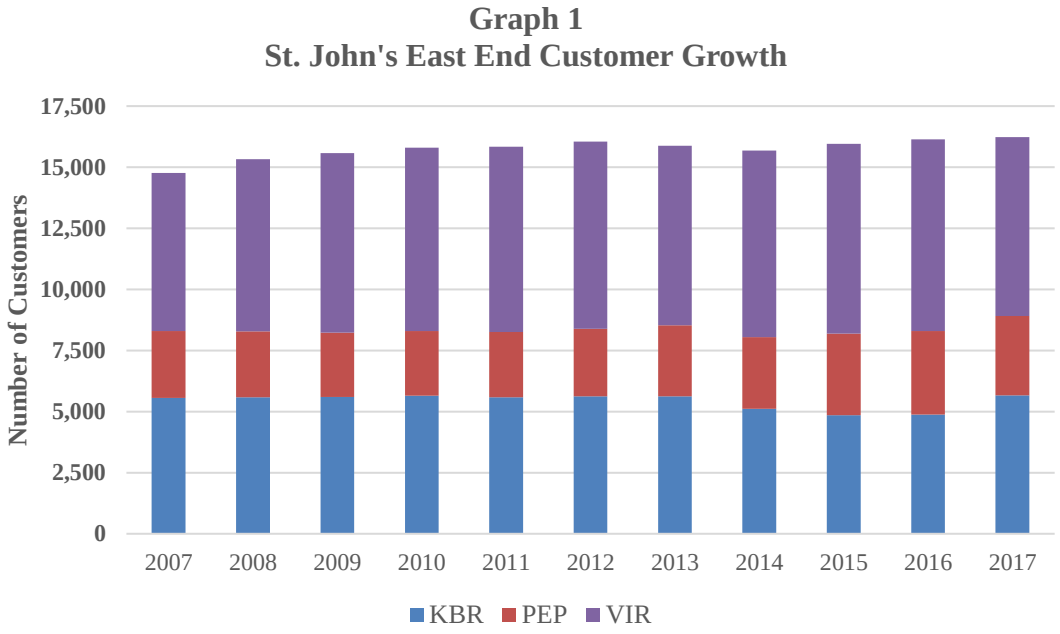
3.0 Load Forecast

From 2007 to 2017, the number of customers served from the St. John's east end area substations (KBR, PEP, and VIR) has increased by 10% from 14,760 to 16,227 customers. In addition, the customer load on the St. John's east end area substations has increased by 23% over the period from 2010 to 2017.[4] These increases are due to the residential and commercial developments that are occurring throughout the east end of St. John's. Due to Canopy's cannabis production facility and natural growth in the St. John's east end area, the customer load of the area is forecasted to increase by an additional 12% from 2017 to 2020.[5]

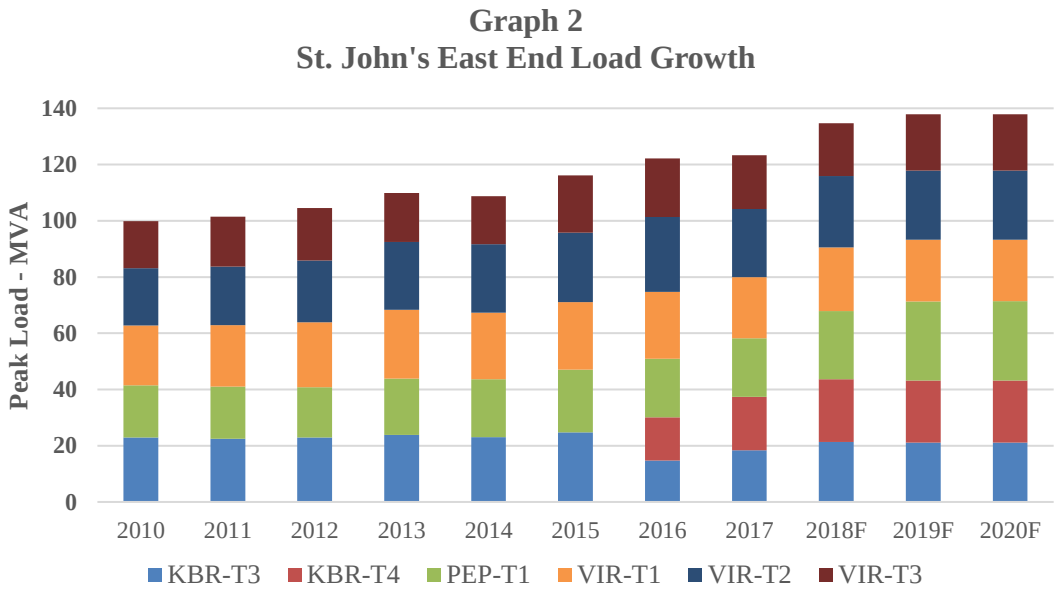
[4] From the period of 2010 to 2017 customer load increased from 99.87 MVA to 123.31 MVA ([123.31/99.87-1]*100% = 23.47%).

[5] Customer load of the area is forecast to increase from 123.31 MVA in 2017 to 137.88 MVA in 2020 ([137.88/123.31-1]*100% = 11.81%).

Graph 1 shows the growth in the number of customers on St. John's east end substations between 2007 and 2017.



Graph 2 shows the historical load growth on St. John's east end substations between 2010 and 2017, as well as the forecasted 2018, 2019, and 2020 loads.[6]



[6] A 5 year worst case load factor adjustment is used in 2018F, the first year of the forecast.

PEP-T1 transformer is rated at 25 MVA. The forecasted peak substation load that is expected for PEP-T1 in the winter of 2019 is 28.2 MVA.

This study uses a 20 year load forecast for each substation transformer in the St. John's east end area. Included in the forecast is the additional load for Canopy's cannabis production facility. There have been a variety of different substation forecasts developed. These forecasts use different long term growth rates to account for the uncertainty in the long term economic state of the Province of Newfoundland and Labrador and how that may impact electricity sales and substation peak load.

A yearly 1.08% growth rate has been used as the base case for the development of alternatives.[7] Due to the possibility of expansion at Canopy's cannabis production facility and other large customers within the East White Hills Road area, high and low load growth forecasts have also been developed for use in sensitivity analysis. The high growth case includes an expansion to Canopy's cannabis production facility and other large load additions by 2023 and the low growth case shows no large load additions to the area. The base case, high growth and low growth 20 year substation forecasts for PEP-T1, VIR-T1, VIR-T2, and VIR-T3 are located in Appendix D.

4.0 Development of Alternatives

Three alternatives have been developed to eliminate the forecasted overload conditions using a set of defined technical criteria.[8] These alternatives will provide sufficient capacity to meet the forecasted loads over the next 20 years.[9]

Each alternative contains estimates for all of the costs involved, including new substation transformers and feeders. The results of a net present value ("NPV") calculation are provided for each alternative.

4.1 Alternative 1

- In 2019, add a new 25 MVA, 66/12.47 kV transformer (VIR-T4) to VIR Substation. The additional transformer would be configured to operate in parallel with the existing 25 MVA, 66/12.47 kV VIR-T3. This transformer addition would increase the total

[7] The 1.08% yearly growth rate represents the 10 year historical average customer growth rate for the St. John's east end area.

[8] The following technical criteria were applied:
- The steady state substation transformer loading should not exceed the nameplate rating.
- The minimum steady state feeder voltage should not fall below 116 Volts (on a 120 Volt base).
- The feeder normal peak loading should be sufficient to permit cold load pickup.

[9] The alternatives included in this study focus on expansion of PEP and VIR substations in order to address the long term load growth requirements of the St. John's east end area. Alternative options related to utilization of existing spare capacity at KBR substation were analyzed and deemed not viable due to the construction challenges and high costs associated with the construction of new distribution feeder infrastructure required to offload PEP Substation load.

substation 12.47 kV transformer capacity on the VIR-T3 bus from 25 MVA to 49.4 MVA.[10,11]

- In 2019, construct a new 12.47 kV distribution feeder (VIR-09). This involves installing a new feeder termination at VIR Substation, including a breaker and associated switches, as well as constructing approximately 0.11 km of new 477 ASC trunk feeder and upgrading 0.87 km of existing distribution line to 3-phase, 477 ASC conductor. This new feeder will supply residential customers in Logy Bay, Middle Cove and Outer Cove as well as provide sufficient feeder capacity for future load growth in the area.

- In 2029, add a new 25 MVA, 66/12.47 kV transformer (PEP-T2) to PEP Substation. The additional transformer would be configured to operate in parallel with the 25 MVA, 66/12.47 kV PEP-T1. This transformer addition would increase the total substation 12.47 kV transformer capacity from 25 MVA to 48.8 MVA.

- In 2029, construct a new 12.47 kV distribution feeder (PEP-05). This involves installing a new feeder termination at PEP Substation, including a breaker and associated switches, as well as constructing approximately 1.0 km of new 477 ASC trunk feeder. This new feeder will supply residential and commercial customers in the Pleasantville neighbourhood and along East White Hills Road.

Table 1 shows the capital costs estimated for Alternative 1.

[10] VIR-T1 and VIR-T2 would operate in parallel while VIR-T3 and VIR-T4 would also operate in parallel but independent of the other two transformers in the substation. The 12.47 kV distribution bus supplied by VIR-T1 and VIR-T2 is separated from the 12.47 kV distribution bus supplied by VIR-T3 and VIR-T4 by a normally open bus-tie switch.

[11] New transformers are being purchased with a per unit impedance of 7% on the transformer base. As a result, the load split between new and existing transformers may not be evenly or proportionately divided so as to use 100% of each paralleled transformer's nameplate capacity. Therefore, the substation capacity is not necessarily equal to the algebraic sum of the paralleled transformer capacities.

Table 1
Alternative 1 Capital Costs

Year	Item	Cost
2019	Purchase and install a new 25 MVA transformer at VIR Substation in parallel with the existing VIR-T3.	$2,666,000
2019	Distribution portion of the construction of a new 12.5 kV distribution feeder (VIR-09).	$220,000
2019	Substation portion of the construction of a new 12.5 kV distribution feeder (VIR-09).	$250,000
2029	Purchase and install a new 25 MVA transformer at PEP Substation in parallel with the existing PEP-T1.	$2,384,000[12]
2029	Distribution portion of the construction of a new 12.5 kV distribution feeder (PEP-05).	$150,000
2029	Substation portion of the construction of a new 12.5 kV distribution feeder (PEP-05).	$158,000
	Total	**$5,828,000**

4.2 Alternative 2

- In 2019, add a new 25 MVA, 66/12.47 kV transformer (PEP-T2) to PEP Substation. The additional transformer would be configured to operate in parallel with the 25 MVA, 66/12.47 kV PEP-T1. This transformer addition would increase the total substation 12.47 kV transformer capacity from 25 MVA to 48.8 MVA.

- In 2019, construct a new 12.47 kV distribution feeder (PEP-05). This involves installing a new feeder termination at PEP, including a breaker and associated switches, as well as constructing approximately 1.0 km of new 477 ASC trunk feeder. This new feeder will supply residential and commercial customers in the Pleasantville neighbourhood and along East White Hills Road.

- In 2029, complete a 5.75 MVA load transfer from VIR-01 and VIR-03 (VIR-T1/T2) to PEP-01 and PEP-02 (PEP-T1/T2).

Table 2 shows the capital costs estimated for Alternative 2.

[12] The 2019 Substation Refurbishment and Modernization ("R&M project") project approved in Order No. P.U. 35 (2018) included the refurbishment of PEP Substation. By project managing the transformer installation with the R&M project, cost efficiencies will be gained. If a transformer addition were to occur in 2029, there is approximately $50,000 in additional costs associated with project management that is already included as a part of the 2019 R&M project estimate for PEP.

Table 2
Alternative 2 Capital Costs

Year	Item	Cost
2019	Purchase and install a new 25 MVA transformer at PEP Substation in parallel with the existing PEP-T1.	$2,334,000
2019	Distribution portion of the construction of a new 12.5 kV distribution feeder (PEP-05).	$150,000
2019	Substation portion of the construction of a new 12.5 kV distribution feeder (PEP-05).	$158,000
	Total	**$2,642,000**

4.3 Alternative 3

- In 2019, construct a new 66/12.47 kV substation in the area of East White Hills Road and Sugar Loaf Road. The substation will consist of a new 66/12.47 kV 25 MVA transformer, two 12.47 kV distribution feeder terminations, two 66 kV transmission terminations, one 66 kV bus structure, one 12.47 kV bus structure, and a control building. This involves procuring land for the proposed substation location and transmission line easements, construction of approximately 1.5 km of new 715.5 ASC transmission line, construction of approximately 1.0 km of 477 ASC trunk feeder.

- In 2033, complete a 3 MVA load transfer from PEP-01 (PEP-T1) to the new substation.

- In 2033, complete a 2.5 MVA load transfer from VIR-01 (VIR-T1/T2) to the new substation.

Table 3 shows the capital costs estimated for Alternative 3.

Table 3
Alternative 3 Capital Costs

Year	Item	Cost
2019	Construct a new substation and purchase and install a new 25 MVA transformer at the new substation.	$3,458,000
2019	Distribution portion of the construction of two new 12.5 kV distribution feeders.	$165,000
2019	Transmission portion of the construction of two new transmission lines.	$586,000
2019	Purchase land for the new substation location.	$700,000
	Total	**$4,909,000**

5.0 Evaluation of Alternatives

5.1 Economic Analysis

In order to compare the economic impact of the alternatives, a NPV calculation of customer revenue requirement was completed for each alternative. Capital costs from 2019 to 2036 were converted to the customer revenue requirement and the resulting customer revenue requirement was reduced to a NPV using the Company's weighted average incremental cost of capital.[13] Capital costs required beyond the 20 year forecast period that are required to balance the installed transformer capacity across all three alternatives are also included in the NPV calculation and are known simply as end effect capital costs.

Table 4 shows the NPV of customer revenue requirement for each alternative under the base case load forecast.

Table 4
Net Present Value Analysis
($000)

Alternative	NPV
1	5,758
2	4,435
3	7,070

[13] This analysis captures the customer revenue requirement for the life of a new transformer asset.

Alternative 2 has the lowest NPV of customer revenue requirement. As a result, Alternative 2 is recommended as the most appropriate expansion plan.

5.2 Sensitivity Analysis

To assess the sensitivity to load forecast variability of each alternative, a variety of long term growth rates were developed. The growth rates used in the sensitivity analysis are 0.25%, 0.63%, 1.08%, 1.40% and 2.0% per year.[14] For each of these growth rates, base case, high growth and low growth scenarios were analyzed to further assess the sensitivity to load forecast variability.

In general, the low load growth forecast results in delaying the required construction projects. Similarly, with a higher load growth forecast the timing of the required construction projects is advanced. Using these revised timelines, the NPV of the customer revenue requirement was recalculated.

Tables 5-9 show the NPV of customer revenue requirement for each alternative under the different sensitivities.

Table 5
0.25% Yearly Growth Sensitivity Analysis
($000)

Alternative	Base Case Forecast NPV	High Load Forecast NPV	Low Load Forecast NPV[15]
1	3,637	3,637	0
2	3,063	3,063	0
3	5,699	5,699	0

Table 6
0.63% Yearly Growth Sensitivity Analysis
($000)

Alternative	Base Case Forecast NPV	High Load Forecast NPV	Low Load Forecast NPV
1	5,528	5,602	2,204
2	3,980	3,980	1,891
3	6,728	6,853	3,453

14 These growth rates are based on a range of historical weather adjusted yearly growth rates that have been observed in the St. John's east end area over the last 15 years.

15 There are no NPVs for the 0.25% low growth case because no work is required in this scenario within the 20 year study period.

Table 7
1.08% Yearly Growth Sensitivity Analysis
($000)

Alternative	Base Case Forecast NPV	High Load Forecast NPV	Low Load Forecast NPV
1	5,758	6,311	4,036
2	4,435	4,435	3,493
3	7,070	7,152	5,245

Table 8
1.40% Yearly Growth Sensitivity Analysis
($000)

Alternative	Base Case Forecast NPV	High Load Forecast NPV	Low Load Forecast NPV
1	5,927	6,311	4,422
2	4,956	5,732	3,662
3	7,452	8,374	5,477

Table 9
2.0% Yearly Growth Sensitivity Analysis
($000)

Alternative	Base Case Forecast NPV	High Load Forecast NPV	Low Load Forecast NPV
1	7,389	7,683	6,111
2	7,209	7,209	5,956
3	9,969	10,213	8,137

Under all scenarios, Alternative 2 is the least cost alternative. This indicates that Alternative 2 is a suitable alternative under varying load growth scenarios. As a result, the recommendation to implement Alternative 2 is still appropriate given the results of the sensitivity analysis.

6.0 Project Costs

Table 10 shows the estimated project costs for the chosen alternative.

Table 10
Project Capital Costs

Year	Item	Cost
2019	Purchase and install a new 25 MVA transformer at PEP Substation in parallel with the existing PEP-T1.	$2,334,000
2019	Distribution portion of the construction of a new 12.5 kV distribution feeder (PEP-05).	$150,000
2019	Substation portion of the construction of a new 12.5 kV distribution feeder (PEP-05).	$158,000
	Total	**$2,642,000**

7.0 Conclusion and Recommendation

A 20 year load forecast has projected the electrical demands for the St. John's east end area. The development and analysis of distribution system alternatives has established a preferred expansion plan to meet the forecasted needs of the area.

The economic analysis performed in Section 5.1 of this study indicates that Alternative 2 is the most appropriate alternative that meets all of the required technical criteria. The sensitivity analysis performed in Section 5.2 indicates that Alternative 2 is the least cost alternative under a variety of sensitivities. The sensitivity analysis is performed to ensure that the least cost alternative indicated by the economic analysis is a suitable alternative for varying levels of load growth. As a result, the Alternative 2 expansion plan has been selected as the most appropriate project.

The least cost expansion plan includes the following items in the 2019 Capital Budget:

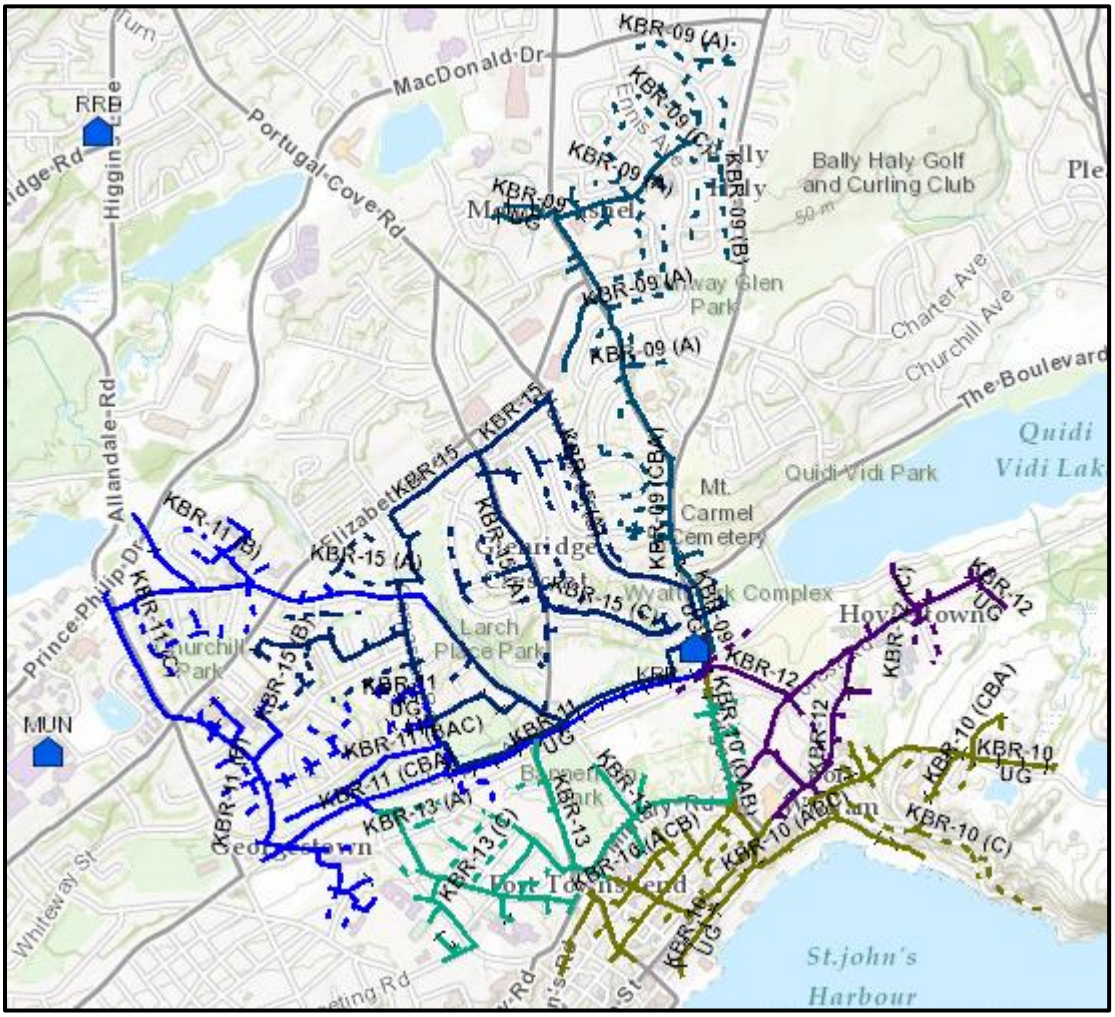
1) The purchase and installation of a new 25 MVA transformer at PEP Substation in parallel with the existing PEP-T1.

2) The construction of a new 12.5 kV distribution feeder (PEP-05).

The 2019 project is estimated to cost $2,642,000.

Appendix A
KBR Substation Service Area Map and Customer Count

KBR Substation Service Area Map

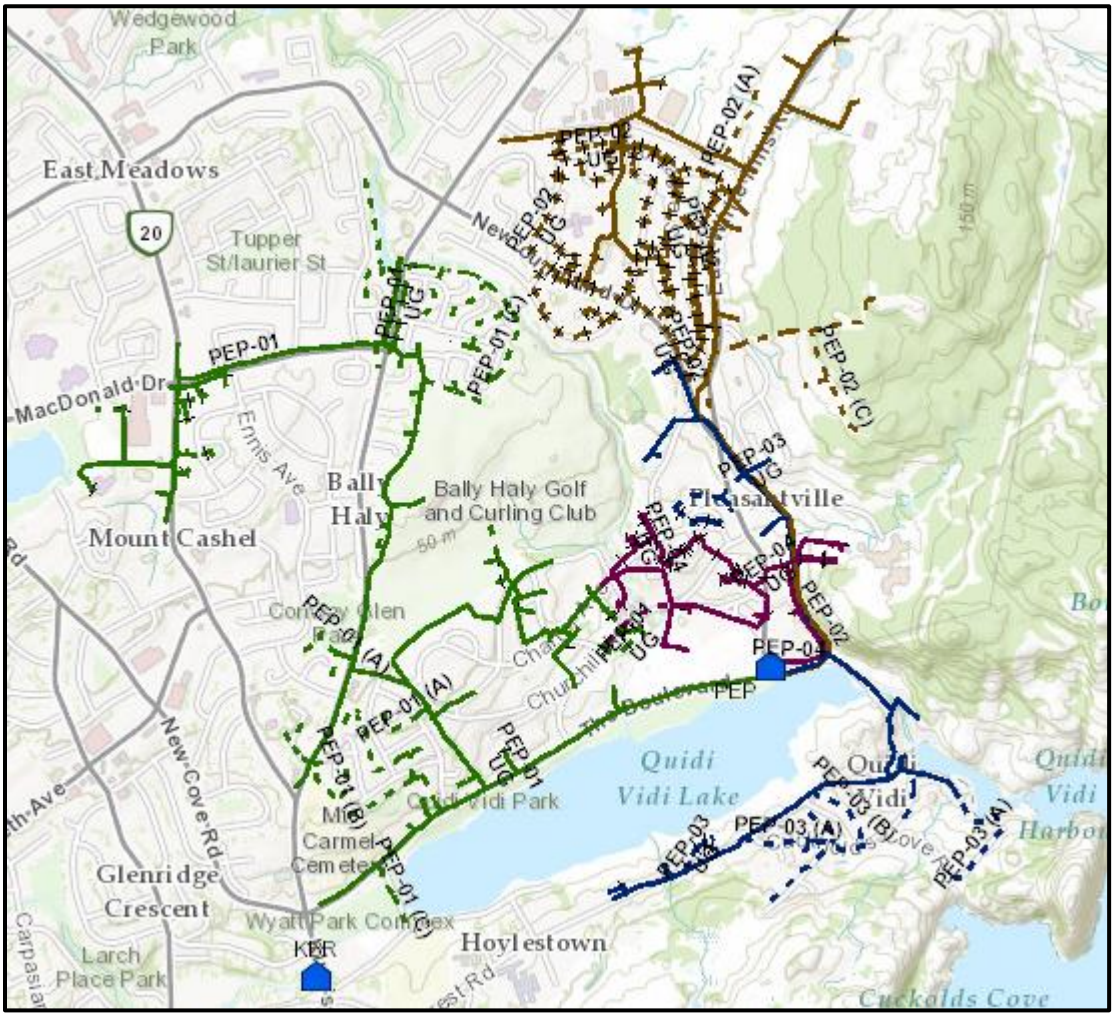


KBR Feeder Customer Count

Feeder Name	Customer Count	Feeder(s) with Tie Points
KBR-09	996	RRD-02, PEP-01
KBR-10	1,334	KBR-12, SJM-03, SJM-04
KBR-11	794	KBR-13, KBR-15, SLA-13, RRD-05
KBR-12	448	KBR-10 KBR-13, PEP-02
KBR-13	1,009	KBR-10, KBR-11, SLA-09
KBR-15	1,059	KBR-11

Appendix B
PEP Substation Service Area Map and Customer Count

PEP Substation Service Area Map

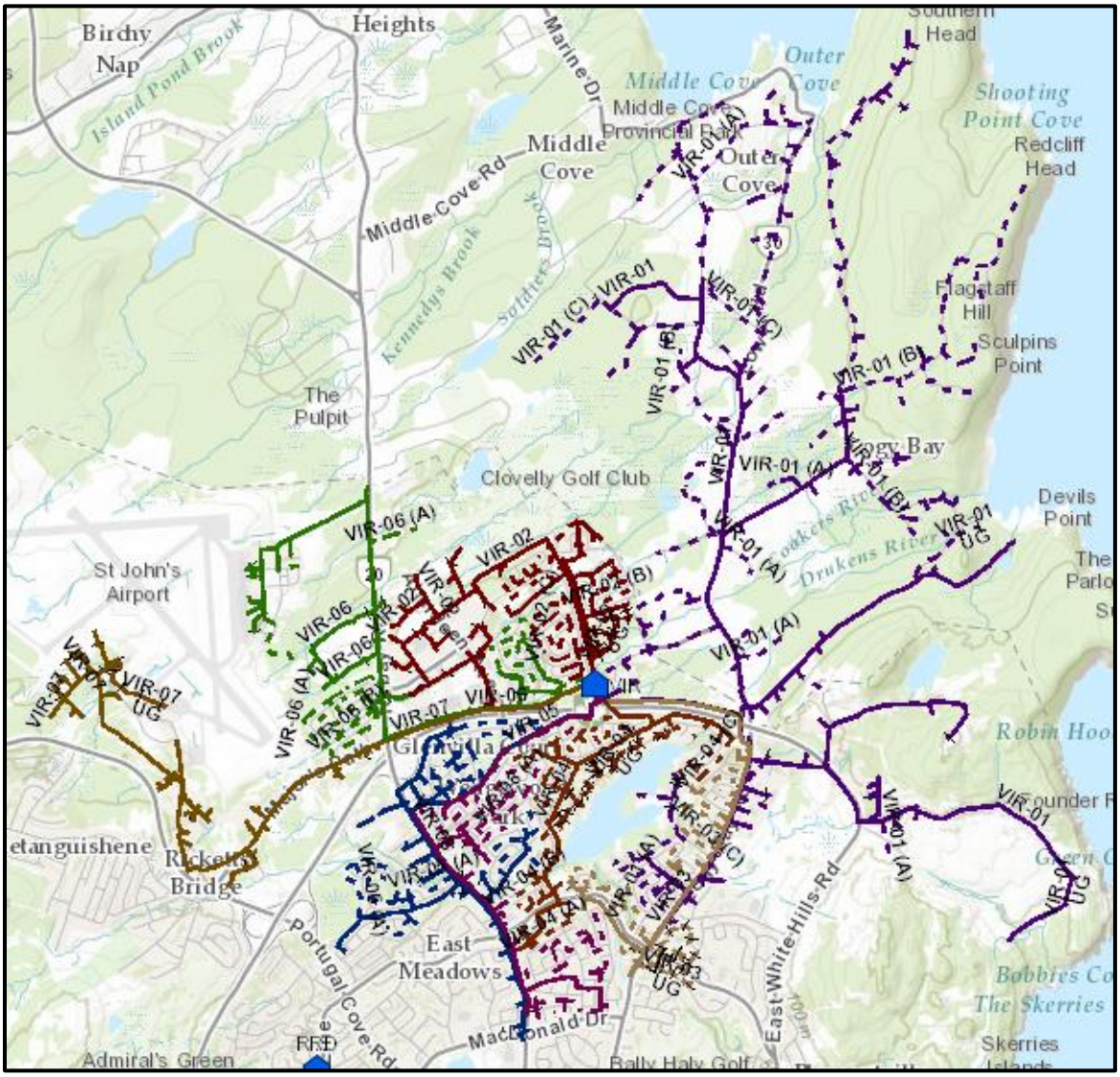


PEP Feeder Customer Count

Feeder Name	Customer Count	Feeder(s) with Tie Points
PEP-01	1,503	KBR-09, PEP-04, VIR-03, VIR-05, VIR-08
PEP-02	926	PEP-03, VIR-01
PEP-03	442	KBR-12, PEP-02, PEP-04
PEP-04	379	PEP-01, PEP-03

Appendix C
VIR Substation Service Area Map and Customer Count

VIR Substation Service Area Map



VIR Feeder Customer Count

Feeder Name	Customer Count	Feeder(s) with Tie Points
VIR-01	1,115	PEP-02, VIR-03
VIR-02	731	VIR-06, VIR-07
VIR-03	827	PEP-01, VIR-01
VIR-04	765	VIR-08
VIR-05	1,364	RRD-07, VIR-07, VIR-08
VIR-06	694	PUL-01, VIR-02
VIR-07	784	RRD-09, PUL-04, VIR-02, VIR-06
VIR-08	1,030	RRD-03, RRD-07, PEP-01, VIR-05

Appendix D
2017 Substation Load Forecasts – Base Cases

20 Year Substation Load Forecast – 1.08% Yearly Growth Base Case

Device	PEP-T1	VIR-T1	VIR-T2	VIR-T3
Sec. Voltage (kV)	12.5	12.5	12.5	12.5
Rating (MVA)	25.0	25.0	25.0	25.0
2017 Peak (MVA)	20.8	21.8	24.2	19.1
Year	**Forecasted Undiversified Peak (MVA)**			
2018	24.3	22.6	25.3	18.8
2019	28.2	21.9	24.6	20.0
2020	28.2	21.9	24.6	20.0
2021	27.9	21.7	24.3	20.4
2022	27.6	21.4	24.0	20.1
2023	27.2	21.1	23.6	19.8
2024	27.5	21.3	23.9	20.0
2025	27.8	21.5	24.1	20.2
2026	28.1	21.8	24.4	20.4
2027	28.4	22.0	24.7	20.7
2028	28.7	22.2	24.9	20.9
2029	29.0	22.5	25.2	21.1
2030	29.4	22.7	25.5	21.3
2031	29.7	23.0	25.7	21.6
2032	30.0	23.2	26.0	21.8
2033	30.3	23.5	26.3	22.0
2034	30.7	23.7	26.6	22.3
2035	31.0	24.0	26.9	22.5
2036	31.3	24.2	27.2	22.8
2037	31.7	24.5	27.4	23.0

20 Year Substation Load Forecast – 1.08% Yearly Growth High Growth

Device	PEP-T1	VIR-T1	VIR-T2	VIR-T3
Sec. Voltage (kV)	12.5	12.5	12.5	12.5
Rating (MVA)	25.0	25.0	25.0	25.0
2017 Peak (MVA)	20.8	21.8	24.2	19.1
Year	**Forecasted Undiversified Peak (MVA)**			
2018	24.3	22.6	25.3	18.8
2019	28.2	21.9	24.6	20.0
2020	28.2	21.9	24.6	20.0
2021	30.4	21.7	24.3	20.4
2022	30.1	21.4	24.0	20.1
2023	31.7	21.1	23.6	19.8
2024	32.1	21.3	23.9	20.0
2025	32.4	21.5	24.1	20.2
2026	32.8	21.8	24.4	20.4
2027	33.1	22.0	24.7	20.7
2028	33.5	22.2	24.9	20.9
2029	33.8	22.5	25.2	21.1
2030	34.2	22.7	25.5	21.3
2031	34.6	23.0	25.7	21.6
2032	35.0	23.2	26.0	21.8
2033	35.3	23.5	26.3	22.0
2034	35.7	23.7	26.6	22.3
2035	36.1	24.0	26.9	22.5
2036	36.5	24.2	27.2	22.8
2037	36.9	24.5	27.4	23.0

20 Year Substation Load Forecast – 1.08% Yearly Growth Low Growth

Device	PEP-T1	VIR-T1	VIR-T2	VIR-T3
Sec. Voltage (kV)	12.5	12.5	12.5	12.5
Rating (MVA)	25.0	25.0	25.0	25.0
2017 Peak (MVA)	20.8	21.8	24.2	19.1
Year	**Forecasted Undiversified Peak (MVA)**			
2018	22.6	22.6	25.3	18.8
2019	22.4	21.9	24.6	20.0
2020	22.5	21.9	24.6	20.0
2021	22.2	21.7	24.3	20.4
2022	22.0	21.4	24.0	20.1
2023	21.7	21.1	23.6	19.8
2024	21.9	21.3	23.9	20.0
2025	22.2	21.5	24.1	20.2
2026	22.4	21.8	24.4	20.4
2027	22.6	22.0	24.7	20.7
2028	22.9	22.2	24.9	20.9
2029	23.1	22.5	25.2	21.1
2030	23.4	22.7	25.5	21.3
2031	23.6	23.0	25.7	21.6
2032	23.9	23.2	26.0	21.8
2033	24.2	23.5	26.3	22.0
2034	24.4	23.7	26.6	22.3
2035	24.7	24.0	26.9	22.5
2036	24.9	24.2	27.2	22.8
2037	25.2	24.5	27.4	23.0

IN THE MATTER OF the *Public Utilities Act,* (the "Act"); and

IN THE MATTER OF an Application by Newfoundland Power Inc. (the "Applicant") for approval to proceed with the construction and purchase of certain improvements and additions to its property pursuant to Section 41(3) of the Act.

AFFIDAVIT

I, Byron Chubbs, of St. John's in the Province of Newfoundland and Labrador, make oath and say as follows:

1. That I am Vice-President, Energy Supply and Planning of Newfoundland Power Inc.
2. To the best of my knowledge, information and belief, all matters, facts and things set out in this Application are true.

SWORN to before me at St. John's
in the Province of Newfoundland and
Labrador this 30th day of January, 2019

Barrister

Byron Chubbs

NEWFOUNDLAND AND LABRADOR

AN ORDER OF THE BOARD OF COMMISSIONERS OF PUBLIC UTILITIES

NO. P.U. ___ (2019)

IN THE MATTER OF THE PUBLIC UTILITIES ACT, R.S.N. 1990, CHAPTER P-47 (THE "ACT")

AND

IN THE MATTER OF AN APPLICATION BY NEWFOUNDLAND POWER INC. (THE"APPLICANT") FOR APPROVAL OF A SUPPLEMENTAL CAPITAL EXPENDITURE FOR THE CONSTRUCTION AND PURCHASE OF CERTAIN IMPROVEMENTS AND ADDITIONS TO ITS PROPERTY PURSUANT TO SECTION 41(3) OF THE ACT.

WHEREAS the Applicant is a corporation duly organized and existing under the laws of the Province of Newfoundland and Labrador, is a public utility within the meaning of the Act, and is also subject to the provisions of the *Electrical Power Control Act, 1994*; and

WHEREAS the Applicant operates transmission lines, distribution lines and substations to deliver electricity to customers throughout its service territory on the island portion of the Province of Newfoundland and Labrador; and

WHEREAS the Applicant's Pepperrell Substation (the "Substation") is a 12.5 kV distribution substation located at the intersection of The Boulevard and East White Hills Road. The Substation's 4 existing distribution feeders serve approximately 3,250 customers; and

WHEREAS a request for service from a customer has increased the forecast load for the Substation's only power transformer to become overloaded if no capital improvements are undertaken; and

WHEREAS the most cost-effective option for continuing to provide safe, reliable electric service to the customers served by the Substation is to add a second transformer and an additional distribution feeder at a cost of $2,642,000; and

WHEREAS the proposed capital expenditures are necessary for the Applicant to provide service and facilities which are reasonably safe and adequate and just and reasonable pursuant to Section 37 of the Act; and

IT IS THEREFORE ORDERED THAT:

Pursuant to Section 41(3) of the Act, the Board approves the capital expenditures in excess of $50,000 associated with the improvements and additions to the Applicant's property as proposed in the Application.

DATED at St. John's, Newfoundland and Labrador, this 30th day of January, 2019.

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_____

G. Cheryl Blundon

Board Secretary