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BY EMAIL, COURIER, RESS

November 15, 2019

Ms. Christine E. Long
Board Secretary
Ontario Energy Board
Suite 2700, 2300 Yonge Street
P.O. Box 2319
Toronto, ON M4P 1E4

Dear Ms. Long,

EB-2019-0165 – Hydro One Networks Inc. Leave to Construct Application - D6V/D7V Transmission Line Refurbishment Project – Application and Evidence

Pursuant to Section 92 of the *Ontario Energy Board Act, 1998* (the "**Act**") Hydro One seeks the Board's approval for an Order or Orders granting leave to refurbish approximately 10 kilometres of transmission line between Guelph North Junction ("JCT") and Fergus JCT.

This line refurbishment is required to ensure that the area continues to receive a safe and reliable supply of electricity.

An electronic copy of this has been filed through the Ontario Energy Board's Regulatory Electronic Submission System (RESS).

Sincerely,

ORIGINAL SIGNED BY PASQUALE CATALANO FOR JOANNE RICHARDSON

Joanne Richardson

Exhibit List

Exh	Tab	Schedule	Attachment	Contents
A				
	1	1		Exhibit List
B				
	1	1		Application
	2	1		Project Overview
	2	1	1	Schematic Diagram
	3	1		Evidence In Support of Need
	4	1		Classification and Categorization
	5	1		Cost Benefit Analysis and Options
	6	1		Quantitative Benefits of the Project
	7	1		Apportioning Project Costs and Risks
	8	1		Network Reinforcement
	9	1		Transmission Rate Impact Assessment
	10	1		Deferral Account Requests
	11	1		Project Schedule
C				
	1	1		Physical Design
	2	1		Maps

Exh	Tab	Schedule	Attachment	Contents
	2	1	1	General Area Map
D				
	1	1		Operational Details
E				
	1	1		Land Matters
	1	1	1	Temporary Access and Temporary Access Road
	1	1	2	Temporary Construction Licence
	1	1	3	Damage Claim
F				
	1	1		System Impact Assessment
	1	1	1	Notification of IESO Approval
	1	1	2	IESO System Impact Assessment
G				
	1	1		Customer Impact Assessment
	1	1	1	Hydro One Customer Impact Assessment

ONTARIO ENERGY BOARD

IN THE MATTER OF the *Ontario Energy Board Act, 1998*;

AND IN THE MATTER OF an Application by Hydro One Networks Inc. pursuant to s. 92 of the *Act* for an Order or Orders granting leave to refurbish the existing transmission line D6V/D7V ("**D6V/D7V Transmission Line Refurbishment Project**" or the "**D6V/D7V Project**") between Guelph North Junction and Fergus Transmission Station in Centre Wellington area.

And in the matter of an Application by Hydro One Networks Inc. pursuant to s. 97 of the Act for an Order granting approval of the forms of the agreement offered or to be offered to affected landowners.

And in the matter of an Application by Hydro One Networks Inc. pursuant to s. 21 of the Act for an Order that this proceeding be disposed of without a hearing.

APPLICATION

1. The Applicant is Hydro One Networks Inc. ("**Hydro One**"), a subsidiary of Hydro One Inc. The Applicant is an Ontario corporation with its head office in the City of Toronto. Hydro One carries on the business, among other things, of owning and operating transmission facilities within Ontario.
2. Hydro One hereby applies to the Ontario Energy Board (the "**Board**" or "**OEB**") pursuant to s. 92 of the *Ontario Energy Board Act, 1998* (the "**Act**") for an Order or Orders granting leave to refurbish approximately 10 kilometres of transmission line section between Guelph North Junction ("JCT") and Fergus JCT. This line refurbishment is required to ensure that the area continues to receive a safe and reliable supply of electricity.

3. The proposed D6V/D7V Project will refurbish approximately 10 km of 230 kilovolt ("kV") double circuit ("**D6V/D7V**") between Guelph North JCT and Fergus JCT. An overview map of this area is provided at **Exhibit C, Tab 2, Schedule 1, Attachment 1** and a schematic diagram of the Project can be found at **Exhibit B, Tab 2, Schedule 1, Attachment 1**.

4. The proposed in-service date for the D6V/D7V Project is the end of December 2020, assuming a construction commencement date of June 2020. A project schedule is provided at **Exhibit B, Tab 11, Schedule 1**.

5. The D6V/D7V Project will utilize the existing transmission corridor. As a result, this Project will not require any new permanent property rights. Should the need arise, temporary construction rights for access or staging areas may be required for the duration of the construction period of the D6V/D7V Project. Further information on land related matters is found in **Exhibit E, Tab 1, Schedule 1**.

6. The line section has reached end of life per conductor laboratory testing and requires refurbishment. Accordingly, this Project has been identified as a non-discretionary sustainment project in **Exhibit B, Tab 4, Schedule 1**.

7. The IESO has also provided an expedited and final System Impact Assessment ("**SIA**"). The SIA concludes that the Project is expected to have no material adverse impact on the reliability of the integrated power system. The SIA isprovided as **Exhibit F, Tab 1, Schedule 1, Attachment 1** of Hydro One's prefiled evidence.

8. The total cost of the transmission line facilities for which Hydro One is seeking approval is approximately $8.6 million. The details pertaining to these costs are provided at **Exhibit B, Tab 7, Schedule 1, Table 1**. Project economics, as filed in **Exhibit B, Tab 9, Schedule 1**, show that the D6V/D7V Project will result in no material impact ($0.00/kw/month) in the network connection pool rate and no impact (0.00%) on the overall average Ontario consumer's electricity bill.

9. This Application also seeks approval of the forms of the agreement offered or to be offered to affected landowners, pursuant to s. 97 of the Act, if temporary construction rights for access or staging areas are required for the duration of the construction period. The agreements are in the same form as previously approved in prior Hydro One Networks leave to construct proceedings. The agreements can be found as attachments to **Exhibit E, Tab 1, Schedule 1**.

10. The Application is supported by written evidence that includes details of the Applicant's proposal for the transmission line. The written evidence is prefiled and may be amended from time to time prior to the Board's final decision on this Application.

11. Given the information provided in the prefiled evidence, Hydro One submits that the Project is in the public interest. The Project meets the need of the transmission system and improves quality of service and reliability with no material impact on price.

12. Hydro One is consenting that this proceeding be disposed of without a hearing pursuant to section 21(4) of the OEB Act. As is documented in the Customer Impact Assessment (**"CIA"**), filed at **Exhibit G, Tab 1, Schedule 1, Attachment 1**, there are no directly connected customers that are adversely affected by this Project. This, in concert with the aforementioned results of the SIA and that the Project will have no material impact on the network connection pool rate or on the overall average Ontario consumer's electricity bill, Hydro One concludes that this Project will not adversely affect customers in any material way.

13. This position is further supported by the fact that this Project is, in effect, a sustainment project and would not trigger the need for leave to construct, i.e., it would be a like-for-like sustainment solution to replace end-of-life facilities. Leave of the Board is required, however, because Hydro One is pursuing a technical solution that will minimize transmission line losses (estimated to result in customer savings of approximately $70k per annum) by utilizing a larger conductor size. Minimizing transmission line losses was guidance provided to

Hydro One in its most recently approved Transmission Rates Application (EB-2016-0160) by the Board. The installation of a larger conductor will increase the like-for-like alternative cost by $0.8M, which is below Hydro One's materiality threshold. Further information on the cost-benefit analysis of the alternatives considered can be found at **Exhibit B, Tab 5, Schedule 1**.

14. If the OEB determines that disposing of this proceeding without a hearing is appropriate, Hydro One requests that this Application be decided by an employee of the OEB who has been delegated this authority pursuant to section 6 of the OEB Act and that a decision be rendered on this Application within 90 days. Such a decision will ensure that the in-service schedule of these facilities, as provided in **Exhibit B, Tab 11, Schedule 1,** is met.

15. Hydro One requests that a copy of all documents filed with the Board be served on the Applicant and the Applicant's counsel, as follows:

a) The Applicant:

Linda Gibbons
Sr. Regulatory Coordinator
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b) The Applicant's counsel:

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Project Overview Documents

The Hydro One 230kV double circuit transmission line D6V/D7V is 84 km long and connects Orangeville TS in Dufferin County to Detweiler TS in Waterloo County. It provides bulk power supply to the City of Guelph, Centre Wellington Township, and Town of Waterloo.

The conductor on a section of the D6V/D7V line between Guelph North JCT and Fergus JCT has reached end-of-life as per conductor laboratory testing and as a result line refurbishment is recommended for this section of the line. This line refurbishment is required to ensure that the area continues to receive a safe and reliable supply of electricity.

This project is identified in the Kitchener-Waterloo-Cambridge-Guelph (KWCG) area Need Assessment Report[1] and the KWCG Study Team has recommended that this line section be refurbished.

Hydro One's proposed D6V/D7V Project will refurbish a section of the D6V/ D7V double circuit transmission line replacing the existing 795 kcmil conductor with larger 1443 kcmil conductor. The purpose of using the larger size conductor is to take advantage of the conductor replacement opportunity to reduce transmission line losses.

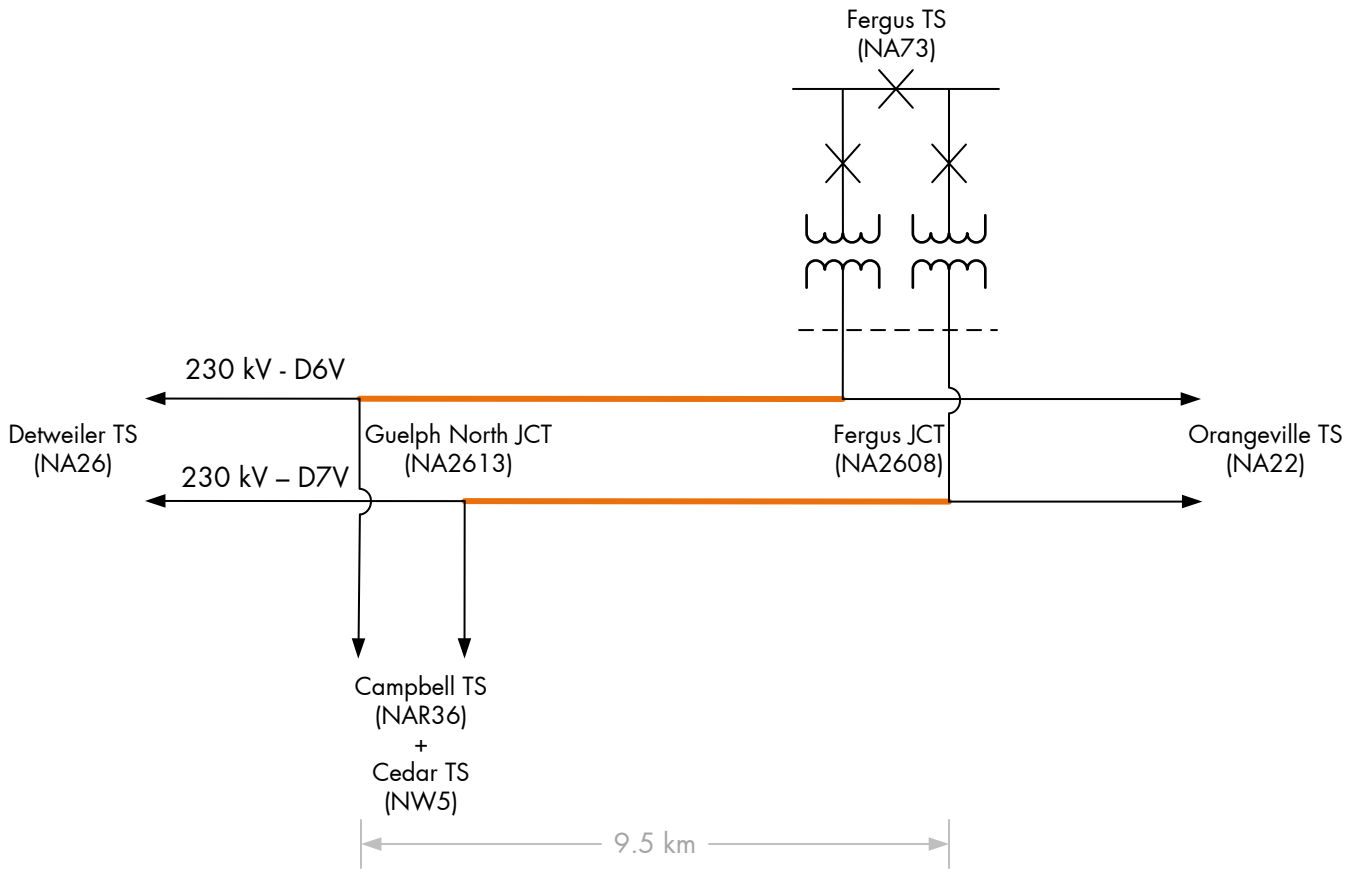
This application seeks OEB approval to allow Hydro One to refurbish its transmission facilities, and specifically to refurbish approximately 10 km of existing 230 kV transmission line from Guelph North JCT to Fergus JCT and Fergus TS.

[1] HONI Report – "Need Assessment Report – Kitchener –Waterloo-Cambridge-Guelph Region", 18 Dec 2018. Available at: https://www.hydroone.com/abouthydroone/CorporateInformation/regionalplans/kitchenerwaterloocambridgeguelph/Documents/KWCG%20Needs%20Assessment%202018.pdf

Exhibit B, Tab 2, Schedule 1, Attachment 1 schematically depicts the approximately 10 km section which will be refurbished as well as the location of the connecting transmission stations. A map showing the geographic location of the proposed facilities is provided as **Exhibit B, Tab 2, Schedule 1, Attachment 2**.

Schematic Diagram

230 kV double circuit D6V/D7V between Guelph North JCT and Fergus JCT



Legend

- Transmission line
- Transmission line refurbishment
- Transformer
- Breaker
- Station Fence

Evidence In Support of Need

This Project is a Hydro One Line refurbishment project where work to replace transmission line facilities that are nearing end of life.

The 230 kV D6V/D7V double circuit line is about 84 km long and is part of the bulk power system supplying the Waterloo and Guelph area 230 kV and South Central Guelph 115 kV loads. There is a continuing need for this line to supply the area.

The D6V/D7V line built in 1950 is currently 70 years old. The section of the line between Fergus J=CT and Guelph North JCT (about 9.5 km) is strung with 795 kcmil ACSR conductor.

These conductors were manufactured with aluminum strands surrounding a steel strands core. The steel core strands, which supply the majority of the conductor's strength, are galvanized. The galvanized coating wears off over the decades due to weather, strand movement and corrosion. Once the protective galvanized coating has worn off the exposed steel strands will corrode quickly and lose their strength and ductility. Conductors with loss of ductility in the steel strands are susceptible to failure from movements caused by wind, ice and changes in conductor tension.

Conductor tests reveal that the tensile strength and ductility on this line have deteriorated to the extent that the conductor has reached its end-of-life. The conductor's steel core has lost the majority of its galvanizing and has rusted badly, making the conductor susceptible to failure from loading caused by wind and ice. In addition, the insulators, hardware and shieldwire on this line are also approaching end-of-life.

The D6V/D7V conductor was identified as being end of life based on an assessment of the line's structures, shieldwire, U-bolts and insulators. The KWCG Study team also recommended refurbishment of the line in the 2018 Need Assessment report for the KWCG region[1].

Consistent with the OEB direction[2] for Hydro One to explore opportunities for economically reducing transmission line losses, Hydro One investigated options to complete the sustainment work including investigating the use of the larger 1443 kcmil conductor for the D6V/D7V line refurbishment project.

This Project is a reflection of the investments that can be made to address transmission line losses that is part of the settlement proposal filed with the OEB in Hydro One's 2020-2022 Transmission Custom IR Application[3].

[1] HONI Report – "Need Assessment Report – Kitchener –Waterloo-Cambridge-Guelph Region", 18 Dec 2018. Available at: https://www.hydroone.com/abouthydroone/CorporateInformation/regionalplans/kitchenerwaterloocambridgeguelph/Documents/KWCG%20Needs%20Assessment%202018.pdf

[2] OEB Decision and Order EB-2016-0160, 28 September 2017 Page 32

[3] EB-2019-0082 – Exhibit B, Tab 1, Schedule 1 – TSP Section 1.8 Attachment 2 – October 17, 2019

Project Classification and Categorization

Project Classification

Per the Board's filing guidelines, rate regulated projects are classified into three groups based on their purpose.

- Development projects are those which
  - (i) provide an adequate supply capacity and/or maintain an acceptable or prescribed level of customer or system reliability for load growth or for meeting increased stresses on the system; or
  - (ii) enhance system efficiency such as minimizing congestion on the transmission system and reducing system losses.
- Connection projects are those which provide connection of a load or generation customer or group of customers to the transmission system.
- Sustainment projects are those which maintain the performance of the transmission network at its current standard or replace end-of-life facilities on a "like for like" basis.

Based on the above criteria, the Project is predominantly a sustainment project to replace end of life line components to maintain reliability and safety. The project does have a development component, specifically with respect to the larger conductor being utilized for transmission line loss reduction purposes, however this is only $0.8M greater than a like-for-like sustainment.

Project Categorization

The Board's filing guidelines require that projects be categorized to distinguish between a project that is a "must-do", which is beyond the control of the applicant ("non-

discretionary"), from a project that is at the discretion of the applicant ("discretionary"). Non-discretionary projects may be triggered or determined by such things as:

a) mandatory requirement to satisfy obligations specified by regulatory organizations including NPCC/NERC or by the Independent Electricity System Operator (IESO);
b) a need to connect new load (of a distributor or large user) or new generation connection;
c) a need to address equipment loading or voltage/short circuit stresses when their rated capacities are exceeded;
d) projects identified in a provincial government approved plan;
e) projects that are required to achieve provincial government objectives that are prescribed in governmental directives or regulations; and
f) a need to comply with direction from the Ontario Energy Board in the event it is determined that the transmission system's reliability is at risk.

Based upon the above criteria, the Project is considered non-discretionary. The Project is primarily being undertaken to address the end of life line components of D6V/D7V in order to maintain reliable supply and public safety in Guelph area. The Project does have a discretionary component, specifically with respect to the larger conductor being utilized for transmission line loss reduction purposes, however this is only $0.8M greater than a like-for-like non-discretionary sustainment project.

Categorization and Classification

		Project Need	
		Non-discretionary	Discretionary
Project Class	Sustainment	**X**	

Cost Benefit Analysis and Options

TRANSMISSION ALTERNATIVES

Hydro One considered four alternative conductor sizes for replacement of the 795 kcmil ACSR conductor on the Fergus Jct. to Guelph North Jct section of the 230 kV double circuit transmission line D6V/D7V.

Alternative 1 – Replace the existing 795 kcmil ACSR conductor with new 795 kcmil ACSR conductor. This is the like for like alternative.

Alternative 2 – Replace the existing 795 kcmil ACSR conductor with new 997.2 kcmil ACSR TW conductor. This conductor has trapezoidal shaped wire and has the same external diameter as the existing 795 kcmil conductor but lower resistance and higher ampacity. The cost of this alternative is similar to that of Alternative 1.

Alternative 3 – Replace the existing 795 kcmil ACSR conductor with new 1192 kcmil ACSR conductor. This conductor is larger than the original conductor with lower resistance and higher ampacity than Alternative 2. This alternative requires tower structure strengthening to accommodate the larger and heavier conductor.

Alternative 4– Replace the existing 795 kcmil ACSR conductor with new 1443 kcmil ACSR/TW conductor. This conductor is similar to that in Alternative 3 but uses trapezoidal wire strands and has the same external diameter. It has still lower resistance and higher ampacity compared to Alternative 3. It requires the same amount of structure strengthening as Alternative 3.

A comparison of the key characteristics of the four conductors is given in Table 1 below.

Table 1 - Key Characteristics of Alternative Conductors

Properties	Alt. #1	Alt. #2	Alt. #3	Alt. #4
Conductor size (kcmil)	795	997.2	1192.5	1443.7
Conductor Material	ACSR	ACSR/TW	ACSR	ACSR/TW
AC Resistance ohm/km @25°C	0.080033	0.065244	0.056296	0.046454
Outside Diameter (mm)	28.14	28.14	33.98	33.98
Ampacity (Normal/Emergency)	840/1090 A	930/1220 A	1060/1400 A	1160/1530 A

Final conductor selection has been made by comparing the extra cost of installing the larger conductor and taking into consideration the transmission line loss savings resulting from the reduced resistance that is obtained by the larger sized conductor. Table 2 compares the costs of the alternatives.

Table 2 - Comparison of the Alternatives

	Alt. #1	Alt. #2	Alt. #3	Alt. #4
Cost	$7.8M	$8.0M	$8.5M	**$8.6M**
Incremental cost[1]	--	$203,490	$715,070	**$800,000**
Annual Losses (MWH)[2]	6,828	5,565	4,801	**3,997**
Annual Cost of losses[3]	$163,359	$133,154	$114,873	**$95,625**
Savings due to reduced Losses compared to Alt. #1		$30,205	$48,487	**$67,734**
Breakeven period	--	6.7	14.7	**11.8**

Notes
1. Includes all costs associated with any structure modifications as well
2. Losses based on 2018 flows
3. Losses calculated based on 2018 Hourly Ontario Energy Price of $23.925/MWH

As shown in Table 2 by utilizing a simple breakeven analysis, the extra $0.8M in cost for installing the larger size conductor is offset, in just under 12 years, by savings in transmission line losses. Given the life expectancy of the asset (over 70 years), Hydro One is recommending and requesting approval to proceed with Alternative 4. Alternative 4 is intended to address the planned sustainment activities and also benefit ratepayers by implementing a cost-effective alternative that will minimize transmission line losses.

Quantitative Benefits of the Project

The D6V/D7V Project encompasses the following quantitative and/or qualitative benefits:

Reduces losses in 10km section of transmission line D6V/D7V

In response to previous OEB direction to explore opportunities to reduce transmission line losses[1], Hydro One investigated the use of a larger size conductor to complete this line refurbishment project. The new plan to use 1443 kcmil conductor instead of the existing 795 kcmil conductor results in a 41% reduction of transmission losses on the Fergus Jct to Guelph North Jct section of the 230kV double circuit transmission line D6V/D7V. Further information on the transmission line losses is discussed in **Exhibit B, Tab 5, Schedule 1**.

Increase Thermal Rating of 10km section of transmission line D6V/D7V

This investment will increase the thermal limits of a 10km line section (Fergus Jct to Guelph North Jct) to a minimum summer continuous rating of 1160A.

[1] EB-2016-0160 – Decision and Order -

Apportioning Project Costs & Risks

The estimated capital cost of the D6V/D7V project is $7.73M, including overheads and capitalized interest, as shown below. Removals are $0.82M for a total project cost (OM&A and Capital) of approximately $8.55M[1].

Table 1: Project Cost

	Estimated Cost ($000's)
Materials	2,085
Labour	2,534
Equipment Rental & Contractor Costs	1,305
Sundry	127
Contingencies	615
Overhead [2]	751
Capitalized Interest [3]	317
Total Line Capital Work	**$7,730[4]**

The cost of the work provided above allows for the schedule of approval, design and construction activities provided in **Exhibit B, Tab 11, Schedule 1**.

[1] For ease of reference, the cost is rounded to $8.6M in all other exhibits of the Application with exception to the Project Economics evidence provided at Exhibit B, Tab 9, Schedule 1.

[2] Overhead costs allocated to the project are for corporate services costs. These costs are charged to capital projects through a standard overhead capitalization rate. As such, they are considered "Indirect Overheads".

[3] Capitalized Interest is calculated using the Board's approved interest rate methodology (EB-2016-0160) to the Project's forecast monthly cash flow and carrying forward closing balances from the preceding month.

[4] Please note that the line work also includes an additional OM&A expenditure of $0.82M for removals which is not accounted for in the total capital line work in the table above.

1.0 RISKS AND CONTINGENCIES

As with most projects, there are risks associated with estimating project costs. Hydro One's cost estimate includes an allowance for contingencies in recognition of such risks.

The most probable project risks are outlined below. These risks are the major contributors to the total contingency recommended for this project.

- **Outage constraints** – There is a risk that securing required transmission system outages may not be supported by customers in the area, or that the required transmission system outages may conflict with those required for other projects. Both these factors could result in schedule delays and increased costs. Although Hydro One routinely schedules transmission system outages in conjunction with other planned projects, unplanned outages, unplanned work, and/or changes to the schedule of other projects and external approvals may potentially impact transmission system outage availability for this project. This could result in potential schedule delays and increased costs.
- **Adverse Weather** – Although a reasonable amount of adverse weather is expected during the construction period, there is a risk that a significant amount of adverse weather (i.e., rain or high winds) could result in schedule delays and increased costs.
- **Procurement** – There is a risk that materials procured for the project may not meet specifications, which could cause schedule delays and increased costs.
- **Archaeological** – Although not anticipated, any significant archaeological finds could result in schedule delays and increased costs.

Cost contingencies that have not been included, due to the unlikelihood or uncertainty of occurrence, include:

- Labour disputes;
- Safety or environmental incidents;

- Significant changes in costs of materials since the estimate preparation, and
- Any other unforeseen and potentially significant event/occurrence.

2.0 COSTS OF COMPARABLE PROJECTS

The OEB Filing Requirements for Electricity Transmission and Distribution Applications, Chapter 4, Section 4.3.2.9 requires the Applicant to provide, the cost of similar projects constructed by the Applicant for baseline cost comparisons. Table 2 below compares this project with two other recent line refurbishment projects in southwestern Ontario.

The projects compared projects are both associated with 115 kV circuits. The D6V/D7V Project is associated with a 230 kV circuit. Any incremental costs incurred for a 230 kV line are attributed to increased material costs as the quantity of insulators is greater and normally the conductor sizes are larger for 230 kV lines.

1 **Table 2: Costs of Comparable Line Projects**

AR No.	Description	Cost per km	Total Cost	In Service Date
22141	D9HS/D10S – Decew TS x Glendale TS Project features: • Area: Niagara • Double parallel 115kV circuit: Length 9 km • Scope: includes modification of existing lattice steel structures, conductor replacement, OPGW installation, and tower coating/cleaning	$700/km Escalated to 2020 $788/km	Actuals: $6.3M Escalated to 2020 $7.9M	Dec. 2015
24265	B3 / B4 – Horning Mountain x Glanford JCT Project features: • Area: Hamilton/Niagara • 115 kV, Double Circuit: Length 11 km • Scope: Line refurbishment (includes modification of existing lattice steel structures, conductor and insulator replacement, shield-wire replacement with OPGW shield-wire, hardware replacement and foundation repair). • 115kV by-pass line. * Excludes additional items unique to this project (i.e., line by-pass, excessive access roads, crane/pulling pads, installation of 17 additional structures)	*$900/km	* $9.9M	June 2020
	This Project			
24275	D6V / D7V - Guelph North JCT x Fergus JCT Project features: • Area: South Western Ontario • 230 kV, Double Circuit Length 9.44 km • Scope: Line refurbishment (includes modifications to existing lattice steel structures, conductor and insulator replacement, replacement of shield-wire with OPGW shield-wire, and hardware replacement).	$910/km	$ 8.6M	Dec 2020

Connection Projects Requiring Network Reinforcement

This is not a connection project, therefore this section is not required.

Transmission Rate Impact Assessment

1.0 ECONOMIC FEASIBILITY

Hydro One's proposed D6V/D7V Transmission Line Refurbishment Project ("**D6V/D7V Project**") will refurbish the D6V and D7V circuit. Hydro One will refurbish approximately 10km of existing 230 kV transmission line from Guelph North JCT to Fergus JCT and Fergus TS. The costs for the refurbished circuits will be included in the Network and Line Connection pools for cost classification purposes and not allocated to any individual customer. See **Exhibit B, Tab 1, Schedule 1**, for information on the proposed work. No customer contribution is required for this project.

There are no incremental operating and maintenance costs as a result of the proposed project. The project will also have no impact on provincial peak load resulting in zero incremental network and line revenue over the 25-year evaluation period.

Transmission Pool Costs

$M	Exhibit B-7-1 Capital Costs	Removal Costs	Total Pool Costs	Net Present Value
Network Pool	5.20	0.55	5.75	(4.95)
Line Connection Pool	2.53	0.27	2.80	(2.40)
Project Cost	**$7.73**	**$0.82**	**$8.55**	

A 25-year discounted cash flow analysis of the network pool work is provided in Table 1. The results show that based on the estimated initial cost of $5.75[1] million, plus the assumed impact on the future capital cost allowance and Hydro One corporate income tax, this capacity enhancement project will have a negative net present value of $4.95 million. This amount will be fully recovered via the network rates.

A 25-year discounted cash flow analysis of the line pool work is provided in Table 2. The results show that based on the estimated initial cost of $2.80[2] million, plus the assumed impact on the future capital cost allowance and Hydro One corporate income tax, this capacity enhancement project will have a negative net present value of $2.40 million. This amount will be fully recovered via the line connection rates.

2.0 COST RESPONSIBILITY

Network Pool and Line connection Pool

The Hydro One D6V/D7V double circuit transmission line is a 230kV dual function transmission line in Central Ontario. The line carries network flows between Orangeville TS and Detweiler TS and supplies customer loads from Fergus TS, Campbell TS, Scheifele MTS and Waterloo North MTS. Based on the cost allocation methodology as approved by the Board[3]. As detailed in in Hydro One's most recent transmission rate filing[4], these lines are allocated 67% to the Network Pool and 33% to the Line Connection Pool.

[1] Initial costs of $5.75 million include $5.20 million of up front capital costs plus $0.55 million cost of removals

[2] Initial costs of $2.80 million include $2.53 million of up front capital costs plus $0.27 million cost of removals

[3] EB-2016-0160

[4] EB-2019-0082, Exhibit I, Tab 10, Schedule 50, Page 2 of 2, Filed August 2, 2019

3.0 RATE IMPACT ASSESSMENT

The analysis of the Network Connection pool rate impacts has been carried out on the basis of Hydro One's transmission revenue requirement for 2019, and the most recently approved Ontario Transmission Rate Schedules. The Network and Line Connection pools revenue requirements would be affected by the line refurbishment based on the project cost allocation.

Network Pool

Based on the project's initial cost of $5.75 million and the associated network pool incremental cash flows, there will be a slight change in the network pool revenue requirement once the project's impacts are reflected in the transmission rate base at the projected in-service date of November 2020. Over a 25-year time horizon, this slight change in the network pool revenue requirement is not material enough to incrementally impact the Provincial Network rate, which was assessed at the approved $3.84/kW/month. The maximum revenue shortfall related to the proposed network facilities will be $0.42 million in the year 2027. The detailed analysis illustrating the calculation of the incremental network revenue shortfall and rate impact is provided in Table 3 below.

Line Connection Pool

Based on the project's initial cost of $2.80 million and the associated line pool incremental cash flows, there will be a slight change in the line pool revenue requirement once the project's impacts are reflected in the transmission rate base at the projected in-service date, November 2020. Over a 25-year time horizon, this slight change in the line pool revenue requirement is not material enough to incrementally impact the Provincial Line Connection rate, which was assessed at the approved $0.96/kW/month. The maximum revenue shortfall related to the proposed network facilities will be $0.20 million in the year 2026. The detailed analysis illustrating the

calculation of the incremental line revenue shortfall and rate impact is provided in Table 4 below.

Impact on Typical Residential Customer

Based on the load forecast, initial capital costs and ongoing maintenance costs, adding the costs of the refurbishment of the required facilities to the network and line connection pools will cause no change in a typical residential customer's rates under the Regulated Price Plan (RPP).

Table 2: DCF Analysis, Line Pool, page 1

Facility Name: D6V/D7V
Description: D6V/D7V
Customer:

			In-Service Date	<------- Project year ended - annualized from In-Service Date ------->											
		Month	Nov-25	Nov-25	Nov-25	Nov-25	Nov-25	Nov-25	Nov-25	Nov-25	Nov-25	Nov-25	Nov-25	Nov-25	Nov-25
		Year	**2020**	**2021**	**2022**	**2023**	**2024**	**2025**	**2026**	**2027**	**2028**	**2029**	**2030**	**2031**	**2032**
			0	*1*	*2*	*3*	*4*	*5*	*6*	*7*	*8*	*9*	*10*	*11*	*12*
Revenue & Expense Forecast															
Load Forecast (MW)				0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Load adjustments (MW)				0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
				0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Tariff Applied ($/kW/Month)				0.96	0.96	0.96	0.96	0.96	0.96	0.96	0.96	0.96	0.96	0.96	0.96
Incremental Revenue - $M				0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Removal Costs - $M			(0.3)												
On-going OM&A Costs - $M			0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Municipal Tax - $M				(0.0)	(0.0)	(0.0)	(0.0)	(0.0)	(0.0)	(0.0)	(0.0)	(0.0)	(0.0)	(0.0)	(0.0)
Net Revenue/(Costs) before taxes - $M			(0.3)	(0.0)	(0.0)	(0.0)	(0.0)	(0.0)	(0.0)	(0.0)	(0.0)	(0.0)	(0.0)	(0.0)	(0.0)
Income Taxes			0.1	0.1	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Operating Cash Flow (after taxes) - $M			(0.2)	0.1	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
		Cumulative PV @ 5.59%													
PV Operating Cash Flow (after taxes) - $M	**(A)**	**0.1**	**(0.2)**	**0.1**	**0.0**	**0.0**	**0.0**	**0.0**	**0.0**	**0.0**	**0.0**	**0.0**	**0.0**	**0.0**	**0.0**
Capital Expenditures - $M															
Upfront - capital cost before overheads & AFUDC			(2.1)												
- Overheads			(0.3)												
- AFUDC			(0.1)												
Total upfront capital expenditures			**(2.5)**												
On-going capital expenditures				0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
PV On-going capital expenditures			0.0												
Total capital expenditures - $M			**(2.5)**												
Capital Expenditures - $M															
PV CCA Residual Tax Shield - $M			**0.0**												
PV Working Capital - $M			**0.0**												
PV Capital (after taxes) - $M	**(B)**	**(2.5)**	**(2.5)**												
Cumulative PV Cash Flow (after taxes) - $M	**(A) + (B)**	**(2.4)**	**(2.7)**	**(2.6)**	**(2.6)**	**(2.6)**	**(2.5)**	**(2.5)**	**(2.5)**	**(2.5)**	**(2.5)**	**(2.5)**	**(2.4)**	**(2.4)**	**(2.4)**

Discounted Cash Flow Summary

Economic Study Horizon - Years:		**25**
Discount Rate - %		**5.59%**
		Before Cont
		$M
PV Incremental Revenue		0.0
PV OM&A Costs		(0.3)
PV Municipal Tax		(0.1)
PV Income Taxes		0.1
PV CCA Tax Shield		0.4
PV Capital - Upfront	(2.5)	
Add: PV **Capital Contribution**	**0.0**	(2.5)
PV Capital - On-going		0.0
PV Working Capital		0.0
PV Surplus / (Shortfall)		**(2.4)**
Profitability Index*		**0.0**

Notes:
*PV of total cash flow, excluding net capital expenditure & on-going capital & proceeds on disposal / PV of net capital expenditure & on-going capital & proceeds on disposal

Other Assumptions

In-Service Date:	25-Nov-20
Payback Year:	2045
No. of years required for payback:	25

Table 2: DCF Analysis, Line Pool, page 2

Facility Name:	D6V/D7V													
Description:	D6V/D7V													
Customer:														
		<------- Project year ended - annualized from In-Service Date -------->												
Month		Nov-25	Nov-25	Nov-25	Nov-25	Nov-25	Nov-25	Nov-25	Nov-25	Nov-25	Nov-25	Nov-25	Nov-25	Nov-25
Year		2033	2034	2035	2036	2037	2038	2039	2040	2041	2042	2043	2044	2045
		13	14	15	16	17	18	19	20	21	22	23	24	25
Revenue & Expense Forecast														
Load Forecast (MW)		0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Load adjustments (MW)		0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
		0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Tariff Applied ($/kW/Month)		0.96	0.96	0.96	0.96	0.96	0.96	0.96	0.96	0.96	0.96	0.96	0.96	0.96
Incremental Revenue - $M		0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Removal Costs - $M														
On-going OM&A Costs - $M		0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Municipal Tax - $M		(0.0)	(0.0)	(0.0)	(0.0)	(0.0)	(0.0)	(0.0)	(0.0)	(0.0)	(0.0)	(0.0)	(0.0)	(0.0)
Net Revenue/(Costs) before taxes - $M		(0.0)	(0.0)	(0.0)	(0.0)	(0.0)	(0.0)	(0.0)	(0.0)	(0.0)	(0.0)	(0.0)	(0.0)	(0.0)
Income Taxes		0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Operating Cash Flow (after taxes) - $M		0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	(0.0)
PV Operating Cash Flow (after taxes) - $M	**(A)**	**0.0**	**0.0**	**0.0**	**0.0**	**0.0**	**0.0**	**0.0**	**0.0**	**0.0**	**0.0**	**0.0**	**0.0**	**(0.0)**
Capital Expenditures - $M														
Upfront - capital cost before overheads & AFUDC														
- Overheads														
- AFUDC														
Total upfront capital expenditures														
On-going capital expenditures		0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
PV On-going capital expenditures														
Total capital expenditures - $M														
Capital Expenditures - $M														
PV CCA Residual Tax Shield - $M														
PV Working Capital - $M														
PV Capital (after taxes) - $M	**(B)**													
Cumulative PV Cash Flow (after taxes) - $M	**(A) + (B)**	**(2.4)**	**(2.4)**	**(2.4)**	**(2.4)**	**(2.4)**	**(2.4)**	**(2.4)**	**(2.4)**	**(2.4)**	**(2.4)**	**(2.4)**	**(2.4)**	**(2.4)**

Table 3: Revenue Requirement and Network Pool Rate Impact, page 1

Revenue Requirement and Network Pool Rate Impact **(Before Capital Contribution)**

D6V/D7V		Project YE 25-Nov 2021	25-Nov 2022	25-Nov 2023	25-Nov 2024	25-Nov 2025	25-Nov 2026	25-Nov 2027	25-Nov 2028	25-Nov 2029	25-Nov 2030	25-Nov 2031	25-Nov 2032
Calculation of Incremental Revenue Requirement ($000)		1	2	3	4	5	6	7	8	9	10	11	12
In-service date	25-Nov-20												
Capital Cost	5,202												
Less: Capital Contribution Required	-												
Net Project Capital Cost	5,202												
Average Rate Base		2,549	5,046	4,942	4,838	4,734	4,630	4,526	4,422	4,318	4,214	4,110	4,006
Incremental OM&A Costs		0	0	0	0	0	0	0	0	0	0	0	0
Grants in Lieu of Municipal tax		20	20	20	20	20	20	20	20	20	20	20	20
Depreciation		104	104	104	104	104	104	104	104	104	104	104	104
Interest and Return on Rate Base		161	319	312	305	299	292	286	279	273	266	259	253
Income Tax Provision		(154)	(29)	(20)	(11)	(4)	3	9	15	20	24	29	32
REVENUE REQUIREMENT PRE-TAX		**130**	**413**	**416**	**418**	**419**	**419**	**419**	**418**	**416**	**414**	**412**	**409**
Incremental Revenue		0	0	0	0	0	0	0	0	0	0	0	0
SUFFICIENCY/(DEFICIENCY)		**(130)**	**(413)**	**(416)**	**(418)**	**(419)**	**(419)**	**(419)**	**(418)**	**(416)**	**(414)**	**(412)**	**(409)**
	Base Year												
Network Pool Revenue Requirement including sufficiency/(deficiency)	953,469	953,599	953,882	953,885	953,887	953,888	953,888	953,888	953,887	953,885	953,883	953,881	953,878
Network MW	249,176	249,176	249,176	249,176	249,176	249,176	249,176	249,176	249,176	249,176	249,176	249,176	249,176
Network Pool Rate ($/kw/month)	3.83	3.83	3.83	3.83	3.83	3.83	3.83	3.83	3.83	3.83	3.83	3.83	3.83
Increase/(Decrease) in Network Pool Rate ($/kw/month), relative to base year		0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
RATE IMPACT relative to base year		**0.00%**	**0.00%**	**0.00%**	**0.00%**	**0.00%**	**0.00%**	**0.00%**	**0.00%**	**0.00%**	**0.00%**	**0.00%**	**0.00%**

Assumptions

Incremental OM&A		Years 1 to 5 0.98% of Initial Capital each year; Years 6 to 15 1.95% of Initial Captial each year; Years 16 to 25 2.44% of Initial Capital each year.
Grants in Lieu of Municipal tax	0.38%	Transmission system average
Depreciation	2.00%	Reflects 50 year average service life for towers, conductors and station equipment, excluding land
Interest and Return on Rate Base	6.31%	Includes OEB-approved ROE of 9%, 2.29% on ST debt, and 4.68% on LT debt. 40/4/56 equity/ST debt/ LT debt split
Income Tax Provision	26.50%	2018 federal and provincial corporate income tax rate
Capital Cost Allowance	8.00%	100% Class 47 assets

Table 1: Revenue Requirement and Network Pool Rate Impact, page 2

Revenue Requirement and Network Pool Rate Impact **(Before Capital Contribution)**

D6V/D7V		25-Nov 2033	25-Nov 2034	25-Nov 2035	25-Nov 2036	25-Nov 2037	25-Nov 2038	25-Nov 2039	25-Nov 2040	25-Nov 2041	25-Nov 2042	25-Nov 2043	25-Nov 2044	25-Nov 2045
Calculation of Incremental Revenue Requirement ($000)		13	14	15	16	17	18	19	20	21	22	23	24	25
In-service date	25-Nov-20													
Capital Cost	5,202													
Less: Capital Contribution Required	-													
Net Project Capital Cost	5,202													
Average Rate Base		3,902	3,798	3,694	3,590	3,486	3,382	3,278	3,173	3,069	2,965	2,861	2,757	2,653
Incremental OM&A Costs		0	0	0	0	0	0	0	0	0	0	0	0	0
Grants in Lieu of Municipal tax		20	20	20	20	20	20	20	20	20	20	20	20	20
Depreciation		104	104	104	104	104	104	104	104	104	104	104	104	104
Interest and Return on Rate Base		246	240	233	227	220	213	207	200	194	187	181	174	167
Income Tax Provision		35	38	41	43	45	47	48	49	50	51	52	52	53
REVENUE REQUIREMENT PRE-TAX		**405**	**402**	**398**	**393**	**389**	**384**	**379**	**373**	**368**	**362**	**356**	**350**	**344**
Incremental Revenue		0	0	0	0	0	0	0	0	0	0	0	0	0
SUFFICIENCY/(DEFICIENCY)		**(405)**	**(402)**	**(398)**	**(393)**	**(389)**	**(384)**	**(379)**	**(373)**	**(368)**	**(362)**	**(356)**	**(350)**	**(344)**
	Base Year													
Network Pool Revenue Requirement including sufficiency/(deficiency)	953,469	953,875	953,871	953,867	953,862	953,858	953,853	953,848	953,842	953,837	953,831	953,825	953,819	953,813
Network MW	249,176	249,176	249,176	249,176	249,176	249,176	249,176	249,176	249,176	249,176	249,176	249,176	249,176	249,176
Network Pool Rate ($/kw/month)	3.83	3.83	3.83	3.83	3.83	3.83	3.83	3.83	3.83	3.83	3.83	3.83	3.83	3.83
Increase/(Decrease) in Network Pool Rate ($/kw/month), relative to base year		0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
RATE IMPACT relative to base year		**0.00%**	**0.00%**	**0.00%**	**0.00%**	**0.00%**	**0.00%**	**0.00%**	**0.00%**	**0.00%**	**0.00%**	**0.00%**	**0.00%**	**0.00%**

Table 4: Revenue Requirement and Line Connection Pool Rate Impact, page 1

Revenue Requirement and Line Pool Rate Impact **(Before Capital Contribution)**

D6V/D7V		Project YE 25-Nov 2021	25-Nov 2022	25-Nov 2023	25-Nov 2024	25-Nov 2025	25-Nov 2026	25-Nov 2027	25-Nov 2028	25-Nov 2029	25-Nov 2030	25-Nov 2031	25-Nov 2032
Calculation of Incremental Revenue Requirement ($000)		1	2	3	4	5	6	7	8	9	10	11	12
In-service date	25-Nov-20												
Capital Cost	2,528												
Less: Capital Contribution Required	-												
Net Project Capital Cost	2,528												
Average Rate Base		1,239	2,452	2,401	2,351	2,300	2,250	2,199	2,149	2,098	2,048	1,997	1,946
Incremental OM&A Costs		0	0	0	0	0	0	0	0	0	0	0	0
Grants in Lieu of Municipal tax		10	10	10	10	10	10	10	10	10	10	10	10
Depreciation		51	51	51	51	51	51	51	51	51	51	51	51
Interest and Return on Rate Base		78	155	152	148	145	142	139	136	132	129	126	123
Income Tax Provision		(75)	(14)	(10)	(6)	(2)	1	4	7	10	12	14	16
REVENUE REQUIREMENT PRE-TAX		**63**	**201**	**202**	**203**	**203**	**204**	**203**	**203**	**202**	**201**	**200**	**199**
Incremental Revenue		0	0	0	0	0	0	0	0	0	0	0	0
SUFFICIENCY/(DEFICIENCY)		**(63)**	**(201)**	**(202)**	**(203)**	**(203)**	**(204)**	**(203)**	**(203)**	**(202)**	**(201)**	**(200)**	**(199)**
	Base Year												
Line Pool Revenue Requirement including sufficiency/(deficiency)	230,065	230,128	230,266	230,267	230,268	230,269	230,269	230,269	230,268	230,267	230,266	230,265	230,264
Line MW	240,481	240,481	240,481	240,481	240,481	240,481	240,481	240,481	240,481	240,481	240,481	240,481	240,481
Line Pool Rate ($/kw/month)	0.96	0.96	0.96	0.96	0.96	0.96	0.96	0.96	0.96	0.96	0.96	0.96	0.96
Increase/(Decrease) in Line Pool Rate ($/kw/month), relative to base year		0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
RATE IMPACT relative to base year		**0.00%**	**0.00%**	**0.00%**	**0.00%**	**0.00%**	**0.00%**	**0.00%**	**0.00%**	**0.00%**	**0.00%**	**0.00%**	**0.00%**

Assumptions

Incremental OM&A		$15.47 k per new km of line each year.
Grants in Lieu of Municipal tax	0.38%	Transmission system average
Depreciation	2.00%	Reflects 50 year average service life for towers, conductors and station equipment, excluding land
Interest and Return on Rate Base	6.31%	Includes OEB-approved ROE of 9%, 2.29% on ST debt, and 4.68% on LT debt. 40/4/56 equity/ST debt/ LT debt split
Income Tax Provision	26.50%	2019 federal and provincial corporate income tax rate
Capital Cost Allowance	8.00%	100% Class 47 assets

Table 4: Revenue Requirement and Line Connection Pool Rate Impact, page 2

Revenue Requirement and Line Pool Rate Impact **(Before Capital Contribution)**

D6V/D7V		**25-Nov 2033**	**25-Nov 2034**	**25-Nov 2035**	**25-Nov 2036**	**25-Nov 2037**	**25-Nov 2038**	**25-Nov 2039**	**25-Nov 2040**	**25-Nov 2041**	**25-Nov 2042**	**25-Nov 2043**	**25-Nov 2044**	**25-Nov 2045**
Calculation of Incremental Revenue Requirement ($000)		13	14	15	16	17	18	19	20	21	22	23	24	25
In-service date	25-Nov-20													
Capital Cost	2,528													
Less: Capital Contribution Required	-													
Net Project Capital Cost	2,528													
Average Rate Base		1,896	1,845	1,795	1,744	1,694	1,643	1,593	1,542	1,491	1,441	1,390	1,340	1,289
Incremental OM&A Costs		0	0	0	0	0	0	0	0	0	0	0	0	0
Grants in Lieu of Municipal tax		10	10	10	10	10	10	10	10	10	10	10	10	10
Depreciation		51	51	51	51	51	51	51	51	51	51	51	51	51
Interest and Return on Rate Base		120	116	113	110	107	104	101	97	94	91	88	85	81
Income Tax Provision		17	19	20	21	22	23	23	24	24	25	25	25	26
REVENUE REQUIREMENT PRE-TAX		**197**	**195**	**193**	**191**	**189**	**186**	**184**	**181**	**179**	**176**	**173**	**170**	**167**
Incremental Revenue		0	0	0	0	0	0	0	0	0	0	0	0	0
SUFFICIENCY/(DEFICIENCY)		**(197)**	**(195)**	**(193)**	**(191)**	**(189)**	**(186)**	**(184)**	**(181)**	**(179)**	**(176)**	**(173)**	**(170)**	**(167)**
	Base Year													
Line Pool Revenue Requirement including sufficiency/(deficiency)	230,065	230,262	230,260	230,258	230,256	230,254	230,252	230,249	230,247	230,244	230,241	230,238	230,235	230,232
Line MW	240,481	240,481	240,481	240,481	240,481	240,481	240,481	240,481	240,481	240,481	240,481	240,481	240,481	240,481
Line Pool Rate ($/kw/month)	0.96	0.96	0.96	0.96	0.96	0.96	0.96	0.96	0.96	0.96	0.96	0.96	0.96	0.96
Increase/(Decrease) in Line Pool Rate ($/kw/month), relative to base year		0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
RATE IMPACT relative to base year		**0.00%**	**0.00%**	**0.00%**	**0.00%**	**0.00%**	**0.00%**	**0.00%**	**0.00%**	**0.00%**	**0.00%**	**0.00%**	**0.00%**	**0.00%**

Table 3: DCF Assumptions

Hydro One Networks -- Transmission Connection Economic Evaluation Model
2016 Parameters and Assumptions

Transmission rates are based on current OEB-approved uniform provincial transmission rates.

	Monthly Rate ($ per kW)
Network	**3.83**
Transformation	**2.30**
Line	**0.96**

Grants in lieu of Municipal tax (% of up-front capital expenditure, a proxy for property value):		**0.38%**	Based on Transmission system average
Income taxes:			
Basic Federal Tax Rate - % of taxable income:	2018	**15.00%**	Current rate
Ontario corporation income tax - % of taxable income:	2018	**11.50%**	Current rate
Capital Cost Allowance Rate:			
Class 47 costs	2018	**8%**	Current rate
Decision Support defined costs (1)	2018	**0%**	
Decision Support defined costs (2)	2018	**0%**	
Decision Support defined costs (3)	2018	**0%**	
After-tax Discount rate:		**5.59%**	Based on OEB-approved ROE of 9% on common equity and 2.29% on short-term debt, 4.68% forecast cost of long-term debt and 40/60 equity/debt split, and current enacted income tax rate of 26.5%

Other Assumptions:

Estimated Incremental OM&A: Project specific ($ k):

There are no incremental operating and maintenance costs as a result of the proposed project. OM&A expenditures that are required today to maintain the existing facilities are not expected to be incrementally impacted going forward to maintain the upgraded facilities.

Deferral Account Requests

There are no new deferral account requests being made as part of this Application.

Project Schedule

TASK	START	FINISH
Section 92 Application Review[1]	November 2019	March 2020
LINES		
Detailed Engineering	November 2019	May 2020
Procurement	February 2020	August 2020
Construction	June 2020	December 2020
IN SERVICE		**December 2020**
Access Road Removal and Restoration	May 2021	July 2021

[1] This review time is predicated on the OEB Performance Standards for Processing Leave to Construct Applications and assumes a written hearing review of this Application. However, Hydro One hopes that regulatory efficiencies can be obtained in the review of this Application and this Application will be disposed of without a hearing for the reasons articulated in Exhibit B, Tab 1, Schedule 1.

Descriptions of the Physical Design

1.0 LINE FACILITIES

Details of Proposed Line Facilities

Hydro One is proposing to refurbish the 230 kilovolt double circuit D6V/D7V between Guelph North Junction and Fergus JCT near Centre Wellington. A map indicating the geographic location and route of the Project is provided as **Exhibit C, Tab 2, Schedule 1, Attachment 1**. A schematic diagram of the proposed facilities is provided at **Exhibit B, Tab 2, Schedule 1, Attachment 1**.

Hydro One is seeking OEB leave to vonstruct approval for the following refurbishment work on existing transmission facilities:

- To refurbish approximately 10 km of transmission double-circuit D6V/D7V between Guelph North JCT to Fergus JCT by replacing existing conductors with new 1443kcmil aluminum conductors that are steel reinforced ("**ACSR**"), with ampacity of 1160A continuous and 1530A emergency;
- To replace all the insulators and hardware;
- To reinforce the existing lattice steel towers from #267 to #296, by replacing existing steel members, or adding additional steel members, to accommodate the new conductors and new shieldwires. The typical tower sketch is shown in Figure 1.
- To raise the bottom phase from the bottom arm to the middle arm on approximately 50% of the towers, for new farmland clearances. The typical tower sketch is shown in Figure 2.
- Clean and coat the grillage footings as needed.

Figure 1: Tower sketch of typical lattice steel tower

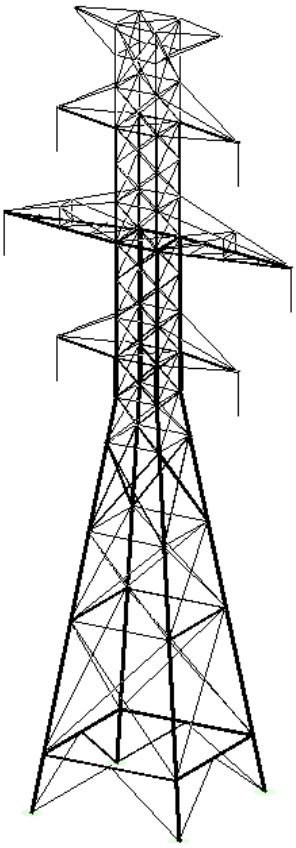
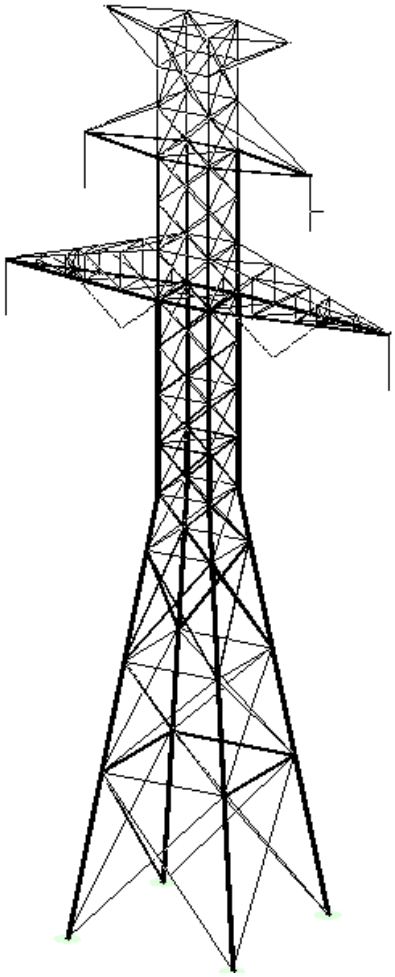
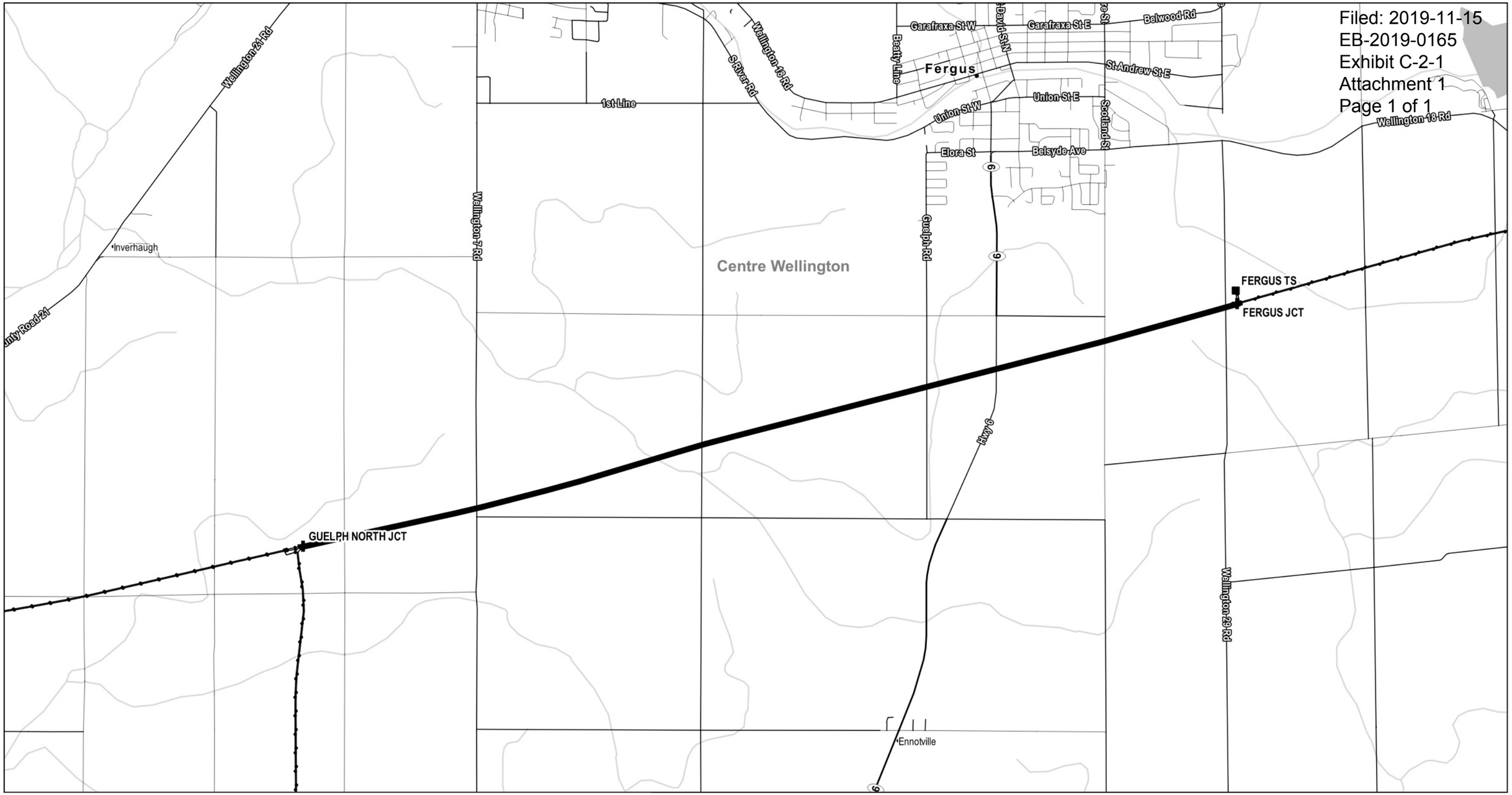


Figure 2: Tower sketch of bottom phase raised from bottom arm to middle arm



Maps

This Project is proposed to refurbish dual sections of 230kV line between Guelph North Junction ("JCT") and Fergus JCT. The D6V/D7V Project is located in the Township of Centre Wellington and a map indicating the geographic location of the line is included as Attachment 1 of this schedule.



LEGEND

- Section of D6V/D7V Circuits to be Replaced
- Stations and Junctions
  - Station
  - Junction
  - Transmission Line
- Municipality
- Water
- Roads
  - Highway
  - Arterial
  - Collector
  - Local Street

0 1000 2000 3000

1:50000 METRES

PROJECT
D6V/D7V

TITLE
GENERAL AREA MAP

REFERENCES
Natural Resources Canada, CANVEC Dataset, 2018
Hydro One Networks, Inc. , 2018

DATE **OCTOBER 2019**

PAGE
1 of 1

Operational Details

The D6V/D7V Project includes the refurbishment of the existing 230 kilovolt ("kV") D6V/D7V double circuit by replacing existing conductors with new 1443kcmil, steel-reinforced ("ASCR") aluminum conductors. No portion of the circuits will be relocated or reconfigured; therefore, there will be no change to the operation of the circuits or to the terminal or control stations. The terminal stations connecting D6V and D7V will remain Fergus Transformer Station ("TS") and Detweiler TS. Both these tapped terminal stations will remain on a dual circuit supply, except during switching operations when only one supply circuit will be available (circuit will be sectionalized by opening loops).

There are three existing customers connected to the D6V/D7V double circuit and these will remain connected to the same electrical locations after the refurbishment work is completed. These customers are:

- Waterloo North Hydro
- Alectra Utilities Corporation
- Hydro One Distribution

Land Matters

Description of Land Rights

As referenced in the Application, the D6V/D7V Project will involve line work on the existing 230 kV circuit on the line section between Guelph North JCT and Fergus JCT. The existing width of the right-of-way ("ROW") is 150 feet and provides sufficient width for the proposed refurbishment work.

The existing transmission corridor crosses an estimated 31 parcels of land, and its ownership is categorized as follows:

- 3 Hydro One fee simple ownership;
- 21 Easement corridor over privately-owned;
- 6 Crossings over Municipal owned road allowances; and
- 1 Crossing over a highway under the jurisdiction of the Ministry of Transportation.

The proposed transmission facility work is not expected to have an impact on the rights of adjacent properties. Hydro One will occupy within public road allowances and exercise legislated occupation rights pursuant to *Section 41* of *Electricity Act*.

Land Easements Required

The existing transmission corridor containing the line section from Guelph North JCT to Fergus JCT is predominantly located on privately-owned properties, over which Hydro One has existing easement rights. The proposed reinforcement work will be executed within the existing corridor. Hydro One will apply for an encroachment permit with the Ministry of Transportation to proceed with construction and stringing activities. Any additional temporary off-corridor requirements (including, but not limited to

construction staging areas, access, flagging and permitting) will be communicated with affected property owners.

Early Access to Land

The line reinforcement work falls under the existing land rights held by Hydro One and it is not expected to require additional corridor rights. Early access will not be required to complete the reinforcement work.

Acquisition of Land Rights on Public Roads and Highways

As required, Hydro One intends to utilize Public Roads and Highways. Given Hydro One's legislated occupation rights under *Section 41* of the *Electricity Act*, Hydro One does not require consent of the owner or any other person having an interest in a public street or highway to locate its proposed project corridor ROW. Hydro One will engage with representatives from the appropriate municipalities and the Ministry of Transportation of Ontario, as these organizations have jurisdiction over Public Roads to ensure compliance with *section 41 (9)* of the *Electricity Act*. If necessary, Hydro One will obtain the requisite encroachment and occupancy permits within roadways under the jurisdiction of the Ministry of Transportation of Ontario.

Land Acquisition Process

Hydro One will be utilizing its existing land rights for the D6V/D7V Project. Should any updates of crossing permits be required, Hydro One will work with the authority under the transmission lines to appropriately update the existing crossing permits. The plan is that the reinforcement work will be accommodated within the existing corridor. If necessary, further temporary off-corridor access or construction requirements will be negotiated with any affected landowner. There are an estimated five Off-Corridor access points identified along this transmission corridor.

Land-related Forms

The following forms are included at the end of this schedule, in Attachments 1 through 3:

1. Temporary Access and Temporary Access Road (for off-corridor access)
2. Temporary Rights Agreement (for construction staging)
3. Damage Claim Agreement and Release form (used as the basis for construction-related compensation, including crop or property damage)

Though leave is requested for approval of the form of these agreements, pursuant to s.97 of the OEB Act, Hydro One highlights that all these forms have already been approved in previous leave to construct applications.

Temporary Access and Temporary Access Road

THIS AGREEMENT made in duplicate the _____day of _____20XX

Between:

INSERT NAME OF OWNER

(hereinafter referred to as the "Grantor")

OF THE FIRST PART

--- and ---

HYDRO ONE NETWORKS INC.

(hereinafter referred to "HONI")

OF THE SECOND PART

WHEREAS the Grantor is the owner in fee simple and in possession of certain lands legally described as, ***INSERT LEGAL DESCRIPTION*** (the "Lands").

WHEREAS HONI in connection with its **[Insert Project Name]** Project (the "Project") desires the right to enter onto the Lands in order to construct temporary access roads on, over and upon the Lands in order to access the construction site associated with the "Project.

WHEREAS the Grantor is agreeable in allowing HONI to enter onto the Lands for the purpose of constructing temporary access roads on, over and upon the Lands, subject to the terms and conditions contained herein.

NOW THEREFORE THIS AGREEMENT WITNESSETH that in consideration of the sum of ***INSERT CONSIDERATION*** to be paid by HONI to the Grantor, and the mutual covenants herein contained and other good and valuable consideration, the receipt and sufficiency of which are hereby acknowledged, the parties agree as follows:

1. The Grantor hereby grants, conveys and transfers to HONI in, over, along and upon that part of the Lands highlighted in yellow as shown in Schedule "A" attached hereto (the "Access Lands"), the rights privileges, and easements as follows:

(a) for the servants, agents, contractors and workmen of HONI at all times with all necessary vehicles and equipment to pass and repass over the Access Lands for the purpose of access to the construction site associated with the Project, subject to payment of compensation for damages to any crops caused thereby;

(b) to construct, use and maintain upon the Access Lands, a temporary road to the construction site associated with the Project, together with such gates, bridges and drainage works as may be necessary for HONI's purposes (collectively, the "Works"), all of which Works shall be removed by HONI upon completion of the construction associated with the Project.; and

(c) to cut and remove all trees, brush and other obstructions made necessary by the exercise of the rights granted hereunder

2. The term of this Agreement and the permission granted herein shall be XXXX from the date written above (the "Term"). HONI may, in its sole discretion, and upon 60 days notice to the Grantor, extend the Term for an additional length of time, which shall be negotiated between the parties.

3. Upon the expiry of the Term or any extension thereof, HONI shall repair any physical damage to the Access Lands and/or Lands resulting from HONI's use of the Access Lands and the permission granted herein; and, shall restore the Access Lands to its original condition so far as possible and practicable.

4. All agents, representatives, officers, directors, employees and contractors and property of HONI located at any time on the Access Lands shall be at the sole risk of HONI and the Grantor shall not be liable for any loss or damage or injury (including loss of life) to them or it however occurring except and to the extent to which such loss, damage or injury is caused by the negligence or willful misconduct of the Grantor.

5. HONI agrees that it shall indemnify and save harmless the Grantor from and against all claims, demands, costs, damages, expenses and liabilities (collectively the "Costs") whatsoever arising out of HONI's presence on the Access Lands or of its activities on or

in connection with the Access Lands arising out of the permission granted herein except to the extent any of such Costs arise out of or are contributed to by the negligence or willful misconduct by the Grantor.

6. Notices to be given to either party shall be in writing, personally delivered or sent by registered mail (except during a postal disruption or threatened postal disruption), telegram, electronic facsimile or other similar means of prepaid recorded communication to the applicable address set forth below (or to such other address as such party may from time to time designate in such manner):

TO HONI:

Hydro One Networks Inc.
Real Estate Services
5th Floor
483 Bay Street South Tower
Toronto, Ontario M5G 2P5

Attention:
Fax:

TO GRANTOR:

7. Notices personally delivered shall be deemed to have been validly and effectively given on the day of such delivery. Any notice sent by registered mail shall be deemed to have been validly and effectively given on the fifth (5th) business day following the date on which it was sent. Any notice sent by telegram, electronic facsimile or other similar means of prepaid recorded communication shall be deemed to have been validly and effectively given on the Business Day next following the day on which it was sent. "Business Day" shall mean any day which is not a Saturday or Sunday or a statutory holiday in the Province of Ontario. This Agreement shall be governed by and construed in accordance with the laws of the Province of Ontario and the laws of Canada applicable herein. The parties hereto submit themselves to the exclusive jurisdiction of the Courts of the Province of Ontario.

8. Any amendments, modifications or supplements to this Agreement or any part thereof shall not be valid or binding unless set out in writing and executed by the parties with the same degree of formality as the execution of this Agreement.

9. The burden and benefit of this Agreement shall run with the Lands and everything herein contained shall operate to the benefit of, and be binding upon, the respective heirs; successors, permitted assigns and other legal representatives, as the case may be, or each of the Parties hereto.

IN WITNESS WHEREOF the parties hereto have caused this Agreement to be executed by their duly authorized representatives as of the day and year first above written.

SIGNED, SEALED & DELIVERED
In the presence of:

OWNER:

_____
Witness

_____

_____
Witness

_____

HYDRO ONE
HST #

HYDRO ONE NETWORKS INC.

By: _____
Name:
Title:

I have authority to bind the Corporation

SCHEDULE "A"

PROPERTY SKETCH

File: XXXXXX

THIS AGREEMENT made in duplicate the XXXXX day of XXXXXX 201X.

BETWEEN:

(INSERT NAME)

[NTD – ENSURE FULL LEGAL NAMES OF ALL OWNERS INSERTED]
[NTD – IF MORE THAN 1 OWNER THEN AMEND TO "(collectively the "**Owner**")"

(the **"Owner"**)
OF THE FIRST PART

AND:

HYDRO ONE NETWORKS INC.

(**"HONI"**)
OF THE SECOND PART

WHEREAS:

1. The Owner is the registered owner of lands legally described as ***(INSERT LEGAL DESCRIPTION)*** (the "Lands")

2. The Owner is agreeable in allowing HONI to enter onto a portion of the Lands highlighted in yellow as shown on the sketch attached hereto as Schedule "A" (the "Strip"), for the purposes of certain construction activities in conjunction with the XXXXXX (the "Project"), which shall include but are not limited to a temporary material storage yard for the purposes of storage of materials and equipment, including but not limited to construction equipment and machinery, requisite to the construction on the Strip subject to the terms and conditions contained herein (collectively the "Activities").

NOW THEREFORE THIS AGREEMENT WITNESSES THAT in consideration of Two Dollars ($2.00) now paid by HONI to the Owner, and the respective covenants and agreements of the parties hereinafter contained and other valuable consideration, the receipt and sufficiency of which are hereby acknowledged by the parties hereto, the parties hereto agree as follows:

1. The Owner hereby grants to HONI and its respective officers, employees, workers, permittees, servants, agents, contractors and subcontractors, with or without vehicles, supplies, machinery, plant, material and equipment, as of the date this Agreement, (i) the right to commence the Activities on the Strip; and (ii) the right to enter upon and exit from, and to pass and repass at any and all times in, over, along, upon, across, and through the Strip and so much of the Lands as may be reasonably necessary.

2. The permission granted herein shall commence as of the date this Agreement (the "Commencement Date") and shall terminate three (3) years from the Commencement Date (the "Initial Term").

3. The Initial Term may be extended upon 60 days prior written notice from HONI to the Owner for an additional two (2) years on the same terms and conditions contained herein save for this right to extend (the "Extended Term").

4. All agents, representatives, officers, directors, employees and contractors and property of HONI located at any time on the Lands shall be at the sole risk of HONI and the Owner shall not be liable for any loss or damage or injury (including loss of life) to them or it however occurring except and to the extent to which such loss, damage or injury is caused by the negligence or willful misconduct of the Owner.

5. Upon execution of this Agreement by all parties, HONI shall pay to the Owner the amount of XXXXX Dollars ($XXXX), which is compensation for the permission granted herein.

6. HONI shall repair any physical damage to the Lands resulting from the Activities and, shall restore the Lands to its original condition so far as possible and practicable to the satisfaction of the Owner, acting reasonably.

7. HONI agrees that it shall indemnify and save harmless the Owner from and against all claims, demands, costs, damages, expenses and liabilities (collectively the "Costs") whatsoever arising out of HONI's presence on the Lands or of its activities on or in connection with the Lands arising out of the permission granted herein except to the extent any of such Costs arise out of the negligence or willful misconduct of the Owner.

8. This Agreement does not commit the Owner to enter into any further agreements with HONI in conjunction with the Project.

9. This Agreement shall be governed by and construed in accordance with the laws of the Province of Ontario and the laws of Canada applicable herein. The parties hereto submit themselves to the exclusive jurisdiction of the Courts of the Province of Ontario.

IN WITNESS WHEREOF the Parties have hereunto set their respective hands and seals to this Agreement of Purchase and Sale.

SIGNED, SEALED AND DELIVERED
In the presence of)
)
)
)
)
_____) _____ (seal)
Print Name of Witness ***(INSERT NAME)***

)
)
)
)
)
_____) _____ (seal)
Print Name of Witness ***(INSERT NAME)***

IF OWNER IS CORPORATION – USE THE FOLLOWING

[INSERT FULL LEGAL NAME]

Per: _____
Print Name:
Print Title:

Per: _____
Print Name:
Print Title:

We/I have authority to bind the Corporation

HYDRO ONE NETWORKS INC.

Per: _____
Print Name: Tony Seravalle
Title: Manager, Facilities & Real Estate Acquisitions

I have authority to bind the Corporation

SCHEDULE "A"

Damage Claim

THIS MEMORANDUM OF AGREEMENT dated the day of 20XX

Between:

herein called the "Claimant"

-and-

Hydro One Networks Inc.

herein called "HONI"

Witnesseth:

The Claimant agrees to accept .....($) in full payment and satisfaction of all claims or demands for damages of whatsoever kind, nature or extent which may have been done to date by HONI during the construction, completion, operation or maintenance of the works of HONI constructed on Lot(s) ..... , Concession(s) ..... or according to Registered Plan No. ..... in the ..... of ..... of which property the Claimant is the ..... and which damages may be approximately summarized and itemized as:

WITNESS

Name:

Address:

HYDRO ONE
HST#

CLAIMANT

Name:

Address:

HYDRO ONE NETWORKS INC.

Per:

Name:

Title:

I have authority to bind the Corporation

RELEASE AND WAIVER

FULL AND FINAL RELEASE

IN CONSIDERATION of the payment or of the promise of payment to the undersigned of the aggregate sum of [INSERT SETTLEMENT AMOUNT] ($), the receipt and sufficiency of which is hereby acknowledged, I/We, the undersigned, on behalf of myself/ourselves, my/our heirs, executors, administrators, successors and assigns (hereinafter the "Releasors"), hereby release and forever discharge HYDRO ONE NETWORKS INC., its officers, directors, employees, servants and agents and its parent, affiliates, subsidiaries, successors and assigns (hereinafter the "Releasees") from any and all actions, causes of action, claims and demands of every kind including damages, costs, interest and loss or injury of every nature and kind, howsoever arising, which the Releasors now have, may have had or may hereafter have arising from or in any way related to [INSERT DESCRIPTION OF THE DAMAGE CAUSED] on lands owned by [INSERT PROPERTY OWNER NAME] and specifically including all damages, loss and injury not now known or anticipated but which may arise or develop in the future, including all of the effects and consequences thereof.

AND FOR THE SAID CONSIDERATION, the Releasors further agree not to make any claim or take any proceedings against any other person or corporation who might claim contribution or indemnity under the provisions of the *Negligence Act* and the amendments thereto from the persons or corporations discharged by this release.

AND FOR THE SAID CONSIDERATION, the Releasors further agree not to disclose, publish or communicate by any means, directly or indirectly, the terms, conditions and details of this settlement to or with any persons other than immediate family and legal counsel.

AND THE RELEASORS hereby confirm and acknowledge that the Releasors have sought or declined to seek independent legal advice before signing this Release, that the terms of this Release are fully understood, and that the said amounts and benefits are being accepted voluntarily, and not under duress, and in full and final compromise, adjustment and settlement of all claims against the Releasees.

IT IS UNDERSTOOD AND AGREED that the said payment or promise of payment is deemed to be no admission whatsoever of liability on the part of the Releasees.

AND IT IS UNDERSTOOD AND AGREED that this Release may be executed in separate counterparts (and may be transmitted by facsimile) each of which shall be deemed to be an original and that such counterparts shall together constitute one and the same instrument, notwithstanding the date of actual execution.

IN WITNESS WHEREOF, the Releasors have hereunto set their respective hands this ..... day of ....., 20XX.

SIGNED, SEALED & DELIVERED
In the presence of:

_____
Witness

_____
Name

SIGNED, SEALED & DELIVERED
In the presence of:

_____
Witness

_____
Name

System Impact Assessment

Please refer to **Attachment 1** for the Final System Impact Assessment ("SIA") prepared by the Independent Electricity System Operator (SIA reference # CAA 2019-EX1031).

Hydro One confirms that it will implement the requirements noted by the IESO and as set forth in the SIA that are associated with the Project. As articulated in the SIA the Project is expected to have no material adverse impact on the reliability of the integrated power system.

REPORT

Expedited System Impact Assessment Report

CONNECTION ASSESSMENT & APPROVAL PROCESS

Final Report

CAA ID: 2019-EX1031
Project: D6V and D7V Transmission Line Refurbishments
Connection Applicant: Hydro One Networks Inc.

Engineering Studies Department
Independent Electricity System Operator

Date: May 16, 2019

Public

Expedited System Impact Assessment Report

Acknowledgement

The IESO wishes to acknowledge the assistance of Hydro One in completing this assessment.

Disclaimers

IESO

This report has been prepared solely for the purpose of assessing whether the connection applicant's proposed connection with the IESO-controlled grid would have an adverse impact on the reliability of the integrated power system and whether the IESO should issue a notice of conditional approval or disapproval of the proposed connection under Chapter 4, section 6 of the *market rules*.

Conditional approval of the proposed connection is based on information provided to the IESO by the connection applicant and Hydro One at the time the assessment was carried out. The IESO assumes no responsibility for the accuracy or completeness of such information, including the results of studies carried out by Hydro One at the request of the IESO. Furthermore, the conditional approval is subject to further consideration due to changes to this information, or to additional information that may become available after the conditional approval has been granted.

If the connection applicant has engaged a consultant to perform connection assessment studies, the connection applicant acknowledges that the IESO will be relying on such studies in conducting its assessment and that the IESO assumes no responsibility for the accuracy or completeness of such studies including, without limitation, any changes to IESO base case models made by the consultant. The IESO reserves the right to repeat any or all connection studies performed by the consultant if necessary to meet IESO requirements.

Conditional approval of the proposed connection means that there are no significant reliability issues or concerns that would prevent connection of the proposed project to the IESO-controlled grid. However, the conditional approval does not ensure that a project will meet all connection requirements. In addition, further issues or concerns may be identified by the transmitter(s) during the detailed design phase that may require changes to equipment characteristics and/or configuration to ensure compliance with physical or equipment limitations, or with the Transmission System Code, before connection can be made.

This report has not been prepared for any other purpose and should not be used or relied upon by any person for another purpose. This report has been prepared solely for use by the connection applicant and the IESO in accordance with Chapter 4, section 6 of the *market rules*. This report does not in any way constitute an endorsement, agreement, consent or acknowledgment of any kind of the proposed connection for the purposes of obtaining or administering a contract with the IESO for the procurement of electricity supply, generation, demand response, conservation and demand management or ancillary services.

The IESO assumes no responsibility to any third party for any use, which it makes of this report. Any liability which the IESO may have to the connection applicant in respect of this report is governed by Chapter 1, section 13 of the *market rules*. In the event that the IESO provides a draft of this report to the connection applicant, the connection applicant must be aware that the IESO may revise drafts of this report at any time in its sole discretion without notice to the connection applicant. Although the IESO will use its best efforts to advise you of any such changes, it is the responsibility of the connection applicant to ensure that the most recent version of this report is being used.

Executive Summary

Project Description

Hydro One Networks Inc. (the "connection applicant" and "transmitter") is proposing to refurbish approximately 10 km each of 230 kV transmission lines D6V and D7V (the "project"). The refurbishment will include conductor replacement and/or insulator structure reinforcement. The planned in-service date is December 1, 2019. The sections to be refurbished are shown in Table 1.

Table 1: D6V and D7V transmission line refurbishment sections

Transmission line	Section	length (km)
D6V	Guelph North JCT – Fergus JCT	9.43
D7V	Guelph North JCT – Fergus JCT	9.43
D6V	Fergus JCT – Fergus TS	0.13
D7V	Fergus JCT – Fergus TS	0.13

Notification of Conditional Approval

This assessment concludes that the project is expected to have no material adverse impact on the reliability of the integrated power system, provided that all requirements in this report are implemented. Therefore, the assessment supports the release of the *Notification of Conditional Approval* for *Connection* of the project.

Findings

1. The impedances of the new lines are the same or smaller than those of the existing lines and are therefore acceptable.
2. The ratings of the new lines are the same or greater than those of the existing lines and are therefore acceptable.

IESO Requirements for Connection

General Requirements: The connection applicant shall satisfy all applicable requirements specified in the *market rules*. The most relevant requirements are presented in Section 2 of this report.

- End of Section –

1. Project Description and Data Verification

Project Description

Hydro One Networks Inc. (the "connection applicant" and "transmitter") is proposing to refurbish approximately 10 km each of 230 kV transmission lines D6V and D7V (the "project"). The refurbishment will include conductor replacement and/or insulator structure reinforcement. The planned in-service date is December 1, 2019. The sections to be refurbished are shown in Table 1.

Data Verification

The electrical characteristics of the existing and proposed lines are shown in Table 2. Resistance (R), reactance (X) and susceptance (B) are in per unit per km.

The ratings of the existing and proposed lines are shown in Table 3. The continuous and long-term emergency (LTE) summer ratings are in amps (A).

The sizes and types of the existing and proposed conductors are shown in Table 4.

Table 2: D6V and D7V electrical characteristics

Circuit	From Bus	To Bus	Length (km)	Existing			New		
				R (pu/km)	X (pu/km)	B (pu/km)	R (pu/km)	X (pu/km)	B (pu/km)
D6V	Guelph North JCT	Fergus JCT	9.43	0.000166	0.001026	0.001615	0.000097	0.001009	0.001646
D7V	Guelph North JCT	Fergus JCT	9.43	0.000166	0.001026	0.001615	0.000097	0.001009	0.001646
D6V	Fergus JCT	Fergus TS	0.13	0.000102	0.000974	0.001689	0.000102	0.000974	0.001689
D7V	Fergus JCT	Fergus TS	0.13	0.000104	0.000969	0.001738	0.000104	0.000969	0.001738

Table 3: D6V and D7V summer ratings

Circuit	From Bus	To Bus	Length (km)	Existing		New	
				Continuous (A)	LTE (A)	Continuous (A)	LTE (A)
D6V	Guelph North JCT	Fergus JCT	9.43	840	1090	1130	1500
D7V	Guelph North JCT	Fergus JCT	9.43	840	1090	1130	1500
D6V	Fergus JCT	Fergus TS	0.13	1110	1460	1110	1460
D7V	Fergus JCT	Fergus TS	0.13	1110	1460	1110	1460

Table 4: D6V and D7V conductor size and type

Circuit	From Bus	To Bus	Length (km)	Voltage (V)	Dominant Structure Type	Existing Conductor	Proposed Conductor
D6V	Guelph North JCT	Fergus JCT	9.43	230	Steel	795 KCMIL ACSR 26/7	1443 KCMIL ACSR/TW
D7V	Guelph North JCT	Fergus JCT	9.43	230	Steel	795 KCMIL ACSR 26/7	1443 KCMIL ACSR/TW
D6V	Fergus JCT	Fergus TS	0.13	230	Wood	1307 KCMIL ACSR/TW 28/19	No Conductor replacement
D7V	Fergus JCT	Fergus TS	0.13	230	Wood	1307 KCMIL ACSR/TW 28/19	No Conductor replacement

2. General Requirements

The connection applicant shall satisfy all applicable requirements specified in the *market rules* and the Transmission System Code (TSC). The following requirements highlight some of the general requirements that are applicable to the project.

1. The connection applicant must notify the IESO at connection.assessments@ieso.ca as soon as they become aware of any changes to the project scope or data used in this assessment. The IESO will determine whether these changes require a re-assessment.
2. The connection applicant must initiate the IESO's Market Registration process at least four months prior to the commencement of any project related outages. Once the IESO's Market Registration process has been successfully completed, the IESO will provide the connection applicant with a Registration Approval Notification (RAN) document, confirming that the project is fully authorized to connect to the IESO-controlled grid. For more details about this process, the connection applicant is encouraged to contact IESO's Market Registration at market.registration@ieso.ca.
3. The connection applicant is required to provide "as-built" equipment data for the project during the IESO Market Registration process. If the "as-built" equipment data differs materially from the ones used in this assessment, then the IESO may decide that further analysis of the project is required.

3. Technical Assessments and Conclusions

3.1 Technical Assessments

The impedances of the new lines are the same or smaller than those of the existing lines and are therefore acceptable.

The ratings of the new lines are the same or greater than those of the existing lines and are therefore acceptable.

3.2 Conclusions

Based on the data submitted by the connection applicant for this assessment, the project is expected to have no material adverse impact on the reliability of the integrated power system.

-End of Report-

Customer Impact Assessment

Please refer to Attachment 1 for the Draft Customer Impact Assessment prepared by Hydro One.

Hydro One Networks Inc.
483 Bay Street
Toronto, Ontario
M5G 2P5

CUSTOMER IMPACT ASSESSMENT

2019-016

D6V AND D7V TRANSMISSION LINE REFURBISHMENT

CIA ID 2019-016
Revision: Final
Date: 10 October 2019

Issued by:
System Planning Division
Hydro One Networks Inc.

Prepared by:

Hemantkumar Barot
Sr. Network Management Engineer
System Planning Division
Hydro One Networks Inc.

Approved by:

Farooq Qureshy
Transmission Plans Manager
System Planning Division
Hydro One Networks Inc.

Disclaimer

This Customer Impact Assessment was prepared based on preliminary information available about the new proposed refurbishment of the 230kV double circuit transmission line D6V/D7V between Fergus Jct and Guelph North Jct. in Wellington County. It is intended to highlight significant impacts, if any, to affected transmission customers early in the project development process and thus allow an opportunity for these parties to bring forward any concerns that they may have, including those needed for the review of the connection and for any possible application for Leave to Construct. Subsequent changes to the required modifications or the implementation plan may affect the impacts of the proposed connection identified in this Customer Impact Assessment. The results of this Customer Impact Assessment and the estimate of the outage requirements are subject to change to accommodate the requirements of the IESO and other regulatory or municipal authority requirements. The fault levels computed as part of this Customer Impact Assessment are meant to assess current conditions in the study horizon and are not intended to be for the purposes of sizing equipment or making other project design decisions. Many other factors beyond the existing fault levels go into project design decisions.

Hydro One Networks Inc. shall not be liable, whether in contract, tort or any other theory of liability, to any person who uses the results of the Customer Impact Assessment under any circumstances whatsoever for any damages arising out of such use unless such liability is created under some other contractual obligation between Hydro One Networks Inc. and such person.

TABLE OF CONTENT

CUSTOMER IMPACT ASSESSMENT

D6V AND D7V TRANSMISSION LINE REFURBISHMENTS

1.0 INTRODUCTION

1.1 Purpose

This Customer Impact Assessment (CIA) study assesses the potential impact of the proposed refurbishment of the double circuit 230kV line D6V/D7V between Fergus Jct and Guelph North Jct., on the transmission customers in the Wellington and Waterloo Counties.

This study is in accordance with section 6 of the Ontario Energy Board's (OEB) Transmission System Code ("TSC"), which requires Hydro One Networks Inc. (Hydro One) to carry out a CIA study to assess the impact of the proposed transmission line refurbishment on existing transmission customers in the affected area. This study is intended to supplement the System Impact Assessment (SIA) CAA ID 2019-EX1031 entitled "D6V and D7V Transmission Line Refurbishments", issued by the IESO. In their report, the IESO concluded that there is no adverse impact of this project on the transmission system.

1.2 Background

The 230 kV D6V/D7V double circuit line connects Orangeville TS to Detweiler TS. The line is 84 km long and is part of bulk power system supplying the Wellington and Waterloo Counties though Fergus TS, Scheifele MTS, Waterloo North MTS #3, Campbell TS and Cedar TS (see Figure 1). There is a continuing need for this line to supply the area loads.

The D6V/D7V line was built in 1950 and is currently 70 years old. The section of the line between Fergus Jct. and Guelph North Jct (about 9.5km) is strung with 795 kcmil ACSR conductor and has been identified as at end of life (see Map 1).

In accordance with the OEB direction for Hydro One to explore line loss mitigation opportunities it is planned to replace the 795 kcmil conductor with new 1443 Compact ACSR/TW conductor. The advantage of the larger size conductor is that it has a lower resistance and would result in reduced transmission line losses compared to the existing conductor.

1.3 Connected Customers

The focus of this study is impact on transmission stations and customers supplied from the D6V/D7V transmission line.

Station	Customer
Fergus TS	Hydro One Distribution
Scheifele MTS	Waterloo North Hydro
Waterloo North MTS 3	Waterloo North Hydro
Campbell TS	Alectra Utilities
Cedar TS	Alectra Utilities

2.0 STUDY RESULTS

Table 1 in Appendix A compares the characteristics of the line using new conductor with the existing conductor.

The conductor replacement results in reduced line resistance for the Fergus Jct to Guelph North Jct. section of the line. However, the new conductor has insignificant effect on the line impedance and therefore power flows, area station voltages and short circuits are not materially impacted by the change.

The existing and new fault levels after implementation of conductor replacement over 9.5kms of D6V/D78V lines are noted in Table 2, Appendix B for reference. All short circuits levels are within rating of Hydro One equipment.

Customers are requested to review these short circuit results and determine if these fault levels are within their equipment ratings and their station grounding system is adequate.

2.1 Customer Reliability and Outage Impact Assessment

The replacement of the aging conductor will reduce the likelihood of conductor failure and thereby result in improved reliability to area customers. Outages will be required during the project's execution but will be managed to minimize any impact to customers.

2.2 Operating Considerations

The D6V/D7V line refurbishment is not expected to result in any operational changes.

3.0 CONCLUSION

This report concludes that D6V/D7V line refurbishment will reduce the likelihood of conductor failure on an aging section of the line. The power flows, area station voltages and short circuit levels remain materially unchanged and there is no adverse impact on the area customers.

Customers are requested to review the fault levels provided in Appendix B to ensure that the capability of their equipment and grounding system is not exceeded.

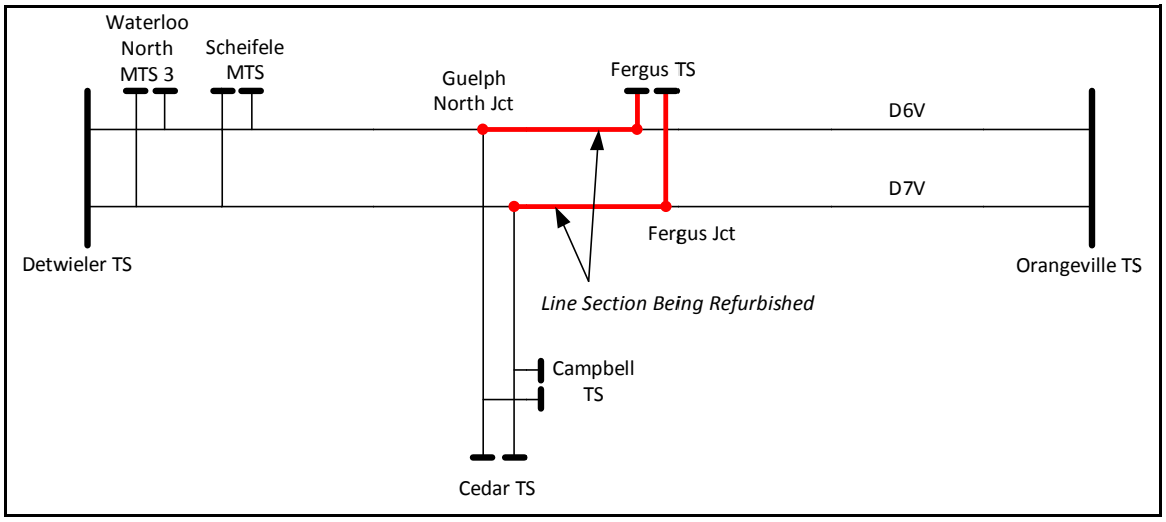


Figure 1. D6V/D7V Connection Configuration and Line section being refurbished.

Map 1. D6V/D7V Transmission Line – Fergus TS to Guelph North TS Section to be refurbished.

APPENDIX A

Table 1: D6V and D7V electrical characteristics

				Existing			New		
Circuit	**From Bus**	**To Bus**	**Length (km)**	**R (pu/km)**	**X (pu/km)**	**B (pu/km)**	**R (pu/km)**	**X (pu/km)**	**B (pu/km)**
D6V	Guelph North JCT	Fergus JCT	9.43	0.000166	0.001026	0.001615	0.000097	0.001009	0.001646
D7V	Guelph North JCT	Fergus JCT	9.43	0.000166	0.001026	0.001615	0.000097	0.001009	0.001646
D6V	Fergus JCT	Fergus TS	0.112	0.000102	0.000974	0.001689	0.000102	0.000974	0.001689
D7V	Fergus JCT	Fergus TS	0.08	0.000102	0.000974	0.001689	0.000102	0.000974	0.001689

APPENDIX B

Table 2: Fault Levels

Area Station Buses	Base kV	Existing Fault Level (kA)				New Fault Level (kA)			
		3-phase		Line to Ground		3-phase		Line to Ground	
		Sym	Asym	Sym	Asym	Sym	Asym	Sym	Asym
Detweiler TS	220	24.6	26.9	23.8	27.7	24.6	26.9	23.8	27.7
Orangeville TS	220	19.8	21.6	17.7	20.1	19.8	21.7	17.7	20.1
Fergus TS (D6V)	220	13.0	14.0	9.8	10.3	13.0	14.1	9.8	10.3
Fergus TS (D7V)	220	13.1	14.1	9.9	10.4	13.1	14.2	9.9	10.4
Fergus TS (BY)	44	15.0	15.4	6.9	8.2	15.0	15.4	6.9	8.2
Scheifele TS (D6V)	220	16.9	18.1	14.1	14.9	16.9	18.1	14.1	14.9
Scheifele TS (D7V)	220	16.9	18.1	14.1	14.9	16.9	18.1	14.1	14.9
Scheifele TS (B)	13.8	8.9	9.4	8.9	10.1	8.9	9.4	8.9	10.1
Scheifele TS (Y)	13.8	8.8	9.3	8.8	10.1	8.8	9.3	8.8	10.1
Scheifele TS (HJ)	13.8	17.0	18.6	17.9	21.4	17.0	18.6	17.9	21.4
Scheifele TS (QT)	13.8	16.9	18.4	17.8	21.3	16.9	18.4	17.8	21.3
WN MTS #3 (D6V)	220	19.5	20.9	17.3	18.6	19.5	20.9	17.3	18.6
WN MTS #3 (D7V)	220	19.4	20.9	17.3	18.6	19.4	20.9	17.3	18.6
WN MTS #3 (LV)	27.6	13.3	14.3	10.4	12.4	13.3	14.3	10.4	12.4
Cedar TS (D6V)	220	9.3	10.1	8.2	9.2	9.3	10.1	8.2	9.2
Cedar TS D7V	220	9.5	10.3	8.4	9.4	9.5	10.4	8.4	9.4
Cedar TS (D)	115	16.5	18.0	16.2	18.3	16.5	18.1	16.2	18.3
Cedar TS (A)	115	15.2	16.6	15.0	17.1	15.2	16.7	15.0	17.1
Cedar TS (EZ)	13.8	16.4	16.9	7.4	8.5	16.4	16.9	7.4	8.5
Cedar TS (BY)	13.8	16.6	17.2	7.4	8.6	16.6	17.2	7.4	8.6
Cedar TS (JQ)	13.8	17.1	17.1	8.5	8.8	17.1	17.1	8.5	8.8
Campbell TS (D6V)	220	10.5	11.4	8.9	9.7	10.5	11.5	8.9	9.7
Campbell TS (D7V)	220	10.7	11.6	9.1	9.9	10.7	11.7	9.1	9.9
Campbell TS (JQ)	13.8	14.3	15.7	8.0	9.7	14.3	15.7	8.0	9.7
Campbell TS (BY)	13.8	15.9	17.2	9.9	11.6	15.9	17.3	9.9	11.6
Campbell TS (EZ)	13.8	18.2	18.6	8.7	10.3	18.2	18.7	8.7	10.3
Campbell TS (IDL)	13.8	17.3	17.7	8.5	10.1	17.3	17.7	8.5	10.1