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NEEDS ASSESSMENT REPORT

Greater Toronto Area (GTA) West Region

Date: May 9, 2019

Prepared by: GTA West Region Study Team

Disclaimer

This Needs Assessment Report was prepared for the purpose of identifying potential needs in the GTA West Region and to recommend which need may require further assessment and/or regional coordination to develop a preferred plan. The results reported in this Needs Assessment are based on the input and information provided by the Study Team.

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Executive Summary

REGION	Greater Toronto Area West (GTA West) Region		
LEAD	Hydro One Networks Inc. ("HONI")		
START DATE	March 11, 2019	**END DATE**	May 7, 2019

1. INTRODUCTION

The first cycle of the Regional Planning process for the GTA West Region was completed in January 2016 with the publication of the Regional Infrastructure Plan ("RIP"). The regional planning reports provided a description of needs and recommendations of preferred plans to address the needs.

This is the second cycle of regional planning starting from Needs Assessment ("NA"). The purpose of NA is to identify any new needs in the region and any update on needs identified in the previous GTA West Regional Planning cycle.

2. REGIONAL ISSUE/TRIGGER

In accordance with the Regional Planning process, the regional planning cycle should be triggered at least every five years. In light of these timelines and new needs in the GTA West Region, the 2nd Regional Planning cycle was triggered for this Region.

3. SCOPE OF NEEDS ASSESSMENT

The assessment's primary objective is to identify the electrical infrastructure needs over the study period, develop options and recommend which needs require further regional coordination.

The scope of this NA includes:

- Review the status of needs/plans identified in the previous RIP; and
- Identification and assessment of any new needs (e.g. system capacity, reliability, operation, and aging infrastructure)

The Study Team may also identify additional needs during the next phases of the planning process, namely Scoping Assessment ("SA"), IRRP and RIP, based on updated information available at that time.

4. INPUTS/DATA

The Study Team representatives from Local Distribution Companies ("LDC"), the Independent Electricity System Operator ("IESO"), and Hydro One provided input and relevant information for the GTA West Region regarding capacity needs, system reliability, operational issues, and major assets/facilities approaching end-of-life ("EOL"). In addition, community energy plans in the region have also been scanned and reviewed.

5. ASSESSMENT METHODOLOGY

The assessment methodology include review of relevant planning information such as load forecast, conservation and demand management ("CDM") forecast and available distributed generation ("DG") information, any system reliability and operation issues, and major high voltage equipment identified to be at or near the end of their useful life.

A technical assessment of needs was undertaken based on:

- Current and future station capacity and transmission adequacy;
- System reliability and operational concerns; and
- Options for replacement/refurbishment of major high voltage equipment identified

6. NEEDS

I. Station Supply Capacity

Previously identified needs as part of regional planning[1] –

a. Halton TS (T3/T4) DESN overloading is now forecasted in 2021-2022 from 2020. To address this Halton TS # 2 is being undertaken, Hydro One working with the LDCs and planning for Q2 2022 in-service.
b. Erindale TS (T1/T2) DESN Overloading is now forecasted in 2023-2024 from 2019. This need is being managed by load transfer on the distribution system by the LDC. No further action is required.

No new station supply capacity needs have been identified by Study Team.

II. Circuit Supply Capacity

Previously identified needs as part of regional planning[1] –

a. Circuits H29/H30 overloading was forecasted in 2023-2026.
b. Circuits R14T/R17T & R19TH/R21TH are currently overloaded under single-circuit contingency and high Flow East Towards Toronto (FETT) interface flows.
c. Circuits T38B / T39B are currently overloaded under single-circuit contingency and Halton Hills GS out of service.

No new circuit supply capacity needs have been identified by Study Team.

III. System Reliability & Operation

a. Supply Security & Supply Restoration needs, identified in the Table 2, will be part of the scope for this cycle of regional planning.

No new circuit supply capacity needs have been identified by Study Team.

IV. Aging Infrastructure – Transformer Replacements and line Section Refurbishment needs

a. Trafalgar TS - Component Replacement (2022)
b. Halton TS - PCT and Component Replacements (2024)
c. Erindale TS - PCT and Component Replacements (2025)
d. Palermo TS - T3 / T4 & Switchyard Refurbishment (2025)
e. Pleasant TS - Breakers, PCT and Component Replacements (2026)
f. Bramalea TS - PCT and Component Replacements (2026)

V. Long-Term Growth

Previously identified needs as part of regional planning

a. GTA West Transmission Corridor

The long-term Growth Plan for the Greater Golden Horseshoe forecasts a significant population growth in the Regions of Peel and Halton. As identified in the previous RIP cycle, a new electricity corridor was recommended for consideration over the long-term to meet the growing electrical demand in the northern parts of this region. These needs will continue to be studied as part of the current cycle of regional planning.

No new long-term needs have been identified by the Study Team.

7. RECOMMENDATIONS

The Study Team's recommends that following -

A. Study Team has reconfirmed the overloading at Halton TS (T3/T4) DESN based on latest load forecast. The need for a new TS in 2021-2022 is being addressed by building Halton TS # 2 being built by Hydro One in coordination with the LDCs for an in-service in Q2 2022.

B. Replacement of end of life component with similar equipment does not require further regional coordination (see further details in Section 7.1). The implementation and execution plan for these needs will be coordinated by Hydro One with affected LDCs:

a. Trafalgar TS - Component Replacement
b. Halton TS - PCT and Component Replacements
c. Erindale TS - PCT and Component Replacements
d. Pleasant TS - Breakers, PCT and Component Replacements
e. Bramalea TS - PCT and Component Replacements

C. Needs requiring further regional coordination will be assessed in the next phase after completion of NA
   a. Overloading of circuits R14T/R17T & R19TH/R21TH
   b. Overloading of circuits T38B / T39B

c. Overloading of circuits H29/ H30
d. Supply Security & Supply Restoration needs, identified in the Table 2, will be part of the scope for this cycle of regional planning.
e. EOL replacement of Palermo TS transformers T3/T4 – Study Team will assess and confirm if they should be replaced with same or higher rating.
f. GTA West Transmission Corridor – Study team to review current information and develop a recommendation.

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1 INTRODUCTION

The first cycle of the Regional Planning process for the GTA West Region was completed in January 2016 with the publication of the Regional Infrastructure Plan ("RIP"). The RIP provided a description of needs and recommendations of preferred wires plans to address near- and medium-term needs.

The purpose of this Needs Assessment ("NA") is to identify new needs and to reconfirm needs identified in the previous GTA West regional planning cycle. Since the previous regional planning cycle, some new needs in the region have been identified.

This report was prepared by the GTA West Region Study Team ("Study Team"), led by Hydro One Networks Inc. Participants of the Study Team are listed below in Table 1. The report presents the results of the assessment based on information provided by the Hydro One, the Local Distribution Companies ("LDC") and the Independent Electricity System Operator ("IESO").

Table 1: GTA West Region Study Team Participants

Company
Hydro One Networks Inc. (Lead Transmitter)
Hydro One Networks Inc. (Distribution)
Independent Electricity System Operator ("IESO")
Burlington Hydro Inc.
Alectra Utilities Co.
Milton Hydro Distribution Inc.
Halton Hills Hydro Inc.
Oakville Hydro Electricity Distribution Inc.

2 REGIONAL ISSUE/TRIGGER

In accordance with the Regional Planning process, the Regional Planning cycle should be triggered at least every five years. In light of Regional Planning cycle timelines and new needs in the GTA West Region, the 2nd Regional Planning cycle was triggered for the GTA West region.

3 SCOPE OF NEEDS ASSESSMENT

The scope of this NA covers the GTA West Region and includes:

- Review the status of needs/plans identified in the previous RIP; and
- Identification and assessment of any new needs (e.g. system capacity, reliability, operation, and aging infrastructure)

The Study Team may identify additional needs during the next phases of the regional planning process, namely Scoping Assessment ("SA"), Local Planning ("LP"), IRRP, and/or RIP.

4 REGIONAL DESCRIPTION AND CONNECTION CONFIGURATION

The Greater Toronto Area (GTA) West Region roughly covers the Regional Municipalities of Halton and Peel. The Region includes the area roughly bordered geographically by Highway 27 to the north east, Highway 427 to the south east, Regional Road 25 to the west, King Street to the north and Lake Ontario to the south. The GTA West Region area comprises the municipalities of Brampton, South Caledon, Halton Hills, Mississauga, Milton, Oakville and portions of Burlington.

Electrical supply to the GTA West Region is provided through 500/230 kV autotransformers at Trafalgar TS and at Claireville TS and 230 kV transmission lines and step-down transformation facilities as shown in Fig. 1. The GTA West Region is roughly bounded by the Richview TS to Manby TS 230 kV circuits on the east, the Richview TS to Trafalgar TS to Burlington TS 230 kV circuits on the north and the Manby TS to Cooksville TS to Oakville TS 230 kV circuits on the south. The distribution system in this Region is at two voltage levels, 44 kV and 27.6 kV. Local generation in the area include the two gas fired plants, the 1250 MW Goreway GS in Brampton and the 600 MW TCE generation plant in Halton Hills
The Local Distribution Customers (LDC) in the GTA West Region is Burlington Hydro Inc., Alectra Utilities Co., Halton Hills Hydro Inc., Hydro One Networks Inc., Milton Hydro Distribution Inc. and Oakville Hydro Electricity Distribution Inc. The high-voltage system in this Region also provides supply to Ford Motor Company of Canada's transformer station. An electrical single line diagram for the GTA West Region facilities is shown in Figure 2.

Kleinburg TS is located near Bolton, Ontario and has been part of the GTA North regional planning process. However, majority of the Kleinburg TS transformational capacity is being used to supply communities located into GTA West region. Due to this reason, the Study Team has decided to include the Kleinburg TS as part of the GTA West Regional Planning process as well.

The summer non-coincident regional load forecast is provided as Appendix A. Appendix B lists all step-down transformer stations, Appendix C transmission circuits and Appendix D LDCs in the GTA West Region.

Figure 1: Geographical Area of the GTA WEST Region with Electrical Layout

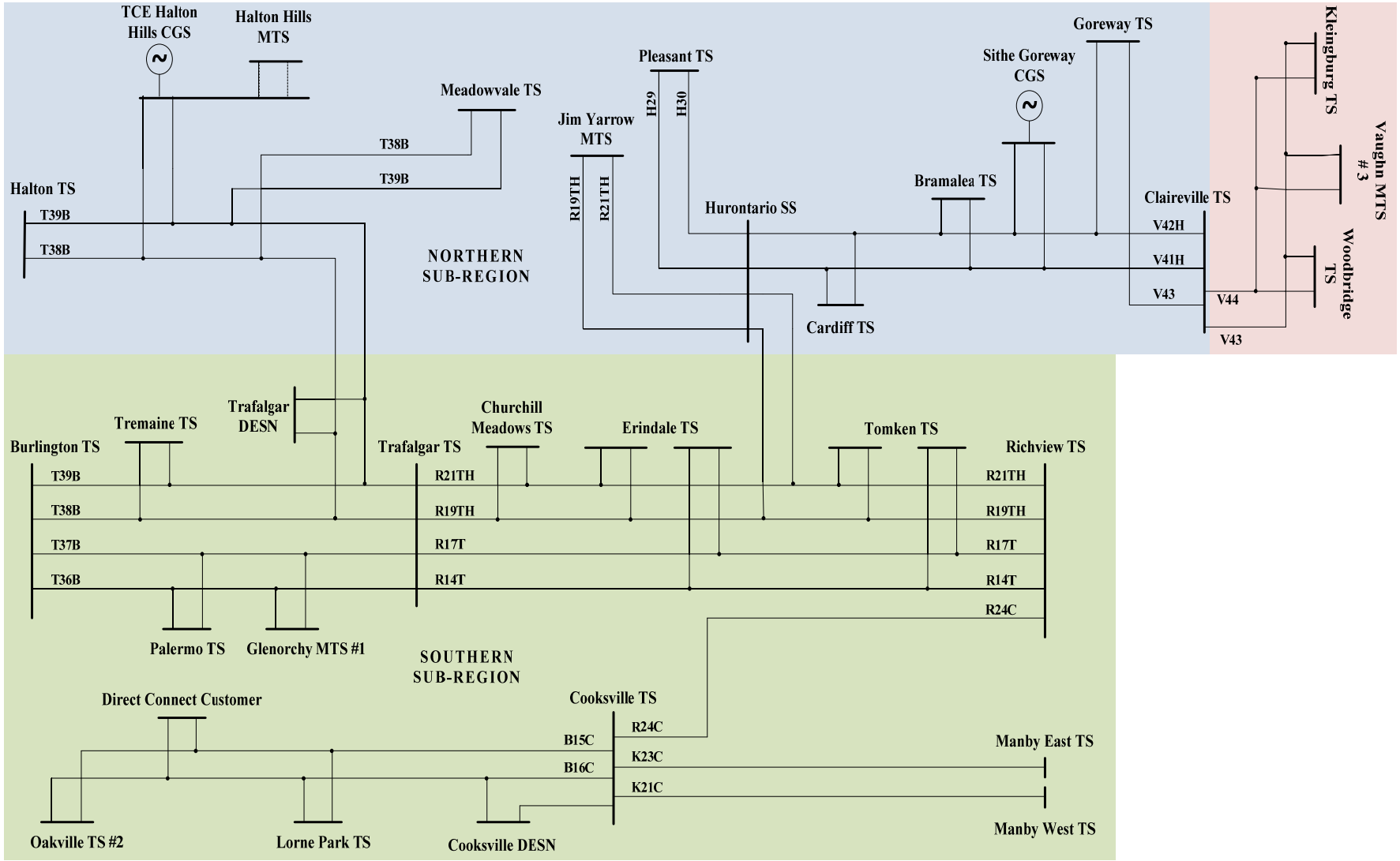

Figure 2: GTA WEST Region (Single Line Diagram)

5 INPUTS AND DATA

Study Team participants, including representatives from LDCs, IESO, and Hydro One provided information and input for the GTA West Region NA. The information provided includes the following:

- GTA West Load Forecast for all supply stations;
- Known capacity and reliability needs, operating issues, and/or major assets approaching the end of their useful life ("EOL"); and
- Planned/foreseen transmission and distribution investments that are relevant to regional planning for the GTA West Region.

6 ASSESSMENT METHODOLOGY

The following methodology and assumptions are made in this Needs Assessment:

Information gathering included:

i. Load forecast: The LDCs provided load forecasts for all the stations supplying their loads in the GTA West region for the 10 year study period. The IESO provided a Conservation and Demand Management ("CDM") forecast and information on existing Distributed Energy Resources ("DER") for the GTA West region. As per IESO, total of 140 kW of new DER contract has been awarded into the region, since the last cycle of regional planning. This represents total of 14 kW of peak DER impact after applying 10% coincident factor. Due to its low contribution to meeting peak demand, the Study Team decided not to include the DER for the purpose of this Needs Assessment (NA). The region's extreme summer non-coincident peak gross load forecast for each station were prepared by applying the LDC load forecast load growth rates to the actual 2018 summer peak extreme weather corrected loads. The extreme summer weather correction factors were provided by Hydro One. The net extreme weather summer load forecasts were produced by reducing the gross load forecasts for each station by the % age CDM. These extreme weather summer load forecast for the individual stations in the GTA West region is given in Appendix A.

ii. Relevant information regarding system reliability and operational issues in the region; and

iii. List of major HV transmission equipment planned and/or identified to be refurbished and/or replaced due to the end of their useful life which is relevant for regional planning purposes. This includes HV transformers, autotransformers, HV Breakers, HV underground cables and overhead lines.

A technical assessment of needs was undertaken based on:

- Current and future station capacity and transmission adequacy;

- System reliability and operational concerns; and
- Any major high voltage equipment reaching the end of its useful life.

In addition, Hydro One has reviewed the Community Energy Plans in the region. There are several Community Energy Plans aiming toward clean air and reduction in Green House Gas (GHG) emission in the region. These plans currently do not have any direct impact on the needs identified by the Study Team.

7 NEEDS

This section describes emerging needs identified in the GTA West Region, and also reaffirms the near, mid, and long-term needs already identified in the previous regional planning cycle.

The recent load forecast prepared for this report is higher than that of the previous cycle of regional planning. A contingency analysis was performed for the region and no new system needs were identified.

The identified/emerging needs pertaining to this NA will be discussed further in the following sub-sections, while the status of the previously identified needs is summarized in Table 2 below.

Table 2: Needs Identified in the Previous Regional Planning Cycle

Type of Needs identified in the previous RP cycle	Needs Details	Current Status
Station Transformation Capacity	Halton TS	2022
	Erindale TS (T1 / T2)	In Progress
Transmission Circuit Capacity	Supply to Pleasant TS (H29/H30)[2]	2024
	Richview x Trafalgar (R14T/R17T & R19TH/R21TH)	To be assessed as part of the current cycle of regional planning.
	Radial Supply to Halton TS (T38B/T39B)	
Supply Security	Supply security to T38B/T39B radial pocket	
Supply Restoration	Kleinburg Radial Pocket (V43/V44) Halton Radial Pocket (T38B/T39B) Pleasant Radial Pocket (H29/H30) Cardiff/Bramalea Supply (V41H/V42H) West of Cooksville (B15C/B16C) Richview X Trafalgar (R19TH/R21TH) Richview X Trafalgar (R14T/R17T)	

[2] The current regional planning cycle will monitor timing and any related issues.

In addition to previously identified needs, Burlington Hydro Inc. and Milton Hydro Inc. both requested for two new additional feeder breaker positions each at Tremaine TS to the existing six (6) and two (2) feeder breakers respectively supplying their loads. The work is in progress with targeted in-service date of May 2020.

7.1 End-Of-Life (EOL) Equipment Needs

Hydro One and LDCs have provided high voltage asset information under the following categories that have been identified at this time and are likely to be replaced over the next 10 years:

- Autotransformers
- Power transformers
- HV breakers
- Transmission line requiring refurbishment where an uprating is being considered for planning needs and require Leave to Construct (i.e., Section 92) application and approval
- HV underground cables where an uprating is being considered for planning needs and require EA and Leave to Construct (i.e., Section 92) application and approval

The end-of-life assessment for the above high voltage equipment considered the following options:

1. Maintaining the status quo;
2. Replacing equipment with similar equipment of lower ratings and built to current standards;
3. Replacing equipment with lower ratings and built to current standards by transferring some load to other existing facilities;
4. Eliminating equipment by transferring all of the load to other existing facilities;
5. Replacing equipment with similar equipment and built to current standards (i.e., “like-for-like” replacement); and
6. Replacing equipment with higher ratings and built to current standards.

In addition, from Hydro One’s perspective as a facility owner and operator of its transmission equipment, do nothing is not generally an option for major HV equipment due to safety and reliability risk of equipment failure. This also results in increased maintenance cost and longer duration of customer outages.

Accordingly, following major high voltage equipment has been identified as approaching its end of useful life over the next 10 years.

a. Trafalgar TS – Component Replacement

Trafalgar TS, located west of Mississauga, transforms bulk power from 500 kV to 230 kV via 2 X 750 MVA autotransformers and contains a 230 kV switchyard that terminates the two autotransformers and eight transmission lines. In addition, the TS contain two step-down power transformers and a 27.6 kV switchyard that provides local area supply to Oakville Hydro customers.

The scope of this project is to replace various equipment such as surge capacitors, surge arrestors, instrument transformers, bushings, etc. The targeted in-service is in year 2022.

b. Halton TS – Component Replacement

Halton TS is located in Milton and it contains 2 X 75/100/125 MVA, 230/27.6 kV, transformers that supplies Halton Hills Hydro customers via Hydro One distribution express feeders and Milton Hydro customers.

The scope of this project is to replace various equipment such as surge arrestors, instrument transformers and EOL protection and control equipment. The targeted in-service is in year 2024.

c. Erindale TS – PCT & Component Replacements

Erindale TS a step-down transformer station consisting of two 44 kV switchyard and one 27.6 kV switchyard. The facility was originally built in late 1975 and is located in Mississauga, Ontario. The primary transmission-connected customer served by the station feeder is Alectra Utilities Corporation.

The scope of this project is to replace certain PC&T equipment, HV/LV surge arrestors and insulators. The targeted in-service is in year 2025.

d. Palermo TS – T3 / T4 Supply Transformer

Palermo TS is a transmission station that transforms 230 kV into 27.6 kV and facilitates load delivery to Burlington Hydro Inc., Milton Hydro Inc. and Oakville Hydro customers in the cities of Burlington, Milton and Oakville, respectively, via one DESN unit, T3/T4. The size of the T3/T4 transformers is 50/67/83 MVA.

Palermo TS T3/T4 transformer DESN unit was built in 1970 and transformer T3 / T4 have reached EOL. These transformers are 50 years old and currently in the plan for replacement with tentative in-service date of 2025. Study Team will assess and confirm if they should be replaced with same or higher rating.

e. Pleasant TS – Breakers, PCT and Component Replacement

Pleasant TS is located in North West section of Brampton and supplies customers in Brampton, Caledon and Halton Hills area. H29 and H30 230kV circuits from Hurontario SS supply power into Pleasant TS.

The switchyard of the Pleasant TS has four DESN stations. DESN#1 is fed from T1 and T2 power transformers 75/100/125MVA, 230kV-44kV, Y/Y, 3phase units. Two switchyards - DESN#2 and DESN#3 are fed from T5 and T6 power transformers 75/100/125MVA, 230kV-28kV-28kV, YZZ, 3phase units. DESN#4 is fed from T7 and T8 power transformers 75/100/125MVA, 230kV-28kV-28kV, YZZ, 3phase units.

Pleasant TS was originally placed in service in 1954 and many assets are in degraded condition and are in need of replacement. The work includes replacement of EOL breakers T5B, T5E, T6Y, T6Z, BY, EZ, SC6Z, SC5E, M9, M11, and M12 and associated work. The work also includes installation of PCT in the box for the T5 / T6 DESN area and replacement of other component at the station as well. The tentative in-service date for this work is 2026.

f. Bramalea TS – Breakers, PCT and Component Replacement

Bramalea TS is located within the city of Brampton and is a step-down transformer station consisting of two 44 kV switchyard and one 27.6 kV switchyard. The primary transmission-connected customer served by the station feeder is Alectra Utilities Corporation. The scope of this project is to replace various equipment such as surge arrestors, instrument transformers and EOL protection and control equipment. The targeted in-service is in year 2026.

No other lines or HV station equipment in the GTA West region have been identified for major replacement/ refurbishment at this time. If and when new and/or additional information is available, it will be provided during the next planning phase.

7.2 Station and Transmission Capacity Needs in the GTA West Region

The following Station and Transmission supply capacities needs have been identified in the GTA West region during the study period of 2019 to 2028.

7.2.1 Halton TS Station Capacity

Halton TS is located in Milton and is in-service since 1990. Halton TS supplies load to Halton Hills Hydro through 3 feeders and Milton Hydro through 9 feeders at the station. The previous Regional Planning cycle as well as current submitted load forecast identified need for additional capacity in the area.

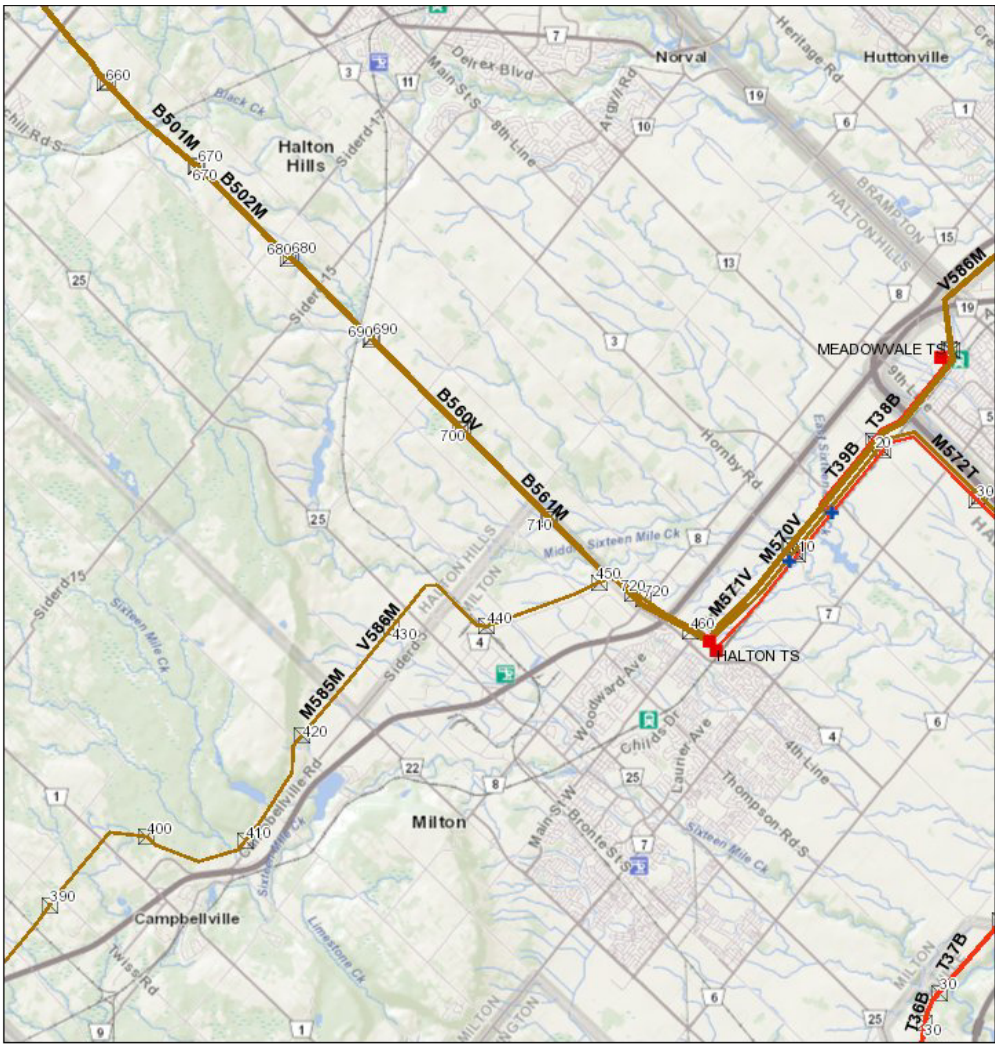

Figure 3: Halton TS and Surrounding Areas

As recommended in the previous regional planning cycle, Halton Hills Hydro has initiated installation of a new step down transformer at the Halton Hills Gas Generation facility. The new station, Halton Hills MTS, will be utilized to serve the load within Halton Hills Hydro territory. The Halton Hills MTS consists of 2 X 50/83 MVA – 230 / 27.6 kV transformers with capacity to connect 8 distribution feeders. The targeted in-service date for the Halton Hills MTS is May 2019.

The previous regional planning cycle and newly submitted load forecast also identifies need for a new DESN station to meet the growing demand in the Milton area. This issue is being address by Hydro One working with the LDCs for a new Halton TS # 2 and planning for Q2 2022 in-service. Hydro One will provide any changes and/or updates to the Study Team. The current regional planning cycle will monitor timing and any related issues.

7.2.2 Erindale TS T1/T2 Station Capacity

Erindale TS is located within city of Mississauga. The existing Erindale TS (T1/T2) DESN consists of 2 X 75/125 MVA, 230 / 27.6 kV transformers and supplies Mississauga area of Alectra Utilities Inc. through 12 feeders. The 27.6 kV load in the area currently exceeds the normal supply capacity at the DESN.

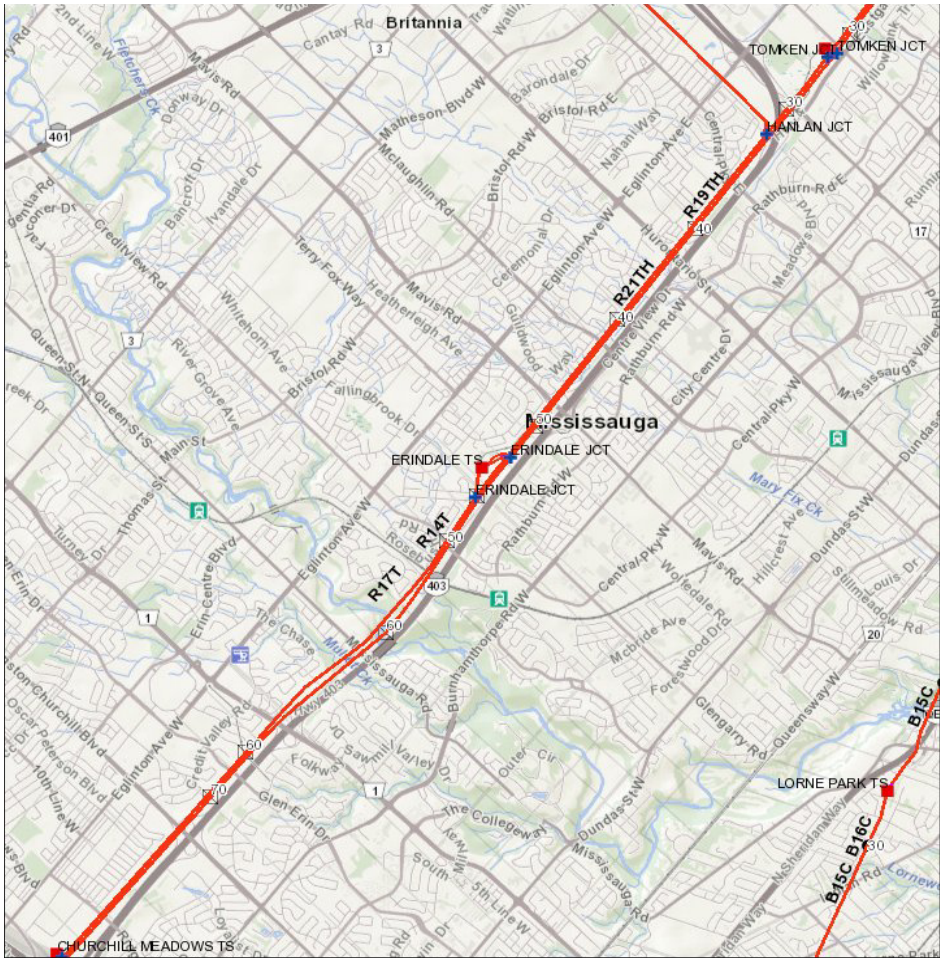

Figure 4: Erindale TS and Surrounding Areas

This need is being managed by distribution planning measure by the LDC and no transmission upgrade is required. No further action is required.

7.2.3 H29 / H30 Transmission Circuit Supply

Pleasant TS is being supplied through 230 kV circuits H29/H30 and has three step-down stations located at the same facility. Circuits H29/H30 has maximum load-carrying capacity of 417 MW limited by the conductors long term emergency rating. The existing load is approaching the conductors LTE ratings and as area is growing, the circuits H29/H30 require to be upgraded to satisfy demand.

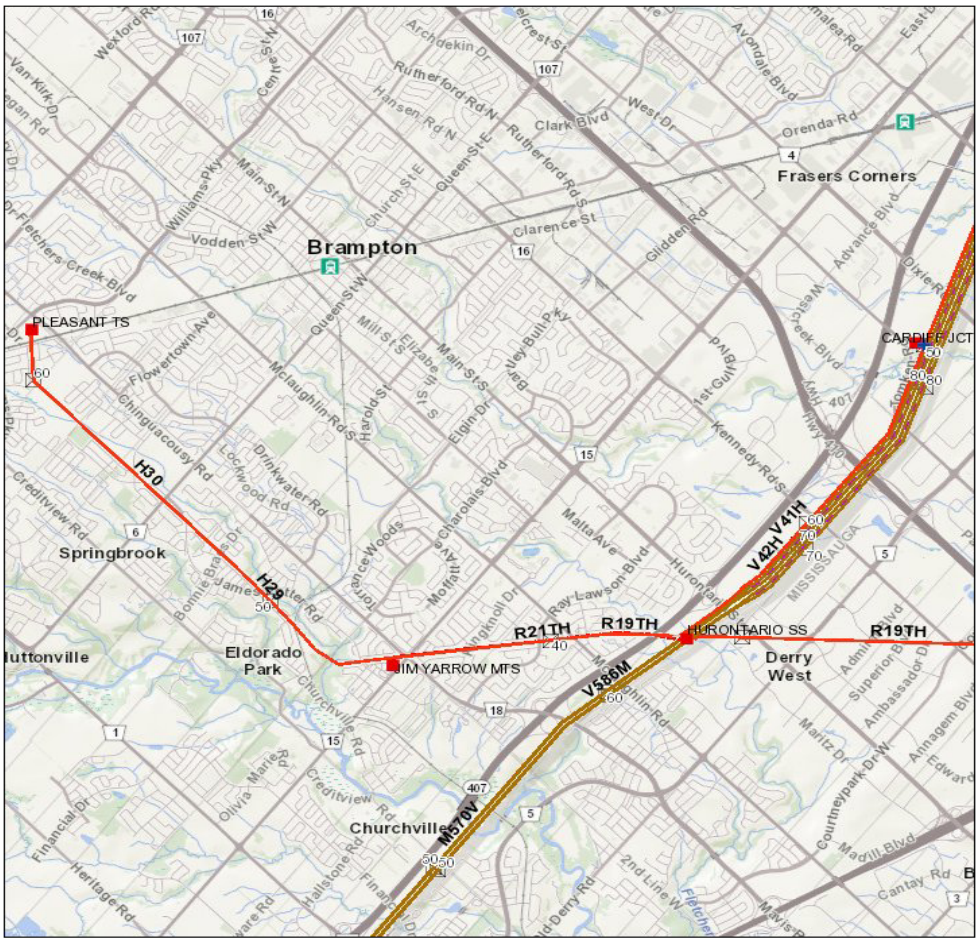

Figure 5: Circuits H29/H30 – Radial supply

The previous RIP report suggested that the circuits will reach their thermal capacity by year 2023 and possible conductor upgrade is required prior to year 2023. The current cycle of load forecast identifies the similar findings, with the need arising in 2024. The most effective solution to address limitation is by replacing existing conductor with higher ratings. Hydro One is planning to replace the existing 795 KCMIL ACSR 26/7 conductors with 1192.5 KCMIL ACSR 54/19 to address this need with an in-service of 2024. This will allow supply capacity to be over 500 MW at Pleasant TS. Hydro One will provide any changes and/or updates to the Study Team. The current regional planning cycle will monitor timing and any related issues.

7.2.4 Richview X Trafalgar Transmission Circuit Capacity

The previous regional planning cycle identified that the loading on the Richview TS to Trafalgar TS circuits, R14/R17 and R19TH/R21TH, exceeds their summer long term emergency (LTE) ratings during one element out of service and high Flow East Towards Toronto (FETT) condition.

The Study Team has decided that these needs will be assessed in the next phase after completion of NA.

Figure 6: Richview X Trafalgar circuit supply

7.2.5 Radial Supply to Halton TS (T38B/T39B)

Circuits T38B/T39B supplies Halton TS, Trafalgar TS, Meadowale TS, Tremaine TS and provides connection to upcoming Halton Hills MTS. As discussed during the previous regional planning cycle, the loading may exceed summer thermal rating of these lines during loss of either T38B or T39B and with Halton Hills CGS out of service. There is also a risk of load exceeding the 600 MW security limit by the mid-2020s. These needs will be further assessed in next phase of this regional planning cycle after completion of NA.

Figure 7: Circuits T38B/T39B – Radial supply

7.3 Supply Security and Restoration

Following Supply Security and Restoration needs were discussed during the previous regional planning cycle.

a. Supply security to T38B/T39B radial pocket
b. Kleinburg Radial Pocket (V43/V44)
c. Halton Radial Pocket (T38B/T39B)
d. Pleasant Radial Pocket (H29/H30)
e. Cardiff/Bramalea Supply (V41H/V42H)
f. West of Cooksville (B15C/B16C)
g. Richview X Trafalgar (R19TH/R21TH)
h. Richview X Trafalgar (R14T/R17T)

The study team has decided that these needs will be considered as part of the current cycle of regional planning and will be assessed in the next phase of this cycle after completion of NA.

8 CONCLUSION AND RECOMMENDATIONS

The Study Team recommendations are as follows:

A. Study Team has reconfirmed the overloading at Halton TS (T3/T4) DESN based on latest load forecast. The need for a new TS in 2021-2022 is being addressed by building Halton TS # 2 being built by Hydro One in coordination with the LDCs for an in-service in Q2 2022.

B. Replacement of end of life component with similar equipment does not require further regional coordination (see further details in Section 7.1). The implementation and execution plan for these needs will be coordinated by Hydro One with affected LDCs:

   a. Trafalgar TS - Component Replacement
   b. Halton TS - PCT and Component Replacements
   c. Erindale TS - PCT and Component Replacements
   d. Pleasant TS - Breakers, PCT and Component Replacements
   e. Bramalea TS - PCT and Component Replacements

C. Needs requiring further regional coordination will be assessed in the next phase after completion of NA
   a. Overloading of circuits R14T/R17T & R19TH/R21TH
   b. Overloading of circuits T38B / T39B
   c. Overloading of circuits H29/ H30
   d. Supply Security & Supply Restoration needs, identified in the Table 2, will be part of the scope for this cycle of regional planning.
   e. EOL replacement of Palermo TS transformers T3/T4 – Study Team will assess and confirm if they should be replaced with same or higher rating.
   f. GTA West Transmission Corridor – Study team to review current information and develop a recommendation.

9 REFERENCES

[1] RIP Report GTA West – January 2016

[2] Local Planning Report – Erindale TS Capacity – July 2015

[3] 2015 Northwest GTA IRRP

[4] Planning Process Working Group Report to the Ontario Energy Board - May 2013

[5] Ontario Resource and Transmission Assessment Criteria (ORTAC) – Issue 5.0 -August 2007

Appendix A: GTA WEST Region Non-Coincident Summer Load Forecast

* Summer LTR based on 0.9 power factor

Transformer Station (DESN)	SLTR (MW)	Type	2018	2019	2020	2021	2022	2023	2024	2025	2026	2027	2028
Bramalea TS (T1/T2)	185	Gross	105	109	111	111	112	113	114	114	116	117	117
		CDM	0	1	3	3	3	3	4	4	4	5	5
		Net	105	108	108	108	109	110	110	110	112	112	112
Bramalea TS (T3/T4)	106	Gross	106	107	108	109	110	111	112	113	113	114	116
		CDM	0	1	3	3	3	3	4	4	4	5	5
		Net	106	106	105	106	107	108	108	109	109	109	111
Bramalea TS (T5/T6)	159	Gross	106	107	109	109	110	111	112	113	114	115	116
		CDM	0	1	3	3	3	3	4	4	4	5	5
		Net	106	106	106	106	107	108	108	109	110	110	111
Cardiff TS (T1/T2)	114	Gross	104	106	106	107	108	109	111	112	113	114	115
		CDM	0	1	2	3	3	3	4	4	4	5	5
		Net	104	105	104	104	105	106	107	108	109	109	110
Goreway TS (T1/T2)	184	Gross	71	74	75	78	81	82	85	88	89	92	95
		CDM	0	1	2	2	2	2	3	3	3	4	4
		Net	71	73	73	76	79	80	82	85	86	88	91
Goreway TS (T4)	78	Gross	27	27	27	27	27	28	28	28	28	28	28
		CDM	0	0	1	1	1	1	1	1	1	1	1
		Net	27	27	26	26	26	27	27	27	27	27	27
Goreway TS (T5/T6)	173	Gross	191	191	191	191	191	191	191	191	191	191	191
		CDM	0	3	4	5	5	6	6	7	7	8	8
		Net	191	188	187	186	186	185	185	184	184	183	183
Halton TS (T3/T4)	186	Gross	140	160	168	188	204	212	219	226	233	240	248
		CDM	0	2	4	4	5	6	7	7	8	9	10
		Net	140	158	164	184	199	206	212	219	225	231	238
Jim Yarrow MTS	157	Gross	128	130	133	135	138	140	143	145	145	146	146
		CDM	0	2	3	3	4	4	5	5	5	6	6
		Net	128	128	130	132	134	136	138	140	140	140	140
Meadowvale TS (T1/T2)	181	Gross	131	132	134	135	136	138	139	140	142	143	145
		CDM	0	2	3	3	3	4	4	5	5	5	6
		Net	131	130	131	132	133	134	135	135	137	138	139

Transformer Station (DESN)	SLTR (MW)	Type	2018	2019	2020	2021	2022	2023	2024	2025	2026	2027	2028
Pleasant TS (T1/T2)	148	Gross	116	118	123	128	132	138	139	140	141	143	144
		CDM	0	2	3	3	4	4	4	5	5	6	6
		Net	116	116	120	125	128	134	135	135	136	137	138
Pleasant TS (T5/T6)	181	Gross	177	177	177	177	177	177	177	177	177	177	177
		CDM	0	2	4	4	5	5	6	6	7	7	7
		Net	177	175	173	173	172	172	171	171	170	170	170
Pleasant TS (T7/T8)	188	Gross	99	102	105	107	110	113	116	120	123	126	129
		CDM	0	1	2	3	3	3	4	4	5	5	5
		Net	99	101	103	104	107	110	112	116	118	121	124
Churchill Meadows TS (T1/T2)	173	Gross	110	111	112	113	115	116	117	118	119	120	122
		CDM	0	1	3	3	3	3	4	4	4	5	5
		Net	110	110	109	110	112	113	113	114	115	115	117
Cooksville TS (T1/T2)	120	Gross	52	52	53	53	54	54	55	56	56	57	57
		CDM	0	1	1	1	1	2	2	2	2	2	2
		Net	52	51	52	52	53	52	53	54	54	55	55
Cooksville TS (T3/T4)	120	Gross	56	57	57	58	58	59	59	60	60	61	62
		CDM	0	1	1	1	2	2	2	2	2	2	3
		Net	56	56	56	57	56	57	57	58	58	59	59
Erindale TS (T1/T2)	172	Gross	169	170	172	174	176	177	179	181	183	185	186
		CDM	0	2	4	4	5	5	6	6	7	7	8
		Net	169	168	168	170	171	172	173	175	176	178	178
Erindale TS (T3/T4)	183	Gross	135	137	139	140	142	142	143	145	146	148	149
		CDM	0	2	3	3	4	4	5	5	5	6	6
		Net	135	135	136	137	138	138	138	140	141	142	143
Erindale TS (T5/T6)	185	Gross	121	122	123	125	126	127	128	129	131	133	134
		CDM	0	2	3	3	3	4	4	5	5	5	6
		Net	121	120	120	122	123	123	124	124	126	128	128
Glenorchy MTS*	153	Gross	52	57	64	72	81	78	86	93	99	105	109
		CDM	0	1	1	2	2	2	3	3	3	4	4
		Net	52	56	63	70	79	76	83	90	96	101	105

Transformer Station (DESN)	SLTR (MW)	Type	2018	2019	2020	2021	2022	2023	2024	2025	2026	2027	2028
Lorne Park TS (T1/T2)	197	Gross	87	87	88	89	90	91	92	93	94	95	96
		CDM	0	1	2	2	2	3	3	3	3	4	4
		Net	87	86	86	87	88	88	89	90	91	91	92
Oakville TS # 2 (T1/T2)	175	Gross	143	141	141	141	141	141	141	141	141	141	142
		CDM	0	2	3	3	4	4	5	5	5	6	6
		Net	143	139	137	137	137	137	137	136	136	135	136
Tomken TS (T1/T2)	164	Gross	139	140	142	143	144	146	147	148	150	151	153
		CDM	0	2	3	3	4	4	5	5	6	6	6
		Net	139	138	139	140	140	142	142	143	144	145	147
Tomken TS (T3/T4)	183	Gross	123	124	125	126	127	129	130	132	133	134	135
		CDM	0	2	3	3	3	4	4	5	5	5	6
		Net	123	122	122	123	124	125	126	127	128	129	129
Tremaine TS (T1/T2)	190	Gross	100	117	124	132	139	147	154	157	159	162	165
		CDM	0	2	3	3	3	4	5	5	6	6	7
		Net	100	115	121	129	136	143	149	152	153	156	158
Palermo TS (T3/T4)	110	Gross	107	105	105	105	106	106	106	106	107	107	107
		CDM	0	1	2	2	3	3	3	3	4	4	4
		Net	107	104	103	103	103	103	103	103	103	103	103
Trafalgar TS (T1/T2)	124	Gross	83	85	85	85	85	85	85	85	85	85	85
		CDM	0	1	2	2	2	2	3	3	3	3	3
		Net	83	84	83	83	83	83	82	82	82	82	82
Kleinburg TS (T1/T2)	196	Gross	142	145	147	149	150	151	151	152	153	153	154
		CDM	0	2	3	4	4	5	5	5	6	6	7
		Net	142	143	144	145	146	146	146	147	147	147	147
Halton Hills MTS	102	Gross	0	11	15	23	26	29	33	37	40	44	49
		CDM	0	0	0	1	1	1	1	1	2	2	2
		Net	0	11	15	22	25	28	32	35	39	43	47

Appendix B: Lists of Step-Down Transformer Stations

Sr. No.	Transformer Stations	Voltages (kV)
1.	Halton TS	230/27.6
2.	Meadowvale TS	230/44
3.	Jim Yarrow MTS	230/27.6
4.	Pleasant TS (T1/T2)	230/44
5.	Pleasant TS (T5/T6)	230/27.6
6.	Pleasant TS (T7/T8)	230/27.6
7.	Cardiff TS	230/27.6
8.	Bramalea TS (T1/T2)	230/27.6
9.	Bramalea TS (T3/T4)	230/44
10.	Bramalea TS (T5/T6)	230/44
11.	Goreway TS (T1/T2)	230/27.6
12.	Goreway TS (T5/T6)	230/27.6
13.	Goreway TS (T4)	230/44
14.	Tremaine TS	230/27.6
15.	Trafalgar TS	230/27.6
16.	Palermo TS	230/27.6
17.	Glenorchy MTS #1	230/27.6
18.	Churchill Meadows TS	230/44
19.	Erindale TS (T1/T2)	230/27.6
20.	Erindale TS (T3/T4)	230/44
21.	Erindale TS (T5/T6)	230/44
22.	Tomken TS (T1/T2)	230/44
23.	Tomken TS (T3/T4)	230/44
24.	Oakville TS #2	230/27.6
25.	Lorne Park TS	230/27.6
26.	Cooksville TS (T1/T2)	230/27.6
27.	Cooksville TS (T3/T4)	230/27.6

Appendix C: Lists of Transmission Circuits

Sr. No.	Circuit ID	From Station	To Station	Voltage (kV)
1.	H29/H30	Hurontario SS	Pleasant TS	230
2.	R14T/R17T	Richview TS	Trafalgar TS	230
3.	R19TH/R21TH	Richview TS	Trafalgar TS/ Hurontario SS	230
4.	T36B/T37B T38B/ T39B	Trafalgar TS	Burlington TS	230
5.	V41H/V42H	Claireville TS	Hurontario SS	230
6.	V43/V44	Claireville TS	Kleinburg TS	230
7.	B15C/B16C	Cooksville TS	Oakville TS	230
8.	K21C/K23C	Manby TS	Cooksville TS	230
9.	R24C	Richview TS	Cooksville TS	230

Appendix D: Lists of LDCs in the GTA WEST Region

Sr. No.	Company	Connection Type (TX/DX)
1.	Alectra Utilities Inc.	Tx / Dx
2.	Burlington Hydro	Tx
3.	Halton Hills Hydro Inc.	Tx / Dx
4.	Hydro One Networks Inc. (Distribution)	Tx
5.	Milton Hydro	Tx / Dx
6.	Oakville Hydro Electricity Distribution Inc.	Tx / Dx

Appendix E: Acronyms

Acronym	Description
A	Ampere
BES	Bulk Electric System
BPS	Bulk Power System
CDM	Conservation and Demand Management
CIA	Customer Impact Assessment
CGS	Customer Generating Station
CSS	Customer Switching Station
CTS	Customer Transformer Station
DESN	Dual Element Spot Network
DG	Distributed Generation
DS	Distribution Station
GS	Generating Station
HV	High Voltage
IESO	Independent Electricity System Operator
IRRP	Integrated Regional Resource Plan
kV	Kilovolt
LDC	Local Distribution Company
LP	Local Plan
LTE	Long Term Emergency
LTR	Limited Time Rating
LV	Low Voltage
MTS	Municipal Transformer Station
MW	Megawatt
MVA	Mega Volt-Ampere
MVAR	Mega Volt-Ampere Reactive
NA	Needs Assessment
NERC	North American Electric Reliability Corporation
NGS	Nuclear Generating Station
NPCC	Northeast Power Coordinating Council Inc.
NUG	Non-Utility Generator
OEB	Ontario Energy Board
OPA	Ontario Power Authority
ORTAC	Ontario Resource and Transmission Assessment Criteria
PF	Power Factor
PPWG	Planning Process Working Group
RIP	Regional Infrastructure Plan
SA	Scoping Assessment
SIA	System Impact Assessment
SPS	Special Protection Scheme
SS	Switching Station
STG	Steam Turbine Generator
TS	Transformer Station