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NEEDS ASSESSMENT REPORT

GTA East Region

Date: August 15, 2019

Prepared by: GTA East Region Study Team



Disclaimer

This Needs Assessment Report was prepared for the purpose of identifying potential needs in the GTA East 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	GTA East Region (the “Region”)	
LEAD	Hydro One Networks Inc. (“HONI”)	
START DATE: JUNE 23, 2019	END DATE:	August 15, 2019

1. INTRODUCTION

The first cycle of the Regional Planning process for the GTA East Region was completed in January 2017 with the publication of the Regional Infrastructure Plan (“RIP”) which provided a description of needs and recommendations of preferred wires plans to address near-term needs.

This is the second cycle of regional planning starting from Needs Assessment (“NA”). The purpose of this NA is to identify any new needs and/or to reaffirm needs identified in the previous GTA East 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, the 2nd Regional Planning cycle was triggered for GTA East 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 and reaffirm needs/plans identified in the previous RIP; and
- Identification and assessment of system capacity, reliability, operation, and aging infrastructure needs in the region.

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 East Region regarding capacity needs, reliability needs, 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 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;
- Reliability needs and operational concerns; and
- Any major high voltage equipment reaching the end of its useful life.

6. NEEDS

I. Previously identified need as part of the regional planning

The NA reaffirms previously identified needs –

- a. Additional transformation capacity in Pickering-Ajax-Whitby sub-region:
Seaton MTS is being built by Elexicon with an in-service date of Q1 2020. No further action is required.
- b. Additional transformation capacity in Oshawa-Clarington sub-region:
Enfield TS went in-service in March 2019. No further action is required.

II. Newly identified needs in the region

a. Line / Station Capacity

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

b. System Reliability & Operation

No new System Reliability and Operation needs have been identified by Study Team.

c. Aging Infrastructure Transformer replacements

- i. Cherrywood TS – 230kV & 500kV Breaker Replacements (multi-phase) (2027)
- ii. Cherrywood TS – MV Switchyard Refurbishment (2025)
- iii. Wilson TS – T1/T2 & Switchyard Refurbishment (2025)

7. RECOMMENDATIONS

The Study Team's recommends that following end of life high voltage equipment should be replaced with similar equipment and it does not require further regional coordination (see further details in Section 7.1).

- a. Cherrywood TS – 230kV & 500kV Breaker Replacement (multi-phase)
- b. Cherrywood TS – MV switchyard Refurbishment
- c. Wilson TS – T1/T2 & Switchyard Refurbishment

The implementation and execution plan for these needs will be coordinated by Hydro One with affected LDCs.

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1 INTRODUCTION

The first cycle of the Regional Planning process for the GTA East Region was completed in January 2017 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 East 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 East 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 East Region Study Team Participants

Company
Elexicon Energy Inc.
Oshawa PUC Networks Inc.
Hydro One Networks Inc. (Lead Transmitter)
Hydro One Networks Inc. (Distribution)
Independent Electricity System Operator (“IESO”)

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 East region, the 2nd Regional Planning cycle was triggered for the GTA East region.

3 SCOPE OF NEEDS ASSESSMENT

The scope of this NA covers the GTA East 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 GTA East Region comprises the municipalities of Pickering, Ajax, Whitby, Oshawa and parts of Clarington, and other parts of the Durham area. The boundaries of the GTA East Region are shown below in Figure 1.

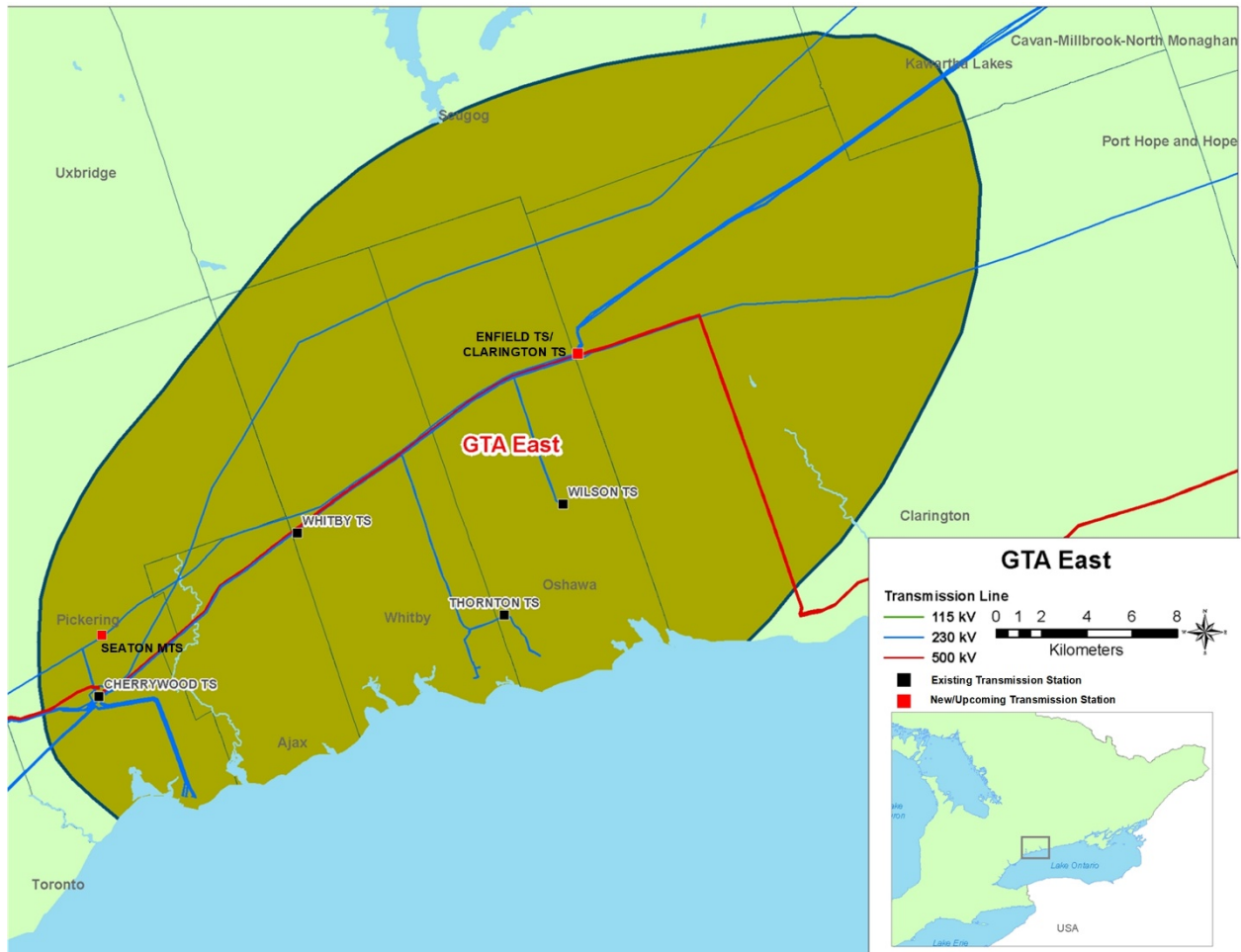


Figure 1: Geographical Area of GTA East Region with Electrical Layout

Electrical supply to the GTA East Region is provided through 500/230kV autotransformers at Cherrywood Transformer Station (TS) and five 230 kV transmission lines connecting Cherrywood to Eastern Ontario. There are four Hydro One step-down transformer stations and three other direct transmission connected load customers. The distribution system is at two voltage levels, 44kV and 27.6kV.

The existing facilities in the Region are summarized below and depicted in the single line diagram shown in Figure 2. The 500kV system is part of the bulk power system and is not studied as part of this Needs Screening:

- Cherrywood TS is the major transmission station that connects the 500kV network to the 230kV system via four 500/230kV autotransformers.
- Five step-down transformer stations supply the GTA East load: Cherrywood TS, Whitby TS, Wilson TS, Thornton TS and Enfield TS.
- Three customer transformer stations (CTS) are supplied in the region.
- Five 230kV circuits (T23C, T29C, T24C, T26C, T28C) emanating east from Cherrywood TS provide local supply to the GTA East Region. They extend from Cherrywood in the City of Pickering to Clarington TS.
- The Pickering Nuclear Generating Station (NGS) consists of 6 generating units with a combined output of approximately 3000 MW. It is connected to the 230kV system at Cherrywood.
- CGS D is a 60 MW gas-fired cogeneration facility that connects to circuit T26C.

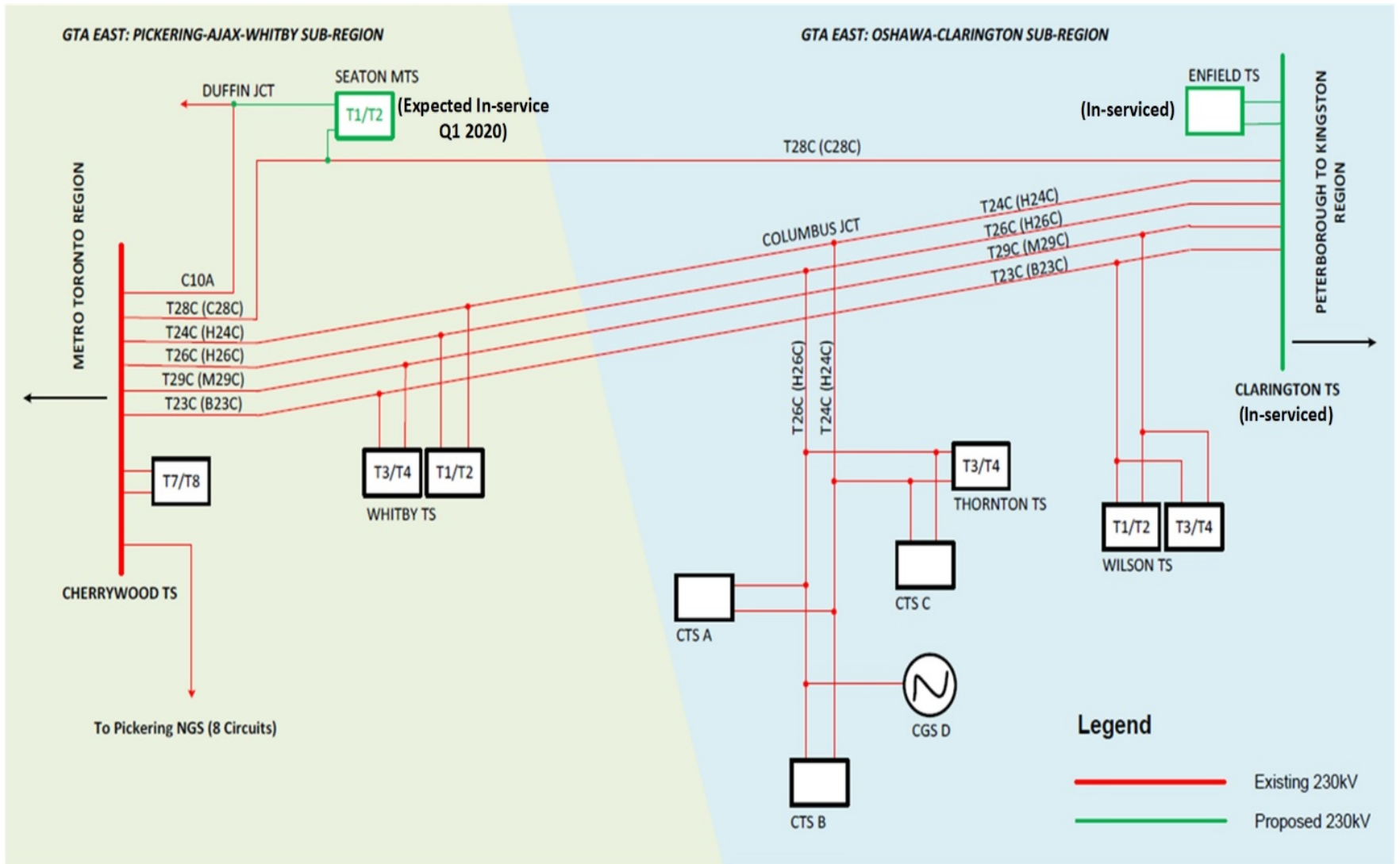


Figure 2: Single Line Diagram of GTA East Region

5 INPUTS AND DATA

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

- GTA East 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 East 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 East region for the 10 year study period. The IESO provided a Conservation and Demand Management (“CDM”) and Distributed Generation (“DG”) forecast for the GTA East region. 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 and then by the amount of effective DG capacity provided by the IESO for that station. These extreme weather summer load forecast for the individual stations in the GTA East 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 currently no active Community Energy Plans in the region which can have any direct impact on the needs identified by the Study Team.

7 NEEDS

This section describes emerging needs identified in the GTA East 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. This is attributed to the load growth at Enfield TS and Seaton MTS. A contingency analysis was performed for the region and no new system needs were identified.

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
Additional transformation capacity for Whitby TS T1/T2 27.6kV in Pickering-Ajax-Whitby Sub-Region	Whitby T1/T2 27.6 kV was expected to be loaded to capacity by 2020 and additional transformation capacity was required for the expected load growth in the area.	Seaton MTS is in construction with an expected in-service date of Q1 2020
Additional transformation capacity for Wilson TS T1/T2 & T3/T4 in Oshawa-Clarington Sub-Region	Wilson TS T1/T2 & T3/T4 was loaded pass its LTR rating and that immediate action was needed to address the overloading issue and expected load growth in the area	Enfield TS is currently in-service.

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 typically included consideration of the following options:

1. Replacing equipment with similar equipment and built to current standards (i.e., “like-for-like” replacement);
2. Replacing equipment with similar equipment of higher / lower ratings i.e. right sizing opportunity 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;

In addition, from Hydro One’s perspective as a facility owner and operator of its transmission equipment, do nothing is generally not 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 and assessed for right sizing opportunity.

a. Cherrywood TS – 230kV & 500kV Breaker Replacements (multi-phase project)

Cherrywood TS is a major Bulk Electricity System (BES), Northeast Power Coordination Council (NPCC) station, located at east end of Greater Toronto Area (GTA). The station includes 500 kV and 230 kV switchyards, four autotransformers that transfer electricity from Darlington and Pickering Nuclear Generating Station into GTA, and a 44kV DESN tapped off the 230kV bus which delivers power to Elexicon. The existing 500kV and 230kV Air Blast Circuit Breaker (ABCBs), with an average age of 48 years are obsolete and at end of life. The age, condition and lack of parts present significant difficulties in maintaining these breakers and the associated high pressure air system.

The scope of this project is to replace the existing eight (8) 500kV and thirty (30) 230kV air-blast circuit breakers in a multi-phase project release. The targeted in-service for the final phase is in year 2022. The Study Team recommended continuation of these end of life asset replacement as per the plan.

b. Cherrywood TS – LV DESN Switchyard Refurbishment

The MV DESN switchyard, with the exception of step-down transformers T7 and T8, at Cherrywood TS is at end of life due to age and condition. The scope of this project is to replace all 44 kV switchyard assets with the current standard equipment. The targeted in-service is in year 2025.

The Study Team recommended continuation of these end of life asset replacement as per the plan.

c. Wilson TS – T1, T2 and Switchyard Refurbishment

Wilson TS is located in Oshawa and it contains 4 X 75/100/125 MVA, 230/44 kV, transformers that supplies city of Oshawa through Oshawa Power feeders and surrounding areas of Oshawa through Hydro One Dx owned feeders. The T1 and T2 transformers at Wilson TS and majority of assets within 44 kV BY switchyard have reached end of life. The associated spill containment structure do not meet current standard.

The scope of this project is to replace T1/T2 step-down transformers, associated spill containment structure and majority of assets within 44 kV BY switchyard. The targeted in-service is in year 2025.

The Study Team has assessed downsizing and/or upsizing a need for these transformers. The Working Group concluded that reducing the size of these transformers is not an option as the load in the area is increasing. Upsizing is also not an option because this is the highest rating of transformer. Accordingly, replacing these transformers with similar size is the best “right sizing”. The Study Team recommends continuation of these end of life asset replacement as per the plan.

No other lines or HV station equipment in the GTA East 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 East Region

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

7.2.1 New Seaton MTS

The Pickering-Ajax-Whitby sub-region is being supplied by two step-down transformer stations, Cherrywood TS at 44 kV and Whitby TS at 27.6 kV and 44 kV. A new residential and mixed use commercial developing area, called Seaton, will result into significant 27.6 kV demand in the sub-region. The previous Regional Planning cycle as well as current submitted load forecast identified need for additional 27.6 kV capacity in the area.



Figure 3: Location of Seaton MTS

As recommended in the previous regional planning cycle, Elexicon has initiated installation of a new step down transformer station, called Seaton MTS. The station will be built and owned by Elexicon. To feed the new Seaton MTS, Hydro One will be converting an existing single circuit 230 kV transmission line (T28C) to a double circuit line from Duffin Jct to Seaton MTS to serve the station. Hydro One is working with Elexicon and planning for Q1 2020 in-service. No further action is required.

7.2.2 Enfield TS

Wilson TS is located within the city of Oshawa and has four 230kV / 44kV (T1/T2 & T3/T4) step down transformers that supplies OPUC and Hydro One Dx customers. Wilson TS normal supply capacities were exceeded due to significant growth over the time. The previous Regional Planning cycle recommended a new TS, now named Enfield TS, in the area mainly to relieve the Wilson TS from overloading as well as to meet the new load growth in the area. As per recommendation, Hydro One has installed a new 230kV / 44kV Enfield TS with six (6) 44kV feeder breaker positions with provision for two (2) additional 44kV future feeder breaker positions. The new Enfield TS is located adjacent to Clarington TS and will supply OPUC through four (4) feeders and Hydro One Dx through two (2) feeders. The station went in-service March 2019 and currently feeder load transfer work is in progress to transfer some existing load from Wilson TS to Enfield TS. No further action is required.



Figure 4: Location of Clarington TS and Enfield TS

7.3 Other Planning Considerations in the GTA East Region

As all the needs in the previous planning cycle are already addressed OR being addressed, and no new needs have arisen in the latest load forecast, no other consideration is needed.

8 CONCLUSION AND RECOMMENDATIONS

In conclusion, the capacity needs identified in the previous planning cycle are being addressed with projects under execution. All the new loads are expected to be accommodated by Enfield TS and Seaton MTS. It is recommended that Hydro One and the LDCs continue to monitor the loading of the existing facilities and new facilities over the next five (5) years to ensure adequate capacity is available for the new load in the region.

The Study Team recommendations are as follows:

- A. Replacement of end of life component with similar equipment does not require further regional coordination. The Study Team considered these end of life asset replacement for right sizing opportunity and recommended continuation of replacing these assets with similar equipment. The implementation and execution plan for these needs will be coordinated by Hydro One with affected LDCs:
 - a. Cherrywood TS – 230kV & 500kV Breaker Replacement (multi-phase)
 - b. Cherrywood TS – MV DESN Switchyard Refurbishment
 - c. Wilson TS – T1/T2 Replacement / Refurbishment

9 REFERENCES

- [1] [Regional Infrastructure Planning Report 2017 – GTA East - January 2017](#)
- [2] [IRRP Report – Pickering-Ajax-Whitby Sub-Region – June 2016](#)
- [3] [Needs Assessment Report GTA East – August 2014](#)
- [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 East Region Non-Coincident Summer Load Forecast

Transformer Station		Summer 10 Day LTR (MW)	Type	Actual	Forecasted										
Name	DESN ID			2018	2019	2020	2021	2022	2023	2024	2025	2026	2027	2028	2029
Cherrywood TS	T7/T8	175	Gross	N/A	166.0	166.0	166.0	166.0	166.0	166.0	166.0	166.0	166.0	166.0	166.0
			DG	N/A	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
			CDM	N/A	1.8	3.0	3.2	3.6	4.2	4.6	5.1	5.4	6.0	6.3	6.6
			Net	161.1	164.2	163.0	162.8	162.4	161.8	161.4	160.9	160.6	160.0	159.7	159.4
Seaton MTS	T1/T2	153	Gross	0.0	0.0	1.0	4.0	20.0	28.0	36.0	43.0	50.0	57.0	65.0	74.1
			DG	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
			CDM	0.0	0.0	0.0	0.1	0.4	0.7	1.0	1.3	1.6	2.0	2.5	3.0
			Net	0.0	0.0	1.0	3.9	19.6	27.3	35.0	41.7	48.4	55.0	62.5	71.2
Thornton TS	T3/T4	160	Gross	N/A	138.5	131.3	133.5	135.8	136.8	137.8	138.8	139.8	140.9	141.9	143.0
			DG	N/A	0.6	0.6	0.6	0.6	0.6	0.6	0.6	0.6	0.6	0.6	0.0
			CDM	N/A	1.5	2.4	2.6	3.0	3.5	3.8	4.3	4.6	5.1	5.4	5.7
			Net	138.3	136.4	128.3	130.4	132.2	132.7	133.4	133.9	134.6	135.2	135.9	137.2
Whitby TS	T3/T4	187	Gross	142.4	143.3	151.0	155.8	161.7	166.7	168.7	170.7	172.8	175.0	177.1	179.2
			DG	19.0	19.0	19.0	19.0	19.0	19.0	19.0	19.0	19.0	19.0	19.0	0.0
			CDM	0.0	1.5	2.7	3.0	3.6	4.2	4.7	5.2	5.6	6.3	6.7	7.2
			Net	123.4	122.8	129.3	133.8	139.1	143.5	145.0	146.5	148.2	149.7	151.4	172.1
Whitby TS	T1/T2 (27.6kV)	90	Gross	56.0	59.0	74.0	90.0	90.0	90.0	90.0	90.0	90.0	90.0	90.0	90.0
			DG	0.0	0.5	0.5	0.5	0.5	0.5	0.5	0.5	0.5	0.5	0.5	0.0
			CDM	0.0	0.6	1.3	1.7	2.0	2.3	2.5	2.8	2.9	3.2	3.4	3.6
			Net	56.0	57.9	72.2	87.8	87.5	87.2	87.0	86.7	86.6	86.3	86.1	86.4
Whitby TS	T1/T2 (44kV)	90	Gross	43.7	57.7	59.5	61.2	63.1	64.3	65.6	66.9	68.3	69.6	71.0	72.4
			DG	0.0	0.5	0.5	0.5	0.5	0.5	0.5	0.5	0.5	0.5	0.5	0.0

			CDM	0.0	0.6	1.1	1.2	1.4	1.6	1.8	2.1	2.2	2.5	2.7	2.9
			Net	43.7	56.6	57.9	59.5	61.2	62.2	63.3	64.3	65.6	66.6	67.8	69.5
Wilson TS	T1/T2	161	Gross	153.6	153.6	155.3	154.1	156.7	159.4	161.2	163.8	165.6	167.4	168.3	169.1
			DG	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
			CDM	0.0	1.6	2.8	3.0	3.4	4.0	4.5	5.0	5.4	6.0	6.4	6.8
			Net	153.6	152.0	152.5	151.2	153.2	155.4	156.7	158.8	160.2	161.4	161.9	162.4
Wilson TS	T3/T4	134	Gross	N/A	169.2	143.3	144.2	152.8	154.7	156.5	158.4	160.2	162.1	163.9	165.7
			DG	N/A	26.0	26.0	26.0	26.0	26.0	26.0	26.0	26.0	26.0	26.0	26.0
			CDM	N/A	1.5	2.1	2.2	2.7	3.2	3.5	3.9	4.2	4.7	5.1	5.4
			Net	141.7	141.7	115.3	116.0	124.1	125.5	127.0	128.5	130.0	131.4	132.9	134.4
Enfield TS	T1/T2	157	Gross	0.0	19.0	83.5	108.9	111.4	115.0	118.5	121.9	126.4	129.9	134.4	139.0
			DG	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
			CDM	0.0	0.2	1.5	2.1	2.4	2.9	3.3	3.7	4.1	4.7	5.1	5.6
			Net	0.0	18.8	82.0	106.8	109.0	112.1	115.2	118.2	122.3	125.2	129.3	133.5
CTS A			Net	25	25	25	25	25	25	25	25	25	25	25	
CTS B			Net	95	95	95	95	95	95	95	95	95	95	95	
CTS C			Net	21	21	21	21	21	21	21	21	21	21	21	
CGS D			Net	0.7	0.7	0.7	0.7	0.7	0.7	0.7	0.7	0.7	0.7	0.7	

Appendix B: Lists of Step-Down Transformer Stations

Sr. No.	Transformer Stations	Voltage Level	Supply Circuits
1.	Cherrywood TS T7/T8	230/44kV	Cherrywood TS, DK Bus
2.	Whitby TS T1/T2 27.6 Whitby TS T1/T2 44	230/27.6kV 230/44kV	T24C/T26C
3.	Whitby TS T3/T4	230/44kV	T23C/T29C
4.	Wilson TS T1/T2	230/44kV	T23C/T29C
5.	Wilson TS T3/T4	230/44kV	T23C/T29C
6.	Thornton TS T3/T4	230/44kV	T24C/T26C
7.	Enfield TS T1/T2	230/44kV	Clarington TS, PK Bus
8.	Seaton MTS	230/44kV	C10A/T28C

Appendix C: Lists of Transmission Circuits

Sr. No.	Circuit ID	From Station	To Station	Voltage (kV)
1.	C10A	Cherrywood TS	Seaton MTS	230
2.	T23C	Cherrywood TS	Clarington TS	230
3.	T24C	Cherrywood TS	Clarington TS	230
4.	T26C	Cherrywood TS	Clarington TS	230
5.	T28C	Cherrywood TS	Clarington TS	230
6.	T29C	Cherrywood TS	Clarington TS	230

Appendix D: Lists of LDCs in the GTA East Region

Sr. No.	Company	Connection Type (TX/DX)
1.	Oshawa PUC	TX
2.	Elexicon Energy Inc.	TX / DX
3.	Hydro One Distribution	TX

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