Third Cycle

NEEDS ASSESSMENT REPORT

Greater Bruce/Huron

Date: September 24, 2024

Needs Assessment Report

Greater Bruce/Huron

Sept. 24, 2024

Lead Transmitter:

Hydro One Networks Inc.

Prepared by: Greater Bruce/Huron Technical Working Group

Page intentionally left blank

Needs Assessment Report Update

As an update[1] to the Needs Assessment (NA) conclusions, The Technical Working Group (TWG) has made a minor correction to the recommendations made in the NA report that was published on September 24, 2024. The NA report has been revised to update the recommendation for the following needs to be addressed in the "next cycle" of Regional Planning instead of "next phases" of the current Regional Planning cycle.

- Operational issue with supply capacity at Hanover TS under outage conditions
- Operational issue with supply capacity on D10H when load is transferred between Detweiler TS in Kitchener-Waterloo-Cambridge-Guelph Region and Hanover TS in the Greater Bruce/Huron Region

As a result, no further regional planning coordination is required at this time for the Great Bruce/Huron Region as recommended by the TWG. The needs identified in the NA report will proceed to the Regional Infrastructure Plan (RIP) phase.

[1] Greater Bruce/Huron Needs Assessment Report-Update, 16/12/2024

Disclaimer

This Needs Assessment ("NA") Report was prepared for the purpose of identifying potential needs in the Greater Bruce/Huron and to recommend which needs a) do not require further regional coordination and can be directly addressed by developing a preferred plan as part of the NA phase and b) require further assessment and regional coordination. The results reported in this NA are based on the input and information provided by the Technical Working Group ("TWG") for this region at the time. Updates may be made based on best available information throughout the planning process.

The TWG participants, their respective affiliated organizations, and Hydro One Networks Inc. (collectively, "the Authors") shall not, under any circumstances whatsoever, be liable to each other, to any third party for whom the Needs Assessment Report was prepared ("the Intended Third Parties") or to any other third party reading or receiving the Needs Assessment Report ("the Other Third Parties"). The Authors, Intended Third Parties and Other Third Parties acknowledge and agree that: (a) the Authors make no representations or warranties (express, implied, statutory or otherwise) as to this document or its contents, including, without limitation, the accuracy or completeness of the information therein; (b) the Authors, Intended Third Parties and Other Third Parties and their respective employees, directors and agents (the "Representatives") shall be responsible for their respective use of the document and any conclusions derived from its contents; (c) and the Authors will not be liable for any damages resulting from or in any way related to the reliance on, acceptance or use of the document or its contents by the Authors, Intended Third Parties or Other Third Parties or their respective Representatives.

Executive Summary

REGION	Greater Bruce/Huron Region (the "Region")
LEAD	Hydro One Networks Inc. ("HONI")
START DATE: May 27, 2024	**END DATE:** Sept 24, 2024

1. INTRODUCTION

The second Regional Planning cycle for the Greater Bruce/Huron Region was completed in April 2022 with the publication of the Regional Infrastructure Plan ("RIP") report. This is the third cycle of Regional Planning for the region.

The purpose of this Needs Assessment ("NA") is to:

a) Identify any new needs and reaffirm needs identified in the previous regional planning cycle; and,
b) Recommend which needs:
   i) require further assessment and regional coordination (and hence, proceed to the next phases of the regional planning cycle); and,
   ii) do not require further regional coordination (i.e., can be addressed directly between Hydro One and the impacted LDC(s) to develop a preferred plan and/or no regional investment is required at this time and the need may be reviewed during the next regional planning cycle).

The planning horizon for this NA assessment is 10 years.

2. REGIONAL ISSUE/TRIGGER

In accordance with the Regional Planning process, the Regional Planning cycle should be triggered at least once every five years. Considering these timelines, the 3rd Regional Planning cycle was triggered in May 2024 for the Greater Bruce/Huron Region.

3. SCOPE OF NEEDS ASSESSMENT

The scope of the Greater Bruce/Huron Region NA and includes:

a) Review and reaffirm needs/plans identified in the previous regional planning cycle RIP (as applicable),
b) Identify any new needs resulting from this assessment,
c) Recommend which need(s) require further assessment and regional coordination in the next phases of the regional planning cycle; and,
d) Recommend which needs do not require further regional coordination (i.e., can be addressed directly between Hydro One and the impacted LDC(s) to develop a preferred plan and/or no regional investment is required at this time and the need may be reviewed during the next regional planning cycle).

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

4. REGIONAL DESCRIPTION AND CONNECTION CONFIGURATION

The Greater Bruce/Huron region comprises of the counties of Bruce, Huron, and Perth, as well as portions of Grey, Wellington, Waterloo, Oxford, and Middlesex counties.

Electricity supply for the Region is provided through a network of 230 kV and 115 kV transmission lines supplied mainly by generation from the Bruce Nuclear Generating Station and local renewable generation facilities in the Region. These circuits connect the Region to the adjacent South Georgian Bay/Muskoka Region and the adjacent Kitchener-Waterloo-Cambridge-Guelph ("KWCG") Region.

5. INPUTS/DATA

The TWG comprises of representatives from Local Distribution Companies ("LDC"), the Independent Electricity System Operator ("IESO"), and Hydro One and provides input and relevant information for the Greater Bruce/Huron Region regarding capacity needs, reliability needs, operational issues, and major High-Voltage ("HV") transmission assets requiring replacement over the planning horizon. The LDCs also capture input from municipalities in the development of their 10-year load forecast if applicable.

In accordance with the regional planning process, stakeholder engagement takes place during the IRRP phase.

6. ASSESSMENT METHODOLOGY

The assessment's primary objective is to identify the electrical infrastructure needs in the Region over the 10-year planning horizon. The assessment methodology includes a review of planning information such as load forecast (which factors various demand drivers and consideration of Municipal Energy Plans ("MEP") and/or Community Energy Plans ("CEP") where available), conservation and demand management ("CDM") forecast, Distributed Energy Resource ("DER") forecast, system reliability and operation, and major HV transmission assets requiring replacement.

A technical assessment of needs is undertaken based on:

a) Current and future station capacity and transmission adequacy;

b) System reliability needs and operational concerns;

c) Major HV transmission equipment requiring replacement with consideration to "right-sizing"; and,

d) Sensitivity analysis to capture uncertainty in the load forecast as well as variability of demand drivers such as electrification.

7. NEEDS

I. Updates on needs identified during the previous regional planning cycle

The following needs and projects discussed in the Greater Bruce/Huron second cycle RIP have been completed:

- Bruce A TS – 230kV ABCB Station Refurbishment: Replacing ABCB breakers with SF6 type to maintain station reliability and ensuring continued supply reliability to the customers in the area. This project was completed in 2022.
- Stratford TS – T1 and Component Replacement: Like-for-Like replacement of transformer T1 to maintain supply reliability to Festival Hydro Inc., Hydro One Distribution. This project was completed in 2022.
- Hanover TS – T2 and Component Replacement: Like-for-Like replacement of transformer T2 to maintain supply reliability to Festival Hydro Inc. and Hydro One Distribution. This project was completed in 2022.
- 115 kV L7S Circuit – Capacity Increase and Clearance Improvement between Seaforth TS and Kirkton JCT. This project was completed between 2022 to 2023.

The following needs and projects discussed in the previous cycle RIP for Greater Bruce/Huron region are currently underway:

- Wingham TS – T1/T2 and Component Replacement: Like-for-Like replacement of transformers T1 and T2 to maintain supply reliability to the LDCs in the area. This project is planned to be completed in Q4 2024.
- Bruce B SS – ABCB Replacement need: Replacing end of life ABCB breakers with SF6 type to provide system reliability to the LDCs in the area. This project is projected to be completed by Q2 2025.
- Seaforth TS – T1/T2/T5/T6 and Component Replacement: Like-for-Like replacement of transformers T1, T2, T5 and T6 to maintain supply reliability to the LDCs in the area. This project is planned to be completed by Q4 2026.
- Bruce A TS – 500kV ABCB Replacement and Yard Reconfiguration: Replacing the 500kV ABCB breakers at with new SF6 units to maintain supply reliability to the LDCs in the area. This project is planned to be completed in 2027.
- Owen Sound TS – T5 and Component Replacement: Like-for-Like replacement of transformer T5 to maintain supply reliability to the LDCs in the area. This project is planned to be completed by 2029.

The following needs and projects discussed in the previous cycle RIP for Greater Bruce/Huron region are planned for the long-term horizon:

- Douglas Point TS – T3/T4 and Component Replacement: Like-for-Like replacement of transformers T3 and T4 to maintain supply reliability to the LDCs in the area. This project is planned to be completed by 2037.
- Bruce HWP B TS – T7/T8 and Component Replacement: Like-for-Like replacement of transformers T7 and T8 to maintain supply reliability to the LDCs in the area. This project is planned to be completed by 2038.

II. Newly identified needs in the region

The following are new needs that were identified as part of this assessment:

a) Asset Renewal for Major HV Transmission Equipment

Stratford TS – Like for Like replacement of transformer T2 – Long term planning.

b) Transformation Capacity

During the study period, no transformation capacity needs were identified.

c) Transmission System Capacity

During the study period, no new transmission system capacity needs were identified.

d) System Reliability, Load Restoration, and Operation

- 115 kV L7S Circuit – System Operation and performance issues due to line galloping and line component failures – Even though the line section between Seaforth Ts to Kirkton JCT was replaced in 2022-2023, Hydro one will continue monitoring the performance of the remaining sections of the circuits and will proceed with corrective plans as required.
- Operational issue with supply capacity at Hanover TS under outage conditions
- Operational issue with supply capacity on D10H when load is transferred between Detweiler TS in Kitchener-Waterloo-Cambridge-Guelph Region and Hanover TS in the Greater Bruce/Huron Region

8. SENSITIVITY ANALYSIS

The objective of a sensitivity analysis is to capture uncertainty in the load forecast as well as variability of electric demand drivers to identify any emerging needs and/or advancement or deferment of recommended investments.

The impact of the sensitivity analysis for the high and low growth scenarios identified that the following updates to need dates and/or new station/line capacity needs:

- No new needs were identified for during this study period.

9. RECOMMENDATIONS

The TWG recommendations are as follows:

I. Needs that require further assessment and regional coordination

No further regional planning coordination is required at this time for the needs identified for Great Bruce/Huron Region as recommended by the TWG.

II. Needs that do not require further regional coordination

These needs are local in nature and do not have a regional impact. They can be addressed by a straightforward transmission and/or distribution wires solution. They do not require investment in any

upstream transmission facility or require Leave to Construct (i.e., Section 92) approvals. These needs generally impact a limited number of LDCs and can be addressed directly between Hydro One and the LDC(s) to develop a preferred local plan. A list of these needs are as follows:

a) Wingham TS - T1, T2 and Component Replacement – Near Term
b) Bruce B SS - 500kV ABCB Replacement – Near Term
c) Seaforth TS - T1, T2, T5, T6 and Component Replacement – Mid Term
d) Bruce A TS - 500kV ABCB Replacement and Yard Reconfiguration – Mid Term
e) Owen Sound TS - T5 Transformer and associated equipment Replacement – Mid Term
f) Douglas Point TS - T3, T4 transformers and components Replacement – Mid Term
g) Stratford TS - T2 and BY switchyard Replacement – Long Term
h) Bruce HWP B - T7, T8 Transformers Replacement – Long Term

The following system operational issues will be monitored and reviewed in the next regional planning cycle for further assessment and regional coordination.

a) Operational issue with supply capacity at Hanover TS under outage conditions
b) Operational issue with supply capacity on circuit D10H during load transfer between Detweiler TS in Kitchener-Waterloo-Cambridge-Guelph Region and Hanover TS in the Greater Bruce/Huron Region

List of LDC(s) to be involved in further regional planning phases:

- N/A

List of LDC(s) which are not required to be involved in further regional planning phases:

- Entegrus Powerline Inc.
- Wellington North Power Inc.
- Hydro One Networks Inc. (Distribution)
- Westario Power Inc
- Festival Hydro
- ERTH Power Corporation

Table of Contents

List of Figures

List of Tables

1. INTRODUCTION

The second cycle of the Regional Planning process for the Greater Bruce/Huron Region was completed in April 2022 with the publication of the Regional Infrastructure Plan ("RIP") Report. The RIP report included a common discussion of all the options and recommended plans for preferred wire infrastructure investments to address the near- and medium-term needs.

This Needs Assessment initiates the third regional planning cycle for the Greater Bruce/Huron Region. The purpose of this Needs Assessment ("NA") is to:

a) Identify any new needs and reaffirm needs identified in the previous regional planning cycle; and,
b) Recommend which needs:
   i) require further assessment and regional coordination (and hence, proceed to the next phases of regional planning); and,
   ii) do not require further regional coordination (i.e., can be addressed directly between Hydro One and the impacted LDC(s) to develop a preferred plan and/or no regional investment is required at this time and the need may be reviewed during the next regional planning cycle).

The planning horizon for this NA assessment is ten years. A flow chart of the Regional Planning Process is shown in Figure 1 below.

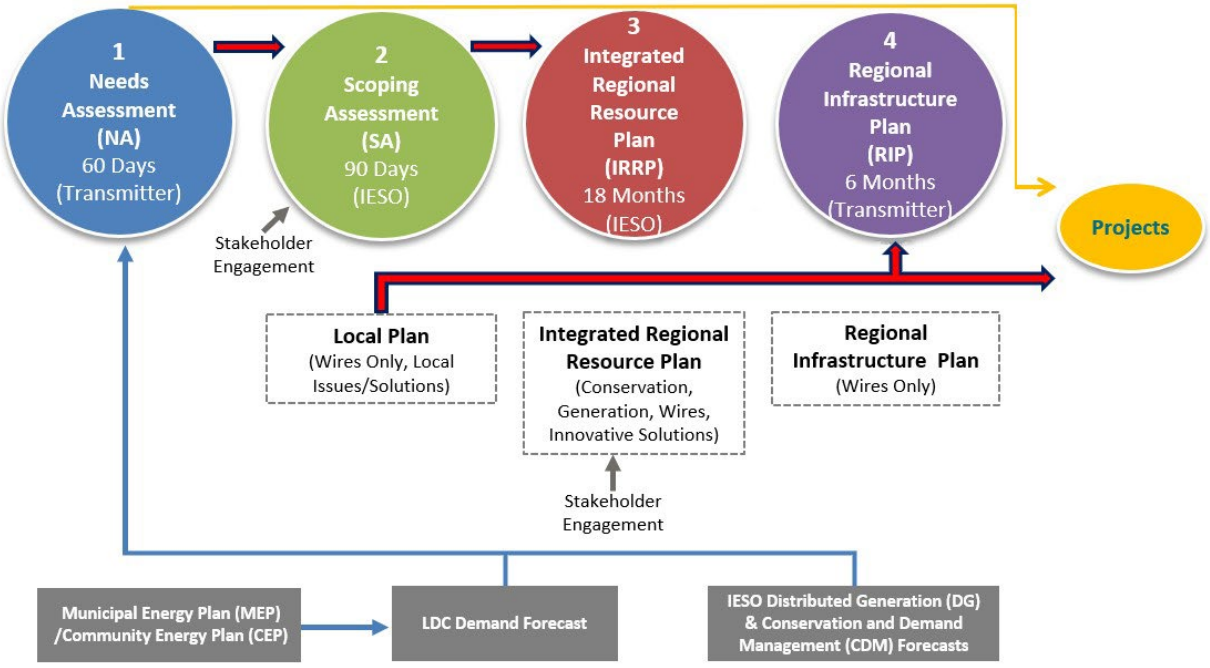

Figure 1: Regional Planning Process

This report was prepared by the Greater Bruce/Huron Technical Working Group ("TWG"), led by Hydro One Networks Inc. 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"). Participants of the TWG are listed below in Table 1.

Table 1: Greater Bruce/Huron Region TWG Participants

Sr. no.	Name of TWG Participants
1	Hydro One Networks Inc. (Lead Transmitter)
2	Hydro One Networks Inc. (Distribution)
3	Independent Electricity System Operator (IESO)
4	ERTH Power Corporation
5	Festival Hydro
6	Westario Power Inc.
7	Entegrus Powerline Inc.
8	Wellington North Power

2. REGIONAL ISSUE/TRIGGER

In accordance with the Regional Planning process, the Regional Planning cycle should be triggered at least once every five years. As such, the 3rd Regional Planning cycle was triggered for the Greater Bruce/Huron region.

3. SCOPE OF NEEDS ASSESSMENT

The scope of this NA covers the Greater Bruce/Huron region and includes:

- Review and reaffirm needs/plans identified in the previous cycle RIP,
- Identify any new needs resulting from this assessment,
- Recommend which need(s) require further assessment and regional coordination in the next phases of the regional planning cycle; and,
- Recommend which needs do not require further regional coordination (i.e., can be addressed directly between Hydro One and the impacted LDC(s) to develop a preferred plan and/or no regional investment is required at this time and the need may be reviewed during the next regional planning cycle).

The Technical Working Group TWG may also identify additional needs during the next phases of the planning process, namely Scoping Assessment ("SA"), Integrated Regional Resource Plan ("IRRP"), Local plan ("LP") and RIP, based on updated information available at that time.

The planning horizon for this NA assessment is 10 years.

4. REGIONAL DESCRIPTION AND CONNECTION CONFIGURATION

The Greater Bruce/Huron region comprises of the counties of Bruce, Huron, and Perth, as well as portions of Grey, Wellington, Waterloo, Oxford, and Middlesex counties as shown in Figure 4.1.

Electricity supply for the Region is provided through a network of 230 kV and 115 kV transmission lines supplied mainly by generation from the Bruce Nuclear Generating Station and local renewable generation facilities in the Region. Majority of the electrical supply in the region is transmitted through 230 kV circuits (B4V, B5V, B22D, B23D, B27S and B28S) radiating out from Bruce A TS.

These circuits connect the Region to the adjacent South Georgian Bay/Muskoka Region and the adjacent Kitchener-Waterloo-Cambridge-Guelph ("KWCG") Region. Within the Region, electricity is delivered to the end users of LDCs and directly connected industrial customers by eleven Hydro One step-down transformation stations, as well as seven customer-owned transformer or distribution stations supplied directly from the transmission system. Appendix B lists all step-down transformer stations in the Region. Appendix C lists all transmission circuits and Appendix D lists LDCs in the Region.

The geographical boundaries and the Single Line Diagram of the Greater Bruce/Huron region are shown in Figures 2 and 3 respectively.

Figure 2: Map of Greater Bruce/Huron Regional Planning Area

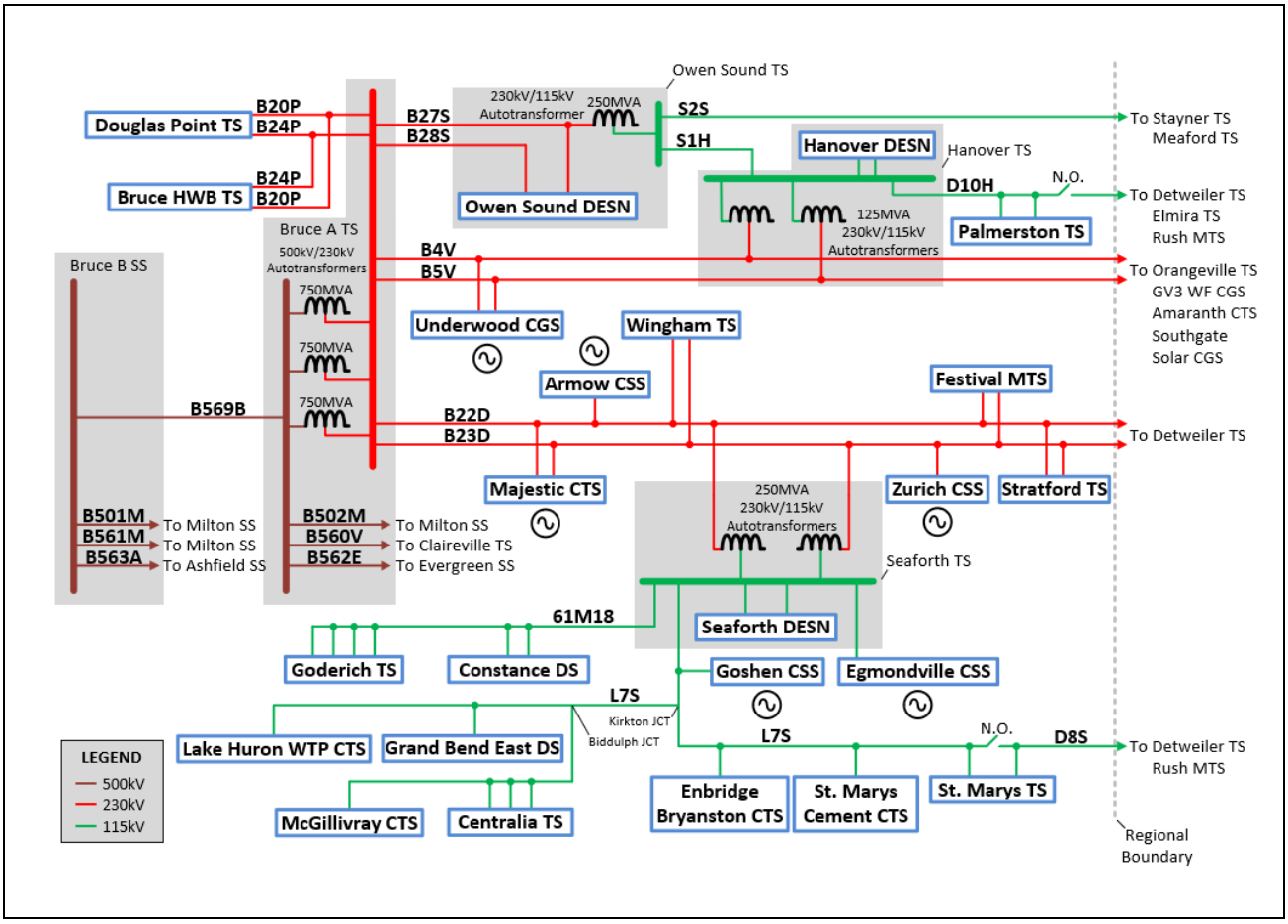

Figure 3: Greater Bruce/Huron Transmission Single Line Diagram

The circuits and stations of the area are summarized in the Table 2 and Table 3 below:

Table 2: Transmission Circuits in the Greater Bruce/Huron Region

115kV circuits		230kV circuits		500kV circuits	
S2S	61M18	B4V	B27S	B569B	B560V
S1H	L7S	B5V	B28S	B501M	B561M
D10H-North	E6L	B22D	B20P	B502M	B562E
		B23D	B24P		B563A

Table 3: Transmission/Distribution/Generation Stations in the Greater Bruce/Huron Region

Transformer/Distribution Stations			Generation Stations	
Bruce A TS *	Wingham TS	Grand Bend East DS	Bruce A NGS	Goshen CGS
Bruce B SS	Festival MTS #1	Stratford TS	Bruce B NGS	Southgate CGS
Bruce HWP B TS	Palmerston TS	Customer CTS #1	Underwood CGS	Blake CGS
Douglas Point TS	Goderich TS	Customer CTS #2	Armow CGS	K2 Wind Farm CGS
Hanover TS *	Constance DS	Customer CTS #3	Zurich CGS	Grand Bend CGS
Owen Sound TS *	St. Marys TS	Customer CTS #4	Ripley South CGS	
Seaforth TS *	Centralia TS			

*Stations with Autotransformers installed

5. INPUTS AND DATA

TWG participants, including representatives from LDCs, IESO, and Hydro One provided information and input for the Greater Bruce/Huron NA. With respect to the load forecast information, the OEB Regional Planning Process Advisory Group ("RPPAG") recently published a document called "Load Forecast Guideline for Ontario" in Oct. 2022. The objective of this document is to provide guidance to the TWG in the development of the load forecasts used in the various phases of the regional planning process with a focus on the NA and the IRRP. One of the inputs into the LDC's load forecast that is called for in this guideline is information from Municipal Energy Plans ("MEP") and/or Community Energy Plans ("CEP"). The list of all the Municipalities falling under the geographical boundaries of the region are given in Appendix E.

The information provided includes the following:

- Greater Bruce Huron 10-year Load Forecast for all supply stations inclusive of the inputs provided by the municipalities (e.g. through their MEPs & CEPs if applicable).
- Known capacity and reliability needs, operating issues, and/or major assets requiring replacement/ refurbishment; and
- Planned/foreseen transmission and distribution investments that are relevant to Regional Planning for the Greater Bruce/Huron.
- Captured uncertainty in the load forecast as well as variability of electric demand drivers to identify any emerging needs and/or advancement or deferment of recommended investments.

6. ASSESSMENT METHODOLOGY

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

6.1 Technical Assessments and Study Assumptions

The technical assessment of needs was undertaken based on:

- Current and future station capacity and transmission adequacy;
- System reliability and operational considerations;
- Asset renewal for major high voltage transmission equipment requiring replacement with consideration to "right-sizing"; and,
- Load forecast data was requested from industrial customers in the region, and
- This assessment is based on summer and winter peak loads. Three load forecasts were developed i.e. Normal Growth scenario, High & low Growth scenario. The High and low Growth scenario load forecast were developed to conduct a sensitivity analysis to cover unforeseen developments such as, fuel switching, Government policies, higher than expected EV charging trend during peak load conditions, etc.

The following other assumptions are made in this report.

- The study period for this Needs Assessment is 2024-2033.
- Some of the stations in the region are summer peaking and others are winter peaking, so this assessment is based on summer and winter peak loads.
- Line capacity adequacy is assessed by using coincident peak loads in the area.
- Station capacity adequacy is assessed by comparing the non-coincident peak load with the station's normal planning supply capacity, assuming a 90% lagging power factor for stations having no low-voltage capacitor banks and 95% lagging power factor for stations having low-voltage capacitor banks.
- Normal planning supply capacity for transformer stations is determined by the Hydro One summer 10-Day Limited Time Rating ("LTR') of a single transformer at that station.
- Adequacy assessment is conducted as per Ontario Resource Transmission Assessment Criteria ("ORTAC").

6.2 Information Gathering Process

6.2.1. Load forecast:

The LDCs provided their load forecast for summer and winter for all the stations supplying their loads in the Greater Bruce/Huron region for the 10-year study period including the inputs from the Municipalities such as MEPs and CEPs if applicable. The IESO provided a Conservation and Demand

Management ("CDM"), and Distributed Energy Resource ("DER") forecast for the Greater Bruce/Huron region.

The region's extreme summer and winter non-coincident peak gross load forecasts for each station were prepared by applying the LDC load forecast growth rates to the actual 2021 summer peak extreme weather corrected loads. The extreme summer and winter weather correction factors were provided by Hydro One. The net extreme summer weather load forecasts were produced by reducing the gross load forecasts for each station by the percentage CDM and then by the amount of effective DER capacity provided by the IESO for that station.

It is to be noted that as contracts for existing DER resources in the region begin to expire, at which point the load forecast has a decreasing contribution from local DER resources, and an increase in net demand. This extreme summer and winter weather corrected net load forecast for the individual stations in the Greater Bruce/Huron region is given in Appendix A.

Furthermore, based on the historical load and the non-coincident load forecasts, the region contains some stations that are summer peaking and others that are winter peaking.

6.2.2. Sensitivity Analysis:

A sensitivity analysis was undertaken by the TWG to capture uncertainty in the load forecast as well as variability of drivers such as electrification. Hence, the NA recommendations are not necessarily linked to sensitivity scenarios; but rather are used to identify any emerging needs for consideration in developing recommendations. The impact of sensitivity analysis for the high and low growth scenarios are provided in section 8 of this report.

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

6.2.3. Asset Renewal Needs for Major HV Equipment:

List of major HV transmission equipment planned and/or identified to be refurbished and/or replaced based on asset condition assessment, relevant for Regional Planning purposes. This includes HV transformers, autotransformers, HV Breakers, HV underground cables and overhead lines. The scope of equipment considered is given in section 7.1; and

6.2.4. System Reliability and Operational Issues:

Relevant information regarding system reliability and operational issues in the region as feedback provided by the IESO during the NA phase.

TWG members identified the following system operational issues in the Greater Bruce/Huron Region:

- Operational issue with supply capacity on the 115kV circuit D10H due to increasing load:
    - There are operational difficulties in transferring load on circuit D10H between Detweiler TS in Kitchener-Waterloo-Cambridge-Guelph Region and Hanover TS in

Greater Bruce/Huron when autotransformers at Detweiler TS and Hanover TS are out of service

- Operational issue with supply capacity at Hanover TS under outage conditions s during post-contingency load supply at Hanover TS:
    - There are post-contingency load supply concerns at Hanover TS when there is one autotransformer out of service at Hanover TS, and operators need to prepare for the loss of the remaining transformer.

7. NEEDS

This section describes emerging new needs identified in the Greater Bruce/Huron Region as well as updates on previously identified needs since the completion of Previous Regional Planning cycle.

Needs that were identified and discussed in the previous regional planning cycle with associated projects that were recently completed and reaffirmed needs that are underway and are briefly described below with relevant updates. These projects include the followings:

A. <u>Completed projects:</u>

- Bruce A TS - 230kV ABCB Station Refurbishment: Replaced Sixteen (16) Air-Blast Circuit Breakers (ABCB) with SF6 type to maintain station reliability and ensuring continued supply reliability to the customers in the area. This project was completed in 2022.

- Stratford TS – T1 and Component Replacement: Replaced transformer T1 and associated equipment, maintaining station reliability and ensuring continued supply reliability to Festival Hydro Inc., Hydro One Distribution as well as other embedded LDCs in the area. The project was completed in 2022.

- Hanover TS – T2 and Component Replacement: Replaced 230kV motorized switches, step-down transformer T2 and associated equipment, HV motorized switches, surge arrestors, auto-ground switches and potential transformers, maintaining station reliability and ensuring continued supply reliability to Hydro One Distribution and embedded LDCs in the area. The project completed in 2022.

- 115 kV L7S Circuit – Capacity Increase and clearance Improvement: Between year 2022 to 2023, sub-standard clearances of the limiting section of L7S were addressed to increase their sag temperature from 83°C to 125°C and improve the capacity of this circuit. Furthermore, Hydro One undertook a complete condition assessment of L7S and identified a variety of deficiencies that have been addressed.

B. Ongoing projects:

- Wingham TS: Both T1 and T2 step-down transformers are planned to be replaced under this project. This project is planned to be completed in Q4 2024.

- Bruce B SS: The 500 kV switchyard replacement is currently undergoing major station refurbishment work by replacing the 500kV circuit breakers and associated equipment. This project is projected to be completed by Q2 2025.

- Seaforth TS: The 230/115 kV T5 and T6 autotransformers and T1 and T2 step-down transformers are planned for replacement to maintain station reliability and ensure continued supply reliability to Hydro One Distribution and embedded LDCs in the area. The project is planned to be completed by Q4 2026.

- Bruce A: It is planned for the 500kV ABCB to be replaced and reconfigured. The project is planned to be completed by 2027.

- Owen Sound TS: T5 transformer is currently planned for replacement in 2029.

- Douglas Point TS: Both T3 and T4 step-down transformers are planned to be replaced by replaced in 2037.

- Stratford TS: Transformer T2is currently planned for replacement in the long term in 2038.

- Bruce HWP B TS: Transformers T7 and T8 are currently planned for replacement in the long-term in 2038.

Note: The planned in-service year for above ongoing projects is tentative and is subject to change.

All near, and mid-term needs that are discussed as a part of this report are summarized in Table 4 below.

Table 4: Near/Mid-term Needs Identified in Previous RIP and/or this NA

Need Description	Recommended Plan/Update	Previous RIP Report Section	NA Report Section
Asset Renewal Needs			
Wingham TS	T1, T2 Transformer Replacement	4, 6.5.1 and 7.3	7.1.1

Need Description	Recommended Plan/Update	Previous RIP Report Section	NA Report Section
Bruce B SS	ABCB Replacement project	4, 7.3	7.1.2
Seaforth TS	T1, T2, T5, T6 Transformer Replacement	4, 6.5.1 and 7.3	7.1.3
Bruce A TS	500kV ABCB Replacement and Yard Reconfiguration	7.3	7.1.4
Owen Sound TS	T5 Transformer Replacement	7.3	7.1.5
Douglas Point TS *	T3 and T4 Transformers Replacement	7.3	7.1.6
Bruce HWP B *	T7 and T8 Transformers Replacement	7.3	7.1.8
System Reliability, Load Restoration, and Operation Needs			
115 kV L7S Circuit Capacity Increase	Monitoring the performance of this circuits and to proceed with corrective plan as required in the next phase of the Regional Planning cycle	6.6	7.4
Operational issue with supply capacity at Hanover TS, under outage conditions	Monitor and review in next regional planning cycle	N/A	7.4
Operational issue with supply capacity on D10H, during load transfer between Detweiler TS and Hanover TS	Monitor and review in next regional planning cycle	N/A	7.4

*These are Long-Term Investments and are outside of NA study period

7.1 Asset Renewal Needs for Major HV Transmission Equipment

In addition to the previously identified asset renewal needs from the second regional planning cycle, Hydro One and TWG have also identified new asset renewal needs for major high voltage transmission equipment that are expected to be replaced over the next 10 years in the Greater Bruce/Huron Region. The complete list of major HV transmission equipment requiring replacement in the Greater Bruce/Huron Region is provided in table 5 in this section. Hydro One is the only Transmission Asset Owner ("TAO") in the Region.

Asset Replacement needs are determined by asset condition assessment. Asset condition assessment is based on a range of considerations such as:

- Equipment deterioration due to aging infrastructure or other factors,
- Technical obsolescence due to outdated design,
- Lack of spare parts availability or manufacturer support, and/or
  Potential health and safety hazards, etc.

The major high voltage equipment information shared and discussed as part of this process is listed below:

- 230/115kV autotransformers
- 230 and 115kV load serving step down transformers
- 230 and 115kV breakers where:
  replacement of six breakers or more than 50% of station breakers, the lesser of the two
- 230 and 115kV transmission lines requiring refurbishment where:
  Leave to Construct (i.e., section 92) approval is required for any alternative to like-for-like
- 230 and 115kV underground cable requiring replacement where:
  Leave to Construct (i.e., section 92) approval is required for any alternative to like-for-like

The Asset renewal assessment considers the following options for "right sizing" the equipment:

- Maintaining the status quo
- Replacing equipment with similar equipment with *lower* ratings and built to current standards
- Replacing equipment with similar equipment with *lower* ratings and built to current standards by transferring some load to other existing facilities
- Eliminating equipment by transferring all the load to other existing facilities
- Replacing equipment with similar equipment and built to current standards (i.e., "like-for-like" replacement)
- Replacing equipment with higher ratings and built to current standards

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.

Table 5: Major HV Transmission Asset assessed for Replacement in the region

Station/Circuit	Need Description	Planned ISD
Stratford TS	T2 Transformer Replacement	Long Term

7.1.1 Wingham TS (T1/T2)

Wingham TS is a load supply station built in 1965. The station has two 50/67/83 MVA step-down transformers connected to the 230 kV circuits B22D and B23D (Bruce x Detweiler) and supplies Hydro One Distribution via four 44 kV feeders.

The scope of this project is to replace both T1 and T2 with new like-for-like 83.3MVA units which will be sufficient based on the current load forecast. This project is underway and the planned in-service date for the project is in Q4 2024.

7.1.2 Bruce B SS

Bruce B SS is a major Northeast Power Coordinating Council ("NPCC") bulk power station ("BPS"). The 500kV switchyard at this station is used to switch eight terminals via ten 500 kV ABCBs and one 500 kV SF6 circuit breaker.

Following the asset condition assessment, the existing 500 kV ABCB circuit breakers are obsolete and are to be replaced with new SF6 dead tank Circuit breakers. The estimated in-service date for the new equipment is Q2 2025.

7.1.3 Seaforth TS (T1/T2/T5/T6)

Seaforth TS is a major station and consists of two 230/115 kV, 150/200/250 MVA autotransformers supplied by 230 kV circuits B22D and B23D (Bruce x Detweiler). The 115 kV yard from Seaforth TS supplies nearly 200 km of single circuit supply along the circuits L7S and 61M18. Seaforth TS also consists of two 115/27.6 kV, 25/33/42 MVA step-down transformers and supplies Hydro One Distribution and embedded LDCs via four 27.6 kV feeders.

Following the asset condition assessment, the current scope of this project is to replace 230/115 kV autotransformers T5, T6 and step-down transformers T1, T2 with like-for-like units which will be sufficient based on the current load forecast. Operations has identified the need for refined voltage control on the 115 kV system. Therefore, the new autotransformers at Seaforth TS will be equipped with Under Load Tap Changers ("ULTC"). The planned in-service date for the project is in 2026.

7.1.4 Bruce A TS

Bruce A is another major NPCC station in the Greater Bruce/Huron Region. This station has a 500kV switchyard, 230kV switchyard, which provides transfer of bulk power from Bruce Nuclear generation station to Ontario Network Grid.

The 500 kV yard has 9 terminals. Two terminals connect two lines to Milton TS in the west of the GTA, one terminal connects one line to Longwood TS, near London, with tapping to Evergreen TS. Another terminal connects Bruce A 500 KV switchyard to Bruce B 500 kV switchyard. The last three terminals directly connect to Bruce A 230 KV switchyards via three autotransformers.

Following the asset condition assessment, the existing 500 kV air-blast circuit breakers at Bruce A TS are scheduled to be replaced with new 500 kV SF6 circuit breakers. The planned in-service date for the project is in 2027.

7.1.5 Owen Sound TS (T5)

Owen Sound TS is supplied by 230kV circuits B27S and B28S and consists of two 230/44 kV transformers T3 and T4 feeding its JQ DESN. This station also consists of a 230/115kV autotransformer T5 which feeds 115kV circuits S2N and S1H.

Based on asset condition assessment, T5 is expected to reach its end of life during the study period. It is planned for its replacement with a like-for-like unit. The planned in-service date for the project is in 2029.

7.1.6 Douglas Point TS (T3/T4)

Douglas Point TS was built in 1971. This station has two 50/67/83MVA, 230/44kV step-down transformers T3 and T4 which are connected to 230kV circuits B20P and B24P from Bruce A TS. This station supplies Hydro One Distribution and Westario Power Inc via its 44kV feeders. Transformer T3 and T4 are built in 1972 and 1970 respectively.

Following the asset condition assessment, Transformers T3 and T4 are required to be replaced with new like-for-like units. This project is currently planned to be in service in 2029.

7.1.7 Stratford TS (T2)

Stratford TS is a load supply station built in 1950. The station has two 50/67/83 MVA step-down transformers connected to 230 kV circuits B22D and B23D (Bruce x Detweiler) and supplies Festival Hydro Inc., Hydro One Distribution as well as other embedded LDCs, via eight 27.6 kV feeders. Transformer T1 was recently replaced and placed in service since 2021 and the transformer T2 is in service since 1997.

The current scope of this project is to replace the 230/27.6 kV transformer T2. Hydro One will continue to monitor the condition of the T2 transformer. Based on asset condition assessment, T2 is expected to reach its end of life beyond the 10-year planning horizon. No further regional coordination is required at this time.

7.1.8 Bruce HWP B TS

Bruce HWP B TS has two 60/80/100MVA, 230/13.8kV step-down transformers T7 and T8 which are connected to 230kV circuits B20P and B24P from Bruce A TS.

Based on asset condition assessment, transformers T7 and T8 are expected to reach their end of life beyond the 10-year planning horizon. No further regional coordination is required at this time.

7.2 Station Capacity Needs

A Station Capacity assessment was performed over the study period 2024-2033 for the 230kV and 115kV Transforming stations in the Greater Bruce/Huron Region using either the summer or winter peak load forecasts that were provided by the TWG.

Following the assessment done in this region, all stations are within their LTR limits and there is no need for station capacity upgrades at this time.

7.3 Transmission Lines Capacity Needs

All line and equipment loads shall be within their continuous ratings with all elements in service and within their long-term emergency ratings with any one element out of service. Immediately following contingencies, lines may be loaded up to their short-term emergency ratings where control actions such as re-dispatch, switching, etc. are available to reduce the loading to the long-term emergency ratings. A Transmission Lines Capacity Assessment was performed over the study period 2024-2033 for the 230kV and 115kV Transmission line circuits in the Greater Bruce/Huron Region by assessing thermal limits of the circuit and the voltage range as per ORTAC to cater this need. Based on the results, no new transmission system capacity needs were identified.

7.4 System Reliability, Restoration, and Operation Needs

The transmission system must be planned to satisfy demand levels up to the extreme weather, median-economic forecast for an extended period with any one transmission element out of service. A study has been performed considering the net coincident load forecast and the loss of one element over the study period 2024-2033 to cater this need. Following the assessment done in this region, below need have been identified for this Region:

- L7S circuit:
  There have been some reports regarding system operation and performance of this circuit. Majority of issues reported were due to line galloping and line component failures.

  To address the line capacity on this circuit, Hydro One increased sub-standard clearances on sections on L7S between Seaforth TS and Kirkton JCT in 2022-2023. During the same time, Hydro One replaced deficient line components on various sections of this circuit to improve the delivery point performance. Hydro One will continue monitoring the performance of the remaining sections of this circuits and will proceed with corrective plans as required.

Based on the results, no new significant system reliability and restoration issues have been identified for this Region.

- System Operational Issues:
  The IESO identified two system operational issues during the development of this NA, related to current load supply concerns under certain operational conditions. First is the operational difficulties transferring load between Detweiler TS in Kitchener-Waterloo-Cambridge-Guelph Region and Hanover TS in this region. This is a concern in the operational timeframe when there are autotransformers out of service Detweiler TS and Hanover TS, due to increasing load on the

115kV circuit D10H. Second is post-contingency load supply concerns at Hanover TS. This is seen when there is one autotransformer out of service, and operators need to prepare for the loss of the remaining transformer. The TWG recognizes that the operational conditions experienced in real-time may not always align with the planning timeframe considerations applied in this NA, but are indicative of potential concerns as load continues to grow. Thus, the TWG agrees that no further action is required at this time. However, the TWG will monitor these concerns and investigate this need further in the next cycle of regional planning.

8. SENSITIVITY ANALYSIS

The objective of a sensitivity analysis is to capture uncertainty in the load forecast as well as variability of electric demand drivers to identify any emerging needs and/or advancement or deferment of recommended investments. The TWG determined that the key electric demand driver in the Greater Bruce/Huron region to be considered in this sensitivity analysis is Electric Vehicle ("EV") penetration and unforeseen electrification which would cause the load to increase at a faster rate than shown in the forecast; or the potential delay in some projects which could result in less demand than anticipated.

The TWG reviewed EV scenarios, and any unforeseen electrification needs to develop high demand growth forecasts by applying 50% additional growth to the growth rate on the extreme summer and winter corrected Normal Growth net load forecasts. The low growth scenario was obtained by reducing the growth rate by applying -50% growth to the annual growth rate on the extreme summer corrected Normal Growth net load forecasts.

The normal and high growth forecasts are shown in Tables A.1 to A.8.

The impact of sensitivity analysis for the high and low growth scenario identified no new needs in Greater Bruce/Huron Region during this study period.

9. CONCLUSION AND RECOMMENDATION

The Technical Working Group's recommendations to address the needs identified are as follows:

Table 6: Needs which do not require further regional coordination

Sr.no.	Need	Recommendation
1	Wingham TS	T1 and T2 Replacement

2	Bruce B SS	ABCB Replacement project
3	Seaforth TS	T1, T2, T5 and T6 Replacement
4	Bruce A TS	500kV ABCB Replacement and Yard Reconfiguration
5	Owen Sound TS	T5 Transformer Replacement
6	Douglas Point TS	T3 and T4 Transformers Replacement
7	Stratford TS	T2 Transformer Replacement
8	Bruce HWP B	T7 and T8 Transformers Replacement
9	Operational issue with supply capacity at Hanover TS under outage conditions	Monitor and review in next regional planning cycle
10	Operational issue with supply capacity on circuit D10H when load is transferred between Detweiler TS in Kitchener-Waterloo-Cambridge-Guelph Region and Hanover TS in the Greater Bruce/Huron Region	Monitor and review in next regional planning cycle

List of LDC(s) to be involved in further regional planning phases:

- N/A

List of LDC(s) which are not required to be involved in further regional planning phases:

- Entegrus Powerline Inc.
- Wellington North Power Inc.
- Hydro One Networks Inc. (Distribution)
- Westario Power Inc
- Festival Hydro
- ERTH Power Corporation

10. REFERENCES

[1] Independent Electricity System Operator, Ontario Resource and Transmission Assessment Criteria (issue 5.0 August 22, 2007)

[2] Ontario Energy Board, Transmission System Code (issue July 14, 2000 rev. August 2, 2023)

[3] Ontario Energy Board, Distribution system Code (issue July 14, 2000 rev. March 27, 2024)

[4] Ontario Energy Board, Load Forecast Guideline for Ontario (issue October 13, 2022)

[5] Greater Bruce/Huron Second Cycle Regional Infrastructure Planning, (issue April 2022)

Appendix A: Extreme Summer and Winter Weather Adjusted Net Load Forecast

Table A.1: Summer Non-Coincident- Normal Growth Net Load Forecast

Station/DESN	Summer LTR (MVA)	Summer LTR (MW)	2023 (Historical) (MW)	Summer Non-Coincident NET Forecast (MW) - Normal									
				2024	2025	2026	2027	2028	2029	2030	2031	2032	2033
Douglas Point TS	97.20	87.48	56.18	57.69	58.16	58.70	59.00	61.61	61.94	62.32	62.92	63.67	64.51
Hanover TS	125.90	119.61	84.99	84.88	85.74	86.68	87.02	87.44	87.80	88.28	89.51	90.78	92.60
Owen Sound TS	208.50	198.08	98.17	104.09	105.19	106.41	108.19	109.20	110.16	111.22	112.80	114.54	116.37
Seaforth TS	45.10	42.85	29.87	29.08	29.29	29.53	29.67	29.84	30.00	30.21	30.50	30.94	31.35
Stratford TS	125.10	118.85	80.23	85.22	85.66	86.18	86.68	87.28	87.84	88.50	89.52	90.91	93.24
Wingham TS	97.00	87.30	50.76	51.50	51.93	52.42	52.73	53.10	53.44	53.83	54.43	55.18	55.96
Palmerston TS	132.20	125.59	66.09	70.42	70.91	71.46	71.73	72.29	72.55	72.86	73.54	74.29	75.09
Goderich TS	126.50	120.18	40.68	43.55	43.77	44.02	44.23	44.38	44.49	44.65	45.00	45.53	46.08
Constance DS	28.80	25.92	18.91	20.26	20.46	20.69	20.84	21.01	21.17	21.37	21.67	22.05	22.49
St. Marys TS	52.80	47.52	23.64	25.31	25.43	25.58	25.73	25.91	26.08	26.28	26.64	27.04	27.47
Centralia TS	61.10	58.05	38.10	40.14	40.65	41.22	41.64	42.12	42.60	43.17	44.14	45.50	46.71
Grand Bend East DS	31.25	28.13	19.58	20.39	20.52	20.67	20.74	20.84	20.91	21.17	21.40	21.72	22.15
Bruce HWP B TS	113.20	101.88	8.83	8.83	8.77	8.73	8.65	8.58	8.50	8.43	8.39	8.36	8.35
Festival MTS #1	N/A	N/A	34.47	37.21	37.47	37.73	37.87	38.05	38.20	38.41	38.83	39.41	40.11
Customer CTS #1	N/A	N/A	3.63	3.45	3.46	3.48	3.50	3.52	3.53	3.55	3.57	3.59	3.61
Customer CTS #2	N/A	N/A	5.92	5.96	6.02	6.07	6.12	6.17	6.23	6.28	6.34	6.39	6.45
Customer CTS #3	N/A	N/A	4.54	4.63	4.67	4.72	4.76	4.81	4.85	4.90	4.94	4.99	5.04
Customer CTS #4	N/A	N/A	15.57	15.75	15.94	16.13	16.33	16.52	16.72	16.92	17.13	17.33	17.54

Table A.2: Summer Coincident – Normal Growth Net Load Forecast

Station/DESN	Summer LTR (MVA)	Summer LTR (MW)	2023 (Historical) (MW)	Summer Coincident NET Forecast (MW) - Normal									
				2024	2025	2026	2027	2028	2029	2030	2031	2032	2033
Douglas Point TS	97.20	87.48	52.73	53.96	54.40	54.90	55.19	57.77	58.08	58.44	59.00	59.71	60.51
Hanover TS	125.90	119.61	84.99	84.88	85.74	86.68	87.02	87.44	87.80	88.28	89.51	90.78	92.60
Owen Sound TS	208.50	198.08	91.35	96.72	97.73	98.87	100.59	101.53	102.42	103.40	104.89	106.51	108.22
Seaforth TS	45.10	42.85	28.55	27.65	27.85	28.09	28.22	28.38	28.53	28.73	29.01	29.44	29.83
Stratford TS	125.10	118.85	78.90	83.79	84.22	84.73	85.23	85.82	86.36	87.01	88.02	89.39	91.70
Wingham TS	97.00	87.30	50.76	45.17	45.55	45.99	46.26	46.59	46.90	47.24	47.77	48.44	49.13
Palmerston TS	132.20	125.59	64.08	68.26	68.74	69.27	69.53	70.08	70.32	70.62	71.29	72.02	72.80
Goderich TS	126.50	120.18	40.68	37.34	37.53	37.75	37.95	38.07	38.16	38.30	38.60	39.07	39.55
Constance DS	28.80	25.92	18.67	19.99	20.20	20.43	20.57	20.74	20.90	21.09	21.39	21.77	22.20
St. Marys TS	52.80	47.52	23.64	25.14	25.26	25.41	25.56	25.74	25.91	26.10	26.46	26.86	27.29
Centralia TS	61.10	58.05	37.53	39.52	40.03	40.59	41.00	41.47	41.94	42.51	43.47	44.81	46.00
Grand Bend East DS	31.25	28.13	17.09	17.69	17.81	17.94	18.00	18.08	18.15	18.39	18.60	18.88	19.26
Bruce HWP B TS	113.20	101.88	5.66	6.03	5.99	5.96	5.91	5.86	5.81	5.76	5.73	5.71	5.70
Festival MTS #1	N/A	N/A	27.53	29.72	29.93	30.13	30.25	30.39	30.51	30.68	31.02	31.48	32.03
Customer CTS #1	N/A	N/A	1.38	1.39	1.40	1.40	1.41	1.42	1.42	1.43	1.44	1.45	1.45
Customer CTS #2	N/A	N/A	3.21	3.24	3.26	3.29	3.32	3.35	3.38	3.41	3.44	3.47	3.50
Customer CTS #3	N/A	N/A	0.05	0.05	0.05	0.05	0.05	0.05	0.05	0.05	0.05	0.05	0.05
Customer CTS #4	N/A	N/A	5.07	5.13	5.19	5.26	5.32	5.38	5.45	5.51	5.58	5.65	5.72

Table A.3: Summer Non-Coincident – High Growth Net Load Forecast

Station/DESN	Summer LTR (MVA)	Summer LTR (MW)	Summer Non-Coincident Net Forecast (MW) - High									
			2024	2025	2026	2027	2028	2029	2030	2031	2032	2033
Douglas Point TS	97.20	87.48	57.69	58.40	59.20	59.66	63.62	64.13	64.73	65.66	66.82	68.16
Hanover TS	125.90	119.61	84.88	86.17	87.60	88.10	88.74	89.29	90.02	91.91	93.87	96.68
Owen Sound TS	208.50	198.08	104.09	105.74	107.58	110.27	111.82	113.29	114.92	117.38	120.09	122.97
Seaforth TS	45.10	42.85	29.08	29.39	29.76	29.97	30.23	30.47	30.78	31.23	31.92	32.54
Stratford TS	125.10	118.85	85.22	85.88	86.66	87.42	88.33	89.17	90.17	91.74	93.88	97.48
Wingham TS	97.00	87.30	51.50	52.14	52.88	53.35	53.92	54.44	55.03	55.95	57.10	58.31
Palmerston TS	132.20	125.59	70.42	71.16	71.99	72.39	73.24	73.63	74.10	75.14	76.29	77.53
Goderich TS	126.50	120.18	43.55	43.87	44.26	44.58	44.79	44.96	45.20	45.74	46.55	47.40
Constance DS	28.80	25.92	20.26	20.57	20.91	21.14	21.40	21.64	21.94	22.41	23.00	23.69
St. Marys TS	52.80	47.52	25.31	25.50	25.72	25.95	26.22	26.48	26.78	27.32	27.94	28.61
Centralia TS	61.10	58.05	40.14	40.91	41.77	42.40	43.13	43.87	44.75	46.27	48.40	50.33
Grand Bend East DS	31.25	28.13	20.39	20.59	20.81	20.92	21.06	21.18	21.57	21.92	22.42	23.08
Bruce HWP B TS	113.20	101.88	8.83	8.75	8.67	8.56	8.46	8.34	8.24	8.18	8.14	8.11
Festival MTS #1	N/A	N/A	37.21	37.60	37.99	38.20	38.47	38.70	39.02	39.67	40.55	41.63
Customer CTS #1	N/A	N/A	3.45	3.47	3.50	3.52	3.55	3.58	3.60	3.63	3.66	3.69
Customer CTS #2	N/A	N/A	5.96	6.04	6.12	6.20	6.28	6.36	6.45	6.53	6.62	6.70
Customer CTS #3	N/A	N/A	4.63	4.69	4.76	4.83	4.90	4.97	5.04	5.11	5.18	5.25
Customer CTS #4	N/A	N/A	15.75	16.04	16.33	16.62	16.92	17.23	17.54	17.85	18.17	18.50

Table A.4: Summer Coincident – High Growth Net Load Forecast

Station/DESN	Summer LTR (MVA)	Summer LTR (MW)	Summer Coincident High Forecast (MW) - High									
			2024	2025	2026	2027	2028	2029	2030	2031	2032	2033
Douglas Point TS	97.20	87.48	53.96	54.63	55.38	55.81	59.73	60.21	60.77	61.65	62.75	64.01
Hanover TS	125.90	119.61	84.88	86.17	87.60	88.10	88.74	89.29	90.02	91.91	93.87	96.68
Owen Sound TS	208.50	198.08	96.72	98.24	99.96	102.56	104.00	105.37	106.89	109.19	111.72	114.41
Seaforth TS	45.10	42.85	27.65	27.95	28.30	28.51	28.76	28.98	29.28	29.71	30.37	30.97
Stratford TS	125.10	118.85	83.79	84.43	85.21	85.95	86.85	87.67	88.66	90.20	92.31	95.88
Wingham TS	97.00	87.30	45.17	45.74	46.39	46.81	47.32	47.78	48.30	49.12	50.15	51.22
Palmerston TS	132.20	125.59	68.26	68.97	69.78	70.17	71.00	71.37	71.83	72.84	73.96	75.16
Goderich TS	126.50	120.18	37.34	37.62	37.95	38.25	38.44	38.58	38.79	39.25	39.96	40.69
Constance DS	28.80	25.92	19.99	20.30	20.64	20.87	21.12	21.36	21.66	22.12	22.71	23.38
St. Marys TS	52.80	47.52	25.14	25.32	25.54	25.77	26.04	26.30	26.60	27.14	27.76	28.42
Centralia TS	61.10	58.05	39.52	40.28	41.12	41.75	42.47	43.19	44.06	45.56	47.67	49.57
Grand Bend East DS	31.25	28.13	17.69	17.87	18.06	18.16	18.28	18.39	18.75	19.06	19.49	20.08
Bruce HWP B TS	113.20	101.88	6.03	5.97	5.92	5.84	5.77	5.70	5.63	5.58	5.56	5.54
Festival MTS #1	N/A	N/A	29.72	30.03	30.34	30.51	30.72	30.90	31.17	31.68	32.39	33.25
Customer CTS #1	N/A	N/A	1.39	1.40	1.41	1.42	1.43	1.44	1.45	1.46	1.47	1.49
Customer CTS #2	N/A	N/A	3.24	3.28	3.32	3.36	3.41	3.45	3.50	3.54	3.59	3.64
Customer CTS #3	N/A	N/A	0.05	0.05	0.05	0.05	0.05	0.05	0.05	0.05	0.05	0.05
Customer CTS #4	N/A	N/A	5.13	5.23	5.32	5.42	5.51	5.61	5.71	5.82	5.92	6.03

Table A.5: Winter Non-Coincident - Normal Growth Net Load Forecast

Station/DESN	Winter LTR (MVA)	Winter LTR (MW)	2022/23 (Historical) (MW)	Winter Non-Coincident NET Forecast (MW) - Normal									
				2023/24	2024/25	2025/26	2026/27	2027/28	2028/29	2029/30	2030/31	2031/32	2032/33
Douglas Point TS	109.80	98.82	58.70	55.11	55.71	56.34	56.79	63.01	63.45	63.94	64.63	65.41	66.43
Hanover TS	138.80	131.86	83.83	80.13	81.13	82.15	82.68	83.29	83.83	84.86	85.70	87.33	88.62
Owen Sound TS	232.50	220.88	108.11	112.61	114.07	115.64	118.27	119.68	120.94	122.31	124.17	126.12	128.21
Seaforth TS	55.40	52.63	28.44	25.86	26.07	26.29	26.46	26.67	26.83	27.03	27.37	27.77	28.25
Stratford TS	137.50	130.63	67.97	70.44	70.89	71.39	71.90	72.50	73.01	73.60	74.48	75.52	77.62
Wingham TS	107.90	97.11	55.48	53.56	54.11	54.67	55.06	55.52	55.89	56.35	57.10	58.05	59.15
Palmerston TS	147.20	139.84	67.75	71.04	71.68	72.33	72.78	73.52	73.91	74.35	75.02	75.80	76.64
Goderich TS	132.00	125.40	38.86	40.59	40.86	41.14	41.49	41.71	41.86	42.06	42.42	42.87	43.39
Constance DS	35.00	31.50	17.20	18.15	18.39	18.64	18.84	19.07	19.27	19.50	19.78	20.09	20.43
St. Marys TS	59.00	53.10	21.79	22.92	23.07	23.24	23.42	23.62	23.80	24.00	24.30	24.65	25.05
Centralia TS	65.40	62.13	32.57	34.18	34.80	35.46	36.07	36.75	37.42	38.19	39.41	40.55	41.83
Grand Bend East DS	40.00	36.00	16.92	17.11	17.26	17.41	17.52	17.65	17.75	18.10	18.33	18.62	18.96
Bruce HWP B TS	114.80	103.32	11.37	11.79	11.73	11.68	11.60	11.53	11.43	11.35	11.30	11.27	11.25
Festival MTS #1	N/A	N/A	27.50	28.91	29.15	29.38	29.54	29.72	29.86	30.06	30.40	30.86	31.41
Customer CTS #1	N/A	N/A	3.57	3.46	3.43	3.39	3.36	3.33	3.30	3.27	3.24	3.20	3.17
Customer CTS #2	N/A	N/A	5.54	5.71	5.75	5.80	5.84	5.89	5.93	5.98	6.03	6.07	6.12
Customer CTS #3	N/A	N/A	4.51	4.62	4.66	4.70	4.75	4.79	4.84	4.89	4.93	4.98	5.03
Customer CTS #4	N/A	N/A	15.81	16.00	16.19	16.39	16.59	16.79	16.99	17.19	17.40	17.61	17.82

Table A.6: Winter Coincident – Normal Growth Net Load Forecast

Station/DESN	Winter LTR (MVA)	Winter LTR (MW)	2022/23 (Historical) (MW)	Winter Coincident NET Forecast (MW) - Normal									
				2023/24	2024/25	2025/26	2026/27	2027/28	2028/29	2029/30	2030/31	2031/32	2032/33
Douglas Point TS	109.80	98.82	56.27	52.55	53.13	53.73	54.17	60.36	60.78	61.25	61.91	62.66	63.65
Hanover TS	138.80	131.86	75.33	71.20	72.10	73.02	73.49	74.04	74.53	75.50	76.25	77.79	78.97
Owen Sound TS	232.50	220.88	93.56	97.26	98.62	99.99	102.45	103.67	104.75	105.93	107.53	109.18	110.95
Seaforth TS	55.40	52.63	26.81	24.15	24.35	24.56	24.72	24.91	25.07	25.26	25.57	25.96	26.40
Stratford TS	137.50	130.63	66.42	68.81	69.25	69.74	70.24	70.83	71.32	71.90	72.76	73.77	75.85
Wingham TS	107.90	97.11	52.88	50.83	51.35	51.12	51.49	51.91	52.26	52.69	53.40	54.28	55.32
Palmerston TS	147.20	139.84	63.28	66.34	66.94	67.55	67.97	68.66	69.02	69.43	70.06	70.79	71.58
Goderich TS	132.00	125.40	36.06	37.65	37.90	38.17	38.50	38.70	38.85	39.03	39.36	39.78	40.27
Constance DS	35.00	31.50	16.72	17.64	17.86	18.08	18.25	18.44	18.61	18.81	19.10	19.45	19.85
St. Marys TS	59.00	53.10	19.79	20.82	20.96	21.11	21.27	21.46	21.62	21.80	22.07	22.39	22.75
Centralia TS	65.40	62.13	31.57	33.11	33.72	34.36	34.94	35.61	36.26	37.00	38.19	39.29	40.54
Grand Bend East DS	40.00	36.00	12.58	12.55	12.67	12.78	12.86	12.96	13.03	13.34	13.51	13.73	13.99
Bruce HWP B TS	114.80	103.32	9.65	10.01	9.96	9.92	9.85	9.79	9.71	9.64	9.60	9.57	9.55
Festival MTS #1	N/A	N/A	24.07	24.63	24.84	25.04	25.18	25.34	25.46	25.85	26.15	26.55	27.03
Customer CTS #1	N/A	N/A	3.32	3.29	3.26	3.23	3.20	3.17	3.14	3.11	3.08	3.05	3.02
Customer CTS #2	N/A	N/A	2.17	2.19	2.20	2.22	2.24	2.26	2.27	2.29	2.31	2.33	2.35
Customer CTS #3	N/A	N/A	0.14	0.14	0.14	0.15	0.15	0.15	0.15	0.15	0.15	0.15	0.16
Customer CTS #4	N/A	N/A	14.42	14.59	14.77	14.94	15.12	15.31	15.49	15.68	15.86	16.06	16.25

Table A.7: Winter Non-Coincident – High Growth Net Load Forecast

Station/DESN	Winter LTR (MVA)	Winter LTR (MW)	Winter Non-Coincident High Forecast (MW) - High									
			2023/24	2024/25	2025/26	2026/27	2027/28	2028/29	2029/30	2030/31	2031/32	2032/33
Douglas Point TS	109.80	98.82	55.11	56.02	56.96	57.65	67.11	67.81	68.59	69.71	70.98	72.63
Hanover TS	138.80	131.86	80.13	81.63	83.18	83.97	84.91	85.74	87.30	88.60	91.13	93.15
Owen Sound TS	232.50	220.88	112.61	114.81	117.17	121.17	123.33	125.28	127.41	130.31	133.38	136.69
Seaforth TS	55.40	52.63	25.86	26.17	26.51	26.77	27.08	27.33	27.64	28.15	28.78	29.51
Stratford TS	137.50	130.63	70.44	71.12	71.87	72.64	73.55	74.32	75.23	76.58	78.18	81.44
Wingham TS	107.90	97.11	53.56	54.38	55.22	55.81	56.51	57.08	57.79	58.95	60.40	62.13
Palmerston TS	147.20	139.84	71.04	72.00	72.98	73.67	74.79	75.38	76.05	77.08	78.28	79.59
Goderich TS	132.00	125.40	40.59	40.99	41.42	41.95	42.28	42.51	42.81	43.36	44.05	44.85
Constance DS	35.00	31.50	18.15	18.51	18.89	19.20	19.54	19.85	20.20	20.64	21.13	21.65
St. Marys TS	59.00	53.10	22.92	23.15	23.40	23.67	23.98	24.25	24.56	25.02	25.56	26.17
Centralia TS	65.40	62.13	34.18	35.11	36.11	37.04	38.09	39.14	40.34	42.26	44.10	46.19
Grand Bend East DS	40.00	36.00	17.11	17.34	17.56	17.73	17.93	18.08	18.61	18.96	19.41	19.95
Bruce HWP B TS	114.80	103.32	11.79	11.71	11.63	11.51	11.40	11.26	11.13	11.06	11.02	10.99
Festival MTS #1	N/A	N/A	28.91	29.27	29.63	29.86	30.14	30.35	30.64	31.18	31.87	32.72
Customer CTS #1	N/A	N/A	3.46	3.41	3.36	3.31	3.27	3.22	3.17	3.13	3.08	3.04
Customer CTS #2	N/A	N/A	5.71	5.78	5.84	5.91	5.98	6.05	6.12	6.19	6.26	6.34
Customer CTS #3	N/A	N/A	4.62	4.68	4.75	4.82	4.88	4.95	5.03	5.10	5.17	5.24
Customer CTS #4	N/A	N/A	16.00	16.29	16.58	16.88	17.19	17.50	17.81	18.13	18.46	18.79

Table A.8: Winter Coincident – High Growth Net Load Forecast

Station/DESN	Winter LTR (MVA)	Winter LTR (MW)	Winter Coincident High Forecast (MW) - High									
			2023/24	2024/25	2025/26	2026/27	2027/28	2028/29	2029/30	2030/31	2031/32	2032/33
Douglas Point TS	109.80	98.82	52.55	53.42	54.32	54.98	64.42	65.09	65.84	66.91	68.13	69.73
Hanover TS	138.80	131.86	71.20	72.55	73.94	74.65	75.50	76.25	77.73	78.89	81.27	83.12
Owen Sound TS	232.50	220.88	97.26	99.31	101.36	105.11	106.99	108.66	110.49	112.99	115.60	118.42
Seaforth TS	55.40	52.63	24.15	24.45	24.76	25.01	25.30	25.53	25.83	26.31	26.90	27.59
Stratford TS	137.50	130.63	68.81	69.48	69.98	70.49	71.12	71.57	72.19	73.19	74.28	76.89
Wingham TS	107.90	97.11	50.83	51.61	51.27	51.82	52.46	52.98	53.64	54.72	56.07	57.68
Palmerston TS	147.20	139.84	66.34	67.24	68.16	68.80	69.85	70.39	71.02	71.99	73.10	74.33
Goderich TS	132.00	125.40	37.65	38.03	38.43	38.94	39.24	39.45	39.74	40.25	40.89	41.63
Constance DS	35.00	31.50	17.64	17.97	18.30	18.56	18.86	19.12	19.42	19.87	20.41	21.04
St. Marys TS	59.00	53.10	20.82	21.03	21.25	21.50	21.78	22.02	22.31	22.73	23.22	23.77
Centralia TS	65.40	62.13	33.11	34.02	34.99	35.88	36.90	37.92	39.09	40.96	42.74	44.77
Grand Bend East DS	40.00	36.00	12.55	12.72	12.89	13.01	13.16	13.28	13.75	14.02	14.35	14.75
Bruce HWP B TS	114.80	103.32	10.01	9.94	9.88	9.77	9.68	9.56	9.46	9.40	9.36	9.33
Festival MTS #1	N/A	N/A	24.63	24.94	25.25	25.46	25.71	25.89	26.47	26.94	27.55	28.30
Customer CTS #1	N/A	N/A	3.29	3.24	3.20	3.15	3.11	3.06	3.02	2.97	2.93	2.89
Customer CTS #2	N/A	N/A	2.19	2.21	2.24	2.27	2.29	2.32	2.35	2.37	2.40	2.43
Customer CTS #3	N/A	N/A	0.14	0.14	0.15	0.15	0.15	0.15	0.15	0.16	0.16	0.16
Customer CTS #4	N/A	N/A	14.59	14.85	15.12	15.40	15.67	15.96	16.24	16.54	16.83	17.14

Appendix B: Lists of Step-Down Transformer/Distribution Stations

No.	Transformer Station	Voltage (kV)	Supply Circuits
1	Bruce HWP B TS	230 kV	B20P/B24P
2	Douglas Point TS	230 kV	B20P/B24P
3	Hanover TS	115 kV	B4V/B5V
4	Owen Sound TS	230 kV	B27S/B28S
5	Seaforth TS	115 kV	B22D/B23D
6	Stratford TS	230 kV	B22D/B23D
7	Wingham TS	230 kV	B22D/B23D
8	Festival MTS #1	230 kV	B22D/B23D
9	Palmerston TS	115 kV	D10H
10	Goderich TS	115 kV	61M18
11	Constance DS	115 kV	61M18
12	St. Marys TS	115 kV	L7S
13	Customer CTS #1	115 kV	L7S
14	Centralia TS	115 kV	L7S
15	Grand Bend East DS	115 kV	L7S
16	Customer CTS #2	115 kV	L7S
17	Customer CTS #3	115 kV	L7S
18	Customer CTS #4	115 kV	L7S

Appendix C: Lists of Transmission Circuits

No.	Connecting Stations	Circuit ID	Voltage (kV)
1	Bruce A TS – Orangeville TS	B4V/B5V	230 kV
2	Bruce A TS – Detweiler TS	B22D/ B23D	230 kV
3	Bruce A TS – Owen Sound TS	B27S/B28S	230 kV
4	Bruce A TS – Douglas Point TS	B20P/B24P	230 kV
5	Hanover TS – Palmerston TS	D10H-North	115 kV
6	Seaforth TS – Goderich TS	61M18	115 kV
7	Seaforth TS – St. Marys TS	L7S	115 kV
8	Owen Sound TS – Hanover TS	S1H	115 kV
9	Seaforth TS – Edmondville CSS	E6L	115 kV

Appendix D: List of LDC's in the Greater Bruce/Huron Region

No.	Name of LDC
1	Hydro One Networks Inc. (Distribution)
2	ERTH Power Corporation
3	Festival Hydro
4	Westario Power Inc.
5	Entegrus Powerline Inc.
6	Wellington North Power

Appendix E: List of Municipalities in the Greater Bruce/Huron Region

No.	Name of Municipality
1	Bruce county
2	Huron county
3	Perth county
4	Portion of Grey county
5	Portion of Wellington county
6	Portion of Waterloo county
7	Portion of Oxford county
8	Portion of Middlesex county

Appendix F: Acronyms

Acronym	Description
A	Ampere
ABCB	Air Blast Circuit Breaker
BES	Bulk Electric System
BPS	Bulk Power System
CDM	Conservation and Demand Management
CEP	Community Energy Plan
CIA	Customer Impact Assessment
CGS	Customer Generating Station
CSS	Customer Switching Station
CTS	Customer Transformer Station
DESN	Dual Element Spot Network
DER	Distributed Energy Resource
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
MEP	Municipal Energy Plan
MTS	Municipal Transformer Station
MW	Megawatt
MVA	Mega Volt-Ampere
MVAR	Mega Volt-Ampere Reactive
NA	Needs Assessment
NERC	North American Electric Reliability Corporation

Acronym	Description
NGS	Nuclear Generating Station
NPCC	Northeast Power Coordinating Council Inc.
NUG	Non-Utility Generator
OEB	Ontario Energy Board
ORTAC	Ontario Resource and Transmission Assessment Criteria
PCT	Protection, Control and Telecom
PF	Power Factor
PPWG	Planning Process Working Group
RIP	Regional Infrastructure Plan
SA	Scoping Assessment
SF6	Sulphur hexafluoride
SIA	System Impact Assessment
SPS	Special Protection Scheme
SS	Switching Station
STG	Steam Turbine Generator
TS	Transformer Station
ULTC	Under Load Tap Changers