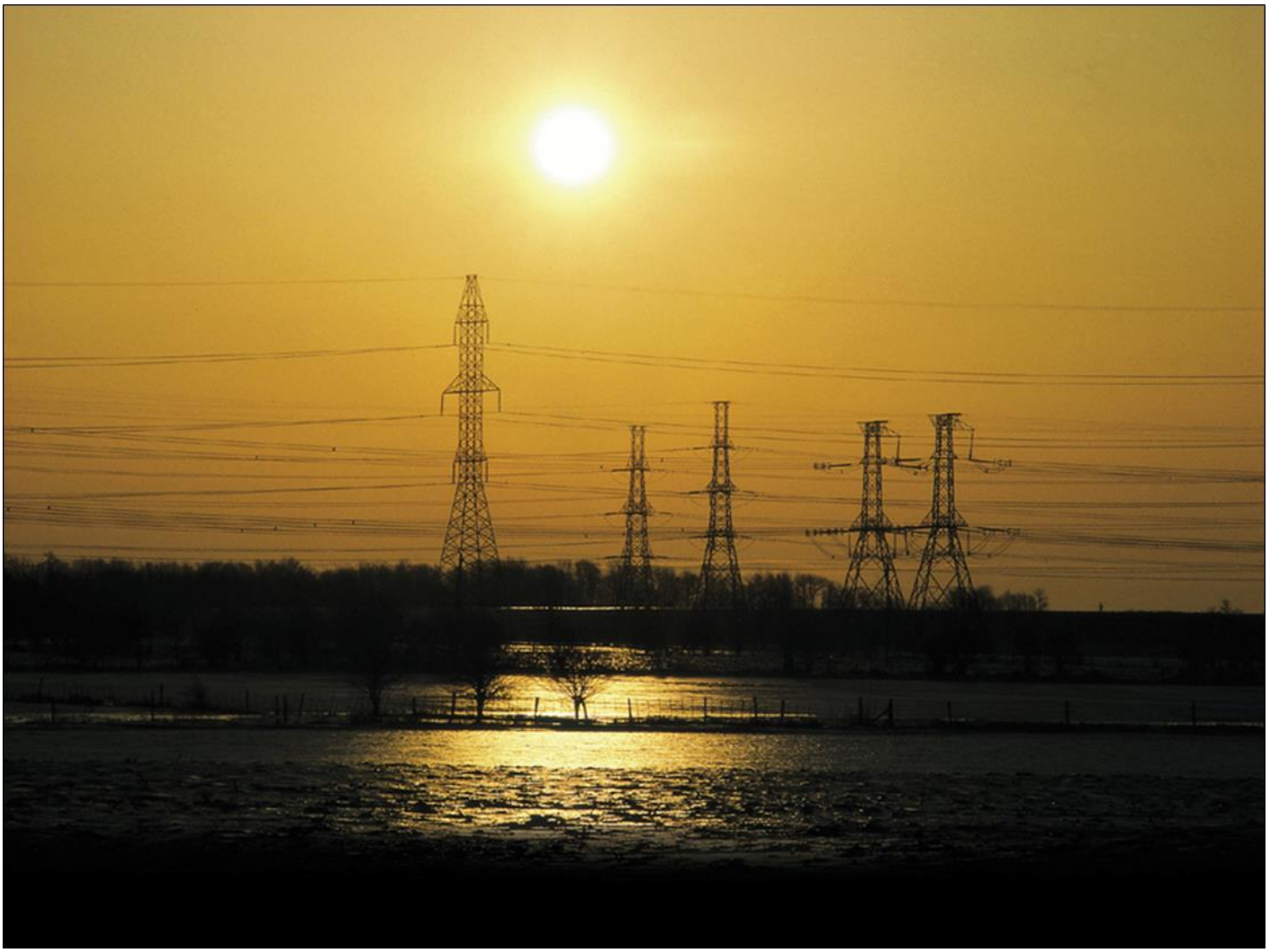

Greater Bruce - Huron Regional Infrastructure Plan

April 25, 2022

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Prepared and supported by:

Company
Hydro One Networks Inc. (Lead Transmitter)
Entegrus Power Lines Inc.
ERTH Power Corporation
Festival Hydro Inc.
Hydro One Networks Inc. (Distribution)
Independent Electricity System Operator
Wellington North Power Inc.
Westario Power Inc.

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Disclaimer

This Regional Infrastructure Plan ("RIP") report was prepared for the purpose of developing an electricity infrastructure plan to address all near and mid-term needs (2019-2028) identified in previous planning phases and any additional needs identified based on new and/or updated information provided by the RIP Working Group.

The preferred solution(s) that have been identified in this report may be re-evaluated based on the findings of further analysis. The load forecast and results reported in this RIP report are based on the information provided and assumptions made by the participants of the RIP Working Group.

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Executive Summary

THIS REGIONAL INFRASTRUCTURE PLAN ("RIP") WAS PREPARED BY HYDRO ONE AND THE WORKING GROUP IN ACCORDANCE WITH THE ONTARIO TRANSMISSION SYSTEM CODE REQUIREMENTS. IT IDENTIFIES INVESTMENTS IN TRANSMISSION FACILITIES, DISTRIBUTION FACILITIES, OR BOTH, THAT SHOULD BE PLANNED AND IMPLEMENTED TO MEET THE ELECTRICITY INFRASTRUCTURE NEEDS WITHIN THE GREATER BRUCE-HURON (GBH) REGION.

The participants of the RIP Working Group included members from the following organizations:

- Hydro One Networks Inc. (Lead Transmitter)
- Entegrus Power Lines Inc.
- ERTH Power Corporation
- Festival Hydro Inc.
- Hydro One Networks Inc. (Distribution)
- Independent Electricity System Operator
- Wellington North Power Inc.
- Westario Power Inc.

In the first cycle of the Regional Planning (RP) process for the GBH Region, a Needs Assessment ("NA") was published in May 2016 and recommended that an Integrated Regional Resource Plan ("IRRP") was not required. The first cycle of RP process was completed in August 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 RIP is the final phase of the second cycle of the regional planning process for the Greater Bruce-Huron Region, which follows the completion of the South Huron-Perth Sub-Region IRRP in September 2021 and the GBH Needs Assessment in May 2019. This report provides a consolidated summary of needs and recommended plans for the Greater Bruce-Huron Region for the near-term (up to 5 years) and mid-term (5 to 10 years). Long term needs (10 to 20 years) in the region, include circuit L7S capacity (which has transitioned to the mid-term with recent new connection requests) and Hanover TS capacity. The delivery point performance along circuit L7S continues to be monitored to confirm whether recent upgrades have resulted in improvements, and to determine if additional plans are required.

Investments planned for the Greater Bruce-Huron Region over the near and mid-term, identified in the various phases of the regional planning process, are given in the table below.

No.	Project	In-Service Date	Cost
1	Increase Capacity of Limiting Section of L7S	2023-2025	$550k - TBD
2	Continued assessment of L7S condition to address deteriorating components	TBD	TBD

In accordance with the Regional Planning process, the RIP should be reviewed and/or updated at least every five years. The Region will continue to be monitored and should there be a need that emerges earlier due to a change in load forecast or any other reason, the next regional planning cycle will be started to address the need.

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1. INTRODUCTION

THIS REPORT PRESENTS THE REGIONAL INFRASTRUCTURE PLAN (“RIP”) TO ADDRESS THE ELECTRICITY NEEDS OF THE GREATER BRUCE-HURON REGION.

The report was prepared by Hydro One Networks Inc. (“Hydro One”) and documents the results of the joint study carried out by Hydro One, Entegrus Power Lines Inc., ERTH Power Corporation, Festival Hydro Inc., Hydro One Distribution, the Independent Electricity System Operator (“IESO”), Wellington North Power Inc. and Westario Power Inc. in accordance with the Regional Planning process established by the Ontario Energy Board (“OEB”) in 2013.

Figure 1-1. Greater Bruce Huron Region

The Greater Bruce-Huron Region includes the counties of Bruce, Huron and Perth, as well as portions of Grey, Wellington, Waterloo, Oxford and Middlesex counties. Electrical supply to the Region is provided from six 230 kV and twelve 115 kV step-down transformer stations. The boundaries of the Region are highlighted in Figure 1-1 above.

1.1 Objective and Scope

This RIP report examines the needs in the Greater Bruce-Huron Region. Its objectives are:

- To develop a wires plan to address needs identified in previous planning phases for which a wires only alternative was recommended by the Working Group
- To identify new supply needs that may have emerged since previous planning phases (e.g. Needs Assessment, Scoping Assessment, Local Plan, and/or Integrated Regional Resource Plan)
- To provide the status of wires planning currently underway or completed for specific needs
- To identify investments in transmission and distribution facilities or both that should be developed and implemented on a coordinated basis to meet the electricity infrastructure needs within the region

The RIP reviewed factors such as the load forecast, major high voltage sustainment work, transmission and distribution system capability along with any updates with respect to local plans, conservation and demand management (CDM), renewable and non-renewable generation development, and other electricity system and local drivers that may impact the need and alternatives under consideration.

The scope of this RIP is as follows:

- A consolidated report of all the needs and relevant plans to address near and mid-term needs (2019-2028) identified in previous planning phases (Needs Assessment or Local Plan)
- Identification of any new needs over the 2019-2028 period
- Develop a plan to address any longer term needs identified by the Working Group

1.2 Structure

The rest of the report is organized as follows:

- Section 2 provides an overview of the regional planning process
- Section 3 describes the region
- Section 4 describes the transmission work completed over the last ten years
- Section 5 describes the load forecast and study assumptions used in this assessment
- Section 6 describes the results of the adequacy assessment of the transmission facilities and identifies needs
- Section 7 summarizes the Regional Plan to address the needs
- Section 8 provides the conclusion and next steps

2. REGIONAL PLANNING PROCESS

2.1 Overview

Planning for the electricity system in Ontario is done at essentially three levels: bulk system planning, regional system planning, and distribution system planning. These levels differ in the facilities that are considered and the scope of impact on the electricity system. Planning at the bulk system level typically looks at issues that impact the system on a provincial level, while planning at the regional and distribution levels looks at issues on a more regional or localized level.

Regional planning looks at supply and reliability issues at a regional or local area level. Therefore, it largely considers the 115 kV and 230 kV portions of the power system that supply various parts of the province.

2.2 Regional Planning Process

A structured regional planning process was established by the Ontario Energy Board in 2013, through amendments to the Transmission System Code ("TSC") and the Distribution System Code ("DSC"). The process consists of four phases: the Needs Assessment ("NA"), the Scoping Assessment ('SA"), the Integrated Regional Resource Plan ("IRRP"), and the Regional Infrastructure Plan ("RIP").

The regional planning process begins with the NA phase which is led by the transmitter to determine if there are regional needs. The NA phase identifies the needs and the Working Group determines whether further regional coordination is necessary to address them. If no further regional coordination is required, further planning is undertaken by the transmitter and the impacted local distribution company ("LDC") or customer and develops a Local Plan ("LP") to address them. These needs are local in nature and can be best addressed by a straight forward wires solution.

In situations where identified needs require coordination at the regional or sub-regional levels, the IESO initiates the SA phase. During this phase, the IESO, in collaboration with the transmitter and impacted LDCs, reviews the information collected as part of the NA phase, along with additional information on potential non-wires alternatives, and makes a decision on the most appropriate regional planning approach. The approach is either a RIP, which is led by the transmitter, or an IRRP, which is led by the IESO. If more than one sub-region was identified in the NA phase, it is possible that a different approach could be taken for different sub-regions.

The IRRP phase will generally assess infrastructure (wires) versus resource options (e.g. CDM, generation and Distributed Energy Resources ("DER")) at a higher or more macro level but sufficient to permit a comparison of options. If the IRRP process identifies that infrastructure

options may be most appropriate to meet a need, the RIP phase will conduct detailed planning to identify and assess the specific wires alternatives and recommend the preferred wires solution. Similarly, resource options which the IRRP identifies as best suited to meet a need are then further planned in greater detail by the IESO. The IRRP phase also includes IESO led stakeholder engagement with municipalities and establishes a Local Advisory Committee in the region or sub-region.

The RIP phase is the final stage of the regional planning process and involves: confirmation of previously identified needs; identification of any new needs that may have emerged since the start of the planning cycle; and development of a wires plan to address the needs where a wires solution was determined to be the best overall approach. This phase is led and coordinated by the transmitter and the deliverable of this stage is a comprehensive report of a wires plan for the region. Once completed, this report can be referenced in rate filing submissions or as part of LDC rate applications with a planning status letter provided by the transmitter. Reflecting the timeliness provisions of the RIP, plan level stakeholder engagement is not undertaken at this stage. However, stakeholder engagement at a project specific level will be conducted as part of the project approval requirement.

To efficiently manage the regional planning process, Hydro One has been undertaking wires planning activities in collaboration with the IESO and/or LDCs for the Greater Bruce-Huron region as part of and/or in parallel with:

- Planning activities that were already underway in the region prior to the new regional planning process taking effect.
- The NA, IRRP, and LP phases of regional planning.
- Working and planning for connection capacity requirements with the LDCs and transmission connected customers

Figure 2-1 illustrates the various phases of the regional planning process (NA, SA, IRRP, and RIP) and their respective phase trigger, lead, and outcome.

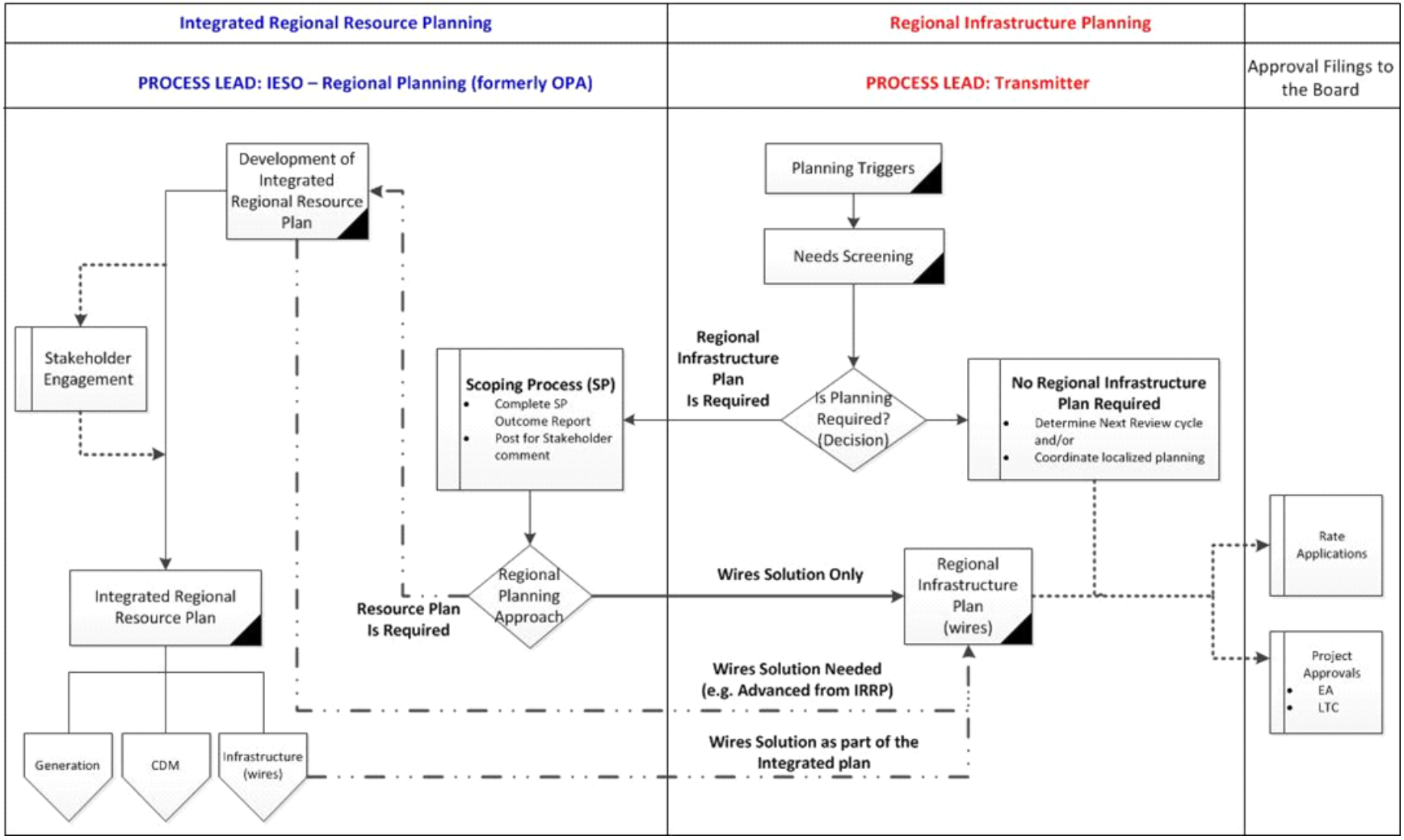

Figure 2-1. Regional Planning Flowchart

2.3 RIP Methodology

The RIP phase consists of four steps (see Figure 2-2) as follows:

1. Data Gathering: The first step of the RIP phase is the review of planning assessment data collected in the previous stages of the regional planning process. Hydro One collects this information and reviews it with the Working Group to reconfirm or update the information as required. The data collected includes:
   - Gross and net peak demand forecast at the transformer station level. This includes the effect of any distributed generation and/or conservation and demand management programs.
   - Existing area network and capabilities including any bulk system power flow assumptions.
   - Other data and assumptions as applicable such as asset conditions; load transfer capabilities, and previously committed transmission and distribution system plans.
2. Technical Assessment: The second step is a technical assessment to review the adequacy of the regional system including any previously identified needs. Additional near and mid-term needs may be identified at this stage.
3. Alternative Development: The third step is the development of wires options to address the needs and to come up with a preferred alternative based on an assessment of technical considerations, feasibility, environmental impact and costs.
4. Implementation Plan: The fourth and last step is the development of the implementation plan for the preferred alternative.

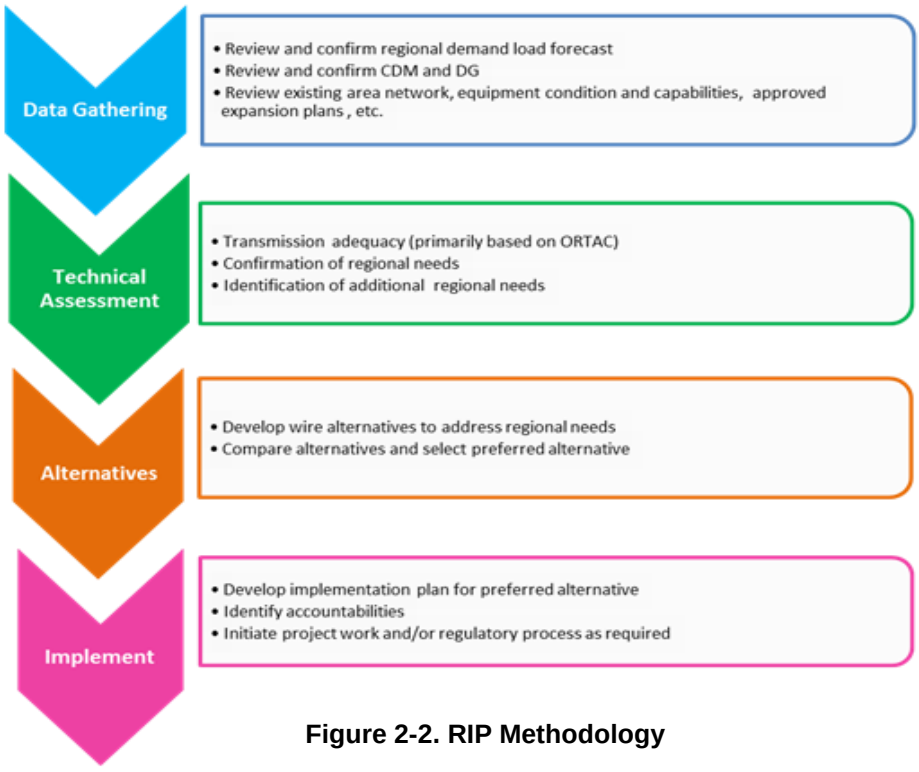

Figure 2-2. RIP Methodology

3. REGIONAL CHARACTERISTICS

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 3-1.

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. The 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 A lists all step-down transformer stations in the Region. Appendix B lists all transmission circuits and Appendix C lists LDCs in the Region. The Single Line Diagram for the Greater Bruce-Huron Region transmission system facilities is shown below in Figure 3-2.

Figure 3-1. Geographical Area of the Greater Bruce-Huron Region with Electrical Layout

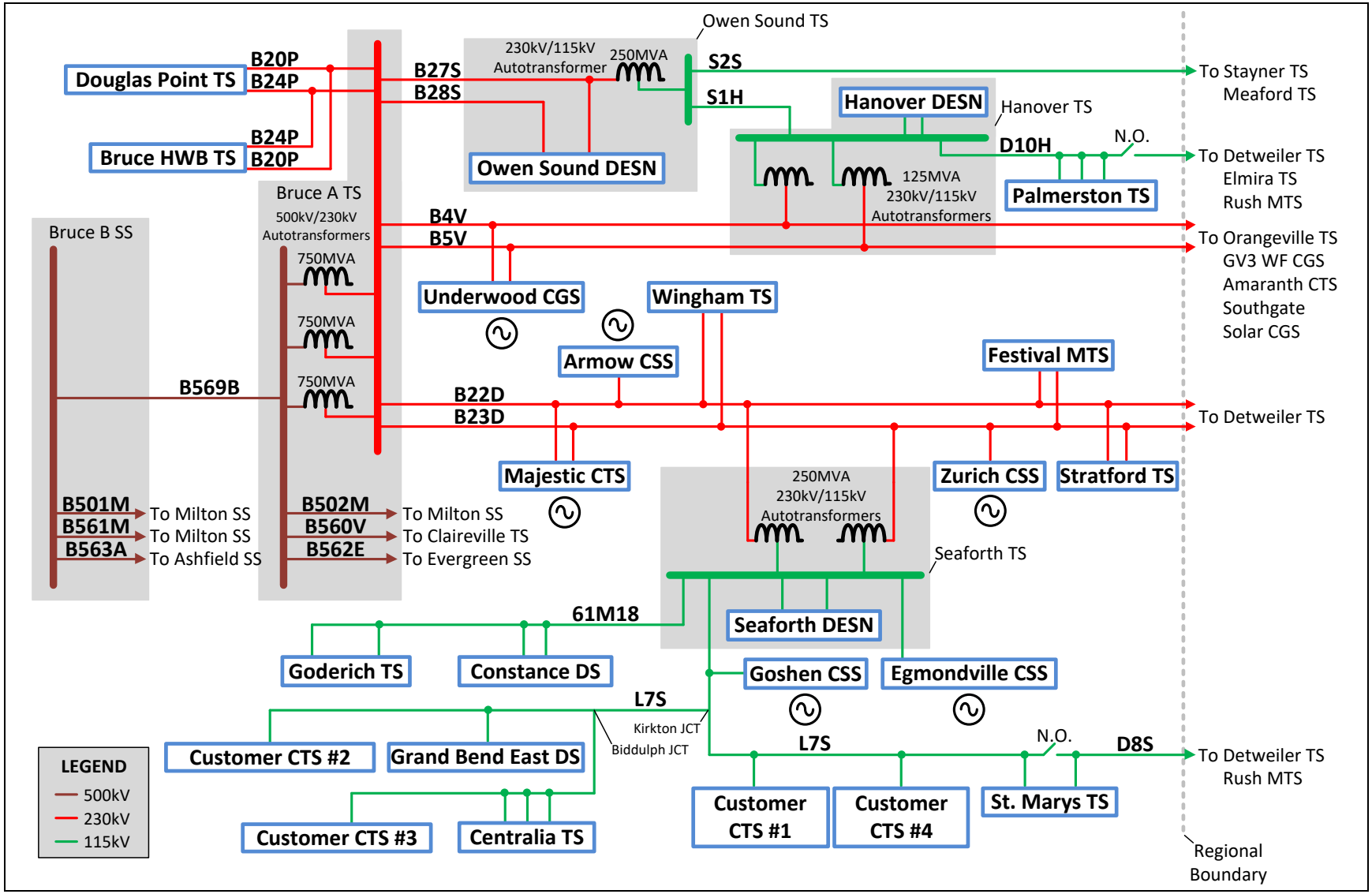

Figure 3-2. Greater Bruce-Huron Region Single-Line Diagram

4. TRANSMISSION FACILITIES COMPLETED OVER LAST TEN YEARS OR CURRENTLY UNDERWAY

OVER THE LAST 10 YEARS A NUMBER OF TRANSMISSION PROJECTS HAVE BEEN PLANNED AND COMPLETED BY HYDRO ONE, OR ARE UNDERWAY, AIMED AT IMPROVING THE SUPPLY TO THE GREATER BRUCE-HURON REGION.

In addition to Hydro One's ongoing transmission station and line sustainment programs, specific projects were identified as a result of joint planning studies undertaken by Hydro One, IESO and the LDCs; or initiated to meet the needs of the LDCs; and/or to meet Provincial Government policies. A brief listing of the completed projects is given below.

For bulk power system transfer needs:

- 500 kV double circuit line from the Bruce Nuclear Complex to Milton SS in 2011
- 230 kV Static Var Compensator (SVC) at Detweiler TS in 2011
- Bruce Reactor Switching Scheme (RSS) modifications in 2018

For major station refurbishment needs based on asset condition assessment:

- Goderich TS in 2017
- Centralia TS in 2018
- Palmerston TS in 2019
- Stratford TS in 2021

For renewable generation connection needs:

- 230 kV Dufferin Wind Farm into Orangeville TS in 2014
- 500 kV Jericho/Adelaide/Bornish Wind Farms into Evergreen SS in 2014
- 230 kV Grand Valley 3 Wind Farm onto circuit B4V in 2015
- 115 kV Bluewater Wind Farm into Seaforth TS in 2015
- 115 kV Goshen Wind Farm onto circuit L7S in 2015
- 500 kV K2 Wind Farm into Ashfield SS in 2015
- 230 kV Grand Bend Wind Farm onto circuit B23D in 2016
- 230 kV Armow Wind Farm onto circuit B22D in 2016
- 230 kV Southgate Solar Farm onto circuit B4V in 2016

The following projects are underway:

- Bruce A TS 230 kV switchyard is currently undergoing major station refurbishment work with a projected in-servicing by Q2 2022.
- Wingham TS switchyard is currently undergoing major station refurbishment work with a projected in-servicing by Q2 2023
- Seaforth TS switchyard is currently undergoing major station refurbishment work with a projected in-servicing by Q4 2024
- Bruce B SS 500 kV switchyard is currently undergoing major station refurbishment work with a projected in-servicing by Q4 2024.

5. LOAD FORECAST AND STUDY ASSUMPTIONS

5.1 Load Forecast

The load in the Greater Bruce-Huron Region is forecast to increase annually between 2019 and 2028. The growth rate varies across the Region with most of the growth concentrated in the County of Bruce and more specifically in the Kincardine area. The Region's 2022 RIP load forecasts are provided in Appendix D and were prepared by the Working Group upon initiation of the RIP phase. The RIP forecasts are identical to the Needs Assessment forecast except as otherwise noted in Appendix D.

As per the load forecasts in Appendix D, the winter *gross* coincident load in the Region is expected to grow at an average rate of approximately 1.7% annually from 2019-2028 and the summer *gross* coincident load in the Region is expected to grow at an average rate of approximately 2.3% from 2019-2028.

As per the load forecasts in Appendix D, the winter *net* coincident load in the Region is expected to grow at an average rate of approximately 1.2% annually from 2019-2028 and the summer *net* coincident load in the Region is expected to grow at an average rate of approximately 1.9% from 2019-2028.

Figure 5-1 shows the Region's gross and net *winter* coincident forecasts while Figure 5.2 shows the Region's gross and net *summer* coincident forecasts. The regional-coincident (at the same time) forecast represents the total peak load of all 18 step-down transformer stations in the Region.

Based on historical load and on the coincident load forecasts, the Region's winter coincident peak load is larger than its summer coincident peak load. Based on historical load and the non-coincident load forecasts, the Region contains some stations that are summer peaking and others that are winter peaking. Equipment ratings are normally lower in the summer than winter due to ambient temperature. Based on these factors, assessment for this Region was conducted for both summer and winter peak load.

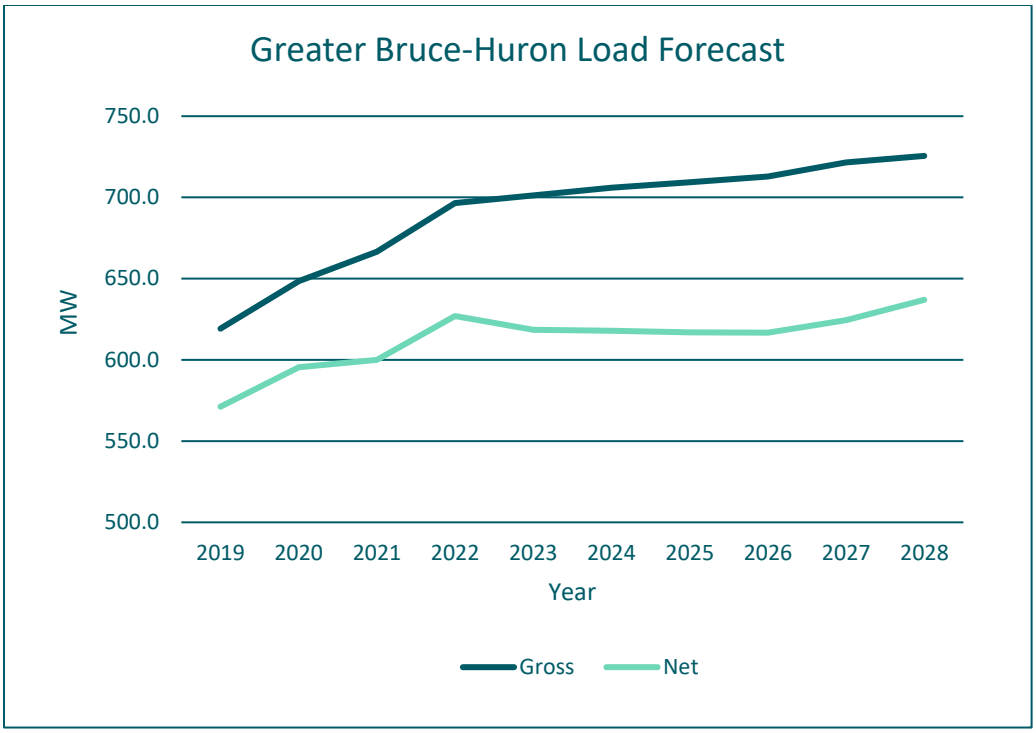

Figure 5-1. Greater Bruce-Huron Region Winter Coincident Forecast

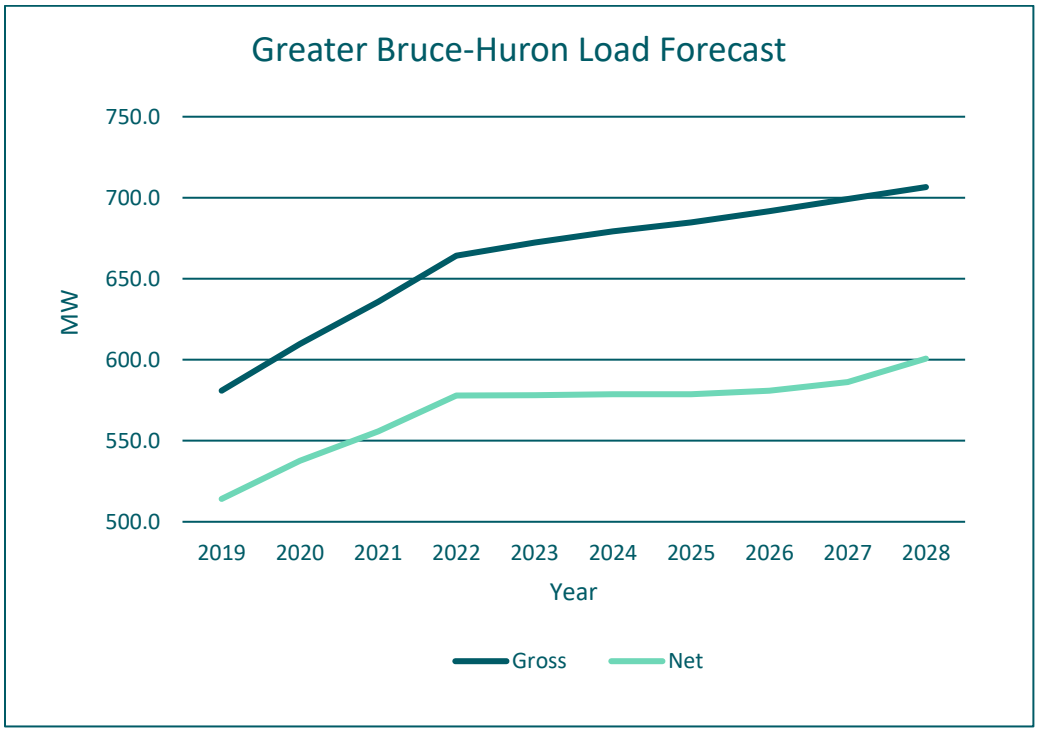

Figure 5-2. Greater Bruce-Huron Region Summer Coincident Forecast

5.2 Study Assumptions

The following assumptions are made in this report.

1) The study period for the RIP assessments is 2019-2028.

2) All planned facilities listed in Section 4 are assumed to be in-service.

3) The Region contains some stations that are summer peaking and others that are winter peaking. The assessment is therefore based on both summer and winter peak loads.

4) Station capacity adequacy is assessed by comparing the non-coincident peak load with the station's normal planning supply capacity by assuming a 90% lagging power factor for stations without low-voltage capacitor banks or the historical low voltage power factor, whichever is more conservative. Normal planning supply capacity for transformer stations in this Region is determined by the summer and winter 10-Day Limited Time Rating (LTR), as appropriate.

5) Adequacy assessment is conducted as per Ontario Resource Transmission Assessment Criteria (ORTAC).

6. ADEQUACY OF FACILITIES AND REGIONAL NEEDS OVER THE 2019-2028 PERIOD

THIS SECTION REVIEWS THE ADEQUACY OF THE EXISTING TRANSMISSION SYSTEM AND STEP-DOWN TRANFORMATION STATION FACILITIES SUPPLYING THE GREATER BRUCE-HURON REGION AND LISTS THE FACILITIES REQUIRING REINFORCEMENT OVER THE NEAR AND MID-TERM.

Within the current regional planning cycle, three regional assessments have been conducted for the Greater Bruce-Huron Region. The findings of these studies are input to the RIP. The studies are:

1) Needs Assessment Report - Greater Bruce-Huron Region, May 2019
2) Greater Bruce-Huron Region Scoping Assessment Report, September 2019
3) Southern Huron-Perth Sub-Region IRRP, September 2021

This RIP reviewed the loading on transmission lines and stations in the Greater Bruce-Huron Region based on the RIP load forecast. Sections 6.1-6.6 presents the results of this review and Table 6-1 lists the Region's needs identified in both the Needs Assessment and the RIP phases.

In addition, this RIP reviewed an updated list of Hydro One transmission lines and station major sustainment work over the next several years to determine if there are opportunities to consolidate with any emerging development needs within the Region. Section 7.5 presents the results of this review.

Table 6-1: Near and Mid-term Regional Needs

Type	Section	Needs	Timing
Needs and Timing Identified in the Needs Assessment Report [1]			
Transmission Circuit Capacity	7.2	Overload on sections of 115 kV single circuit line, L7S	2022 (emergency rating exceeded based on NA summer gross coincident load forecast)
			2027 (continuous rating exceeded based on NA summer gross load forecast)
End-Of-Life Equipment Needs	7.4	Wingham TS	2022
		Stratford TS	2021
		Seaforth TS	2023
		Hanover TS (T2)	2023

6.1 230 kV Transmission Facilities

Half of the 230 kV transmission circuits in the Greater Bruce-Huron Region are classified as part of the Bulk Electricity System ("BES"). They connect the Region to the rest of Ontario's transmission system and are also part of the transmission path from generation in Southwestern Ontario to the load centers in the KWCG, Georgian Bay and GTA areas. These circuits also serve local area stations within the Region and the power flow on them depends on the bulk system transfer as well as local area loads. These circuits are as follows (refer to Figure 3-2):

1) Bruce A TS to Orangeville TS 230kV transmission circuits B4V/B5V – supplies Hanover TS
2) Bruce A TS to Detweiler TS 230kV transmission circuits B22D/ B23D – supplies Wingham TS, Seaforth TS, Festival MTS #1, and Stratford TS
3) Bruce A TS to Owen Sound TS 230kV transmission circuits B27S/B28S – supplies Owen Sound TS
4) Bruce A TS to Douglas Point TS 230kV transmission circuits B20P/B24P – supplies Douglas Point TS and Bruce HWP B TS

The RIP review shows that based on current forecast station loadings and bulk transfers, all 230 kV circuits are expected to be adequate over the study period.

6.2 500/230 kV and 230/115 kV Transformation Facilities

Bulk power supply to the Greater Bruce-Huron Region is provided by Hydro One's 500 kV to 230 kV and 230 kV to 115 kV autotransformers. The number and location of these autotransformers are as follows:

1) Three (3) 500/230kV autotransformers at Bruce A TS
2) Two (2) 230/115kV autotransformers at Seaforth TS
3) Two (2) 230/115kV autotransformers at Hanover TS

The RIP review shows that based on current forecast station loadings and bulk transfers, the auto-transformation supply capacity is adequate over the study period.

6.3 Supply Capacity of the 115 kV Network

The Greater Bruce-Huron Region contains four (4) single circuit 115 kV lines. This 115 kV network serves local area load. These circuits are as follows (see Figure 3-2):

1) Hanover TS to Detweiler TS 115 kV transmission circuit D10H with Normally Open (N/O) point at Palmerston TS – supplies Palmerston TS & Elmira TS
2) Seaforth TS to Goderich TS 115 kV transmission circuit 61M18 – supplies Constance DS and Goderich TS
3) Seaforth TS to St. Marys TS 115 kV transmission circuit L7S – supplies Grand bend East DS, Lake Huron WTP CTS, Centralia TS, McGillivray R&BP CTS, Enbridge Bryanston CTS and St. Marys Cement CTS
4) Hanover TS to Owen Sound TS 115 kV transmission circuit S1H

The RIP review shows that based on current forecast station loadings, the supply capacity of the 115 kV network is adequate over the study period. The Needs Assessment coincident forecast identified that circuit L7S will exceed its short- and long-term emergency rating in 2022 and its continuous rating in 2027, however, the updated IRRP forecast resulted in these needs being deferred to the long-term period (2029-2038).

6.4 Step-down Transformer Stations

There are 18 step-down transformer stations within the Greater Bruce-Huron Region. Fourteen supply electricity to LDCs and four are transmission-connected industrial customer stations. These stations are listed in Appendix C. Of the 18 stations, 3 of them are owned and operated by LDCs.

As part of the Needs Assessment, IRRP, as well as this RIP, step-down transformation station capacity was reviewed. Since the May 2019 Needs Assessment, the load forecasts at stations supplied by L7S were updated during the IRRP phase of Regional Planning, while the other station forecasts remained unchanged; refer to Appendix D for the updated forecasts. The analysis showed that the gross load forecasts at all stations can be accommodated over the study period.

6.5 Other Items Identified During Regional Planning

6.5.1 End-Of-Life Equipment Replacement Needs

Wingham TS – T1/T2 and Component Replacement

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 current scope of this project is to replace the 230/44 kV step-down transformers, T1 and T2 and associated surge arrestors.

Based on the load forecast, similar equipment ratings are required for the EOL replacement. This project is underway and the planned in-service date for the project is in year 2023.

Stratford TS – T1 and Component Replacement

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. Transformers T1 and T2 are in service since 1970 and 1997 respectively.

The current scope of this project included the replacement of 230/27.6 kV transformer T1 and associated equipment.

Based on the load forecast similar equipment ratings are required for EOL replacement. The planned in-service date for the project was set for 2023, however the project work was advanced and completed in 2021.

Seaforth TS – T5/T6/T1/T2 and Component Replacement

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.

The current scope of this project is to replace 230/115 kV autotransformers T5, T6, step-down transformers T1, T2, the capacitor breaker SC1B and several high voltage and low voltage switches that are at end of their life. 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 (ULTCs).

Based on the load forecast for the station similar equipment ratings are required for EOL replacement of all equipment discussed above. The planned in-service date for the project is in year 2024.

Hanover TS – T2 and Component Replacement

Hanover TS consists of two 230/115 kV, 75/100/125 MVA autotransformers supplied by 230 kV circuits B4V and B5V (Bruce x Orangeville). The 115 kV yard has connectivity to Detweiler TS via 115 kV transmission circuit D10H with a Normally Open point at Palmerston TS. Another 115 kV transmission circuit S1H connects to Owen Sound TS. Hanover TS also consists of two 115/44 kV, 50/67/83 MVA step-down transformers connecting to six feeders and one capacitor bank, supplying Hydro One Distribution and embedded LDCs.

The scope of this project included the replacement of 230 kV motorized switches, 115/44 kV step-down transformer T2 and associated equipment, 115 kV motorized switches, surge arrestors, auto-ground switches and potential transformers. This work was planned to be completed in 2028, however due to a recent transformer tap changer failure, T2 and its associated transformer switch are being replaced immediately and are expected in-service by the end of 2022. The remaining component replacements that were planned as part of the T2 work will be bundled with the replacement of T1 and have an expected in-service date of 2031.

6.6 Long-Term Regional Needs

115kV L7S Circuit

In analyzing the updated IRRP coincident load forecast for stations supplied by L7S, no capacity needs were identified during the study period (2019-2028), however long-term capacity needs were observed under the high growth scenario following a single element contingency. Following the loss of D8S, a long-term capacity need was identified to emerge in 2035. Furthermore, with a planned outage to D8S, a capacity need begins to emerge in 2030, following the loss of Seaforth T6. With the uncertainty of how the forecast will develop over the next 5-10 years the working group will continue to monitor load growth to determine when an L7S upgrade is required. In the meantime, CDM programs and load transfers can be implemented to mitigate overloading the L7S circuit.

Recently, there have been connection requests at Grand Bend East DS which will result in increased loading on L7S, bringing the demand on the circuit closer to its Load Meeting Capability (LMC). The L7S capacity is limited by sub-standard clearance on certain spans of the

section of circuit between Seaforth TS and Kirkton JCT, and this has triggered a re-assessment of this section to address these clearance constraints that are limiting the circuit's capacity.

Hanover TS

In the long-term (2029-2038), Hanover TS is expected to exceed its gross summer load forecast in 2034, however accounting for DER and CDM, the need for additional capacity at the station is deferred to 2038. The end-of-life replacements planned for 2031 will likely increase the station's 10-day LTR by 5-10 MW, further deferring the need. Since the capacity need at Hanover TS does not arise for another 12-16 years, it is recommended to monitor load growth and re-evaluate the need in the next regional planning cycle.

7. REGIONAL PLANS

THIS SECTION SUMMARIZES THE REGIONAL PLANS FOR ADDRESSING THE NEEDS LISTED IN TABLE 6-1.

7.1 Transmission Circuit Capacity

7.1.1 Circuit L7S

L7S is a single 115 kV circuit transmission line operated radial from Seaforth TS to St. Marys TS. As per the updated IRRP coincident load forecast for stations supplied by L7S, no capacity needs were identified during the study period, however, the recent connection requests at Grand Bend East DS have triggered a re-assessment of the L7S section between Seaforth TS and Kirkton JCT to address the sub-standard clearances that are limiting the circuit's capacity.

Recommended Plan and Current Status

To address the potential need for additional capacity on L7S, it is recommended that Hydro One Transmission proceed with the re-assessment of the limiting section of L7S, currently underway, to increase the limiting spans' sag temperature from 83°C to 125°C. Addressing these sub-standard clearances will result in an L7S capacity increase of more than 10 MW. The Development Plan was initially detailed in the 2016 Local Planning – L7S Thermal Overload [3]. The Development Plan specified that when loading on L7S is expected to exceed its limits within a 3 year period, Hydro One Transmission will increase the thermal rating of the limiting spans of circuit L7S. The cost to increase the rating was estimated to be approximately $550k. An updated estimate will be available once the scope is confirmed, following the completion of the re-assessment. Strengthening L7S will be sufficient for supplying load connected to L7S load for the study period and into the long-term. Loading beyond the study period's forecast may then require additional voltage support and Hydro One Transmission will continue to monitor this need. Capacity cost allocation will be as per the Transmission System Code.

7.2 Customer Delivery Point Performance

7.2.1 Customers Supplied from Circuit L7S

The performance of delivery points supplied from circuit L7S, specifically Centralia TS, Grand Bend East DS, St. Marys TS and the 4 industrial customer connections, were reviewed. Specifically, the Centralia TS and McGillivray CTS delivery points, which are supplied by the same branch on L7S, were classified as outliers due to interruptions to this section of the circuit.

While the performance of the McGillivray CTS delivery point, with respect to frequency of outages, has been fluctuating between 1 and 8 interruptions per year since 2015, its performance with respect to duration of outages has drastically improved.

On the other hand, the Centralia TS delivery points were showing exemplary performance with respect to frequency and duration of outages until they were recently classified as outliers with respect to frequency and duration, due to a number of weather and equipment related outages experienced on the L7S circuit in 2019 and 2020.

Current Status and Recommended Plan

In 2021, remotely-operated switches were installed at three locations on the L7S circuit, namely, at Kirkton JCT, Biddulph JCT, and St. Marys TS. These switches will reduce the outage duration and improve restoration by quickly isolating the problematic sections while resupplying the healthy sections of the line. Hydro One's line sustainment and wood pole replacement programs will continue to assess the condition of this circuit to determine where deteriorating components exist and refurbish the sections of concern to improve the integrity of the circuit. Hydro One will continue to monitor the delivery point performance to determine whether further improvement are required. Capital contribution from customers is not anticipated at this time. If, however, capital contribution is required from customers such financial obligation will be determined using methodology set out in the Transmission System Code.

7.2.2 Customers Supplied from Hanover TS

The performance of the Hanover TS delivery points supplied from circuits D10H and S1H, were reviewed. The delivery point performance at Hanover TS with respect to frequency has been excellent over the last 10 years, averaging less than 1 interruption per year. Other than 2019, its performance with respect to duration has also been very good. The delivery points at Hanover TS had not been classified as outliers until 2020 due to a human triggered P&C failure which resulted in a 3-4 hour interruption.

Hanover TS is typically a very reliable station as it is supplied by two 230kV lines and two 115kV lines and the unique event that cause the delivery points to become outliers is very unlikely to reoccur.

Current Status and Recommended Plan

The on-demand replacement of the Hanover T2 transformer and its associated disconnect switch is expected to be completed in 2022, and Hanover T1 transformer and component replacement is planned to be completed in 2031. It is recommended to proceed with the capital plans and continue to monitor the delivery points which are expected to perform reliably.

7.3 Transmission Sustainment Plans

As part of Hydro One's transmitter requirements, Hydro One continues to ensure a reliable transmission system by carrying out maintenance programs as well as periodic replacement of equipment based on their condition. Table 7.1 lists Hydro One's major transmission sustainment *projects* in the Region that are currently planned or underway. There is currently no major line sustainment *projects* planned within the next 5 years. Maintenance *programs* such as insulator, shield wire, structure replacements will continue to be carried out in the Region as required based on equipment/asset condition assessments.

Table 7-1: Hydro One Transmission Major Sustainment Initiatives[1]

Station	General Description of Work	Planning In Service Date
Bruce A TS	• Replacement of 230 kV circuit breakers and switches • Uprating of station strain buses • Replacement of Protection and Control relay building	2022
	• Replacement of 500 kV circuit breakers and switches • Replacement of 2 autotransformers 500/230 kV • Upgrading of Protection and Control equipment	2027
Bruce B SS	• Replacement of 500 kV circuit breakers and switches	2024
Bruce HWP B TS	• Replacement of T7/T8 transformers and associated switches • Replacement of low voltage transformer breakers • Replacement of Protection and Control systems	2028
Douglas Point TS	• Replacement of T3/T4 transformers and associated switches • Replacement of low voltage circuit breakers and switches • Replacement of Protection and Control systems	2028
Hanover TS	• Replacement of T1 transformers and associated switches • Replacement of low voltage circuit breakers and switches • Replacement of Protection and Control systems and CVT's *Additional scope of work currently under development*	2031
Owen Sound TS	• Replacement of T4/T5 transformers and associated switches • Replacement of low voltage circuit breakers and switches • Replacement of Protection and Control systems	2028
	• Replacement of T3 transformer and associated switches • Replacement of low voltage transformer breaker	2031

[1] Scope and dates as of April 2022 and are subject to change

Seaforth TS	• Replacement of 2 autotransformers 230/115 kV • Replacement of 2 step-down transformers 115/27.6 kV • Replacement of 230kV switches • Upgrade Protection and Control systems • Updated AC & DC station service	2024
Wingham TS	• Complete station refurbishment	2023

Based on the needs identified in the region thus far and the transmission sustainment plans listed in Table 7-1, consolidation of sustainment and development needs is not necessary at this time.

8. CONCLUSION

THIS REGIONAL INFRASTRUCTURE PLAN REPORT CONCLUDES THE REGIONAL PLANNING PROCESS FOR THE GREATER BRUCE-HURON REGION.

Two near and mid-term needs were identified for the Greater Bruce-Huron Region. They are:

I. Transmission Circuit Capacity on L7S (mid-term)

II. Customer delivery point performance review on the 115 kV system

This RIP report addresses both of these needs and has concluded that regional plans are required. Next Steps, Lead Responsibility, and Timeframes for implementing the regional plans to address needs I and II are summarized in the Table 8-1 below.

Table 8-1: Regional Plans – Next Steps, Lead Responsibility and Plan In-Service Dates

No.	Project	Next Steps	Lead Responsibility	In-Service Date	Cost	Needs Mitigated
1	Increase Capacity of Limiting Section of L7S	Assessment of Limiting Section	Hydro One Transmission	2023-2025	$550k - TBD	I
2	Continued assessment of L7S condition to address deteriorating components	Monitor performance & assess condition	Hydro One Transmission	TBD	TBD	II

In accordance with the Regional Planning process, the Regional Plan should be reviewed and/or updated at least every five years. The region will continue to be monitored and should there be a need that emerges due to a change in load forecast or any other reason, the next regional planning cycle will be started earlier to address the need.

9. REFERENCES

[1] Hydro One, “Needs Assessment Report, Greater Bruce-Huron Region”, 31 May 2019. https://www.hydroone.com/abouthydroone/CorporateInformation/regionalplans/greaterbrucehuron/Documents/Greater%20Bruce-Huron%20Needs%20Assessment%20Report%20-%20May%202019.pdf

[2] IESO, “Greater Bruce-Huron Scoping Assessment Report”, 19 September 2019. https://www.ieso.ca/-/media/Files/IESO/Document-Library/regional-planning/Greater-Bruce-Huron/greater-bruce-huron-20190919-scoping-assessment-outcome-report.ashx

[3] IESO, “South Huron-Perth Sub-Region Integrated Regional Resource Planning”, September 2021. https://www.ieso.ca/-/media/Files/IESO/Document-Library/regional-planning/Greater-Bruce-Huron/Southern-Huron-Perth-IRRP-20210916.ashx

APPENDIX A: STEP-DOWN TRANSFORMER STATIONS IN THE GREATER BRUCE-HURON REGION

Station	Voltage (kV)	Supply Circuits
Bruce HWP B TS	230 kV	B20P/B24P
Douglas Point TS	230 kV	B20P/B24P
Hanover TS	115 kV	B4V/B5V
Owen Sound TS	230 kV	B27S/B28S
Seaforth TS	115 kV	B22D/B23D
Stratford TS	230 kV	B22D/B23D
Wingham TS	230 kV	B22D/B23D
Festival MTS #1	230 kV	B22D/B23D
Palmerston TS	115 kV	D10H
Goderich TS	115 kV	61M18
Constance DS	115 kV	61M18
St. Marys TS	115 kV	L7S
Customer CTS #1	115 kV	L7S
Centralia TS	115 kV	L7S
Grand Bend East DS	115 kV	L7S
Customer CTS #2	115 kV	L7S
Customer CTS #3	115 kV	L7S
Customer CTS #4	115 kV	L7S

APPENDIX B: REGIONAL TRANSMISSION CIRCUITS IN THE GREATER BRUCE-HURON REGION

Location	Circuit Designation	Voltage (kV)
Bruce A TS – Orangeville TS	B4V/B5V	230 kV
Bruce A TS – Detweiler TS	B22D/ B23D	230 kV
Bruce A TS – Owen Sound TS	B27S/B28S	230 kV
Bruce A TS – Douglas Point TS	B20P/B24P	230 kV
Hanover TS – Palmerston TS	D10H-North	115 kV
Seaforth TS – Goderich TS	61M18	115 kV
Seaforth TS – St. Marys TS	L7S	115 kV
Owen Sound TS – Hanover TS	S1H	115 kV

APPENDIX C: DISTRIBUTORS IN THE GREATER BRUCE-HURON REGION

Distributor Name	Station Name	Connection Type
Hydro One Networks Inc.	Constance DS	Tx
	Centralia TS	Dx
	Grand Bend East DS	Tx
	Douglas Point TS	Dx
	Goderich TS	Dx
	Hanover TS	Dx
	Owen Sound TS	Dx
	Palmerston TS	Dx
	Seaforth TS	Dx
	St. Marys TS	Dx
	Stratford TS	Dx
	Wingham TS	Dx
Entegrus Powerlines Inc.	Centralia TS	Dx
ERTH Power Corporation	Constance DS	Dx
	Goderich TS	Dx
	Seaforth TS	Dx
	Stratford TS	Dx
Festival Hydro Inc.	Grand Bend East DS	Dx
	Seaforth TS	Dx
	St. Marys TS	Dx
	Stratford TS	Dx
	Festival MTS #1	Tx
Lake Huron Primary Water Supply System	Lake Huron WTP CTS	Tx
Lake Huron Primary Water Supply System	McGillivray R&BP CTS	Tx
Wellington North Power Inc.	Hanover TS	Dx
	Palmerston TS	Dx
Westario Power Inc.	Douglas Point TS	Dx
	Hanover TS	Dx
	Palmerston TS	Dx
	Wingham TS	Dx
Enbridge Pipeline Inc.	Enbridge Bryanston CTS	Tx
St. Marys Cement Inc.	St. Marys Cement CTS	Tx

APPENDIX D: REGIONAL LOAD FORECAST (2019-2028)

Table D-1. Gross Winter Regional-Coincident Forecast (MW)

Transformer Station Name	Winter LTR (MVA)	2019	2020	2021	2022	2023	2024	2025	2026	2027	2028
Festival MTS #1	NA	28.0	25.6	25.8	26.0	26.2	26.4	26.6	26.8	27.0	27.2
Centralia TS	65.4	30.6	33.6	33.9	37.0	37.3	37.5	37.7	37.9	38.1	38.3
Douglas Point TS	109.8	62.4	76.3	82.4	89.1	88.9	88.6	88.3	88.0	87.7	87.5
Goderich TS	132.0	31.3	31.7	34.7	36.8	37.2	37.5	37.8	38.1	38.4	38.7
Hanover TS	124.7	68.8	70.1	70.7	72.4	73.2	74.8	75.4	76.0	76.7	77.3
Owen Sound TS	232.5	109.6	111.5	112.4	113.3	114.5	115.1	115.7	116.4	117.2	117.9
Palmerston TS	147.2	70.1	73.4	75.0	77.8	78.7	79.6	80.3	81.0	81.7	82.5
Seaforth TS	55.4	28.7	30.8	31.0	31.3	31.5	31.6	31.8	32.1	32.3	32.5
St. Marys TS	59.0	21.9	21.9	22.0	22.2	22.3	22.3	22.4	22.5	22.5	22.6
Stratford TS	128.6	68.5	70.5	71.0	72.9	73.5	74.0	74.4	75.0	75.5	76.0
Wingham TS	107.9	40.5	42.3	46.6	51.9	52.4	52.8	53.1	53.5	53.9	54.4
Constance DS	35.0	16.8	17.0	17.1	17.1	17.2	17.3	17.3	17.4	17.5	17.5
Grand Bend East DS	NA	11.8	12.6	13.2	13.3	13.4	13.5	13.6	13.6	13.7	13.8
Bruce Power HWB TS	114.8	10.4	11.2	11.1	10.9	10.8	10.6	10.5	10.3	10.3	10.3
Customer CTS #1	NA	2.6	2.6	2.6	2.6	2.6	2.6	2.6	2.6	2.6	2.6
Customer CTS #2	NA	3.3	3.3	3.3	3.3	3.3	3.3	3.3	3.3	3.3	3.3
Customer CTS #3	NA	0.1	0.1	0.1	0.1	0.1	0.1	0.1	0.1	0.1	0.1
Customer CTS #4	NA	13.8	13.8	13.8	18.4	18.4	18.4	18.4	18.4	23.0	23.0

Table D-2. Gross Summer Regional-Coincident Forecast (MW)

Transformer Station Name	Summer LTR (MVA)	2019	2020	2021	2022	2023	2024	2025	2026	2027	2028
Festival MTS #1	NA	25.0	25.2	25.4	25.5	25.7	25.9	26.1	26.3	26.5	26.7
Centralia TS *	61.1	29.9	33.2	34.0	36.0	37.0	37.0	37.0	37.0	37.0	38.0
Douglas Point TS	97.2	51.0	60.6	69.7	77.6	78.6	79.5	80.4	81.3	82.3	83.3
Goderich TS	126.5	31.8	32.2	35.2	37.2	37.6	37.9	38.2	38.5	38.8	39.1
Hanover TS	109.9	75.9	78.5	80.4	83.7	85.8	88.9	90.9	93.0	95.2	97.5
Owen Sound TS	208.5	92.7	94.8	95.7	96.7	97.8	98.4	98.9	99.5	100.1	100.8
Palmerston TS	132.2	52.3	55.0	57.3	58.4	59.2	60.0	60.5	61.1	61.8	62.4
Seaforth TS	45.1	29.7	32.1	32.6	33.2	33.7	34.3	34.8	35.3	35.9	36.5
St. Marys TS *	52.8	22.7	22.9	25.0	26.0	26.0	26.0	26.0	26.0	27.0	27.0
Stratford TS	117.3	73.6	75.7	76.3	78.2	78.9	79.4	79.9	80.5	81.0	81.6
Wingham TS	97	36.9	38.8	44.7	52.2	52.4	52.4	52.4	52.5	52.7	52.8
Constance DS	25	17.4	17.7	17.8	17.9	18.0	18.1	18.1	18.2	18.2	18.3
Grand Bend East DS *	NA	16.5	17.3	16.0	16.0	16.0	16.0	16.0	17.0	17.0	17.0
Bruce Power HWB TS	113.2	4.3	4.6	4.6	4.5	4.5	4.4	4.3	4.3	4.3	4.3
Customer CTS #1 *	NA	2.3	2.3	2.3	2.3	2.3	2.3	2.3	2.3	2.3	2.3
Customer CTS #2 *	NA	5.0	5.0	6.0	6.0	6.0	6.0	6.0	6.0	6.0	6.0
Customer CTS #3 *	NA	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Customer CTS #4 *	NA	13.9	13.9	13.0	13.0	13.0	13.0	13.0	13.0	13.0	13.0

*Updated to align with South Huron-Perth IRRP Forecast

Table D-3. Gross Winter Non-Coincident Forecast (MW)

Transformer Station Name	Winter LTR (MVA)	2019	2020	2021	2022	2023	2024	2025	2026	2027	2028
Festival MTS #1	NA	29.7	27.2	27.4	27.6	27.8	28.1	28.3	28.5	28.7	28.9
Centralia TS	65.4	33.3	36.7	36.9	40.4	40.7	40.9	41.1	41.3	41.6	41.8
Douglas Point TS	109.8	63.1	77.2	83.3	90.2	89.9	89.6	89.3	89.0	88.7	88.5
Goderich TS	132.0	35.8	36.2	39.7	42.1	42.4	42.8	43.1	43.5	43.8	44.2
Hanover TS	124.7	72.0	73.4	74.0	75.8	76.6	78.3	78.9	79.5	80.2	80.9
Owen Sound TS	232.5	109.9	111.9	112.8	113.7	114.8	115.5	116.1	116.8	117.6	118.3
Palmerston TS	147.2	70.3	73.7	75.3	78.1	79.0	79.9	80.6	81.3	82.0	82.8
Seaforth TS	55.4	34.8	37.3	37.5	37.9	38.1	38.3	38.6	38.8	39.1	39.3
St. Marys TS	59.0	23.7	23.7	23.8	23.9	24.0	24.1	24.2	24.3	24.3	24.4
Stratford TS	128.6	71.9	74.0	74.5	76.5	77.1	77.6	78.1	78.7	79.2	79.8
Wingham TS	107.9	62.6	65.3	71.9	80.2	81.0	81.5	82.1	82.7	83.3	84.0
Constance DS	35.0	16.9	17.1	17.2	17.3	17.4	17.4	17.4	17.5	17.6	17.6
Grand Bend East DS	NA	13.0	14.0	14.6	14.7	14.9	14.9	15.0	15.1	15.2	15.3
Bruce Power HWB TS	114.8	12.1	13.0	12.8	12.7	12.5	12.3	12.1	12.0	12.0	12.0
Customer CTS #1	NA	3.4	3.4	3.4	3.4	3.4	3.4	3.4	3.4	3.4	3.4
Customer CTS #2	NA	5.9	5.9	5.9	5.9	5.9	5.9	5.9	5.9	5.9	5.9
Customer CTS #3	NA	4.6	4.6	4.6	4.6	4.6	4.6	4.6	4.6	4.6	4.6
Customer CTS #4	NA	15.0	15.0	15.0	20.0	20.0	20.0	20.0	20.0	25.0	25.0

Table D-4. Gross Summer Non-Coincident Forecast (MW)

Transformer Station Name	Summer LTR (MVA)	2019	2020	2021	2022	2023	2024	2025	2026	2027	2028
Festival MTS #1	NA	32.6	32.9	33.1	33.4	33.6	33.9	34.1	34.4	34.6	34.9
Centralia TS *	61.1	34.5	38.2	37.0	40.0	41.0	41.0	41.0	41.0	42.0	42.0
Douglas Point TS	97.2	51.2	60.8	70.0	77.9	78.9	79.8	80.7	81.6	82.6	83.6
Goderich TS	126.5	38.2	38.7	42.2	44.7	45.2	45.5	45.9	46.2	46.6	47.0
Hanover TS	109.9	75.9	78.5	80.4	83.7	85.8	88.9	90.9	93.0	95.2	97.5
Owen Sound TS	208.5	104.1	106.4	107.4	108.6	109.9	110.5	111.1	111.7	112.4	113.1
Palmerston TS	132.2	62.6	65.8	68.5	69.9	70.9	71.8	72.4	73.2	73.9	74.7
Seaforth TS	45.1	31.4	33.9	34.4	35.0	35.6	36.2	36.7	37.3	37.9	38.5
St. Marys TS *	52.8	24.9	25.1	28.0	28.0	28.0	28.0	28.0	29.0	29.0	29.0
Stratford TS	117.3	82.2	84.5	85.2	87.3	88.0	88.6	89.2	89.8	90.5	91.1
Wingham TS	97	51.2	53.9	62.1	72.5	72.7	72.7	72.8	72.9	73.1	73.3
Constance DS	25	18.2	18.4	18.5	18.6	18.8	18.8	18.9	18.9	19.0	19.1
Grand Bend East DS *	NA	22.1	23.1	22.0	22.0	22.0	22.0	22.0	22.0	22.0	22.0
Bruce Power HWB TS	113.2	8.3	8.9	8.8	8.7	8.6	8.4	8.3	8.2	8.2	8.2
Customer CTS #1 *	NA	3.4	3.4	3.0	3.0	3.0	3.0	3.0	3.0	3.0	3.0
Customer CTS #2 *	NA	5.8	5.8	7.0	7.0	7.0	7.0	7.0	7.0	7.0	7.0
Customer CTS #3 *	NA	4.5	4.5	5.0	5.0	5.0	5.0	5.0	5.0	5.0	5.0
Customer CTS #4 *	NA	15.0	15.0	15.0	15.0	15.0	15.0	15.0	15.0	15.0	15.0

*Updated to align with South Huron-Perth IRRP Forecast

Table D-5. Net Winter Regional Coincident Forecast (MW)

Transformer Station Name	Winter LTR (MVA)	2019	2020	2021	2022	2023	2024	2025	2026	2027	2028
Festival MTS #1	NA	27.7	25.2	25.7	25.8	25.5	25.5	25.5	25.6	25.6	25.7
Centralia TS	65.4	30.3	32.8	33.0	36.0	35.5	35.5	35.4	35.4	35.4	35.4
Douglas Point TS	109.8	47.7	61.0	67.9	74.3	72.5	71.5	70.7	70.0	69.2	80.7
Goderich TS	132.0	31.0	31.2	34.1	36.0	35.6	35.6	35.6	35.7	36.2	36.3
Hanover TS	124.7	50.5	51.3	52.8	54.2	53.6	54.6	54.7	54.9	55.1	55.3
Owen Sound TS	232.5	108.5	109.7	107.9	108.4	107.5	107.4	107.3	107.4	111.0	111.2
Palmerston TS	147.2	69.4	72.3	74.1	76.6	76.1	76.4	76.6	76.9	77.2	77.5
Seaforth TS	55.4	17.8	19.6	20.2	20.3	19.9	19.8	19.7	19.7	19.7	19.7
St. Marys TS	59.0	21.7	21.5	21.8	21.9	21.6	21.4	21.4	21.3	21.3	21.2
Stratford TS	128.6	67.9	69.4	69.5	71.1	70.3	70.2	70.3	70.4	70.4	70.5
Wingham TS	107.9	40.1	41.6	33.6	38.6	37.7	37.5	37.3	37.3	37.2	37.2
Constance DS	35.0	16.7	16.7	16.9	16.9	16.7	16.7	16.6	16.6	16.5	16.5
Grand Bend East DS	NA	11.7	12.4	12.0	12.1	11.9	11.9	11.9	11.9	11.9	11.9
Bruce Power HWB TS	114.8	10.3	11.0	11.0	10.8	10.5	10.2	10.0	9.8	9.7	9.7
Customer CTS #1	NA	2.6	2.6	2.6	2.6	2.5	2.5	2.5	2.5	2.5	2.5
Customer CTS #2	NA	3.3	3.2	3.2	3.2	3.2	3.2	3.2	3.2	3.2	3.2
Customer CTS #3	NA	0.1	0.1	0.1	0.1	0.1	0.1	0.1	0.1	0.1	0.1
Customer CTS #4	NA	13.7	13.6	13.6	18.1	18.0	17.9	17.9	17.9	22.3	22.2

Table D-6. Net Summer Regional Coincident Forecast (MW)

Transformer Station Name	Summer LTR (MVA)	2019	2020	2021	2022	2023	2024	2025	2026	2027	2028
Festival MTS #1	NA	24.7	24.7	25.0	24.9	24.7	24.7	24.6	24.6	24.5	24.5
Centralia TS *	61.1	29.6	32.4	31.6	33.3	33.8	33.5	33.2	33.0	32.6	33.4
Douglas Point TS	97.2	36.0	45.0	54.4	61.6	61.7	62.0	62.3	62.7	63.1	75.6
Goderich TS	126.5	31.5	31.7	34.0	35.7	35.6	35.5	35.5	35.5	35.9	36.0
Hanover TS	109.9	56.1	58.1	60.5	63.0	64.2	66.5	67.8	69.3	70.7	72.3
Owen Sound TS	208.5	90.0	91.1	88.8	88.9	88.9	88.5	88.3	88.2	91.5	91.5
Palmerston TS	132.2	51.8	54.0	54.8	55.4	55.4	55.6	55.6	55.7	55.8	56.0
Seaforth TS	45.1	17.9	20.1	20.8	21.0	21.2	21.4	21.7	22.0	22.3	22.6
St. Marys TS *	52.8	22.4	22.5	24.2	25.0	24.7	24.5	24.3	24.1	24.9	24.7
Stratford TS	117.3	72.8	74.4	73.6	74.8	74.5	74.3	74.2	74.1	74.0	74.0
Wingham TS	97	23.6	25.2	31.1	37.9	37.3	36.7	36.3	35.9	35.5	35.2
Constance DS	25	17.3	17.4	17.2	17.1	17.0	16.9	16.9	16.8	16.7	16.7
Grand Bend East DS *	NA	15.1	15.7	14.5	14.3	14.0	13.9	13.7	14.6	14.4	14.3
Bruce Power HWB TS	113.2	4.3	4.6	4.5	4.3	4.2	4.1	4.0	3.9	3.8	3.8
Customer CTS #1 *	NA	2.2	2.2	2.2	2.2	2.2	2.2	2.2	2.2	2.2	2.2
Customer CTS #2 *	NA	4.9	4.9	5.9	5.9	5.9	5.9	5.9	5.8	5.8	5.8
Customer CTS #3 *	NA	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Customer CTS #4 *	NA	13.8	13.7	12.7	12.6	12.5	12.5	12.4	12.4	12.2	12.1

*Updated to align with South Huron-Perth IRRP Forecast

Table D-7. Net Winter Non-Coincident Forecast (MW)

Transformer Station Name	Winter LTR (MVA)	2019	2020	2021	2022	2023	2024	2025	2026	2027	2028
Festival MTS #1	NA	29.5	26.8	27.3	27.4	27.1	27.1	27.2	27.2	27.3	27.4
Centralia TS	65.4	33.0	35.8	36.1	39.3	38.9	38.8	38.8	38.8	38.8	38.9
Douglas Point TS	109.8	48.5	61.8	68.9	75.3	73.5	72.6	71.8	71.0	70.3	81.7
Goderich TS	132.0	35.4	35.6	39.0	41.2	40.8	40.9	41.0	41.1	41.6	41.8
Hanover TS	124.7	53.7	54.5	56.1	57.5	57.0	58.1	58.2	58.5	58.7	59.0
Owen Sound TS	232.5	108.9	110.1	108.3	108.8	107.9	107.8	107.7	107.8	111.4	111.6
Palmerston TS	147.2	69.7	72.5	74.4	76.9	76.4	76.7	76.9	77.2	77.5	77.8
Seaforth TS	55.4	23.9	26.0	26.7	26.9	26.5	26.4	26.5	26.5	26.5	26.6
St. Marys TS	59.0	23.4	23.3	23.6	23.7	23.3	23.2	23.2	23.1	23.1	23.1
Stratford TS	128.6	71.2	72.8	73.0	74.7	73.9	73.9	74.0	74.1	74.1	74.3
Wingham TS	107.9	49.4	51.6	59.0	66.9	66.2	66.2	66.3	66.5	66.6	66.8
Constance DS	35.0	16.8	16.8	17.0	17.1	16.8	16.8	16.7	16.7	16.7	16.6
Grand Bend East DS	NA	12.9	13.8	13.4	13.5	13.4	13.4	13.4	13.4	13.4	13.4
Bruce Power HWB TS	114.8	11.9	12.8	12.8	12.6	12.2	11.9	11.7	11.5	11.4	11.3
Customer CTS #1	NA	3.4	3.3	3.3	3.3	3.3	3.3	3.3	3.3	3.3	3.3
Customer CTS #2	NA	5.8	5.8	5.8	5.8	5.8	5.8	5.7	5.7	5.7	5.7
Customer CTS #3	NA	4.6	4.6	4.6	4.5	4.5	4.5	4.5	4.5	4.5	4.5
Customer CTS #4	NA	14.9	14.8	14.7	19.6	19.6	19.5	19.5	19.4	24.2	24.2

Table D-8. Net Summer Non-Coincident Forecast (MW)

Transformer Station Name	Summer LTR (MVA)	2019	2020	2021	2022	2023	2024	2025	2026	2027	2028
Festival MTS #1	NA	32.3	32.3	32.8	32.7	32.6	32.6	32.6	32.7	32.7	32.7
Centralia TS *	61.1	34.1	37.3	34.6	37.3	37.8	37.5	37.2	37.0	37.6	37.4
Douglas Point TS	97.2	50.7	59.7	54.7	61.8	62.0	62.3	62.6	63.0	63.4	75.9
Goderich TS	126.5	37.8	38.1	41.1	43.2	43.2	43.2	43.2	43.3	43.8	43.9
Hanover TS	109.9	56.1	58.1	60.5	63.0	64.2	66.5	67.8	69.3	70.7	72.3
Owen Sound TS	208.5	101.3	102.5	100.6	100.8	100.9	100.6	100.4	100.4	103.9	103.9
Palmerston TS	132.2	62.0	64.7	66.1	66.9	67.1	67.4	67.5	67.8	68.0	68.3
Seaforth TS	45.1	19.6	21.9	22.6	22.9	23.1	23.3	23.6	24.0	24.3	24.6
St. Marys TS *	52.8	24.6	24.7	27.2	27.0	26.7	26.5	26.3	27.1	26.9	26.7
Stratford TS	117.3	81.3	83.1	82.4	83.9	83.6	83.5	83.5	83.5	83.5	83.5
Wingham TS	97	50.7	53.0	48.5	58.1	57.6	57.0	56.6	56.3	56.0	55.7
Constance DS	25	18.0	18.1	17.9	17.9	17.8	17.7	17.6	17.5	17.5	17.4
Grand Bend East DS *	NA	21.9	22.7	20.5	20.3	20.0	19.9	19.7	19.6	19.4	19.3
Bruce Power HWB TS	113.2	8.2	8.8	8.7	8.5	8.3	8.1	7.9	7.8	7.7	7.7
Customer CTS #1 *	NA	3.4	3.3	2.9	2.9	2.9	2.9	2.9	2.9	2.9	2.9
Customer CTS #2 *	NA	5.7	5.7	6.9	6.9	6.9	6.8	6.8	6.8	6.8	6.8
Customer CTS #3 *	NA	4.5	4.5	4.9	4.9	4.9	4.9	4.9	4.9	4.8	4.8
Customer CTS #4 *	NA	14.8	14.7	14.7	14.6	14.5	14.5	14.4	14.4	14.1	14.1

APPENDIX E: LIST OF 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
DCF	Discounted Cash Flow
DER	Distributed Energy Resources
DESN	Dual Element Spot Network
DG	Distributed Generation
DSC	Distribution System Code
GATR	Guelph Area Transmission Reinforcement
GS	Generating Station
GTA	Greater Toronto Area
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
ROW	Right-of-Way
SA	Scoping Assessment
SIA	System Impact Assessment
SPS	Special Protection Scheme
SS	Switching Station
TS	Transformer Station
TSC	Transmission System Code
UFLS	Under Frequency Load Shedding
ULTC	Under Load Tap Changer
UVLS	Under Voltage Load Rejection Scheme