# London Area Regional Infrastructure Plan

**August 12, 2022**

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Prepared and supported by:

| Company |
|---|
| Entegrus Power Lines Inc. |
| ERTH Power Inc. |
| Hydro One Networks Inc. (Distribution) |
| London Hydro Inc. |
| Tillsonburg Hydro Inc. |
| Independent Electricity System Operator |
| Hydro One Networks Inc. (Lead Transmitter) |

# 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 identified in previous planning phases and any additional needs identified based on new and/or updated information provided by the RIP Study Team.

The preferred solution(s) that have been identified in this report may be reevaluated 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 Study Team.

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# Executive Summary

This Regional Infrastructure Plan ("RIP") was prepared by Hydro One with support from the RIP Study Team in accordance to the Ontario Transmission System Code requirements. It identifies investments in transmission facilities, distribution facilities, or both, that should be developed and implemented to meet the electricity infrastructure needs within the London Area.

The participants of the Regional Infrastructure Plan ("RIP") Study Team included members from the following organizations:

- Entegrus Power Lines Inc.
- ERTH Power Inc.
- Hydro One Networks Inc. (Distribution)
- London Hydro Inc
- Tillsonburg Hydro Inc.
- Independent Electricity System Operator
- Hydro One Networks Inc. (Transmission)

This RIP is the final phase of the second cycle of the London Area regional planning process, which follows the completion of the London Area Needs Assessment in May 2020 [5] and the Greater London Sub-region Restoration Local Planning Report in October 2021 [6]. Scoping Assessment and Integrated Regional Resource Plan was not carried out in this cycle. This RIP provides a consolidated summary of the needs and recommended plans for London Area Region over the planning horizon (10 years). No new need had been identified at this time.

This RIP discusses needs identified in the previous regional planning cycle, the Needs Assessment and Local Planning reports for this cycle, and wires solutions recommended to address these needs. Implementation plans to address some of these needs are already completed or are underway. Since the previous regional planning cycle, the following projects have commenced and/or completed:

- Aylmer TS transformers and low-voltage switchyard replacement project competed in 2017.
- Strathroy TS failed transformer T1 and low-voltage switchyard replacement project completed in 2019.
- Wonderland TS failed transformer T6 was replaced in 2019.
- St. Thomas TS was decommissioned and 115 kV circuit W14 re-termination work was completed in 2020.
- Sarnia Scott TS to Buchanan TS 230 kV circuits N21W/N22W tower structures refurbishment project was completed in 2021.
- Nelson TS station refurbishment project will be completed in 2022.
- Tillsonburg TS new low-voltage capacitor banks installed in 2021 and switchyard component replacement project to be completed in 2022.
- Longwood TS protection and control replacement project to be completed in 2023.
- Edgeware TS protection and control replacement project to be completed in 2024.

The major infrastructure investments planned for the London Area over the near and mid-term planning horizon are provided in the Table 1 below, along with the planned in-service dates.

**TABLE 1 - RECOMMENDED PLANS FOR LONDON AREA OVER THE NEXT 10 YEARS**

| Need | Stations / Lines | Recommended Action Plan | In-service |
|---|---|---|---|
| **Station capacity** | Talbot TS | No action required | -- |
| **Greater London sub-region restoration need** | W36/W37 | No action required | -- |
| **End-of-life equipment replacement** | Buchanan TS | Replacement of autotransformers and associated equipment | 2028 |
| | Clarke TS | Replacement of step-down transformers, associated disconnect switches, low-voltage switchyard components | 2028 |
| | Talbot TS | Replacement of step-down transformers (T3/T4), associated disconnect switches, low-voltage switchyard components | 2028 |
| | Wonderland TS | Low-voltage switchyard components replacement | 2026 |
| | M31W/ M32W (Salford Junction x Ingersoll) | London Area East Optical Ground Wire (OPGW) Infrastructure | 2027 |
| | W36/W37/W5 NL/W6NL/W2S/ N21W | London Area West Telecom Optical Ground Wire (OPGW) Infrastructure Installation | 2029 |

The Study Team recommends Hydro One to continue with the implementation of infrastructure investments listed in Table 1 above.

In accordance with the Regional Planning process, the RIP should be reviewed and/or updated at least every five years. The London Area 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 triggered in advance of the five-year timeline.

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# 1. Introduction

## THIS REPORT PRESENTS THE REGIONAL INFRASTRUCTURE PLAN (“RIP”) TO ADDRESS THE ELECTRICITY NEEDS OF THE LONDON AREA REGION BETWEEN 2021 AND 2031.

The report was prepared by Hydro One Networks Inc. (Transmission) (“Hydro One”) on behalf of the Study Team that consists of Entegrus Power Lines Inc., ERTH Power Inc., London Hydro Inc., Tillsonburg Hydro Inc., Hydro One Networks Inc. (Distribution), and the Independent Electricity System Operator (“IESO”), in accordance with the new Regional Planning process established by the Ontario Energy Board in 2013.

The London Area includes the municipalities of Oxford County (comprising Township of Blandford-Blenheim, Township of East Zorra-Tavistock, Town of Ingersoll, Township of Norwich, Township of South-West Oxford, Town of Tillsonburg, Township of Zorra), City of Woodstock, Middlesex County (comprising Municipality of Adelaide Metcalfe , Municipality of Lucan Biddulph, Municipality of Middlesex Centre, Municipality of North Middlesex, Municipality of Southwest Middlesex, Municipality of Strathroy-Caradoc, Municipality of Thames Centre, Village of Newbury), City of London, Elgin County (comprising Municipality of Town of Aylmer, Municipality of Bayham, Municipality of Central Elgin, Municipality of West Elgin, Municipality of Dutton/Dunwich, Township of Malahide, Township of Southwold), and the City of St. Thomas. In addition, the facilities located in the London Region supply part of Norfolk County. The boundaries of the London Area are shown below in Figure 1-1.

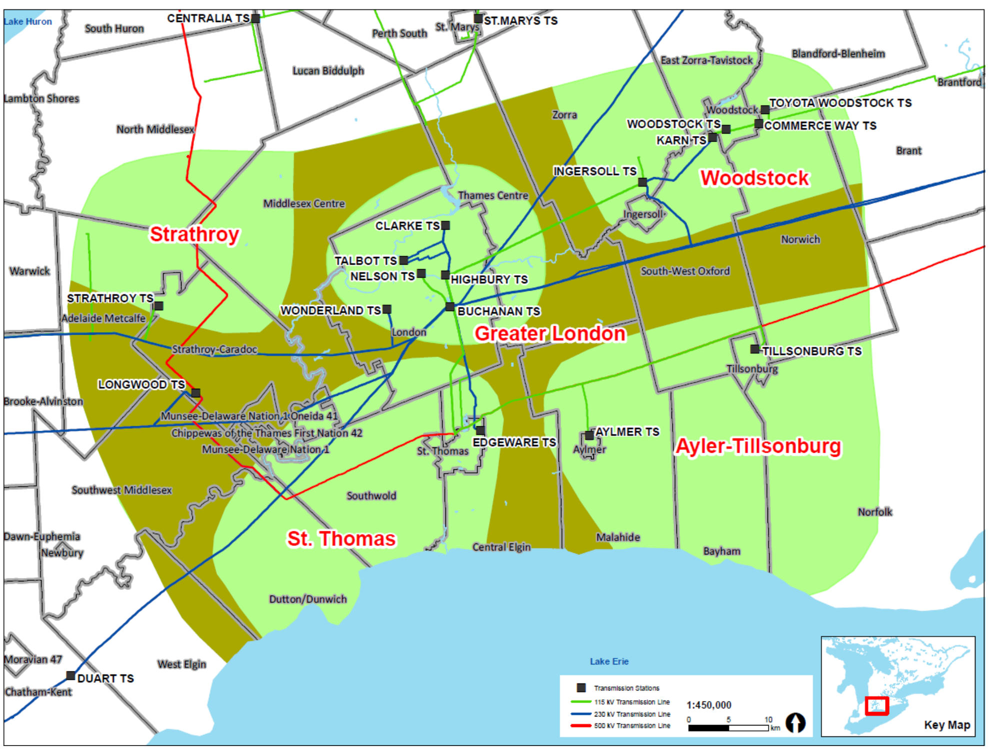



**FIGURE 1-1: LONDON AREA REGION MAP**

## 1.1. Objectives and Scope

The RIP report examines the needs in the London Area Region. Its objectives are to:

- Provide a comprehensive summary of needs and wires plans to address the needs;
- Identify any new needs that may have emerged since previous planning phases i.e., Needs Assessment and Local Planning;
- Assess and develop a wires plan to address these needs; and
- 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 needs emerging over the near and medium term horizon, transmission and distribution system capability along with any updates to local plans, conservation and demand management ("CDM") forecasts, 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 the relevant wires plans to address near and medium-term needs identified in previous planning phases;
- Discussion of any other major transmission infrastructure investment plans over the planning horizon;
- Identification of any new needs and a wires plan to address these needs based on new and/or updated information;
- Develop a plan to address any longer term needs identified by the Study Team.

## 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 regional characteristics.
- 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 discusses the needs and provides the alternatives and preferred solutions.
- Section 7 provides the conclusion and next steps.

# 2. Regional Planning Process

## 2.1. Overview

Planning for the electricity system in Ontario takes place at 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 focuses on assessing 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 ("OEB") in 2013 through amendments to the Transmission System Code ("TSC") and Distribution System Code ("DSC"). The process consists of four phases: the Needs Assessment[1] ("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 Study Team 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.

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 (non-wires alternatives) options at a higher or more macro level, but sufficient to permit a comparison of options. If the IRRP phase 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 a preferred wires solution. Similarly, resource options that the IRRP identifies as best suited to meet a need are then further planned in greater detail by the IESO.

[1] Also referred to as Needs Screening

The IRRP phase also includes IESO led stakeholder engagement with municipalities, Indigenous communities, business sectors and other interested stakeholders in the region.

The RIP phase is the fourth and final phase of the regional planning process and involves discussion of previously identified needs and plans, 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 would be the best overall approach. This phase is led and coordinated by the transmitter and the deliverable is a comprehensive report of a wires plan for the region. Once completed, this report is also referenced in transmitter's rate filing submissions and as part of LDC rate applications with a planning status letter provided by the transmitter.

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 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, SA, and LP phases of regional planning;
- Participating in and conducting wires planning as part of the IRRP for the region or sub-region;
- 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.

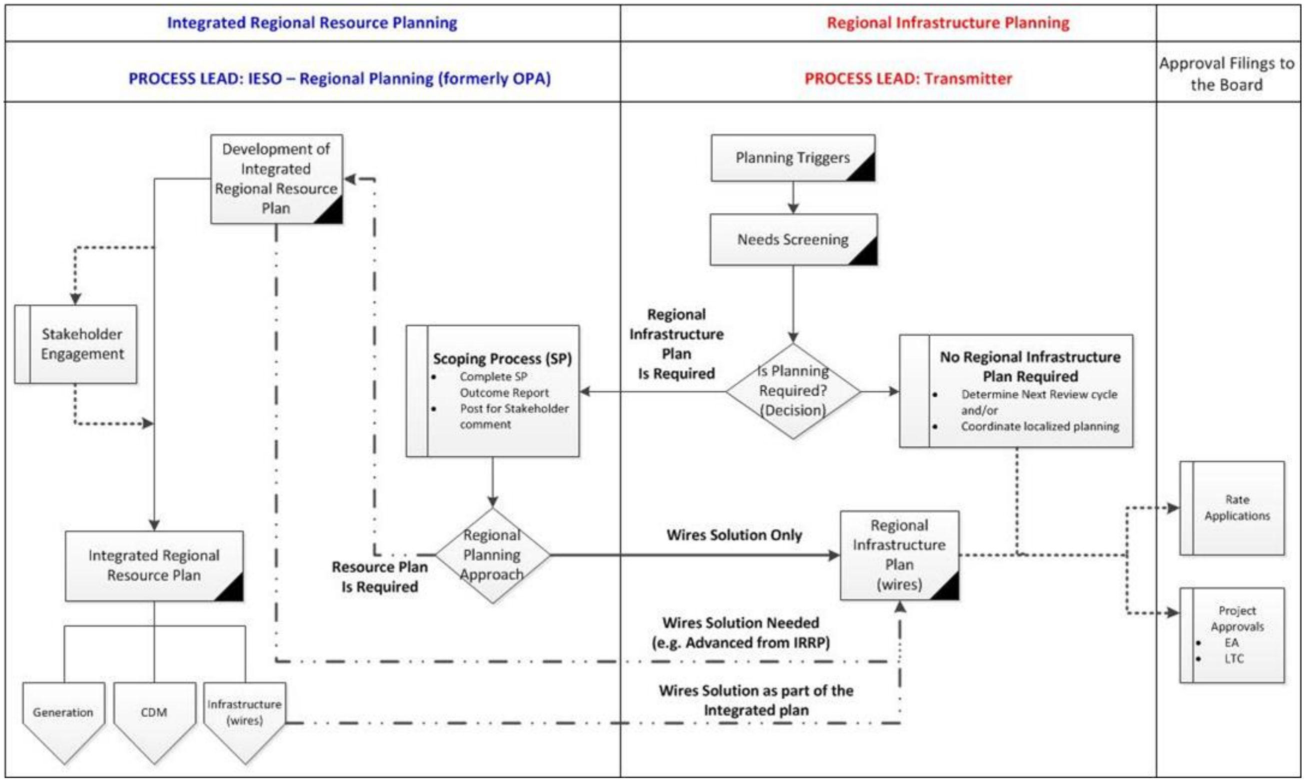



**FIGURE 2-2: REGIONAL PLANNING PROCESS FLOWCHART**

Upon the conclusion of Needs Assessment, the Study Team agreed that the need in the region (i.e., Greater London sub-region restoration need) was local in nature and no further regional coordination was required. Subsequently, a Local Planning report was completed to specifically address the restoration need. Therefore, Scoping Assessment and Integrated Regional Resource Plan was not carried out for London Area in this cycle.

## 2.3. RIP Methodology

The RIP phase consists of a four step process (see Figure 2-3) as follows:

1) Data Gathering: The first step of the process is the review of planning assessment data collected in the previous phase of the regional planning process. Hydro One collects this information and reviews it with the Study Team to reconfirm or update the information as required. The data collected includes:

    - Net peak demand forecast at the transformer station level. This includes the effect of any distributed generation 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. Depending upon the changes to load forecast or other relevant information, regional technical assessment may or may not be required or be limited to specific issue only. Additional near and mid-term needs may be identified in this phase.
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.

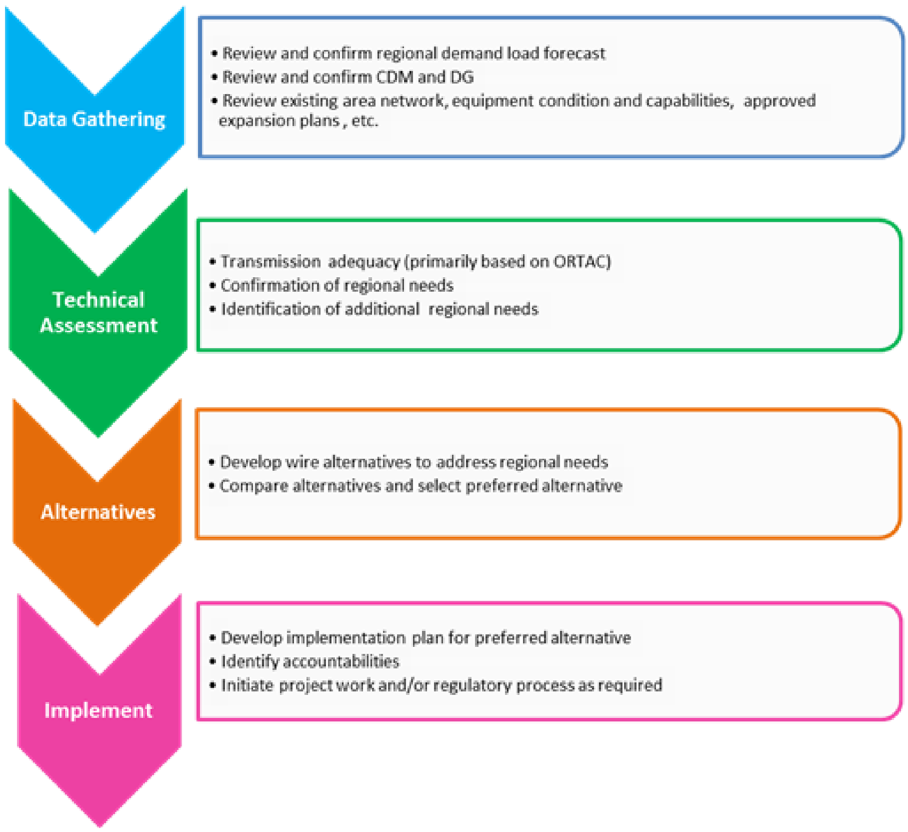



FIGURE 2-3: RIP METHODOLOGY

# 3. Transmission System Supplying London Area

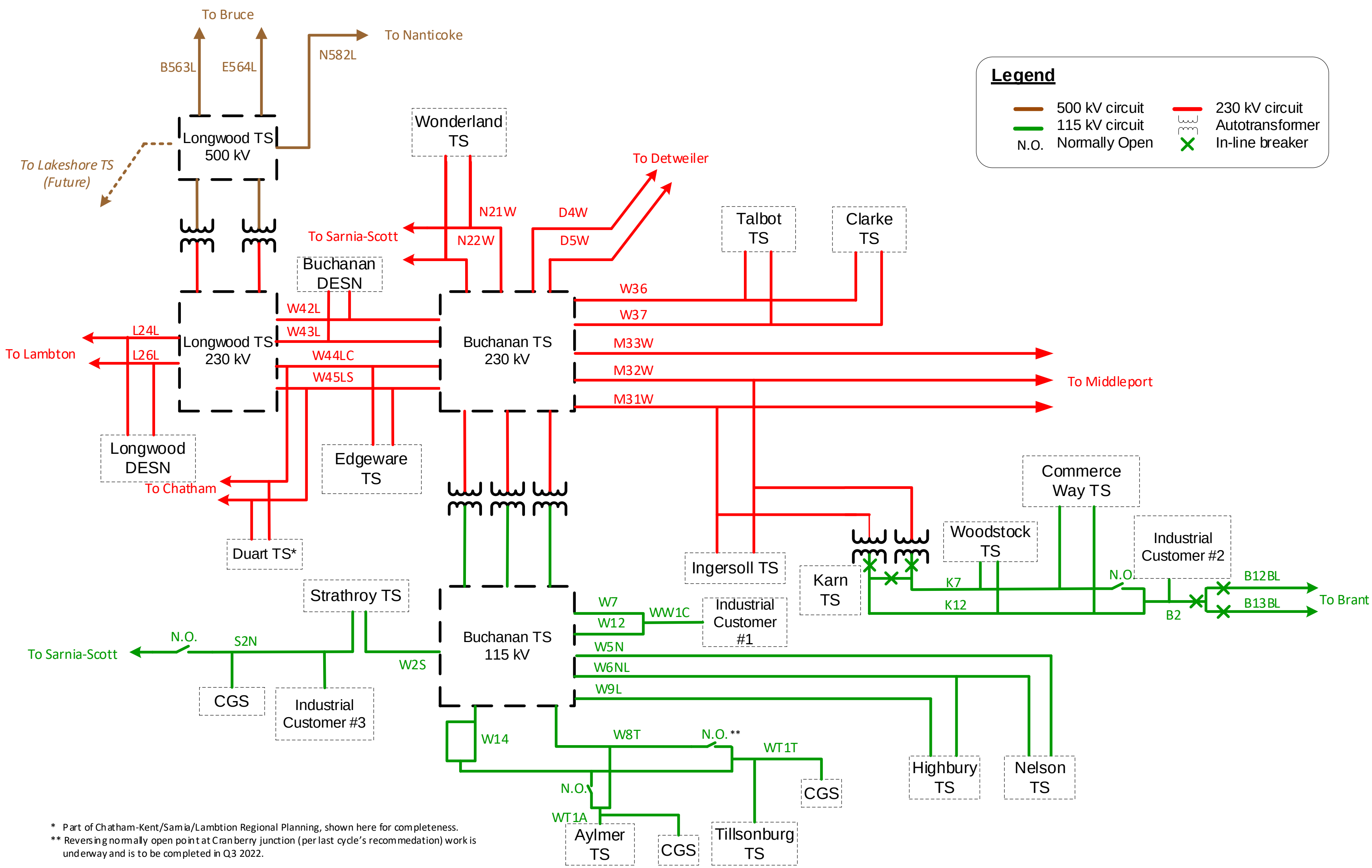
The hub of the electrical system in London Area is Longwood Transformer Station (“TS”). Longwood TS provides the single connection to the 500 kV system in this area, through which provides majority of the resources to meet the demand in the London Area and rest of southwestern Ontario. The 500 kV system is part of the bulk power system and although it is not studied as part of this RIP, it should be noted that in 2021, the IESO identified a need to expand the 500 kV bulk system to supply the load growth in the Leamington area by 2030. The IESO recommended a new 500 kV single-circuit line connecting Longwood TS and Lakeshore TS and two 500/230 kV autotransformers to be constructed at Lakeshore TS.

London Area is supplied by a network of 230 kV and 115 kV circuits which is connected to Longwood TS through five 500/230 kV autotransformers. Autotransformers at Buchanan TS and Karn TS provide the necessary 230/115 kV autotransformation. Step-down transformer stations are connected to both 230 kV and 115 kV systems to bring the power to distribution level of 27.6 kV to serve the area. There are fourteen Hydro One step-down TS’s, three transmission connected industrial load customers and three transmission connected generators in the London Area. The London Area Region summer coincident peak demand in 2021 was about 1152 MW, adjusted to extreme weather.

The existing facilities in the London Area are summarized below and depicted in the single line diagram shown in Figure 3-4:

- Fourteen step-down transformer stations supply the London Area load: Aylmer TS, Buchanan TS, Clarke TS, Commerce Way TS, Edgeware TS, Highbury TS, Ingersoll TS, Longwood TS, Nelson TS, Strathroy TS, Talbot TS (two Dual Element Spot Networks, DESN 1 and DESN 2), Tillsonburg TS, Wonderland TS, and Woodstock TS.
- Three directly connected industrial customer loads are connected in the London Area: Enbridge Keyser CTS, Lafarge Woodstock CTS and Toyota Woodstock TS.
- There are three existing transmission-connected generating stations in the London Area as follows:
    - Suncor Adelaide GS is a 40 MW wind farm connected to 115 kV circuit west of Strathroy TS
    - Port Burwell GS is a 99 MW wind farm connected to 115 kV circuit near Tillsonburg TS
    - Silver Creek GS is a 10 MW solar generator connected to 115 kV circuit near Aylmer TS

Although depicted, Duart TS is not included in the London Area study and will be studied as part of the Chatham-Kent/Lambton/Sarnia (CKLS) Area Regional Planning.




* Part of Chatham-Kent/Sarnia/Lambtion Regional Planning, shown here for completeness.
** Reversing normally open point at Cranberry junction (per last cycle's recommendation) work is underway and is to be completed in Q3 2022.

**Figure 3-4: Simplified Single Line Diagram of the London Area Region's Transmission Network**

# 4. Transmission Projects Completed and/or Underway Over the Last Ten Years

OVER THE LAST TEN YEARS, A NUMBER OF TRANSMISSION PROJECTS HAVE BEEN PLANNED AND UNDERTAKEN BY HYDRO ONE AIMED TO MAINTAIN THE RELIABILITY AND ADEQUACY OF ELECTRICITY SUPPLY IN THE LONDON AREA REGION.

A summary and description of the major projects completed and/or currently underway over the last ten years is provided below.

- Strathroy TS like-for-like replacement of 25/42 MVA 115/27.6 kV transformer T2 due to failure completed in 2012.
- Ingersoll TS like-for-like replacement of 75/125 MVA 230/27.6 kV transformers T5 & T6 that were approximately 35 years old. The transformers were identified to have a design weakness and were replaced to mitigate the risk of failures, improve restoration time and maintain system performance completed in 2012.
- Woodstock TS 50/83 MVA 115/27.6 kV transformers T1 & T2 that were approximately 50 years old and were deemed end-of-life were replace like-for-like in 2014.
- Aylmer TS transformers and low-voltage switchyard replacement project competed in 2017.
- Strathroy TS failed transformer T1 and low-voltage switchyard replacement project completed in 2019.
- Wonderland TS failed transformer T6 was replaced in 2019.
- St. Thomas TS was decommissioned and 115 kV circuit W14 re-termination work was completed in 2020.
- Sarnia Scott TS to Buchanan TS 230 kV circuits N21W/N22W tower structures refurbishment project was completed in 2021.
- Nelson TS station refurbishment project will be completed in 2022.
- Tillsonburg TS new low-voltage capacitor banks installed in 2021 and switchyard component replacement project to be completed in 2022.
- Longwood TS protection and control replacement project to be completed in 2023.
- Edgeware TS protection and control replacement project to be completed in 2024.

# 5. London Area Demand

## 5.1. Load Forecast

The electricity demand in the London Area Region is anticipated to grow at an average rate of 1% over the next ten years. The London Area Region has been historically a summer-peaking region. Figure 5-5 shows the London Area Region's summer coincident peak load forecast for the 2022 – 2031 study period (extreme weather corrected peak) developed during the RIP phase. The load forecast prepared for the RIP phase is approximately 5% lower than the Needs Assessment load forecast due to higher forecasted contributions from CDM and DG.

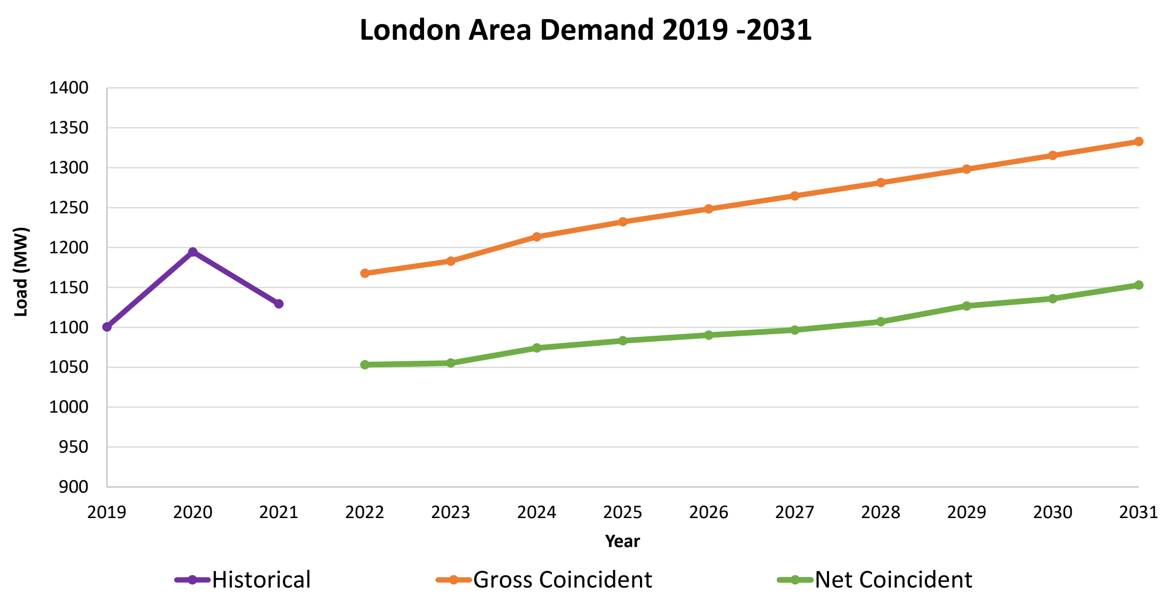



**FIGURE 5-5: LONDON AREA REGION LOAD FORECAST**

The load forecast shows that the region peak summer load increases from 1053 MW in 2022 to 1153 MW by 2031. The corresponding non-coincident summer peak loads increase from 1159 MW to about 1250 MW over the same period. The non-coincident and coincident net load forecasts for the individual stations in the London Area Region are given in Appendix D, Table D-1 and Table D-2.

LDCs in this region emphasized that impact of electrification have not been factored into the current RIP load forecasts. Should initiatives such as gas furnace conversion and continued electric vehicle adoption accelerate, transmission system adequacy will have to be re-assessed.

## 5.2. Forecast Assumptions

The following assumptions are made:

- The study period for the RIP assessment is 2022 – 2031.
- The 2021 summer station peak load is considered as a reference point and was adjusted for extreme weather impact (2.12% in 2021). Growth rates were extrapolated from LDCs' load forecasts via linear regression and are applied onto to the reference point to develop a gross load forecast.
- Distributed generation ("DG") refers to small-scale power generation connected in the distribution system which is located close to where the electricity is consumed. Both conservation & demand management ("CDM") as well as DG can reduce the amount of load that needs to be supplied and their contributions, as provided by the IESO, are directly net against the gross load forecast to develop a net load station forecast. A non-coincident version of the net load forecast was used to assess the station capacity.
- Load data for transmission-connected industrial customers in the region was assumed to be consistent with historical peak loads.
- All facilities that are identified in Section 4 and that are planned to be placed in-service within the study period are assumed to be in-service.
- Normal planning supply capacity for transformer stations is determined by the summer 10-day Limited Time Rating ("LTR"), assuming a 90% lagging power factor.

# 6. Regional Needs and Plans

THIS SECTION DISCUSSES ELECTRICAL INFRASTRUCTURE NEEDS IN THE LONDON AREA AND SUMMARIZES THE PLANS DEVELOPED TO ADDRESS THESE NEEDS.

This section outlines and discusses electrical infrastructure needs in the London Area and plans to address these needs for the study period of 2022 – 2031.

Based on the gross regional non-coincident load forecast, Clarke TS is forecasted to exceed its 10-Day LTR in 2023 and Highbury TS and Tillsonburg TS will also exceed station LTR in the medium term. However, these stations are expected to be adequate to meet the net load forecast for the remainder of the study period as planned CDM targets and DG contributions continue to offset the load growth. Overall, as the net load forecast prepared for the RIP phase is approximately 5% lower than the Needs Assessment load forecast, no new need was identified.

During the development of this RIP, issue about available capacity was raised at a number of stations, most notably Strathroy TS and Tillsonburg TS. Available capacity and its allocation among LDCs are governed by OEB’s Transmission System Code and are separate from the regional planning process. Hydro One Transmission will continue to engage with its customers following the conclusion of this RIP.

Table 6-2 provides a summary of the needs identified in this cycle and the corresponding sub-sections where recommendations and plans are discussed. The planned in-service dates are tentative and will be finalized closer to project commencement in coordination with impacted LDCs.

**TABLE 6-2: IDENTIFIED NEAR AND MID-TERM NEEDS IN LONDON AREA REGION**

| No. | Need | Need Date | Section |
|---|---|---|---|
| 1 | Talbot TS station capacity | Today | 6.1 |
| 2 | Greater London sub-region restoration need | Today | 6.2 |
| 3 | End-of-life equipment replacement | Vary | 6.3 |

## 6.1. Talbot TS

### 6.1.1. Sustainment Need

The existing Talbot TS comprises two 230 kV/27.6 kV DESNs (T1/T2 and T3/T4) and supplies electricity to London Hydro customers. It is supplied by two 230 kV circuits W36 and W37. Step-down transformers T3 and T4 have been in-service from 1979 and are in poor condition and approaching end-of-life. A number of 27.6 kV breakers and protection equipment have also been identified for replacement.

### 6.1.2. Station Capacity Need

The station capacity for T1/T2 and T3/T4 are 113 MW and 161 MW respectively. The summer regional non-coincident peak load of the two DESNs in 2021 are 119 MW and 168 MW. According to the regional non-coincident net load forecast in the study period, Talbot TS T1/T2 DESN is expected to exceed its station capacity throughout the study period and Talbot TS T3/T4 DESN will exceed its capacity in 2029.

### 6.1.3. Recommendation

The station capacity need was first identified in the 2020 Needs Assessment and was primarily driven by temporary load transfer from neighbouring station (Nelson TS). As noted in Section 4, Nelson TS underwent refurbishment which includes converting the low-voltage supply from 13.8 kV to 27.6 kV. During the construction period, significant portion of the load that was originally supplied by this station was transferred to Clarke TS and Talbot TS. The newly refurbished Nelson TS was placed in-service in December 2018 and as more 27.6 kV distribution feeders becomes available in downtown London, London Hydro confirmed load will be transferred back to Nelson TS and additional transformation capacity is not required at this time.

The Study Team recommends Hydro One to proceed with like-for-like replacement of T3 and T4 at Talbot TS. Project is expected to be completed in 2028. In addition, Hydro One will look for opportunities to coordinate this project with London Hydro for the metalclad switchgear replacement.

## 6.2. Greater London Sub-region Restoration Need

### 6.2.1. Description

The 230 kV double-circuit line,W36 and W37, emanates from Buchanan TS and supplies Talbot TS (both DESNs) and Clarke TS. Should the simultaneous loss of W36/W37 occurs, all of the loads supplied by the Clarke TS and Talbot TS, which amounts to over 340 MW[2], would be interrupted by configuration. The potential load loss exceeds the ORTAC 30-minute restoration criteria.

### 6.2.2. Recommendation

This need was first reported in the first cycle of regional planning for the London Area Region in 2015. The 2017 IRRP working group recommended installing switching devices and feeder extensions on the distribution system. The IRRP working group also acknowledged while these measures will not fully address the restoration need, they will substantially improve the restoration capability in a cost-effective manner.

The restoration need persists in the current regional planning cycle and was further re-assessed with London Hydro via the Local Planning process. The Study Team noted a significant portion of the interrupted load could be restored by a neighbouring unaffected station, Highbury TS, if its station capacity limit is lifted. This option was not pursued further at this time as work required will be extensive and cost prohibitive. Hydro One undertook a detailed historical equipment performance review to assess the probability of common-mode failure that would lead to simultaneous loss of W36 and W37. It was concluded that the only common-mode failure that may result in the simultaneous loss of both W36/W37 is the failure of the steel poles that carry

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[2] 2021 historical coincident peak load.

the two circuits and probability of this event is very low. Therefore, the Study Team recommends no action is required at this time.

## 6.3. End-of-Life Equipment Replacement

### 6.3.1. Buchanan TS

#### 6.3.1.1. Description

Buchanan TS is a major 230/115 kV transformer station in the area that supplies load stations in London Area. The station houses three 230/115 kV auto-transformers, three 230 kV capacitor banks, one 115 kV capacitor bank and two 230/27.6 kV step-down transformers. There are sixteen 230 kV oil breakers and nine SF6 circuit breakers in the 230 kV switchyard; seventeen oil circuit and three SF6 circuit breakers in the 115 kV switchyard.

Two of the 3 auto-transformers T2 and T3 are 48 and 54 years old respectively, are in poor condition, and approaching the end of life.

#### 6.3.1.2. Recommendation

To address poor equipment performance of deteriorating equipment, Hydro One plans to replace two 230kV autotransformers, spill containment pits, AC and DC station service equipment, as well as some obsolete protection, controls and telecom equipment.

### 6.3.2. Clarke TS

#### 6.3.2.1. Description

Clarke TS is a DESN station located in the northern part of the London Area. The station is supplied by two 230 kV circuits W36 and W37. The station supplies electricity to London Hydro and Hydro One Distribution customers.

The two 230/27.6 kV 50/83 MVA transformers T3 and T4 are 55 years old, in poor condition, and approaching end of life. Some of the protection equipment is also found to be obsolete.

#### 6.3.2.2. Recommendation

To address the assets in poor condition and end-of-life, Hydro One plans to replace step-down transformers like-for-like, associated disconnect switches, 27.6 kV switchyard components including breakers, station services, capacitors and protections. Replacement plan will be closely coordinated with affected LDCs and the expected completion date is 2028.

## 6.3.3. Wonderland TS

### 6.3.3.1. Description

Wonderland TS is a DESN station located in the western part of the London Area. The station is supplied by two 230 kV circuits N21W and N22W. The station supplies electricity to London Hydro and Hydro One Distribution customers.

The Wonderland T5/T6 DESN facility was originally built in the 1960s and its equipment is degrading in condition. The 50/83 MVA T6 power transformer was replaced in 2004 due to failure. The companion transformer, T5, failed in July 2019 and was subsequently replaced. The existing air insulated 27.6 kV switchgear, majority of which are original installations have reached end-of-life due to deteriorated condition and has limited availability of parts for ongoing support and maintenance. All site protection and control equipment, consisting of first generation electro-mechanical relaying are deemed end-of-life, obsolete and require replacement. During the early project development phase, London Hydro and Hydro One Distribution were consulted to assess if there is a capacity need to replace the 50/83 MVA transformers with 75/125 MVA and it was concluded there is no such need at the time.

### 6.3.3.2. Recommendation

To address the end-of-life need, Hydro One plans to replace the Wonderland 27.6 kV switchyard. Replacement plan will be closely coordinated with affected LDCs and the expected completion date is 2026.

## 6.3.4. London Area East OPGW Infrastructure

### 6.3.4.1. Description

M31W and M32W are 230 kV network circuits that connect Buchanan TS and Middleport Port TS. Ingersoll TS and Karn TS are tapped off M31W/M32W at Salford Junction. High voltage 230/115 kV autotransformers are located at Karn TS provide the necessary transformation from the 230 kV system to the Woodstock and Commerce Way 115 kV system.

### 6.3.4.2. Recommendation

To improve the reliability of power system telecom network, Hydro One plans to install 9km of OPGW fibre from Salford Junction to Ingersoll TS and remove the existing licensed microwave link connects Ingersoll TS to Buchanan TS. Project is expected to be completed in 2027.

## 6.3.5. London Area West OPGW Infrastructure

### 6.3.5.1. Description

Several transmission lines in the London area that emanate from Buchanan TS currently rely on leased legacy dedicated metallic cable infrastructure for DC remote trip protections. These include 230kV circuits W36/W37 that connect to Talbot TS and Clarke TS, 115 kV circuits W5N/W6NL that connect to Nelson TS and Highbury TS, 115 kV circuit W2S that connects to Strathroy TS and 230kV circuit N21W connecting to Sarnia Scott TS.

### 6.3.5.2. Recommendation

To improve the reliability of power system telecom network, Hydro One plans to establish a geographically diverse and fully redundant fibre optic network for protection and SCADA applications. A combination of Hydro One’s existing and new OPGW-based fibre and two leased third-party fibre links would be utilized. The existing metallic cable will be removed and the project is expected to be completed in 2029.

# 7. Conclusions and Next Steps

## THIS REGIONAL INFRASTRUCTURE PLAN CONCLUDES THE REGIONAL PLANNING PROCESS FOR THE LONDON AREA REGION.

The major infrastructure investments recommended by the Study Team in the near and mid-term planning horizon are provided in Table 7-3 below are all end of life needs, along with their planned in-service date. The planned in-service dates are tentative and will be finalized closer to project commencement in coordination with impacted LDCs.

TABLE 7-3: RECOMMENDED PLANS IN LONDON AREA REGION OVER THE NEXT 10 YEARS

| Stations / Lines | Scope | In-service |
|---|---|---|
| **Buchanan TS** | Replacement of autotransformers and associated equipment | 2028 |
| **Clarke TS** | Replacement of step-down transformers, associated disconnect switches, low-voltage switchyard components | 2028 |
| **Talbot TS** | Replacement of step-down transformers (T3/T4), associated disconnect switches, low-voltage switchyard components | 2028 |
| **Wonderland TS** | Low-voltage switchyard components replacement | 2026 |
| **M31W/ M32W (Salford Junction x Ingersoll)** | London Area East OPGW Infrastructure | 2027 |
| **W36/W37/W5 NL/W6NL/W2S/ N21W** | London Area West Telecom OPGW Infrastructure Installation | 2029 |

The Study Team recommends Hydro One to continue with the implementation of infrastructure investments listed in Table 7-3.

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 triggered in advance of the five-year timeline.

# References


[1] London Area Needs Assessment [2015]
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[2] Strathroy TS Transformer Capacity Local Planning [2016]
https://www.hydroone.com/abouthydroone/CorporateInformation/regionalplans/london/Documents/Local%20Planning%20Report%20-Strathroy%20TS.pdf

[3] Woodstock Sub-region Restoration Local Planning [2017]
https://www.hydroone.com/abouthydroone/CorporateInformation/regionalplans/london/Documents/Woodstock%20Restoration%20Local%20Planning%20Report%20(Final)%2020170519.pdf

[4] London Area Integrated Regional Resource Plan [2017]
https://www.ieso.ca/-/media/Files/IESO/Document-Library/regional-planning/London-Area/Final-Greater-London-IRRP-20170120.ashx

[5] London Area Needs Assessment [2020]
https://www.hydroone.com/abouthydroone/CorporateInformation/regionalplans/london/Documents/Needs-Assessment-Report-London-2020.pdf

[6] Greater London Sub-region Restoration Local Planning [2021]
https://www.hydroone.com/abouthydroone/CorporateInformation/regionalplans/london/Documents/Local_Planning_Report_Greater_London_Subregion.pdf

# Appendix A. Stations in the London Area Region

| Station | Voltage (kV) | Supply Circuits |
| --- | --- | --- |
| Aylmer TS | 115/27.6 | W8T |
| Buchanan TS | 230/27.6 | W42L/W43L |
| Clarke TS | 230/27.6 | W36/W37 |
| Commerce Way TS | 115/27.6 | K7/K12 |
| Edgeware TS | 230/27.6 | W44LC/W45LC |
| Highbury TS | 115/27.6 | W6NL/W9L |
| Ingersoll TS | 230/27.6 | M31W/M32W |
| Longwood TS | 230/27.6 | L24L/L26L |
| Nelson TS | 115/27.6 | W5N/W6NL |
| Strathroy TS | 115/27.6 | W2S |
| Talbot TS (T1/T2 and T3/T4) | 230/27.6 | W36/W37 |
| Tillsonburg TS | 115/27.6 | W14 |
| Wonderland TS | 230/27.6 | N21W/N22W |
| Woodstock TS | 115/27.6 | K7/K12 |

# Appendix B. Transmission Lines in the London Area Region

| Circuit Designations | Location | Voltage (kV) |
|---|---|---|
| N21W, N22W | Scott TS to Buchanan TS | 230 |
| W42L, W43L | Longwood TS to Buchanan TS | 230 |
| W44LC | Longwood TS to Chatham TS to Buchanan TS | 230 |
| W45LS | Longwood TS to Spence SS to Buchanan TS | 230 |
| W36, W37 | Buchanan TS to Talbot TS and Clarke TS | 230 |
| D4W, D5W | Buchanan TS to Detweiler TS | 230 |
| M31W, M32W, M33W | Buchanan TS to Middleport TS | 230 |
| W2S | Buchanan TS to Strathroy TS | 115 |
| W5N | Buchanan TS to Nelson TS | 115 |
| W6NL | Buchanan TS to Highbury TS to Nelson TS | 115 |
| W9L | Buchanan TS to Highbury TS | 115 |
| W7, W12 | Buchanan TS to CTS | 115 |
| WW1C | Buchanan TS to CTS | 115 |
| W8T | Buchanan TS to ESWF JCT | 115 |
| WT1T | Cranberry Junction to Tillsonburg TS | 115 |
| W14 | Buchanan TS to Cranberry Junction | 115 |
| WT1A | Aylmer TS to Lyons JCT | 115 |
| K7, K12 | Karn TS to Commerce Way TS | 115 |

# Appendix C. Distributors in London Area Region

| Distributor Names | Station Name | Connection Type |
|---|---|---|
| Entegrus Power Lines Inc. [Middlesex ] | Edgeware TS | Tx |
| | Longwood TS | Dx |
| | Strathroy TS | Dx |
| | | Tx |
| ERTH Power Corporation | Aylmer TS | Tx |
| | Buchanan TS | Dx |
| | Edgeware TS | Dx |
| | Ingersoll TS | Dx |
| | Tillsonburg TS | Dx |
| Hydro One Networks Inc. | Aylmer TS | Tx |
| | Buchanan TS | Tx |
| | Clarke TS | Tx |
| | Edgeware TS | Tx |
| | Highbury TS | Tx |
| | Ingersoll TS | Tx |
| | Longwood TS | Tx |
| | Strathroy TS | Tx |
| | Tillsonburg TS | Tx |
| | Wonderland TS | Tx |
| | Woodstock TS | Tx |
| London Hydro Inc. | Buchanan TS | Dx |
| | | Tx |
| | Clarke TS | Tx |
| | Edgeware TS | Dx |
| | Highbury TS | Dx |
| | | Tx |
| | Nelson TS | Tx |
| | Talbot TS | Tx |
| | Wonderland TS | Dx |
| | | Tx |
| Tillsonburg Hydro Inc. | Tillsonburg TS | Tx |

# Appendix D. London Area Region Load Forecast

## TABLE D1: LONDON AREA REGIONAL NON-COINCIDENT NET LOAD FORECAST

| Transformer Station | LTR* (MW) | Quantities | Reference | Near Term Forecast (MW) | | | | | Medium Term Forecast (MW) | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | | | 2021** | 2022 | 2023 | 2024 | 2025 | 2026 | 2027 | 2028 | 2029 | 2030 | 2031 |
| Aylmer TS | | Gross | 32.46 | 32.98 | 33.51 | 34.05 | 34.61 | 35.16 | 35.73 | 36.31 | 36.90 | 37.49 | 38.10 |
| | | DG | | 0.02 | 0.02 | 0.02 | 0.02 | 0.02 | 0.02 | 0.02 | 0.02 | 0.02 | 0.02 |
| | | CDM | | 0.67 | 1.06 | 1.38 | 1.66 | 1.93 | 2.22 | 2.49 | 2.75 | 2.99 | 3.04 |
| | 40 | Net | | 32.29 | 32.44 | 32.65 | 32.92 | 33.22 | 33.49 | 33.80 | 34.13 | 34.48 | 35.03 |
| Buchanan TS | | Gross | 131.49 | 133.22 | 134.96 | 136.73 | 138.52 | 140.34 | 142.17 | 144.04 | 145.92 | 147.84 | 149.77 |
| | | DG | | 14.74 | 14.74 | 14.74 | 14.74 | 14.74 | 14.74 | 14.74 | 14.74 | 14.74 | 14.74 |
| | | CDM | | 2.70 | 4.26 | 5.54 | 6.65 | 7.69 | 8.85 | 9.86 | 10.87 | 11.81 | 11.96 |
| | 173 | Net | | 115.77 | 115.96 | 116.45 | 117.12 | 117.90 | 118.58 | 119.44 | 120.31 | 121.29 | 123.07 |
| Clarke TS | | Gross | 102.45 | 103.58 | 104.72 | 105.88 | 107.05 | 108.23 | 109.43 | 110.64 | 111.86 | 113.10 | 114.35 |
| | | DG | | 3.40 | 3.40 | 3.40 | 3.40 | 3.40 | 3.40 | 3.40 | 3.40 | 3.40 | 3.40 |
| | | CDM | | 2.10 | 3.30 | 4.29 | 5.14 | 5.93 | 6.81 | 7.57 | 8.33 | 9.03 | 9.13 |
| | 103 | Net | | 98.08 | 98.03 | 98.20 | 98.51 | 98.91 | 99.22 | 99.67 | 100.13 | 100.67 | 101.82 |
| Commerce Way TS | | Gross | 34.55 | 35.12 | 35.69 | 36.27 | 36.87 | 37.47 | 38.08 | 38.70 | 39.33 | 39.97 | 40.63 |
| | | DG | | 2.94 | 2.94 | 2.94 | 2.94 | 2.94 | 2.94 | 2.94 | 2.94 | 2.94 | 2.94 |
| | | CDM | | 0.71 | 1.13 | 1.47 | 1.77 | 2.05 | 2.37 | 2.65 | 2.93 | 3.19 | 3.25 |
| | 106 | Net | | 31.46 | 31.62 | 31.86 | 32.15 | 32.47 | 32.77 | 33.11 | 33.46 | 33.84 | 34.44 |
| Edgeware TS | | Gross | 102.45 | 103.93 | 105.43 | 121.83 | 126.36 | 127.92 | 129.52 | 131.13 | 132.77 | 134.43 | 136.12 |
| | | DG | | 4.47 | 4.47 | 4.47 | 4.47 | 4.47 | 4.47 | 4.47 | 4.47 | 4.47 | 4.44 |
| | | CDM | | 2.11 | 3.33 | 4.93 | 6.07 | 7.01 | 8.06 | 8.98 | 9.89 | 10.74 | 10.87 |
| | 180 | Net | | 97.35 | 97.64 | 112.43 | 115.81 | 116.44 | 116.98 | 117.68 | 118.40 | 119.22 | 120.81 |
| Highbury TS | | Gross | 74.76 | 75.72 | 76.70 | 77.69 | 78.69 | 79.70 | 80.72 | 81.76 | 82.81 | 83.88 | 84.96 |
| | | DG | | 5.51 | 5.51 | 5.51 | 5.51 | 5.51 | 5.51 | 5.51 | 5.51 | 5.51 | 5.51 |
| | | CDM | | 1.53 | 2.42 | 3.15 | 3.78 | 4.37 | 5.02 | 5.60 | 6.17 | 6.70 | 6.79 |
| | 80 | Net | | 68.68 | 68.77 | 69.02 | 69.39 | 69.82 | 70.18 | 70.65 | 71.13 | 71.66 | 72.67 |
| Ingersoll TS | | Gross | 69.40 | 71.92 | 74.53 | 77.24 | 80.05 | 82.96 | 85.98 | 89.10 | 92.34 | 95.70 | 99.17 |
| | | DG | | 12.95 | 12.95 | 12.95 | 12.95 | 12.95 | 12.95 | 12.95 | 12.95 | 12.95 | 12.93 |
| | | CDM | | 1.46 | 2.35 | 3.13 | 3.85 | 4.55 | 5.35 | 6.10 | 6.88 | 7.64 | 7.92 |
| | 158 | Net | | 57.51 | 59.24 | 61.17 | 63.26 | 65.47 | 67.68 | 70.05 | 72.51 | 75.11 | 78.33 |
| Longwood TS | | Gross | 40.27 | 41.14 | 42.04 | 42.95 | 43.88 | 44.83 | 45.80 | 46.80 | 47.81 | 48.85 | 49.91 |
| | | DG | | 1.16 | 1.16 | 1.16 | 1.16 | 1.16 | 1.16 | 1.16 | 1.16 | 1.16 | 1.12 |
| | | CDM | | 0.83 | 1.33 | 1.74 | 2.11 | 2.46 | 2.85 | 3.20 | 3.56 | 3.90 | 3.99 |
| | 121 | Net | | 39.15 | 39.55 | 40.05 | 40.61 | 41.21 | 41.79 | 42.43 | 43.09 | 43.79 | 44.80 |
| Nelson TS | | Gross | 53.39 | 53.78 | 54.17 | 54.56 | 54.95 | 55.34 | 55.74 | 56.14 | 56.55 | 56.96 | 57.37 |
| | | DG | | 17.55 | 17.55 | 17.55 | 17.55 | 17.55 | 17.55 | 17.55 | 17.55 | 17.55 | 17.55 |
| | | CDM | | 1.09 | 1.71 | 2.21 | 2.64 | 3.03 | 3.47 | 3.84 | 4.21 | 4.55 | 4.58 |
| | 107 | Net | | 35.14 | 34.91 | 34.80 | 34.76 | 34.77 | 34.73 | 34.75 | 34.79 | 34.86 | 35.24 |
| Strathroy TS | | Gross | 39.63 | 40.19 | 40.77 | 41.35 | 41.94 | 42.54 | 43.15 | 43.77 | 44.39 | 45.03 | 45.67 |
| | | DG | | 8.63 | 8.63 | 8.63 | 8.63 | 8.63 | 8.63 | 8.63 | 8.63 | 8.63 | 8.63 |
| | | CDM | | 0.81 | 1.29 | 1.67 | 2.01 | 2.33 | 2.69 | 3.00 | 3.31 | 3.60 | 3.65 |
| | 56 | Net | | 30.75 | 30.86 | 31.05 | 31.30 | 31.58 | 31.84 | 32.14 | 32.46 | 32.80 | 33.40 |
| Talbot T1/T2 | | Gross | 121.81 | 122.79 | 123.77 | 124.77 | 125.78 | 126.79 | 127.81 | 128.84 | 129.87 | 130.92 | 131.97 |
| | | DG | | - | - | - | - | - | - | - | - | - | - |
| | | CDM | | 2.49 | 3.90 | 5.05 | 6.04 | 6.95 | 7.95 | 8.82 | 9.68 | 10.46 | 10.54 |
| | 113 | Net | | 120.30 | 119.87 | 119.72 | 119.73 | 119.84 | 119.85 | 120.02 | 120.20 | 120.46 | 121.43 |
| Talbot T3/T4 | | Gross | 172.17 | 173.87 | 175.59 | 177.33 | 179.08 | 180.85 | 182.64 | 184.45 | 186.27 | 188.11 | 189.97 |
| | | DG | | 12.28 | 12.28 | 12.28 | 12.28 | 12.28 | 12.28 | 12.28 | 0.52 | 0.52 | 0.45 |
| | | CDM | | 3.52 | 5.54 | 7.18 | 8.60 | 9.91 | 11.37 | 12.63 | 13.88 | 15.03 | 15.18 |
| | 161 | Net | | 158.06 | 157.77 | 157.86 | 158.20 | 158.66 | 158.99 | 159.54 | 171.87 | 172.56 | 174.35 |
| Tillsonburg TS | | Gross | 94.95 | 96.18 | 97.42 | 98.68 | 99.95 | 101.25 | 102.56 | 103.88 | 105.23 | 106.59 | 107.96 |
| | | DG | | 3.54 | 3.54 | 3.54 | 3.54 | 3.54 | 3.54 | 0.97 | 0.97 | 0.97 | 0.91 |
| | | CDM | | 1.95 | 3.07 | 4.00 | 4.80 | 5.55 | 6.38 | 7.11 | 7.84 | 8.51 | 8.62 |
| | 103 | Net | | 90.68 | 90.80 | 91.14 | 91.61 | 92.16 | 92.63 | 95.80 | 96.42 | 97.10 | 98.43 |
| Wonderland TS | | Gross | 91.36 | 92.76 | 94.17 | 95.61 | 97.08 | 98.56 | 100.07 | 101.60 | 103.15 | 104.73 | 106.33 |
| | | DG | | 2.00 | 2.00 | 2.00 | 2.00 | 2.00 | 2.00 | 2.00 | 2.00 | 2.00 | 1.87 |
| | | CDM | | 1.88 | 2.97 | 3.87 | 4.66 | 5.40 | 6.23 | 6.95 | 7.68 | 8.37 | 8.49 |
| | 115 | Net | | 88.87 | 89.20 | 89.74 | 90.41 | 91.16 | 91.84 | 92.64 | 93.47 | 94.36 | 95.96 |
| Woodstock TS | | Gross | 64.10 | 64.68 | 65.27 | 65.87 | 66.47 | 67.07 | 67.69 | 68.30 | 68.92 | 69.55 | 70.19 |
| | | DG | | 2.29 | 2.29 | 2.29 | 2.29 | 2.29 | 2.29 | 2.29 | 2.29 | 2.23 | 1.60 |
| | | CDM | | 1.31 | 2.06 | 2.67 | 3.19 | 3.68 | 4.21 | 4.68 | 5.13 | 5.56 | 5.61 |
| | 81 | Net | | 61.08 | 60.92 | 60.91 | 60.99 | 61.11 | 61.18 | 61.34 | 61.50 | 61.77 | 62.98 |
| Industrial Customer #1 | | | 12 | 12 | 12 | 12 | 12 | 12 | 12 | 12 | 12 | 12 | 12 |
| Industrial Customer #2 | | | 19.9 | 19.9 | 19.9 | 19.9 | 19.9 | 19.9 | 19.9 | 19.9 | 19.9 | 19.9 | 19.9 |
| Industrial Customer #3 | | | 2 | 2 | 2 | 2 | 2 | 2 | 2 | 2 | 2 | 2 | 2 |
| London Area Total | | | | 1159 | 1161 | 1181 | 1191 | 1199 | 1206 | 1217 | 1238 | 1248 | 1267 |

*Station LTR is based on 90% power factor

** Adjusted to extreme weather

Note (1) Edgeware TS step increases in 2024 & 2025 reflects a new connection request of 20MW.

## TABLE D2: LONDON AREA REGIONAL COINCIDENT NET LOAD FORECAST

| Transformer Station | Quantities | Reference | Near Term Forecast (MW) | | | | | Medium Term Forecast (MW) | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | | 2021^ | 2022 | 2023 | 2024 | 2025 | 2026 | 2027 | 2028 | 2029 | 2030 | 2031 |
| Aylmer TS | Gross | 25.99 | 26.41 | 26.83 | 27.27 | 27.71 | 28.16 | 28.61 | 29.07 | 29.54 | 30.02 | 30.51 |
| | DG | | 0.02 | 0.02 | 0.02 | 0.02 | 0.02 | 0.02 | 0.02 | 0.02 | 0.02 | 0.02 |
| | CDM | | 0.54 | 0.85 | 1.10 | 1.33 | 1.54 | 1.78 | 1.99 | 2.20 | 2.40 | 2.44 |
| | Net | | 25.85 | 25.97 | 26.14 | 26.36 | 26.59 | 26.81 | 27.06 | 27.32 | 27.60 | 28.05 |
| Buchanan TS | Gross | 129.03 | 130.72 | 132.43 | 134.17 | 135.92 | 137.70 | 139.51 | 141.34 | 143.19 | 145.06 | 146.96 |
| | DG | | 14.74 | 14.74 | 14.74 | 14.74 | 14.74 | 14.74 | 14.74 | 14.74 | 14.74 | 14.74 |
| | CDM | | 2.65 | 4.18 | 5.43 | 6.53 | 7.55 | 8.68 | 9.68 | 10.67 | 11.59 | 11.74 |
| | Net | | 113.33 | 113.51 | 113.99 | 114.65 | 115.42 | 116.08 | 116.92 | 117.78 | 118.73 | 120.48 |
| Clarke TS | Gross | 86.32 | 87.27 | 88.24 | 89.21 | 90.20 | 91.20 | 92.20 | 93.22 | 94.25 | 95.29 | 96.35 |
| | DG | | 3.40 | 3.40 | 3.40 | 3.40 | 3.40 | 3.40 | 3.40 | 3.40 | 3.40 | 3.40 |
| | CDM | | 1.77 | 2.78 | 3.61 | 4.33 | 5.00 | 5.74 | 6.38 | 7.02 | 7.61 | 7.70 |
| | Net | | 82.11 | 82.06 | 82.21 | 82.47 | 82.80 | 83.07 | 83.45 | 83.84 | 84.29 | 85.26 |
| Commerce Way TS | Gross | 32.18 | 32.71 | 33.24 | 33.78 | 34.34 | 34.90 | 35.47 | 36.05 | 36.63 | 37.23 | 37.84 |
| | DG | | 2.94 | 2.94 | 2.94 | 2.94 | 2.94 | 2.94 | 2.94 | 2.94 | 2.94 | 2.94 |
| | CDM | | 0.66 | 1.05 | 1.37 | 1.65 | 1.91 | 2.21 | 2.47 | 2.73 | 2.97 | 3.02 |
| | Net | | 29.10 | 29.25 | 29.47 | 29.74 | 30.04 | 30.32 | 30.64 | 30.96 | 31.32 | 31.87 |
| Edgeware TS | Gross | 102.45 | 103.93 | 105.43 | 121.83 | 126.36 | 127.92 | 129.52 | 131.13 | 132.77 | 134.43 | 136.12 |
| | DG | | 4.47 | 4.47 | 4.47 | 4.47 | 4.47 | 4.47 | 4.47 | 4.47 | 4.47 | 4.44 |
| | CDM | | 2.11 | 3.33 | 4.93 | 6.07 | 7.01 | 8.06 | 8.98 | 9.89 | 10.74 | 10.87 |
| | Net | | 97.35 | 97.64 | 112.43 | 115.81 | 116.44 | 116.98 | 117.68 | 118.40 | 119.22 | 120.81 |
| Highbury TS | Gross | 74.61 | 75.57 | 76.54 | 77.53 | 78.52 | 79.53 | 80.56 | 81.59 | 82.64 | 83.71 | 84.78 |
| | DG | | 5.51 | 5.51 | 5.51 | 5.51 | 5.51 | 5.51 | 5.51 | 5.51 | 5.51 | 5.51 |
| | CDM | | 1.53 | 2.41 | 3.14 | 3.77 | 4.36 | 5.01 | 5.59 | 6.16 | 6.69 | 6.77 |
| | Net | | 68.52 | 68.61 | 68.87 | 69.24 | 69.66 | 70.03 | 70.49 | 70.97 | 71.50 | 72.50 |
| Ingersoll TS | Gross | 54.92 | 56.92 | 58.99 | 61.13 | 63.35 | 65.65 | 68.04 | 70.51 | 73.08 | 75.73 | 78.49 |
| | DG | | 12.95 | 12.95 | 12.95 | 12.95 | 12.95 | 12.95 | 12.95 | 12.95 | 12.95 | 12.93 |
| | CDM | | 1.15 | 1.86 | 2.48 | 3.04 | 3.60 | 4.23 | 4.83 | 5.44 | 6.05 | 6.27 |
| | Net | | 42.82 | 44.18 | 45.71 | 47.36 | 49.11 | 50.86 | 52.74 | 54.69 | 56.74 | 59.29 |
| Longwood TS | Gross | 37.74 | 38.56 | 39.39 | 40.25 | 41.12 | 42.01 | 42.93 | 43.86 | 44.81 | 45.78 | 46.77 |
| | DG | | 1.16 | 1.16 | 1.16 | 1.16 | 1.16 | 1.16 | 1.16 | 1.16 | 1.16 | 1.12 |
| | CDM | | 0.78 | 1.24 | 1.63 | 1.98 | 2.30 | 2.67 | 3.00 | 3.34 | 3.66 | 3.74 |
| | Net | | 36.62 | 36.99 | 37.46 | 37.99 | 38.55 | 39.09 | 39.69 | 40.31 | 40.96 | 41.92 |
| Nelson TS | Gross | 37.94 | 38.22 | 38.49 | 38.77 | 39.05 | 39.33 | 39.61 | 39.90 | 40.19 | 40.48 | 40.77 |
| | DG | | 17.55 | 17.55 | 17.55 | 17.55 | 17.55 | 17.55 | 17.55 | 17.55 | 17.55 | 17.55 |
| | CDM | | 0.77 | 1.21 | 1.57 | 1.88 | 2.16 | 2.47 | 2.73 | 2.99 | 3.23 | 3.26 |
| | Net | | 19.90 | 19.73 | 19.65 | 19.63 | 19.63 | 19.60 | 19.62 | 19.65 | 19.70 | 19.96 |
| Strathroy TS | Gross | 30.42 | 30.86 | 31.30 | 31.74 | 32.20 | 32.66 | 33.13 | 33.60 | 34.08 | 34.57 | 35.06 |
| | DG | | 8.63 | 8.63 | 8.63 | 8.63 | 8.63 | 8.63 | 8.63 | 8.63 | 8.63 | 8.63 |
| | CDM | | 0.63 | 0.99 | 1.29 | 1.55 | 1.79 | 2.06 | 2.30 | 2.54 | 2.76 | 2.80 |
| | Net | | 21.60 | 21.68 | 21.83 | 22.02 | 22.24 | 22.44 | 22.67 | 22.91 | 23.18 | 23.63 |
| Talbot T1/T2 | Gross | 109.09 | 109.96 | 110.85 | 111.74 | 112.64 | 113.55 | 114.46 | 115.38 | 116.31 | 117.25 | 118.19 |
| | DG | | - | - | - | - | - | - | - | - | - | - |
| | CDM | | 2.23 | 3.50 | 4.53 | 5.41 | 6.22 | 7.12 | 7.90 | 8.67 | 9.37 | 9.44 |
| | Net | | 107.74 | 107.35 | 107.22 | 107.23 | 107.33 | 107.34 | 107.49 | 107.65 | 107.88 | 108.75 |
| Talbot T3/T4 | Gross | 152.03 | 153.53 | 155.05 | 156.58 | 158.13 | 159.69 | 161.27 | 162.87 | 164.48 | 166.10 | 167.75 |
| | DG | | 12.28 | 12.28 | 12.28 | 12.28 | 12.28 | 12.28 | 12.28 | 0.52 | 0.52 | 0.45 |
| | CDM | | 3.11 | 4.89 | 6.34 | 7.60 | 8.75 | 10.04 | 11.15 | 12.25 | 13.27 | 13.40 |
| | Net | | 138.13 | 137.87 | 137.96 | 138.25 | 138.66 | 138.95 | 139.43 | 151.70 | 152.31 | 153.89 |
| Tillsonburg TS | Gross | 94.21 | 95.43 | 96.66 | 97.91 | 99.18 | 100.46 | 101.76 | 103.07 | 104.41 | 105.76 | 107.12 |
| | DG | | 3.54 | 3.54 | 3.54 | 3.54 | 3.54 | 3.54 | 0.97 | 0.97 | 0.97 | 0.91 |
| | CDM | | 1.93 | 3.05 | 3.97 | 4.76 | 5.50 | 6.33 | 7.06 | 7.78 | 8.45 | 8.56 |
| | Net | | 89.95 | 90.07 | 90.40 | 90.87 | 91.41 | 91.88 | 95.05 | 95.66 | 96.34 | 97.66 |
| Wonderland TS | Gross | 87.66 | 89.00 | 90.36 | 91.74 | 93.14 | 94.57 | 96.01 | 97.48 | 98.97 | 100.49 | 102.02 |
| | DG | | 2.00 | 2.00 | 2.00 | 2.00 | 2.00 | 2.00 | 2.00 | 2.00 | 2.00 | 1.87 |
| | CDM | | 1.80 | 2.85 | 3.72 | 4.47 | 5.18 | 5.98 | 6.67 | 7.37 | 8.03 | 8.15 |
| | Net | | 85.19 | 85.51 | 86.02 | 86.67 | 87.38 | 88.04 | 88.81 | 89.60 | 90.46 | 92.00 |
| Woodstock TS | Gross | 64.10 | 64.68 | 65.27 | 65.87 | 66.47 | 67.07 | 67.69 | 68.30 | 68.92 | 69.55 | 70.19 |
| | DG | | 2.29 | 2.29 | 2.29 | 2.29 | 2.29 | 2.29 | 2.29 | 2.29 | 2.23 | 1.60 |
| | CDM | | 1.31 | 2.06 | 2.67 | 3.19 | 3.68 | 4.21 | 4.68 | 5.13 | 5.56 | 5.61 |
| | Net | | 61.08 | 60.92 | 60.91 | 60.99 | 61.11 | 61.18 | 61.34 | 61.50 | 61.77 | 62.98 |
| Industrial Customer #1 | | 12 | 12 | 12 | 12 | 12 | 12 | 12 | 12 | 12 | 12 | 12 |
| Industrial Customer #2 | | 19.9 | 19.9 | 19.9 | 19.9 | 19.9 | 19.9 | 19.9 | 19.9 | 19.9 | 19.9 | 19.9 |
| Industrial Customer #3 | | 2 | 2 | 2 | 2 | 2 | 2 | 2 | 2 | 2 | 2 | 2 |
| London Area Total | | | 1053 | 1055 | 1074 | 1083 | 1090 | 1097 | 1107 | 1127 | 1136 | 1153 |

^ Adjusted to extreme weather
Note (1) Edgeware TS step increases in 2024 & 2025 reflects a new connection request of 20MW.

## TABLE D3: CONSERVATION AND DEMAND FORECAST (SOURCE: IESO)

| 2022 | 2023 | 2024 | 2025 | 2026 | 2027 | 2028 | 2029 | 2030 | 2031 |
|---|---|---|---|---|---|---|---|---|---|
| 2.0% | 3.2% | 4.1% | 4.8% | 5.5% | 6.2% | 6.8% | 7.4% | 8.0% | 8.0% |

# Appendix F. 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 |
| DESN | Dual Element Spot Network |
| DG | Distributed Generation |
| DSC | Distribution System Code |
| GATR | Guelph Area Transmission Reinforcement |
| GS | Generating Station |
| HV | High Voltage |
| IESO | Independent Electricity System Operator |
| IRRP | Integrated Regional Resource Plan |
| kV | Kilovolt |
| LDC | Local Distribution Company |
| LP | Local Plan |
| LTE | Long Term Emergency |
| LTR | Limited Time Rating |
| LV | Low Voltage |
| MTS | Municipal Transformer Station |
| MW | Megawatt |
| MVA | Mega Volt-Ampere |
| MVAR | Mega Volt-Ampere Reactive |
| NA | Needs Assessment |
| NERC | North American Electric Reliability Corporation |
| NGS | Nuclear Generating Station |
| NPCC | Northeast Power Coordinating Council Inc. |
| OEB | Ontario Energy Board |
| ORTAC | Ontario Resource and Transmission Assessment Criteria |
| PF | Power Factor |
| PPWG | Planning Process Working Group |
| RIP | Regional Infrastructure Plan |
| SA | Scoping Assessment |
| SIA | System Impact Assessment |
| SPS | Special Protection Scheme |
| SS | Switching Station |
| TS | Transformer Station |
| TSC | Transmission System Code |