

YORK REGION SCOPING ASSESSMENT OUTCOME REPORT

AUGUST 28, 2018



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Scoping Assessment Outcome Report Summary

Region:	GTA North (York Region)		
Start Date	May 1, 2018	End Date	August 28, 2018

1. Introduction

GTA North Region is one of the 21 electricity planning regions in Ontario as identified through the Ontario Energy Board's (OEB) formalized Regional Planning Process. Since the geographical boundaries of GTA North Region roughly encompass the Region of York, this planning region is often referred to as York Region.

This Scoping Assessment Outcome Report is part of the Ontario Energy Board's ("OEB" or "Board") Regional Planning process. The scoping assessment process was led by the Independent Electricity System Operator ("IESO"), in collaboration with the Regional Participants¹ to determine the regional planning approach for the GTA North (York Region) for the needs that were identified for further assessment and/or to require regional coordination. These needs were identified by the Regional Participants in Needs Assessment Report² led by Hydro One Networks Inc. ("Hydro One") and published in March 2018.

The IESO, in collaboration with the Regional Participants, further reviewed the needs identified along with information collected during the Needs Assessment, information on potential wires and non-wires alternatives, and the overall regional area impact to assess and determine the best planning approach for the whole or parts of the region. The available planning options considered in the Scoping Assessment include: an Integrated Regional Resource Plan (IRRP), a Regional Infrastructure Plan (wires only plan), or a Local Plan. More details on the criteria used to determine the appropriate regional planning approach are provided in Appendix A.

This Scoping Assessment report:

- defines the region (or sub-regions) for needs requiring more comprehensive planning as identified in the Needs Assessment report;
- determines the appropriate regional planning approach and scope for the region where a need for regional coordination or more comprehensive planning is

¹ Regional Participants, which includes Independent Electricity System Operator (IESO), transmitter, local utilities serving a particular planning region, are required by the OEB to participate in the formalized regional planning process.

² The Regional Infrastructure Plan from the previous planning cycle and the Needs Assessment report for the GTA North Region (York Region) can be found at:

<https://www.hydroone.com/about/corporate-information/regional-plans/gta-north>

identified;

- establishes a terms of reference when an IRRP is the recommended approach; and
- establishes a Working Group to carry out the IRRP.

2. Team

The Scoping Assessment was carried out with the following Regional Participants:

- Independent Electricity System Operator
- Alectra Utilities Corporation
- Newmarket-Tay Power Distribution Ltd.
- Toronto Hydro Electric System Ltd.
- Veridian Connections Inc.
- Hydro One Networks Inc. (Distribution)
- Hydro One Networks Inc. (Transmission)

3. Categories of Needs, Analysis and Results

3.1 Overview of the Region

GTA North Region (York Region)

The GTA North Region (York Region), as shown in Figure 1, roughly comprises of municipalities in York Region (Vaughan, Richmond Hill, Markham, Aurora, Newmarket, King, East Gwillimbury, Whitchurch-Stouffville and Georgina) and Chippewas of Georgina Island. Its electrical infrastructure also serves parts of the City of Toronto, Brampton, and Mississauga.

Figure 1: Geographical Boundaries of GTA North (York Region)



GTA North Region (York Region) is one of the fastest growing regions in Ontario. Provincial policies, including the Places to Grow Act and the Greenbelt Act, have played a key role in facilitating and driving development in this region. While a large portion of the land in this region is part of the designated Greenbelt area and is protected from urban development, the 2005 Places to Grow Act has promoted rapid intensification and development in specific designated urban areas surrounding and south of the Greenbelt. Extensive urbanization in these areas over the past decade has resulted in continued increase in electricity demand. In 2017, GTA North (York Region) had an electricity demand peak of over 2000 MW. Under the updated province's Places to Grow Act 2017, significant population growth and intensification are expected to continue in GTA North (York Region) in the coming decades.

At the same time, many communities in GTA North (York Region), including the City of

Markham, the City of Vaughan, Town of Newmarket, Region of York and Chippewas of Georgina Island First Nations, are actively engaged in local energy planning activities and are exploring opportunities to better manage their energy uses using community-based energy solutions, such as energy storage, combined heat and power and renewable energy resources.

230kV Network Supplying GTA North (York Region)

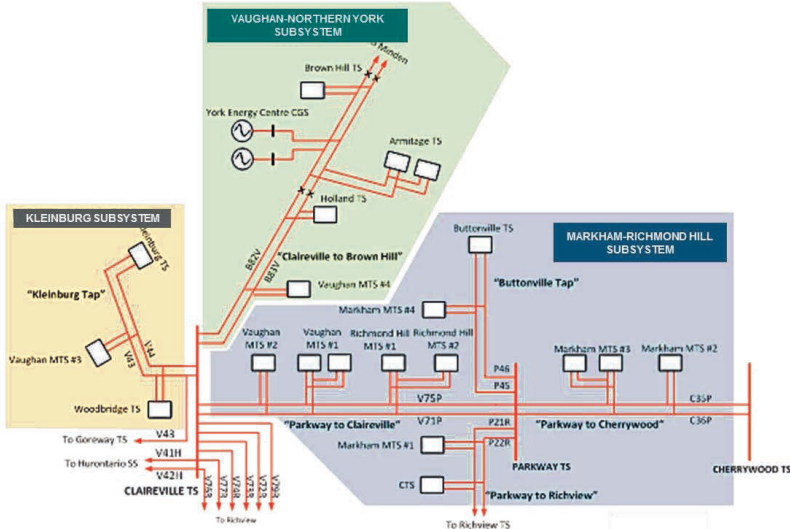
Today, as shown in Figure 2, power is delivered from the rest of the province into this region through a 230kV bulk network. In addition to delivering power into this area, this 230kV bulk network also serve as major pathways for power to flow between Northern Ontario and Southern Ontario as well as across the GTA.

From 230 kV subsystems shown in Figure 2, power is then delivered through transformer stations to various communities and customers through low-voltage distribution networks. There are 20 customer and utility-owned transformer stations that service the various communities and customers in this region.

The low-voltage distribution system is managed and operated by five LDCs: Alectra Utilities Corporation (“Alectra”), Newmarket-Tay Power Distribution Ltd., Toronto Hydro Electric System Ltd., Veridian Connections Inc., and Hydro One Distribution. All LDCs are directly connected to the transmission system, with the exception of Veridian which has low voltage connections to Hydro One distribution feeders.

In addition to transmission and distribution systems, York Energy Centre, a 393 MW gas-fired generation, also provide a local source of supply to the community.

Figure 2: Single Line Diagram of GTA North Region (York Region)



For the purpose of Regional Planning, this 230kV bulk network is broken down into three 230kV subsystems, as shown in Figure 2:

- **Kleinburg 230kV Subsystem (V44/43)** - This subsystem consists of 3 step-down transformer stations that primarily supply rural and urban communities in Vaughan and Caledon, with smaller amounts of supply provided to Brampton, Mississauga, and Toronto. Power is delivered into this subsystem from Claireville TS.
- **Vaughan-Northern York 230kV Subsystem (B82/83H, H82/83V)** - This subsystem consists of five step-down transformer stations that supply northern Vaughan and communities in Northern York region (Aurora, Newmarket, King, East Gwillimbury, Whitchurch-Stouffville and Georgina and Chippewas of Georgina Island). York Energy Centre GS is connected to these 230kV circuits. This subsystem also serves as a major pathway for power to flow between Northern Ontario and Southern Ontario.
- **Markham-Richmond Hill 230kV Subsystem (V75/71P, P45/46, P21/22R, C35/36P)** - This subsystem consists of 12 step-down transformer stations that are located in urban communities in the Markham, Richmond Hill and Vaughan areas. This subsystem is further broken down into four subcomponents: (1) Buttonville Tap - P45/46 (2) Parkway to Cherrywood - P21/22R (3) Parkway to Claireville - V71/75P and (4) Parkway to Richview - C35/36P, as shown in Figure 2. This subsystem also serves as a major pathway for power to flow across the GTA.

3.2 GTA North (York Region) Regional Planning Activities

Previous Planning Cycle

Regional planning in GTA North (York Region) has been underway for a number of years. A regional planning Working Group for GTA North Region (York Region), consisting of the Independent Electricity System Operator (IESO), Newmarket-Tay Power Distribution Ltd., Alectra Utilities and Hydro One Transmission and Distribution, has been active since 2011. In 2013, the planning process was restructured to conform to the timelines and requirements of the Ontario Energy Board's (OEB) formalized Regional Planning Process. The first cycle of the regional planning process for GTA North Region (York Region) was completed in 2016, with the focus on ensuring there is adequate supply to support near-term strong growth in the Vaughan area and minimizing the impact of supply interruptions under major outage conditions. Through this formalized regional planning process, a number of projects were recommended to support the near-term growth and to maximizing the use of the existing system, including the installation of a new transformer station in Vaughan and new switching equipment at Holland transformer station and on the parkway belt/Hwy 407 corridor. All of these projects have since come into service. Even with the implementation of these near-term projects and on-going conservation efforts identified in the 2015 York

Region IRRP, electricity demand growth is forecasted to exceed the system capability in the Markham-Richmond Hill area in early 2020s and Northern York-Vaughan in the mid and late 2020s.

In-Between Planning Cycles

Since the completion of the first cycle of the regional planning process in GTA North (York Region), the Working Group has taken steps to better understand the extent to which non-wires solutions can be used to help manage the electricity demand growth in GTA North (York Region) in the medium to longer term. Specifically, in 2016, Alectra Utilities and the IESO conducted a study to examine the feasibility of implementing residential solar-storage technology in Markham, Richmond Hill and Vaughan. Given the timing and magnitude of electricity demand growth in the Markham-Richmond Hill area, the study confirmed that it is not feasible to solely rely on residential solar-storage technology to defer the near-term supply need in this area. The IESO, on behalf of the Working Group, confirmed the need for a new transformer station and associated lines in the Markham-Richmond Hill area by 2023, and provided a letter to Hydro One and Alectra to initiate the development work for this project.

Over the last couple of years, the IESO, along with the local utilities, has continued to engage with municipalities and Indigenous communities in GTA North (York Region) to confirm the projected growth, inform them of the near-term need for a new transformer station and associated distribution and/or transmission line in the Markham-Richmond Hill area and to discuss at a high-level the medium- and longer-term planning activities in York Region.

Next Regional Planning Cycle For GTA North (York Region)

In accordance with the OEB's regional planning process, a regional planning cycle should be triggered every five years, or less if there are emerging needs. Based on the OEB Regional Planning Process Timeline the next regional planning process for GTA North (York Region) should be completed by 2020. In accordance to these timelines, the lead transmitter – Hydro One Transmission – kicked off the next cycle of the regional planning process with the completion of the Need Assessments for GTA North (York Region) in March 2018. The Need Assessment report identified that some of the needs required further assessment and coordinated regional planning, resulting in the initiation of the Scoping Assessment process.

3.3 Needs Identified

This section provides a summary of the needs identified through the Hydro One's Needs Assessment for North GTA over the 10 year period (2018-2027). For the purpose of the Scoping Assessment, the IESO has grouped these identified needs into the following key categories of needs: (1) Need to provide an adequate, reliable supply (2) Need to minimize the impact of supply interruptions, and (3) Need to coordinate and align end of life asset replacements with evolving needs in this region (4) Bulk System needs and considerations

Part 1: Need to provide an adequate, reliable supply to support longer-term growth

A. Transformer Station Capacity

Transformer station capacity is the electricity system’s ability to deliver power to the local distribution network through the regional transformer stations. This is limited by the load meeting capability (“LMC”) of the step-down transformer stations in the local area, which is the maximum demand that can be supplied from the transformer stations based on equipment rating and outage conditions.

Table 1 summarizes the transformer station capacity needs identified as part of the GTA North (York Region) Needs Assessment.

Table 1: Transformer Station Capacity Needs

Transformer Stations ³	Status
Markham MTS 4	Electricity demand growth forecast to exceed transformer capability (Markham MTS 4) in the 2025-2026 timeframe
Vaughan MTS 4	Electricity demand growth forecast to exceed transformer station capability (Vaughan MTS 4) after 2027
Northern York Region TS’s (Holland TS/Armitage TS)	Electricity demand growth forecast to exceed transformer stations capability (Holland TS/Armitage TS) after 2027

Similar to the findings from the previous planning cycle, the 2018 GTA North (York Region) Needs Assessment confirmed that electricity demand growth is expected to exceed the capability of the system in Markham-Richmond Hill and Vaughan-Northern York Region over the longer term. However, the timing of these needs have been deferred due to slower than expected electricity demand growth.

Although the demand at Kleinburg TS is not expected to exceed its capability within the next 10 years, continued growth in the southern Caledon and Bolton areas could drive the need for a new transformer and additional supply capacity on the Kleinburg 230kV subsystem over the longer-term (beyond 2027). A more detailed assessment of this longer-term need is required and should be assessed in coordination with other needs identified in the GTA North Region (York Region).

³ Due to transfer capabilities between transformers stations in GTA-North, needs arise within a sub system of stations once their collective capacity has been exceeded. For instance, a need in Markham indicates that all existing Markham transformer stations have reached their limit.

B. Supply Capacity

Supply capacity is the electricity system's ability to provide continuous supply to a local area under applicable transmission and generation outage scenarios as specified in the Ontario Resource and Transmission Assessment Criteria (ORTAC) and various bulk system conditions.

Table 2 summarizes the supply capacity needs identified as part of the Hydro One's GTA North (York Region) Needs Assessment.

Table 2: Supply Capacity Needs

Subsystem	Status
Northern York Region - Vaughan 230kV Subsystem (Claireville to Brown Hill)	Electricity demand growth forecast to exceed system capability beyond 2027 An interruption to the York Energy Centre Generation Station (YEC GS) service supply could lead to the loss of all generation output. This could limit the supply capability on B82/83V under certain outage conditions today

Given that York Region 230kV networks (e.g., Northern York Region-Vaughan 230kV System, Markham-Richmond Hill 230kV) also serve as major pathways for power to flow between Northern Ontario and Southern Ontario and across the GTA, the ability to supply demand growth in these subsystems could be impacted by varying bulk system conditions. A more detailed assessment of the supply capacity on the York Region 230kV networks under varying bulk system conditions is required and should be assessed in coordination with other needs identified in the GTA North Region (York Region).

Part 2: Need to Minimize the Impact of Supply Interruptions

A. Load Restoration

Load restoration describes the electricity system's ability to restore power to those affected by a major transmission outage within reasonable timeframes. The specific load restoration requirements prescribed by ORTAC.

Table 3 summarizes the load restoration needs identified in the GTA North (York Region) Needs Assessment report.

Table 3: Load Restoration Needs

System	Status
Parkway to Buttonville circuits (P45/46)	Following the simultaneous loss of two transmission elements, load supplied by the Parkway to Buttonville circuits is at risk of not meeting the 30 minute restoration guidelines established by ORTAC as early as 2021.
Claireville to Kleinburg circuits (V43/44)	<p>Following the simultaneous loss of two transmission elements, load supplied by the Claireville to Kleinburg circuits is at risk of not meeting the 30 minute restoration guidelines established by ORTAC today.</p> <p>This restoration need was identified during the previous planning cycle as part of Northwest GTA IRRP. At that time, the study team recommended that this need be addressed in coordination with the IESO's GTA West bulk system planning initiative. Since the subsequent GTA West bulk system study did not address the restoration need, the study team recommends that the need be revisited in this planning cycle.</p>

B. Load security

Load security describes the total amount of electricity supply that would be interrupted in the event of a major transmission outage. The specific load security requirements prescribed by ORTAC.

Table 4 summarizes the load security needs identified as part of the GTA North (York Region) Needs Assessment.

Table 4: Load Security Needs

System	Status
Parkway to Claireville circuits (V71/75P)	<p>Following the simultaneous loss of two transmission elements, over 600 MW of load served by the Parkway to Claireville circuits could be at risk of interruption. This exceeds the security guidelines established by ORTAC today.</p> <p>In the previous planning cycle, the study team recommended the installation of inline switches at the Vaughan MTS #1 junction in order to improve the capability of the system to restore load in the event that both 230 kV circuits V71P/V75P are lost. While the installation of these switches will improve the load restoration capabilities and overall reliability on the Parkway to Claireville corridor, it does not address the load security need on V71P/V75P.</p>

Given the changes that have happened since the last cycle of the regional planning process, the study team agreed to review and to revisit these needs in this planning cycle.

C. Customer Service Reliability and Performance

Customer Service Reliability and Performance measures the frequency and duration of supply interruption experienced by customers over a defined period of time. Supply interruptions may be caused by equipment outages on the distribution or transmission networks supplying this area. Various factors that affect reliability include, but are not limited to, a facility’s exposure to various elements, age and maintenance of equipment, length and configuration of the network, and the repair crew’s accessibility to facilities.

Today, LDCs are required by the OEB to report their customer service reliability and performance for the overall service territory as part of their annual scorecard. From the overall service area perspective, no customer service reliability and performances needs are identified for LDCs serving GTA North Region (York Region). However, a more detailed assessment may be required to examine the customer service reliability and various performances at the regional level and to identify any potential localized customer reliability considerations. This assessment will be done in coordination with other needs identified in the GTA North Region (York Region).

Part 3: Need to coordinate and align end of life asset replacements with evolving needs in this region

Equipment reaching the end of its life and planned sustainment activities may impact the needs assessment and options development. The need to replace aging transmission assets may present opportunities to better align investments with evolving power system priorities. This may involve up-sizing equipment in areas with capacity needs, or downsizing or even removing equipment that is no longer considered useful.

A. Facilities Reaching End of Life in the Next 10 Years

Table 5 summarizes the end of life replacement in the next 10 years, as identified in the GTA North (York Region) Needs Assessment.

Table 5: Equipment Reaching End-of-life in the Next 10 Years

Equipment	Anticipated End of life Replacement Timeline
Woodbridge TS: T5 transformer	2022/2023

B. Facilities forecasted to be reaching its expected service life over the next 20 years

For the purpose of long-term planning, expected service life of facilities could be a good high-level indication of the end of life replacements longer-term needs. Currently work is underway to develop a process to systematically gather information on the expected service life of facilities over a 20 year period for a specific area, such as York Region. Based on expected service life information, there could be more end of life replacement considerations identified over the 20 year period and should be assessed in coordination with other needs identified in the GTA North Region (York Region).

Part 4: Bulk System Needs and Considerations

Bulk system needs typically focus on the adequacy and reliability of the 500kV and 230kV bulk networks that are driven by broader provincial electricity needs and broader policy direction, such as assessing the impact of refurbishment of nuclear facilities or renewable energy policies on the electricity system.

Bulk system needs were not part of the scope of the Needs Assessment for the GTA North Region (York Region). Given that York Region 230kV networks also serve as major pathways for power to flow between Northern Ontario and Southern Ontario and across the GTA, a more detailed assessment of the York Region 230kV networks under varying bulk system conditions is required and should be assessed in coordination with other needs identified in the GTA North Region (York Region).

3.4 Analysis of Needs and Planning Approach

Needs to be Addressed in Local Planning

A local planning process is recommended to address the end-of-life need at Woodbridge TS (T5), as it is single component replacement and there is limited opportunity to reconfigure and resize the facility to align with other regional needs.

Needs to be Addressed in Integrated Regional Resources Plan (IRRP)

With the exception of Woodbridge TS (T5) end of life replacements, the remaining needs discussed in Section 3.3:

- Have the potential to be addressed by non-wires solutions
- Could be impacted by varying bulk systems flows
- Could potentially be addressed in a coordinated manner (e.g., one solution may be able to address multiple needs)
- Impacts multiple LDCs in GTA North (York Region)
- Would require on-going engagement and coordination with community-level energy planning activities

As such, these needs should be addressed in a coordinated manner and an IRRP is recommended for the GTA North Region (York Region).

Needs to be addressed in Bulk System Planning

Bulk system needs were not part of the scope of the Needs Assessment for the GTA North Region (York Region). Although the regional planning process will consider various bulk system conditions as part of the analysis, the detailed assessment of the bulk system is typically addressed through the system planning process and is beyond the scope of this IRRP.

4. Conclusion

The Scoping Assessment concludes that:

- A coordinated approach is required to address the needs identified in the GTA North (York Region) Needs Assessment and an IRRP is recommended. The draft Terms of Reference for the GTA North (York Region) IRRP, outlining the scope, objectives and timeline of the IRRP can be found in Appendix B.
- A Local Planning process is recommended for end-of-life needs at Woodbridge TS. The Working Group will actively monitor the replacement plan for this facilities to ensure that any changes to replacement plan (e.g., changes to the replacement timeline, additional components at the station need to be replaced) will be considered in a coordinated manner as part of regional planning activities in this region, as needed.

List of Acronyms

CDM	Conservation and Demand Management
DG	Distributed Generation
IESO	Independent Electricity System Operator
IPSP	Integrated Power System Plan
IRRP	Integrated Regional Resource Plan
kV	Kilovolt
LDC	Local Distribution Company
MW	Megawatt
NA	Needs Assessment
NERC	North American Electric Reliability Corporation
NPCC	Northeast Power Coordinating Council
OEB	Ontario Energy Board
OPA	Ontario Power Authority
ORTAC	Ontario Resource and Transmission Assessment Criteria
RAS	Remedial Action Scheme
RIP	Regional Infrastructure Plan
RPP	Regional Planning Process
SA	Scoping Assessment
TS	Transformer Station

Appendix A: Selecting a Regional Planning Approach

Needs identified through the Needs Assessment (NA) will be reviewed during the Scoping Assessment to determine whether a Local Plan (LP), Regional Infrastructure Plan (RIP), or Integrated Regional Resource Plan (IRRP) regional planning approach is more appropriate. Where multiple sub-regions are identified, each will be considered individually. It is possible that a combination of LP, RIP and IRRP planning approaches could be selected in different sub-regions, although if the need for wires-type solution is urgent, it will typically trigger a hand-off letter instead.

The three potential planning outcomes are designed to carry out different functions, and selection should be made based on the unique needs and circumstances in each area. The criteria used to select the regional planning approach within each sub-region are consistent with the principles laid out in the PPWG Report to the Board⁴, and are discussed in this document to ensure consistency and efficiency throughout the Scoping Assessment.

IRRPs are comprehensive undertakings that consider a wide range of potential solutions to determine the optimal mix of resources to meet the needs of an area for the next 20 years, including consideration of conservation, generation, new technologies, and wires infrastructure. RIPs focus instead on identifying and assessing the specific wires alternatives and recommend the preferred wires solution for an area and are thus, narrower in scope. LPs have the narrowest scope; only considering simple wires solutions that do not require further coordinated planning. A LP process is recommended when needs are:

- a) Local in nature (only affecting one LDC or customer)
- b) Limited investments of wires (transmission or distribution) solutions
- c) Does not require upstream transmission investments
- d) Does not require plan level community and/or stakeholder engagement and,
- e) Does not require other approvals such as Leave to Construct (S92) application or Environmental Approval.

If it is determined that coordinated planning is required to address identified needs, either a RIP or IRRP may be initiated. A series of criteria have been developed to assist in determining

⁴ http://www.ontarioenergyboard.ca/OEB/_Documents/EB-2011-0043/PPWG_Regional_Planning_Report_to_the_Board_App.pdf

which planning approach is the most appropriate based on the identified needs. These are discussed below. In general, an IRRP is initiated:

- Wherever a non-wires measure has the potential to meet or significantly defer the needs identified by the transmitter during the Needs Assessment
- Community or stakeholder engagement is required, or
- The planning process or outcome has the potential to impact bulk system facilities

If it is determined that the only feasible measures involve new/upgraded transmission and/or distribution infrastructure, with no requirement for engagement or anticipated impact on bulk systems, a RIP will be selected instead.

Wires type transmission/distribution infrastructure solutions refer, but are not limited, to:

- Transmission lines
- Transformer/ switching stations
- Sectionalizing devices including breakers and switches
- Reactors or compensators
- Distribution system assets

Additional solutions, including conservation and demand management, generation, and other electricity initiatives can also play a significant role in addressing needs. Because these solutions are non-wires alternatives, they must be studied through an IRRP process.

Determining the feasibility of non-wires alternatives to meet identified needs should also consider issues such as timelines for implementing solutions. For instance, if a need has been identified as immediate or near term, non-wires solutions that rely on lengthy development and roll-out periods may not be feasible.

Appendix B: Terms of Reference 1

GTA North Region (York Region) IRRP

Terms of Reference

GTA North Region is one of the 21 electricity planning regions in Ontario as identified through the Ontario Energy Board's (OEB) formalized Regional Planning Process. Since the geographical boundaries of GTA North Region roughly encompass the Region of York, this planning region is often referred to as York Region.

These Terms of Reference establish the objectives, scope, key assumptions, roles and responsibilities, activities, deliverables and timelines for GTA North Region (York Region) Integrated Regional Resource Plan ("IRRP").

1. Background

1.1. GTA North Region (York Region)

The GTA North Region (York Region), as shown in Figure B-1, roughly comprises of municipalities in York Region (Vaughan, Richmond Hill, Markham, Aurora, Newmarket, King, East Gwillimbury, Whitchurch-Stouffville and Georgina) and Chippewas of Georgina Island. Its electrical infrastructure also serves parts of the City of Toronto, Brampton, and Mississauga.

Figure B-2: Geographical Boundaries of GTA North (York Region)



GTA North (York Region) is one of the fastest growing regions in Ontario. Provincial policies, including the Places to Grow Act and the Greenbelt Act, have played a key role in facilitating and driving development in this region. While a large portion of the land in this region is part of the designated Greenbelt area and is protected from urban development, the 2005 Places to Grow Act has promoted rapid intensification and development in specific designated urban areas surrounding and south of the Greenbelt. Extensive urbanization in these areas over the past decade has resulted in continued increase in electricity demand. In 2017, GTA North (York Region) had an electricity demand peak of over 2000 MW. Under the updated province's Places to Grow Act 2017, significant population growth and intensification are expected to continue in GTA North (York Region) in the coming decades.

At the same time, many communities in York Region, including the City of Markham, the City of Vaughan, Town of Newmarket, Region of York and Chippewas of Georgina Island First Nations, are actively engaged in local energy planning activities and are exploring opportunities to better manage their energy uses using community-based energy solutions, such as energy storage, combined heat and power and renewable energy resources.

1.2. Regional Electricity Planning Activities in GTA North (York Region)

Previous Planning Cycle

Regional planning in GTA North (York Region) has been underway for a number of years. A regional planning Working Group for York Region, consisting of the Independent Electricity System Operator (IESO), Newmarket-Tay Power Distribution Ltd., Alectra Utilities and Hydro One Transmission and Distribution, has been active since 2011. In 2013, the planning process was restructured to conform to the timelines and requirements of the Ontario Energy Board's (OEB) formalized Regional Planning Process. The first cycle of the regional planning process for GTA North (York Region) was completed in 2016, with the focus on ensuring there is adequate supply to support near-term strong growth in the Vaughan area and minimizing the impact of supply interruptions under major outage conditions. Through this formalized regional planning process, a number of projects were recommended to support the near-term growth and to maximizing the use of the existing system, including the installation of a new transformer station in Vaughan and new switching equipment at Holland transformer station and on the parkway belt/Hwy 407 corridor. All of these projects have since come into service. Even with the implementation of these near-term projects and on-going conservation efforts identified in the 2015 York Region IRRP, electricity demand growth is forecasted to exceed the system capability in the Markham-Richmond Hill area in early 2020s and Northern York-Vaughan in the mid and late 2020s.

In-Between Planning Cycles

Since the completion of the first cycle of the regional planning process in GTA North (York Region), the Working Group has taken steps to better understand the extent to which non-wires solutions can be used to help manage the electricity demand growth in GTA North (York Region) in the medium to longer term. Specifically, in 2016, Alectra Utilities and the IESO conducted a study to examine the feasibility of implementing residential solar-storage technology in Markham, Richmond Hill and Vaughan. Given the timing and magnitude of electricity demand growth in the Markham-Richmond Hill area, the study confirmed that it is not feasible to solely rely on residential solar-storage technology to defer the near-term supply need in this area. The IESO, on behalf of the Working Group, confirmed the need for a new transformer station and associated lines in the Markham-Richmond Hill area by 2023, and provided a letter to Hydro One and Alectra to initiate the development work for this project.

Over the last couple of years, the IESO, along with the local utilities, has continued to engage with municipalities and Indigenous communities in GTA North (York Region) to confirm the projected growth, inform them of the near-term need for a new transformer station and associated distribution and/or transmission line in the Markham-Richmond Hill area and to discuss at a high-level the medium- and longer-term planning activities in York Region.

Next Regional Planning Cycle for GTA North (York Region)

In accordance with the OEB's regional planning process, a regional planning cycle should be triggered every five years, or less if there are emerging needs. Based on the OEB Regional Planning Process Timeline the next regional planning process for GTA North (York Region) should be completed by 2020. In accordance to these timelines, the lead transmitter – Hydro One Transmission – kicked off the next cycle of the regional planning process with the completion of the Need Assessments for GTA North (York Region) in March 2018. The Need Assessment report identified that some of the needs required further assessment and coordinated regional planning, resulting in the initiation of the Scoping Assessment process.

Based on the needs identified in the Needs Assessment, the Scoping Assessment process concluded that a coordinated approach is required to address the needs identified in GTA North (York Region) and an Integrated Regional Resources Plan (IRRP) is recommended for the GTA North (York Region).

2. Objectives

The GTA North (York Region) IRRP will assess the adequacy and reliability of electricity supply to customers in York Region and will develop a set of recommended actions to maintain reliability of supply to the region over the next 20 year (2018-2037) in a transparent and coordinated manner.

Specifically, the IRRP will:

- Explore innovative/non-wires solutions and determine the extent to which these solutions can be leveraged to address electricity needs in York Region
- Determine whether there is a need to initiate development work or to fully commit infrastructure investments (wires or non-wires) in this planning cycle
- Assess potential risks over the longer term and identify near-term actions to manage/mitigate these risks, where applicable

3. Scope

The following components will be included as part of the scope of this IRRP:

3.1. Supply Reliability and Adequacy Assessment

The GTA North (York Region) IRRP will assess the adequacy and reliability of the 230kV network supplying York Region (see sub-section below “230kV York Region Networks” for more information) based on industry standards (e.g., Ontario Resources and Transmission Assessment Criteria (ORTAC)) and demand forecast discussed in Section 3.2. Specifically, the IRRP will review needs identified and discussed as part of the Scoping Assessment, with the focus on the following key areas of needs:

- Need to provide an adequate, reliable supply
- Need to minimize the impact of supply interruptions
- Need to coordinate and align end of life asset replacements with evolving needs in this region

Given that York Region 230kV networks also serve as major pathways for power to flow between Northern Ontario and Southern Ontario and across the GTA, the IRRP will also assess the York Region 230kV networks under varying bulk system conditions. However, the detailed assessment of the bulk system and distribution network is typically addressed through the bulk and distribution system planning process and is beyond the scope of this IRRP.

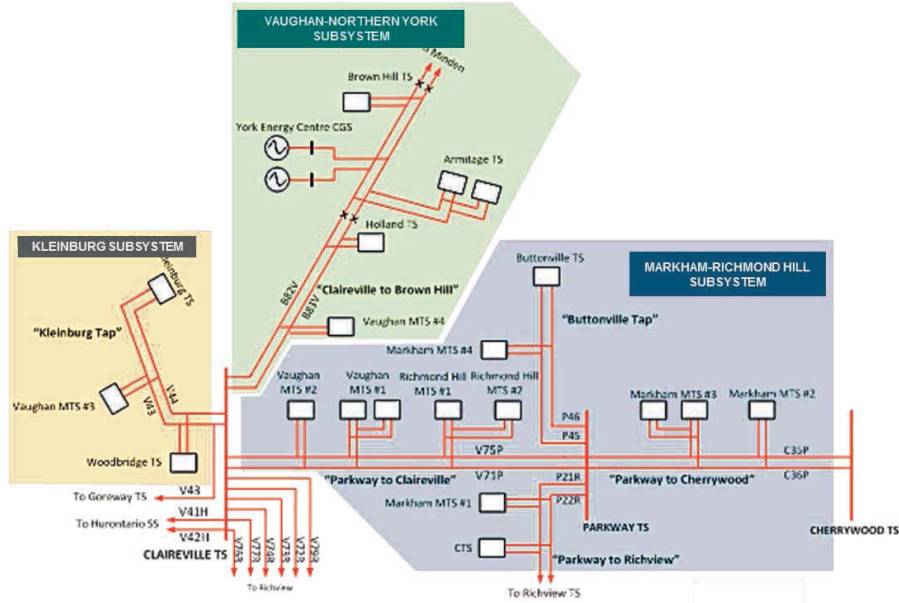
York Region 230kV networks

Today, as shown in Figure B-2, power is delivered from the rest of the province into this Region through 230kV bulk network. In addition to delivering power into this area, this 230kV bulk networks also serve as major pathways for power to flow between Northern Ontario and Southern Ontario and across the GTA.

From these 230 kV subsystems, power is then delivered through transformer stations to various communities and customers through low-voltage distribution networks. There are 20 customer and utility-owned transformer stations that service the various communities and customers in this region. The low-voltage distribution system is managed and operated by five LDCs: Alectra Utilities Corporation (“Alectra”), Newmarket-Tay Power Distribution Ltd., Toronto Hydro Electric System Ltd., Veridian Connections Inc., and Hydro One Distribution. All LDCs are directly connected to the transmission system, with the exception of Veridian which has low voltage connections to Hydro One distribution feeders.

In addition to transmission and distribution system, York Energy Centre, a 393 MW gas-fired generation, also provide a local source of supply to the community.

Figure B-2: Single Line Diagram of GTA North (York Region)



For the purpose of Regional Planning, this 230kV bulk network can be broken down into three 230kV subsystems, as shown in Figure B-2:

- **Kleinburg 230kV Subsystem (V44/43)** - This subsystem consists of 3 step-down transformer stations that primarily supply rural and urban communities in Vaughan and Caledon, with smaller amounts of supply provided to Brampton, Mississauga, and Toronto. Power is delivered into this subsystem from Claireville TS.
- **Vaughan-Northern York 230kV Subsystem (B82/83H, H82/83V)** - This subsystem consists of five step-down transformer stations that supply northern Vaughan and communities in Northern York region (Aurora, Newmarket, King, East Gwillimbury, Whitchurch-Stouffville and Georgina and Chippewas of Georgina Island). York Energy Centre GS is connected to these 230kV circuits. This subsystem also serves as a major pathway for power to flow between Northern Ontario and Southern Ontario.
- **Markham-Richmond Hill 230kV Subsystem (V75/71P, P45/46, P21/22R, C35/36P)** - This subsystem consists of 12 step-down transformer stations that are located in urban communities in the Markham, Richmond Hill and Vaughan areas. This subsystem is further broken down into 4 sub components: (1) Buttonville Tap - P45/46 (2) Parkway to Cherrywood - P21/22R (3) Parkway to Clarieville - V71/75P and (4) Parkway to Richview - C35/36, as shown in Figure B-2. This subsystem also serves as a major pathway for power to flow across the GTA.

3.2 Development of 20 Year Demand Forecast and Scenarios

A 20 year Reference “Business As Usual” Summer Peak Demand forecast (2018-2037) for GTA North (York Region) will be developed as part of the IRRP. Specifically, the Reference forecast will consider the following assumptions:

- LDCs’ Gross Demand Forecast for their service area. This is developed based on local economic development and growth assumptions outlined in community growth plans.
- Estimated peak demand impact of Provincial Energy Conservation Programs, including existing and contracted distributed generation.
- Impact of extreme temperature

To assess potential longer risks and uncertainties, the IRRP will also take into the consideration the following in the development of demand forecast:

- Electrification (e.g., EV, Electrification of Transportation)
- Community Energy and Growth Plans (e.g., Updated 2017 Places to Grow)
- Impact of behind the meter activities (e.g., Industrial Conservation Initiative (ICI), solar/storage)
- Impact of climate change (e.g., hotter summers, storms)

3.3 Options Development and Evaluation

The IRRP will develop and evaluate a wide range of non-wires and wires solutions to address needs identified over a 20 year period (2018-2037).

Non-Wires Options

Specifically, the IRRP will examine the extent to which feasible, cost-effective non-wires solutions could help manage electricity demand growth in GTA North (York Region) over the longer term. Two non-wires-related initiatives are underway in GTA North (York Region) to support and to inform the development of potential non-wires options in GTA North (York Region):

- **York Region Non-Wires Alternative and Interoperability Pilot:** A pilot is being initiated to explore opportunities to address potential barriers to implementing non-wires solutions in York Region, including potential funding mechanisms (e.g., revenue stacking, market-based solutions) and interoperability considerations. Findings from the pilot could help determine the extent to which non-wires alternatives can be used to address the regional electricity needs in York Region over the longer term. Lessons learned from this pilot also will inform the development of longer-term non-wires alternative framework in Ontario. The pilot will be conducted in phases over several years and is expected to be completed in early 2020s.
- **York Local Achievable Potential Study:** A study is being initiated to gather information on the cost and feasibility of implementing non-wires alternatives and community energy based solutions in York Region. The study is expected to be completed in early 2019.

While the detailed implementation of the two initiatives discussed is beyond the scope of the IRRP, the results from these two initiatives will help inform the recommendations for this IRRP.

Wires Options

Should traditional wires options be required, the IRRP will explore potential wires options to address the needs identified. Where applicable, the IRRP, with the input from communities and local utilities, will identify opportunities to align with linear infrastructure corridor and potential end of life asset replacements, if applicable.

Options Evaluation

Both wires and non-wires options will be evaluated based on a wide range of considerations, including technical feasibility, project lead time, cost, flexibility, alignment with planning

policies and priorities and consistency with long-term needs, and opportunity to maximize the use of existing infrastructure and local considerations.

3.4 Recommended Actions

This IRRP will identify a set of recommended actions to maintain reliability of supply in GTA North (York Region) over the next 5-10 years (2018-2027) and to mitigate any potential longer-term risks and uncertainties (beyond 2028).

Depending on the urgency and timing of the electricity needs and risks identified, the IRRP could recommend a combination of following actions:

- Active monitoring
- Project development work to shorten lead time for the project, without commitment
- Commitment of Project and Proceed with Project Implementation (e.g., resources acquisition, transmission procurement, regulatory approval)
- Interim measures to manage the near-term requirements, until longer-term solutions could come into service
- Additional pilots or studies to gather more information
- Coordination with other planning or related processes (e.g., community or bulk system planning)

Should the IRRP identify the need for infrastructure investment, the IRRP will provide a rationale and define high-level project requirements to support project development and implementation. The outcomes from the GTA North (York Region) IRRP would help inform the Hydro One and LDCs rate filing and any related transmission/resources acquisitions processes.

It is important to note that detailed discussion of acquisition mechanisms, cost allocation, cost recovery, siting, operations and implementation of recommended projects are beyond the scope of IRRP.

3.5 Community and Stakeholder Engagement

Communities and stakeholders will be engaged throughout the IRRP process. Below is the scope of community and stakeholder engagement for this IRRP:

- Local electricity needs and considerations
- Status and key assumptions from Community Energy Planning (e.g., energy intensity, Electric Vehicles and fuel switching scenarios)
- Status and key assumptions in Growth Plans and local economic developments (housing, population growth, commercial and industrial development)
- Impact of climate change in York Region
- Long-term Land Use and Infrastructure Corridor Plans
- Local interests in developing and implementing community-based energy solutions and factors that could facilitate or hinder the implementation of community-based energy solutions. For example:
 - Existing or planned pilot projects
 - Available local funding to support these pilots
 - Local policy/programs that enable/hinder the development of these projects
 - Support from local utilities, community groups and government
 - Land use impact and considerations

The IESO Regional and Community Engagement group will work with the Working Group to develop an engagement plan and approaches (e.g., webinars, community advisory committee) to gather this input, and the draft plan will be posted on the IESO's website for a public comment period.

4. Study Approach & Outcomes

The IRRP is broken down into several workstreams.

Workstreams		Activities	Outcomes
1	Data Gathering	<ul style="list-style-type: none"> ▪ Work with local utilities, communities and stakeholders to better understand electricity demand growth and local energy planning activities in GTA North (York Region) ▪ Initiate Local Achievable Potential Study to better understand the cost, feasibility and characteristics of non-wires solutions (e.g., distributed energy resources, energy efficiency) in the GTA North (York Region) ▪ Gather local information, including customer segmentation ▪ Develop demand forecast and scenarios ▪ Estimate peak demand impact of provincial energy conservation targets and contracted distributed generation ▪ Set up system study base cases 	<ul style="list-style-type: none"> ▪ Demand forecast and scenarios ▪ Local Achievable Potential Study ▪ Customer segmentation information ▪ Coordinate with Local Energy Planning Activities (e.g., if applicable) ▪ System study base cases
2	Need Assessment	<ul style="list-style-type: none"> ▪ Assess the reliability and adequacy of the system based on the demand forecast and system study base cases ▪ Define the high-level requirements 	<ul style="list-style-type: none"> ▪ Need definition and potential longer-term risks
3	Non-Wires Options Development	<ul style="list-style-type: none"> ▪ Incorporate findings from the York Region Local Achievable Potential Study ▪ Leverage the Local Achievable Potential Study to help inform non-wires options development ▪ Incorporate findings and key learnings from the York Non-Wires Alternatives Pilot 	<ul style="list-style-type: none"> ▪ The extent to which cost-effective, feasible non-wires solutions could be acquired to address needs in the local area ▪ A high-level scope, feasibility and cost of non-wires options
4	Wires Options Development	<ul style="list-style-type: none"> ▪ Develop potential wires options ▪ Identify opportunities to align with linear infrastructure corridor and end of life replacements considerations, where applicable 	<ul style="list-style-type: none"> ▪ High-level scope, feasibility and costs estimate of wires options

5	Options Evaluation	<ul style="list-style-type: none"> ▪ Evaluate wires and non-wires options based on a wide range of considerations 	<ul style="list-style-type: none"> ▪ Benefits and shortfalls of each of the options and the extent to which the options can address the needs identified
6	Recommendations	<ul style="list-style-type: none"> ▪ Develop a set of recommended actions 	<ul style="list-style-type: none"> ▪ A report summarizing the key findings and recommendations
7	Community Engagement	<ul style="list-style-type: none"> ▪ Work with the Regional and Community Engagement Team to prepare engagement plan ▪ Prepare for and participate in community engagement ▪ Respond to and consider community and stakeholders' input in the analysis and development of the recommendations 	<ul style="list-style-type: none"> ▪ Community Engagement Plan ▪ A summary of community and stakeholders' input

5. GTA North (York Region) IRRP Working Group

In accordance to the OEB’s Regional Planning Process, the IESO is responsible for carrying out the Integrated Regional Resources Planning Process (IRRP), in collaboration with the local distribution companies and transmitter. As such, the GTA North (York Region) IRRP Working Group (“Working Group”) has been established to help carry out the IRRP in York Region. This Working Group consists of system planning representatives from the following organizations:

- Independent Electricity System Operator (*Team Lead for IRRP*)
- Hydro One Transmission
- Hydro One Distribution
- Alectra Utilities
- Newmarket-Tay Power Distribution Ltd.

Although the planning representatives will be key members of GTA North (York Region) IRRP Working Group, where appropriate, others representatives (e.g., conservation, engagement, innovation, demand forecasting) may be invited to attend Working Group meetings and engagements. It is important to note that the York Region 230kV transmission system also supplies a few of the distribution feeders Toronto Hydro and Veridian Connections’ customers. Given that the scope of the GTA North (York Region) IRRP, as discussed in Section 3, has minimal impact on Toronto Hydro and Veridian Connections’, Toronto Hydro and Veridian Connections agreed that it is not necessary for them to be active members of the Working Group. The Working Group will keep Toronto Hydro and Veridian Connections informed of any developments in the GTA North (York Region) IRRP that may have an impact on their customers and will coordinate as required.

6. High-level Timeline

