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April 29, 2015 ***via email***

Mr. Denis Kelly, Regional Clerk
Region of York
17250 Yonge Street
Newmarket, ON L3Y 6Z1

Dear Mr. Kelly:

Re: Release of 20-year Electricity Plan for Greater Toronto Area North

We are pleased to provide the Region of York with the York Region Integrated Regional Resource Plan (IRRP). This 20-year electricity plan identifies the electricity needs of the area and is designed to plan for growth to ensure that electricity is reliable and available as needed. The plan has been developed by a Working Group consisting of Newmarket-Tay Power, PowerStream, Hydro One Networks Inc., and the Independent Electricity System Operator (IESO). To view the York Region IRRP, please visit http://www.ieso.ca/GTA-North.

IRRPs are undertaken in the context of the province's Long-Term Energy Plan, as well as provincial and distribution-level planning. They take an integrated approach to finding the best ways to address electricity needs, including considering existing resources, conservation, generation, wires and other innovative solutions. The plan sets out actions to address near-term electricity needs as well as options to address medium- and long-term needs. The development of IRRPs is mandated by the Ontario Energy Board, and IRRPs are updated every five years or sooner if needed. The York Region IRRP will be updated as needed to reflect any changes to the electricity needs of the Region and based on feedback from the community.

Under the IRRP process, local distributors and transmitters as well as municipalities, Aboriginal communities, stakeholders and members of the general public are increasingly involved in developing integrated energy planning solutions for maintaining a reliable supply of electricity. Below are the activities that will be undertaken to facilitate a regional electricity planning dialogue with the community.

Informational Webinar

An informational webinar will be held at the date and time listed below to review the IRRP and discuss the next steps in the development of longer-term options, including the formation of a Local Advisory Committee. Participants can both view the presentation and listen to the webinar via the weblink, or call the toll-free number to listen to the webinar. Questions will be taken both over the phone and via the weblink.

Thursday, June 4 from 2 p.m. – 4 p.m.
http://www.meetview.com/ieso20150604b
Toll-free: 1-888-239-2037

Municipal Presentation
The Working Group will be available to present the IRRP and discuss next steps in community engagement to Council and/or meet with staff to answer any questions. Please email ontarioregionalplanning@ieso.ca to schedule a presentation or meeting, or to ask any questions about the plan.

Local Advisory Committee
A Local Advisory Committee (LAC) is being established for the York Region IRRP. The role of the LAC is to provide advice and recommendations on the further development of the plan's longer-term options, as well as how to best engage the broader community in this discussion. In the fall, advertisements will be placed in local newspapers to promote the formation of the LAC. An e-blast will also be sent to individuals who have signed up to receive updates on the York IRRP. Additional information on the regional planning Local Advisory Committees can be found at www.ieso.ca/LAC .

IRRP Web Page - http://www.ieso.ca/GTA-North
A dedicated York Region IRRP webpage is available on the IESO website. The IRRP is posted on this page which also highlights key information related to this regional planning area. You will note that there is a "subscribe to receive updates" feature on this page where interested parties can opt to receive email updates related to activities in this area, including the formation of the LAC. This page also includes a link to information on the regional planning process.

We look forward to planning for your future electricity needs together.

Sincerely,

Michael Lyle
Vice President, Planning, Law and Aboriginal Relations

YORK REGION INTEGRATED REGIONAL RESOURCE PLAN

Part of the GTA North Planning Region | April 28, 2015

Independent Electricity System Operator

Integrated Regional Resource Plan

York Region

This Integrated Regional Resource Plan ("IRRP") was prepared by the IESO pursuant to the terms of its Ontario Energy Board licence, EI-2013-0066.

This IRRP was prepared on behalf of the York Region Working Group, which included the following members:

- Independent Electricity System Operator
- Newmarket-Tay Power Distribution Ltd.
- PowerStream Inc.
- Hydro One Networks Inc. (Distribution) and
- Hydro One Networks Inc. (Transmission)

The York Region Working Group assessed the adequacy of electricity supply to customers in the York Region over a 20-year period; developed a flexible, comprehensive, integrated plan that considers opportunities for coordination in anticipation of potential demand growth scenarios and varying supply conditions in the York Region; and developed an implementation plan for the recommended options, while maintaining flexibility in order to accommodate changes in key assumptions over time.

York Region Working Group members agree with the IRRP's recommendations and support implementation of the plan through the recommended actions. York Region Working Group members do not commit to any capital expenditures and must still obtain all necessary regulatory and other approvals to implement recommended actions.

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List of Abbreviations

Abbreviation	Description
C&S	Codes and Standards
CDM	Conservation and Demand Management
CEP	Community Energy Plan
CHP	Combined Heat and Power
CHPSOP	Combined Heat and Power Standard Offer Program
DG	Distributed Generation
DR	Demand Response
EE	Energy Efficiency
EA	Environmental Assessment
EM&V	Evaluation, Measurement and Verification
EMS	Energy Management Systems
EV	Electric Vehicle
FIT	Feed-in Tariff
GHG	Greenhouse Gas
GS	Generating Station
GTA	Greater Toronto Area
IESO	Independent Electricity System Operator
ICI	Industrial/Commercial/Institutional
IRRP	Integrated Regional Resource Plan
kV	Kilovolt
L/R	Load Rejection
LAC	Local Advisory Committee
LDC	Local Distribution Company
LTEP	(2013) Long-Term Energy Plan
LTR	Limited Time Rating
LMC	Load Meeting Capability
MCOD	Maximum Commercial Operation Date

Abbreviation	Description
MW	Megawatt
MEP	Municipal Energy Plan
MEP/CEP	Municipal or Community Energy Planning
MTO	Ministry of Transportation
MTS	Municipal Transformer Station
NT Power	Newmarket-Tay Power Distribution Ltd.
NERC	North American Electric Reliability Corporation
NPCC	Northeast Power Coordinating Council
OEB or Board	Ontario Energy Board
OPA	Ontario Power Authority
ORTAC	Ontario Resource and Transmission Assessment Criteria
PPS	(Ontario's) Provincial Policy Statement
PPWG	Planning Process Working Group
PV	Photovoltaic
Region	York Region
RIP	Regional Infrastructure Plan
SCGT	Simple-Cycle Gas Turbine
SCC	Solar Capacity Contribution
SPS	Special Protection System
TOU	Time-of-Use
TS	Transformer Station
Working Group	Technical Working Group for York Region IRRP
YEC	York Energy Centre

1. Introduction

This Integrated Regional Resource Plan ("IRRP") addresses the electricity needs of York Region ("York Region" or the "Region") over the next 20 years. The report was prepared by the Independent Electricity System Operator ("IESO") on behalf of a technical Working Group composed of the IESO, Newmarket-Tay Power, PowerStream, Hydro One Distribution and Hydro One Transmission (the "Working Group").

The Region encompasses the municipalities of Vaughan, Richmond Hill, Markham, Aurora, Newmarket, King, East Gwillimbury, Whitchurch-Stouffville and Georgina, and is one of the fastest growing regions in Ontario. Extensive urbanization in the Region has resulted in electricity demand growth greater than the provincial average. With a current population of over 1 million, York Region's electricity infrastructure currently supplies almost 2,000 megawatts ("MW") of demand. Under the province's "Places to Grow" policy, York Region is expected to host substantial continued population growth in the coming decades. There is therefore a strong need for integrated regional electricity planning to ensure that the electricity system can support the pace of development in the long term.

The area covered by the York Region IRRP is a sub-region of the Greater Toronto Area ("GTA") North Region identified through the Ontario Energy Board ("OEB" or "Board") regional planning process. A second sub-region, located in the southwest corner of the GTA North Region, was defined that contains the Claireville-to-Kleinburg transmission line. As a substantial portion of the customer loads supplied from this transmission line are located in the GTA West Region, the second sub-region is being studied as part of the GTA West Region and is not included in the scope of this IRRP.

This IRRP for York Region identifies and coordinates the many different options to meet customer needs in the Region over the next 20 years. Specifically, this IRRP identifies investments for immediate implementation necessary to meet near-term needs in the Region. This IRRP also identifies a number of options to meet medium- and longer-term needs, but given forecast uncertainty, the longer development lead time and the potential for technological change, the plan maintains flexibility for longer-term options and does not recommend specific projects at this time. Instead, the long-term plan identifies near-term actions to develop alternatives and engage with the community, to gather information and lay the groundwork for future options. These actions are intended to be completed before the next IRRP cycle, scheduled for 2020 or sooner, depending on demand growth, so that the results of these actions can inform a decision should one be needed at that time.

This report is organized as follows:

- A summary of the recommended plan for York Region is provided in Section 2;
- The process used to develop the plan is discussed in Section 3;
- The context for electricity planning in York Region and the study scope are discussed in Section 4;
- Demand forecast scenarios, and conservation and distributed generation ("DG") assumptions, are described in Section 5;
- Near, medium, and long-term electricity needs in York Region are presented in Section 6;
- Alternatives and recommendations for meeting near-term needs are addressed in Section 7;
- Options for meeting medium- and long-term needs are discussed and near-term actions to support development of the long-term plan are provided in Section 8;
- A summary of community, aboriginal and stakeholder engagement to date, and moving forward in developing this IRRP is provided in Section 9; and
- A conclusion is provided in Section 10.

2. The Integrated Regional Resource Plan

The York Region IRRP addresses the Region's electricity needs over the next 20 years, based on the application of the IESO's Ontario Resource and Transmission Assessment Criteria ("ORTAC"). The IRRP identifies needs that are forecast to arise in the near term (0-5 years), medium term (5-10 years) and long term (10-20 years). These planning horizons are distinguished in the IRRP to reflect the different level of commitment required over these time horizons. The plans to address these timeframes are coordinated to ensure consistency. The IRRP was developed based on consideration of planning criteria, including reliability, cost and feasibility; and, in the near term, it seeks to maximize the use of the existing electricity system, where it is economic to do so.

For the near term, the IRRP identifies specific investments that need to be immediately implemented or that are already being implemented. This is necessary to ensure that they are in service in time to address the Region's more urgent needs, respecting the lead time for their development.

For the medium and long term, the IRRP identifies a number of alternatives to meet needs. However, as these needs are forecast to arise further in the future, it is not necessary (nor would it be prudent given forecast uncertainty and the potential for technological change) to commit to specific projects at this time. Instead, near-term actions are identified to develop alternatives and engage with the community, to gather information and lay the groundwork for future options. These actions are intended to be completed before the next IRRP cycle so that their results can inform a decision at that time.

The needs and recommended actions are summarized below.

2.1 The Near-Term Plan

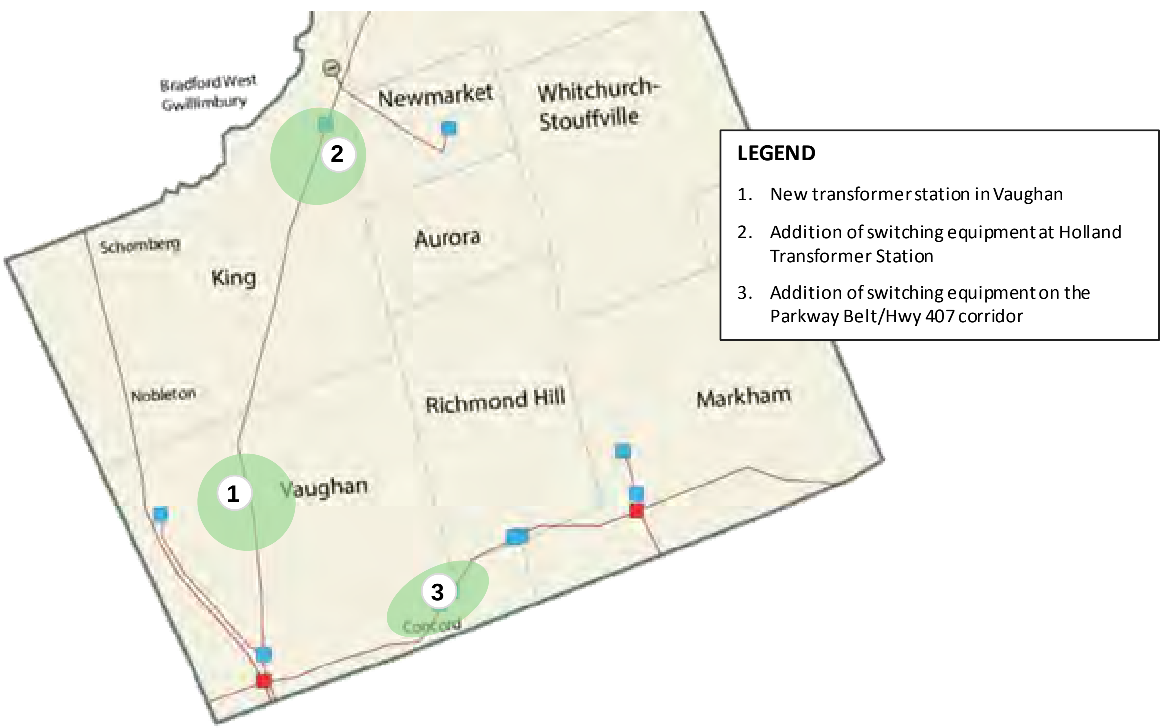
The plan to meet the near-term needs of electricity customers in York Region (see sidebar on the next page) was developed based on consideration of planning criteria, including reliability, cost, feasibility, and maximizing the use of the existing electricity system. The near-term plan was also developed to be consistent with the long-term development of the Region's electricity system.

The first element of the near-term plan is implementation of targeted conservation and DG. To address near-term reliability needs and to supply residual load growth in Vaughan, three transmission projects are also recommended. The development of these "wires" projects is currently underway, in accordance with 2012 and 2013 letters from the former OPA[1] addressed to Hydro One and PowerStream.[2] These transmission projects will also become part of a Regional Infrastructure Planning ("RIP")[3] process to be initiated by Hydro One as an outcome of this IRRP. These projects are described below with their locations indicated in Figure 2-1.

Near-Term Needs

- Meet load security criteria in Northern York Region – **Today**
- Meet load security criteria for stations connected to the Parkway Belt in Richmond Hill and Vaughan – **Today**
- Provide additional transformer station supply capability in Vaughan to meet forecast demand growth – **2017**
- Increase transmission system capability to supply a new station in Vaughan – **2017**

Figure 2-1: Transmission Projects Included in the York Region Near-Term Plan



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[1] On January 1, 2015, the Ontario Power Authority ("OPA") merged with the Independent Electricity System Operator ("IESO") to create a new organization that will combine the OPA and IESO mandates. The new organization is called the Independent Electricity System Operator.

[2] OPA Letter to PowerStream re: Siting Vaughan #4 MTS: http://www.ieso.ca/Documents/Regional-Planning/GTA_North/Vaughan4%20MTS%20Letter%20-2012-12-14.pdf
OPA Letter to Hydro One - York Region: http://www.ieso.ca/Documents/Regional-Planning/GTA_North/OPA-Letter-Hydro-One-York-Subregion.pdf

[3] See Section 3.1 for a description of the IRRP and RIP processes.

Recommended Actions

1. Implement Conservation and Distributed Generation

The implementation of provincial conservation targets established in the 2013 Long-Term Energy Plan ("LTEP") is a key component of the near-term plan for York Region. In developing the demand forecast, peak-demand impacts associated with meeting the provincial targets were assumed before identifying any residual needs; this is consistent with the provincial Conservation First[4] policy. This conservation amounts to approximately 170 MW, or 32% of the forecast demand growth, during the first 10 years of the study.

To ensure that these savings materialize, it is recommended that the local distribution companies ("LDC") conservation efforts be focused as much as possible on measures that will balance the needs for energy savings to meet the Conservation First targets while maximizing peak-demand reductions. Monitoring of conservation success, including evaluation, measurement and verification ("EM&V") of peak demand savings, is an important element of the near-term plan. It will lay the foundation for the long-term plan by evaluating the performance of specific conservation measures in the Region and assessing potential for further conservation.

Provincial programs that encourage the development of DG, such as the Feed-in Tariff ("FIT"), microFIT, and Combined Heat and Power Standard Offer ("CHPSOP") programs, can also contribute to reducing peak demand in the Region; these will, in part, depend on local interest and opportunities for development. The LDCs and the IESO will continue their activities to support these initiatives and monitor their impacts.

2. Develop New Station in Vaughan

To supply forecast demand growth in Vaughan in the near term, PowerStream is developing a new station, "Vaughan Municipal Transformer Station ("MTS") #4." A class Environmental Assessment ("EA") process is complete and PowerStream is proceeding with the design and construction of the station. Located in northern Vaughan, the station is well situated to supply growth due to urbanization, which is forecast to be concentrated toward the northern boundary of the City of Vaughan. The station will connect to the Claireville-to-Minden transmission line.

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[4] Conservation First: A Renewed Vision for Energy Conservation in Ontario: http://www.energy.gov.on.ca/en/conservation-first/

PowerStream will continue to develop this project toward a targeted completion date of spring 2017.

3. Add Switching Facilities at the Holland Station Site

To enable load security criteria to be substantially met in Northern York Region and to complete the integration of local peaking generation at York Energy Centre ("YEC"), Hydro One is developing switching facilities at the Holland station site. This project has the added benefit of increasing the load meeting capability ("LMC") of the Claireville-to-Minden transmission system and enabling the connection of the new Vaughan #4 MTS (recommendation #2 above) without major new transmission expansion. Hydro One will continue to develop this project toward a targeted completion date of spring 2017.

4. Install In-Line Circuit Switchers on Parkway 230 kV Transmission Line

To enable load security criteria to be substantially met for five stations in Richmond Hill and Vaughan supplying 700 MW of customer demand during peak conditions, Hydro One will develop switching facilities along the Parkway Belt (Highway 407) transmission corridor. This project may also involve enhancements to PowerStream's distribution system to facilitate load transfers between stations once the switching facilities are in place. Hydro One will develop this project toward a completion date of spring 2018.

2.2 The Medium- and Long-Term Plan

In the medium and long term, York Region's electricity system is expected to reach its capacity to supply growth. This is based on forecast projections consistent with municipal growth plans and the province's *Places to Grow Act, 2005*. Beginning in the early to mid 2020s, if actual demand growth is as forecast, there will be a need for major new supply in the Region (see sidebar).

The capacity of the Region's transformer stations ("TS") is expected to be exceeded in the early to mid-2020s. With continued demand growth, the transmission system supplying these stations is also expected to reach its limits by the end of that decade. Planning to address the station capacity needs must be coordinated with the plan to address the long-term transmission system needs, as they are interrelated.

A number of alternatives are possible to meet the Region's long-term needs. While specific solutions do not need to be committed today, it is appropriate to begin work now to gather information, monitor developments, engage the community, and develop alternatives, to support decision-making in the next iteration of the IRRP. This IRRP sets out near-term actions required to ensure that options remain available to address future needs if and when they arise.

Medium- and Long-Term Needs

Based on current planning forecasts, and considering the system reinforcements included in the near-term plan, the capability to supply continued electricity demand growth in the following three areas will be exceeded in the long term:

	Transformer station capability exceeded	Transmission system supply capability exceeded*
Markham	2021-2022	2027-2028 (Parkway-to-Buttonville)
Northern York Region	2023-2024	2029-2030 (Claireville-to-Minden)
Vaughan	2023-2024	

* Needs may arise sooner, depending on location of new stations

Recommended Actions

1. Undertake Community Engagement

Broad community and public engagement, including with local First Nation communities, is essential to development of the long-term plan. It is recommended that engagement involve several phases addressing: public education/awareness of electricity issues, planning, technologies and regulatory requirements; fostering understanding of community growth and its relationship to electricity needs; understanding the pros and cons of various alternatives to meeting long-term needs; and obtaining input on community preferences for various approaches to meeting needs.

To provide input and advice on engagement plans for York Region, the Working Group will establish a Local Advisory Committee ("LAC") consisting of community representatives and stakeholders.

The LDCs will lead engagement activities in their communities, with support from the IESO, beginning in mid-2015 and extending over the next 2-3 years as necessary.

2. Develop Community-Based Solutions

There is the potential for emerging technologies and innovative solutions to address the medium- and long-term needs in York Region. These could include combinations of conservation, district heating, local generation, storage, off-grid solutions, and other emerging technologies. However, before such options can be relied upon to address regional capacity needs, it is necessary to identify potential opportunities in the Region, to test the performance of emerging technologies, and to demonstrate how combinations of community-based solutions can be integrated, or "bundled," to provide firm capacity resources at a local level. In addition, cost responsibility and payment mechanisms for solutions that are more costly than traditional supply options will need to be assessed. PowerStream and Newmarket-Tay Power will implement pilot projects to test a variety of innovative solutions in the next 2-3 years (see Section 8.1.3 for examples). The results of these pilots will be an important input to the medium/long-term plan for York Region and will be considered in the next iteration of the York Region IRRP.

3. Continue Ongoing Work to Establish Joint-use Transmission/Transportation Corridor through Peel, Halton Hills, and Northern Vaughan

The Ministry of Transportation ("MTO") recently began Phase 2 of an EA process to establish a new 400-series highway corridor running from the Highway 401/407 junction near Milton to Highway 400 in northern Vaughan. The IESO and Hydro One have been working with MTO and municipal government staff to establish a future transmission corridor in the general vicinity of this highway, consistent with direction on coordinated and efficient use of land, resources, infrastructure and public service facilities in Ontario communities, outlined in the Provincial Policy Statement ("PPS").

In addition, the transmission corridor would be well situated to provide long-term supply capacity for northern Halton, northern Peel, and York Region in the long term, and also enhance the capability of the West GTA Region bulk supply system.

To ensure the viability of this option, the IESO will continue to work with Hydro One and relevant municipal, regional and provincial entities to plan this long-term strategic asset.

4. Monitor Demand Growth, Conservation Achievement and Distributed Generation Uptake

On an annual basis, the IESO, with the Working Group, will review conservation and demand management ("CDM") achievement, the uptake of provincial distributed generation projects, and actual demand growth in York Region. This information will be used to track the expected timing of long-term needs to determine when decisions on the long-term plan are required. Information on conservation and DG performance will also provide useful input into the ongoing development of these options as potential long-term solutions.

5. Initiate the Next Regional Planning Cycle Early, if Needed

Based on current forecasts and CDM assumptions, and considering the lead time necessary to develop options for meeting needs, it is anticipated that the next medium- and long-term supply plan for York Region may need to be developed by 2018. If so, it will be necessary to initiate the next iteration of the regional planning process for York Region as early as 2017. However, if monitoring activities indicate that actual net load growth has slowed to the extent that planning decisions can be deferred, then the next cycle can be started later, possibly up to the usual 5-year IRRP review timeframe.

3. Development of the IRRP

3.1 The Regional Planning Process

In Ontario, planning to meet the electricity needs of customers at a regional level is done through regional planning. Regional planning assesses the interrelated needs of a Region - defined by common electricity supply infrastructure over the near, medium and long term, and develops a plan to ensure cost-effective, reliable, electricity supply. Regional plans consider the existing electricity infrastructure in an area, forecast growth and customer reliability, evaluate options for addressing needs, and recommend actions.

Regional planning has been conducted on an as needed basis in Ontario for many years. Most recently, the Ontario Power Authority ("OPA") carried out regional planning activities to address regional electricity supply needs. The OPA conducted joint regional planning studies with distributors, transmitters, the IESO, and communities and stakeholders in regions where a need for coordinated regional planning had been identified.

In 2012, the Ontario Energy Board convened the Planning Process Working Group ("PPWG") to develop a more structured, transparent, and systematic regional planning process. This group was composed of industry stakeholders including electricity agencies, utilities, and stakeholders. In May 2013, the PPWG released the Working Group Report to the Board, setting out the new regional planning process. Twenty-one electricity planning regions in the province were identified in the Working Group Report and a phased schedule for completion of regional planning was outlined. The Board endorsed the Working Group Report and formalized the process timelines through changes to the Transmission System Code and Distribution System Code in August 2013, as well as through changes to the OPA's licence in October 2013. The OPA licence changes required it to lead a number of aspects of regional planning, including the completion of comprehensive IRRPs. Following the merger of the IESO and the OPA on January 1, 2015, the regional planning responsibilities identified in the OPA's licence became responsibilities of the new IESO.

The regional planning process begins with a Needs Assessment process performed by the transmitter, which determines whether there are electricity needs requiring regional coordination. If regional planning is required, the IESO then conducts a Scoping Assessment process to determine whether a comprehensive IRRP is required, which considers conservation, generation, transmission, and distribution solutions, or whether a straightforward "wires" solution is the only option. If the latter applies, then a transmission and distribution focused Regional Infrastructure Plan is required. The Scoping Assessment process also identifies any sub-regions that require assessment. There may also be regions where infrastructure investments do not require regional coordination and can be planned directly by the distributor and transmitter, outside of the regional planning process. At the conclusion of the Scoping Assessment, the IESO produces a report that includes the results of the Scoping Assessment process – identifying whether an IRRP, RIP or no regional coordination is required - and a preliminary Terms of Reference. If an IRRP is the identified outcome, then the IESO is required to complete the IRRP within 18 months. If a RIP is required, the transmitter takes the lead and is required to complete the plan within six months. Both RIPs and IRRPs are to be updated at least every five years.

The final IRRPs and RIPs are to be posted on the IESO and relevant transmitter websites, and can be used as supporting evidence in a rate hearing or Leave to Construct application for specific infrastructure investments. These documents may also be used by municipalities for planning purposes and by other parties to better understand local electricity growth, conservation opportunities, and infrastructure requirements.

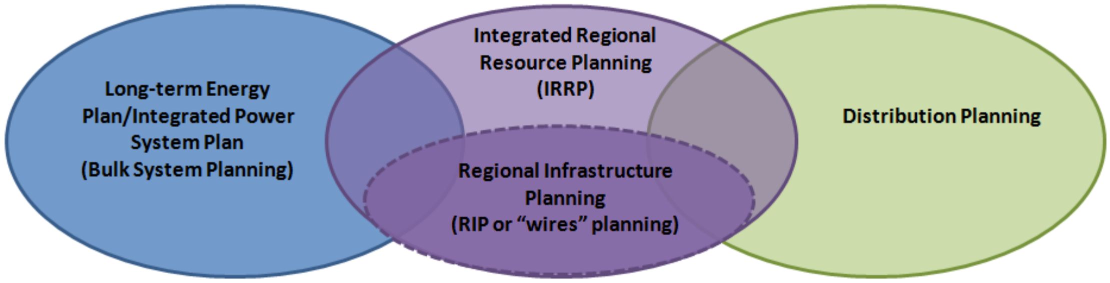
Regional planning, as shown in Figure 3-1, is just one form of electricity planning that is undertaken in Ontario. There are three types of electricity planning in Ontario:

- Bulk system planning
- Regional system planning
- Distribution system planning

Planning at the bulk system level typically considers the 230 kilovolt ("kV") and 500 kV transmission network. Bulk system planning considers the major transmission facilities and assesses the resources needed to adequately supply the province. Bulk system planning is carried out by the IESO. Distribution planning, which is carried out by LDCs, looks at specific investments on the low voltage, distribution system.

Regional planning can overlap with bulk system planning. For example, overlap can occur at interface points where regional resource options may also address a bulk system issue. Similarly, regional planning can overlap with the distribution planning of LDCs. An example of this is when a distribution solution addresses the needs of the broader local area or region. Therefore, to ensure efficiency and cost effectiveness, it is important for regional planning to be coordinated with both bulk and distribution system planning.

Figure 3-1: Levels of Electricity System Planning



Bulk System Planning

- 500 kV & 230 kV transmission
- Interconnections
- Inter-area network transfer capability
- System reliability (security and adequacy) to meet NERC, NPCC, ORTAC
- Congestion and system efficiency
- System supply and demand forecasts
- Incorporation of large generation
- Typically medium- and long-term focused

Regional Planning

- 230 kV & 115 kV transmission
- 115/230 kV autotransformers and associated switchyard facilities
- Customer connections
- Load supply stations
- Regional reliability (security and adequacy) to meet NERC, NPCC & ORTAC
- ORTAC local area reliability criteria
- Regional/local area generation & CDM resources
- Typically near- & medium-term focused

Distribution Network Planning

- Transformer stations to connect to the transmission system
- Distribution network planning (e.g. new & modified Dx facilities)
- Distribution system reliability (capacity & security)
- Distribution connected generation & CDM resources
- LDC demand forecasts
- Near- & medium-term focused

By recognizing the linkages with bulk and distribution system planning, and coordinating multiple needs identified within a given region over the long term, the regional planning process provides an integrated assessment of needs. Regional planning aligns near and long-term solutions and allows specific investments recommended in the plan to be understood as part of a larger context. Furthermore, regional planning optimizes ratepayer interests by avoiding piecemeal planning and asset duplication, and allows Ontario ratepayers' interests to be represented along with the interests of LDC ratepayers. Where IRRPs are undertaken, they allow an evaluation of the multiple options available to meet needs, including conservation, generation, and "wires" solutions. Regional plans also provide greater transparency through engagement in the planning process, and by making plans available to the public.

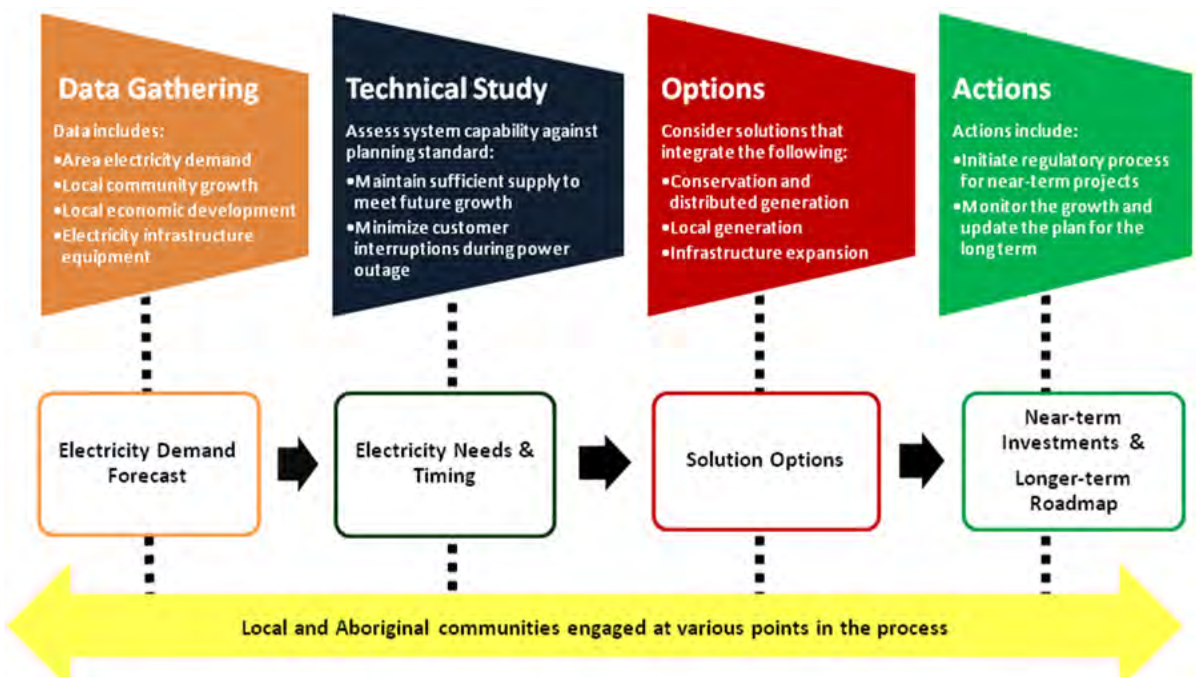
3.2 The IESO's Approach to Regional Planning

IRRPs assess electricity system needs for a region over a 20-year period. The 20-year outlook anticipates long-term trends so that near-term actions are developed within the context of a longer-term view. This enables coordination and consistency with the long-term plan, rather than simply reacting to immediate needs.

In developing an IRRP, a different approach is taken to developing the plan for the first 10 years of the plan—the near- and medium-term—than for the longer-term period of 10-20 years. The plan for the first 10 years is developed based on best available information on demand, conservation, and other local developments. Given the long lead time to develop electricity infrastructure, near-term electricity needs require prompt action to enable the specified solutions in a timely manner. By contrast, the long-term plan is characterized by greater forecast uncertainty and longer development lead time; as such solutions do not need to be committed to immediately. Given the potential for changing conditions and technological development, the IRRP for the long term is more directional, focusing on developing and maintaining the viability of options for the future, and continuing to monitor demand forecast scenarios.

In developing an IRRP, the IESO and the Working Group (see Figure 3-2 below) carry out a number of steps. These steps include electricity demand forecasts; technical studies to determine electricity needs and the timing of these needs; the development of potential options; and, a recommended plan including actions for the near and long term. Throughout this process, engagement is carried out with stakeholders and First Nation and Métis communities who may have an interest in the area. The steps of an IRRP are illustrated in Figure 3-2 below.

Figure 3-2: Steps in the IRRP Process



The IRRP report documents the inputs, findings and recommendations developed through the process described above, and provides recommended actions for the various entities responsible for plan implementation. Where "wires" solutions are included in the plan recommendations, the completion of the IRRP report is the trigger for the transmitter to initiate an RIP process to develop those options. Other actions may involve: development of conservation, local generation, or other solutions; community engagement; or information gathering to support future iterations of the regional planning process in the Region.

3.3 York Region Working Group and IRRP Development

The York Region IRRP process was commenced by the former OPA in 2011 in response to a request by PowerStream. At the time, PowerStream forecast that significant demand growth in its Southern York Region service would exceed the area's supply infrastructure and proposed that a joint integrated planning study be commenced that would also update a 2005 study that had been completed in Northern York Region (see Section 4.2). The OPA agreed that a coordinated, integrated approach was appropriate, and led the establishment of a technical Working Group ("the Working Group") consisting of representatives from the OPA, the IESO, PowerStream, Newmarket-Tay Power, Hydro One Distribution, and Hydro One Transmission. The OPA also developed Terms of Reference for the study.[5] The Working Group gathered data, identified near-, medium- and long-term needs in the Region, and recommended the near-term solutions included in this IRRP. Implementation began in 2012/2013 with the OPA issuing letters supporting the near-term projects so that they could be commenced immediately in order to be in-service in time to address imminent needs.[6]

This York Region IRRP is therefore a transitional IRRP in that it began prior to the development of the OEB's regional planning process and much of the work was completed before the new process and its requirements were known. When the regional planning process was formalized by the OEB in 2013, the Working Group revised the Terms of Reference to reflect the new process and updated the study information, including demand forecasts, and conservation and distributed generation data.[7] With this updated information, the Working Group reconfirmed

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[5] Original Terms of Reference:
http://www.ieso.ca/Documents/Regional-Planning/GTA_North/York-Terms-of-Reference.pdf
[6] OPA letter to Hydro One:
http://www.ieso.ca/Documents/Regional-Planning/GTA_North/OPA-Letter-Hydro-One-York-Subregion.pdf
OPA letter to PowerStream:
http://www.ieso.ca/Documents/Regional-Planning/GTA_North/Vaughan4%20MTS%20Letter%20-2012-12-14.pdf
[7] Revised August 2014 Terms of Reference:
http://www.ieso.ca/Documents/Regional-Planning/GTA_North/York-TOR-Addendum.pdf

the near-term needs revised the near-term plan and developed recommendations for the medium- and long-term plan. This IRRP reflects this revised and updated information.

4. Background and Study Scope

This report presents an integrated regional electricity plan for York Region for the 20-year period from 2014 to 2033. The planning process leading to this IRRP began in 2011, in recognition of the need for continued planning updates following the implementation of a 2005 integrated regional electricity plan for Northern York Region, and additional developments in the Region. These developments include the economic downturn of 2008/2009 and subsequent demand recovery, the adoption of widespread provincial DG programs such as FIT and microFIT, and demand growth in Southern York Region that was expected to exceed the existing infrastructure capability.

To set the context for this IRRP, the scope of this IRRP and the Region's existing electricity system are described in Section 4.1, and the recommendations and implementation of the 2005 Northern York Region plan are summarized in Section 4.2.

4.1 Study Scope

The scope of this plan roughly corresponds to the Regional Municipality of York,[8] which is located in the northern GTA. The electricity infrastructure supplying this area is shown in Figure 4-1. Customers in York Region are supplied from transformer stations connected to a 230 kV transmission network that is supplied primarily from three major 500/230 kV transformer stations: Claireville, Parkway, and Cherrywood. In addition, York Energy Centre, a peaking resource consisting of two 180 MW simple cycle gas generation units, provides a local supply source in Northern York Region.

For the purposes of electricity planning, York Region can be considered two sub-systems: Northern York Region and Southern York Region (see Figure 4-1).

Northern York Region includes the municipalities of Aurora, Newmarket, King, East Gwillimbury, Whitchurch-Stouffville and Georgina, and the Chippewas of Georgina Island First Nation. Retail electricity customers in this area are served by PowerStream, Newmarket-

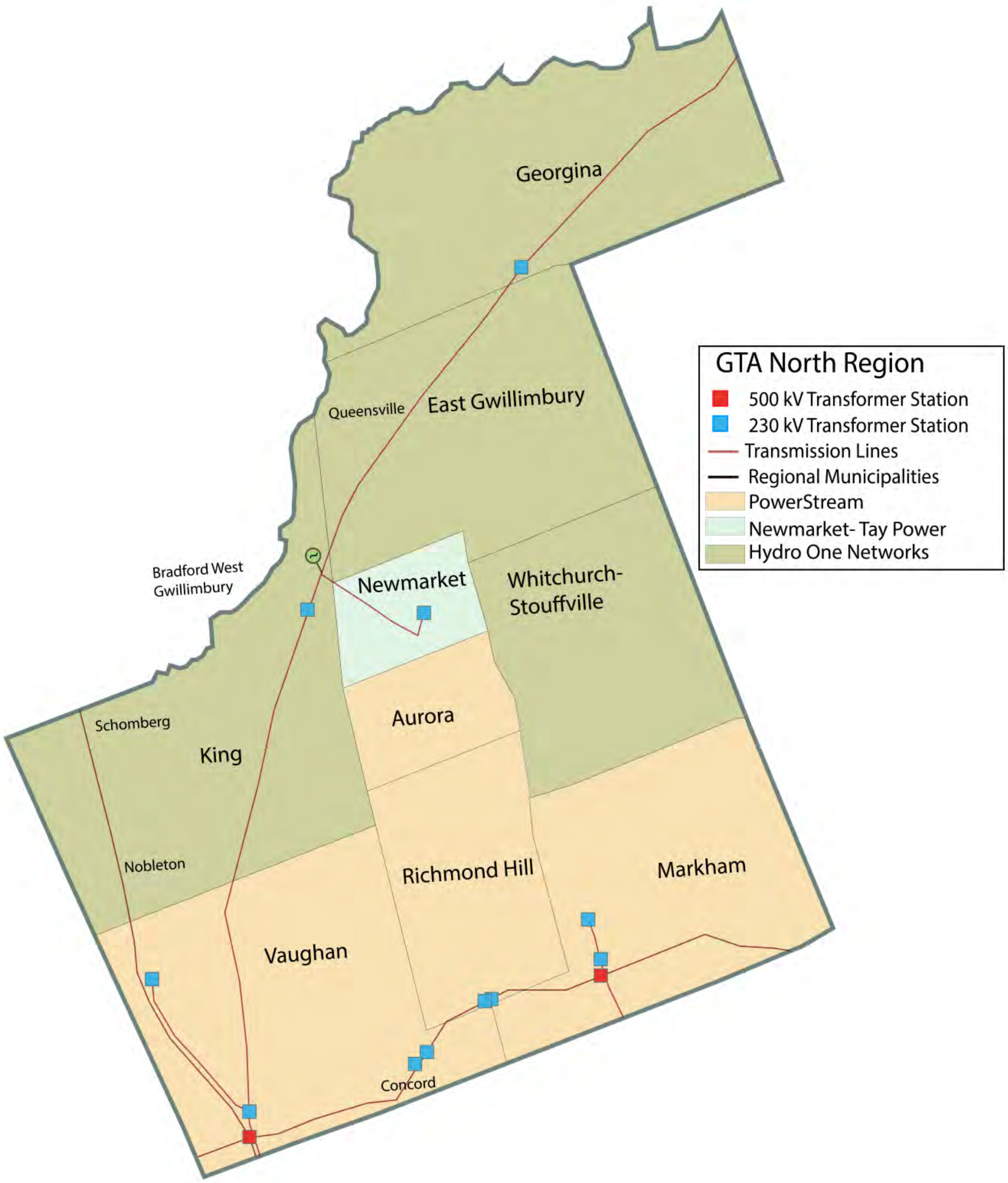
[8] For the purposes of this report, the term "York Region" refers to the electricity supply area that is the subject of this plan. This area roughly corresponds to the Regional Municipality of York boundaries, however as the electricity system was not developed along municipal boundaries there are some exceptions. As a result, customers in some areas near the boundaries of York Region are supplied from infrastructure outside the scope of this study (e.g., parts of Georgina are supplied from infrastructure further north), and some customers in Durham and Simcoe Regions are supplied from the York Region infrastructure. In addition, the Claireville-to-Kleinburg line is being studied as part of the GTA West Region and is thus not included in this IRRP.

Tay Power and Hydro One Distribution (see Figure 4-2). Transmission supply is from three transformer stations—Armitage, Holland and Brown Hill—that are connected to two 230 kV circuits, B82/83V, which originate at the Claireville station and extend northward towards Minden. These stations also supply some load that is outside the municipal boundary of York Region (e.g., the Holland station serves loads in the southeastern part of Simcoe County).

Figure 4-1: York Region Electricity Infrastructure

Southern York Region, which includes the municipalities of Vaughan, Richmond Hill, and Markham, is served at the distribution level by PowerStream through feeders supplied primarily from several transformer stations connected to 230 kV transmission lines that follow the Highway 407 corridor, known as the "Parkway Belt". In addition, some load is supplied from transformer stations along the Richview-Cherrywood 230 kV corridor further south. These stations are shared with other LDCs serving other parts of the GTA and are not part of the scope of this study.

Figure 4-2: Local Distribution Companies Supplying Customers in York Region

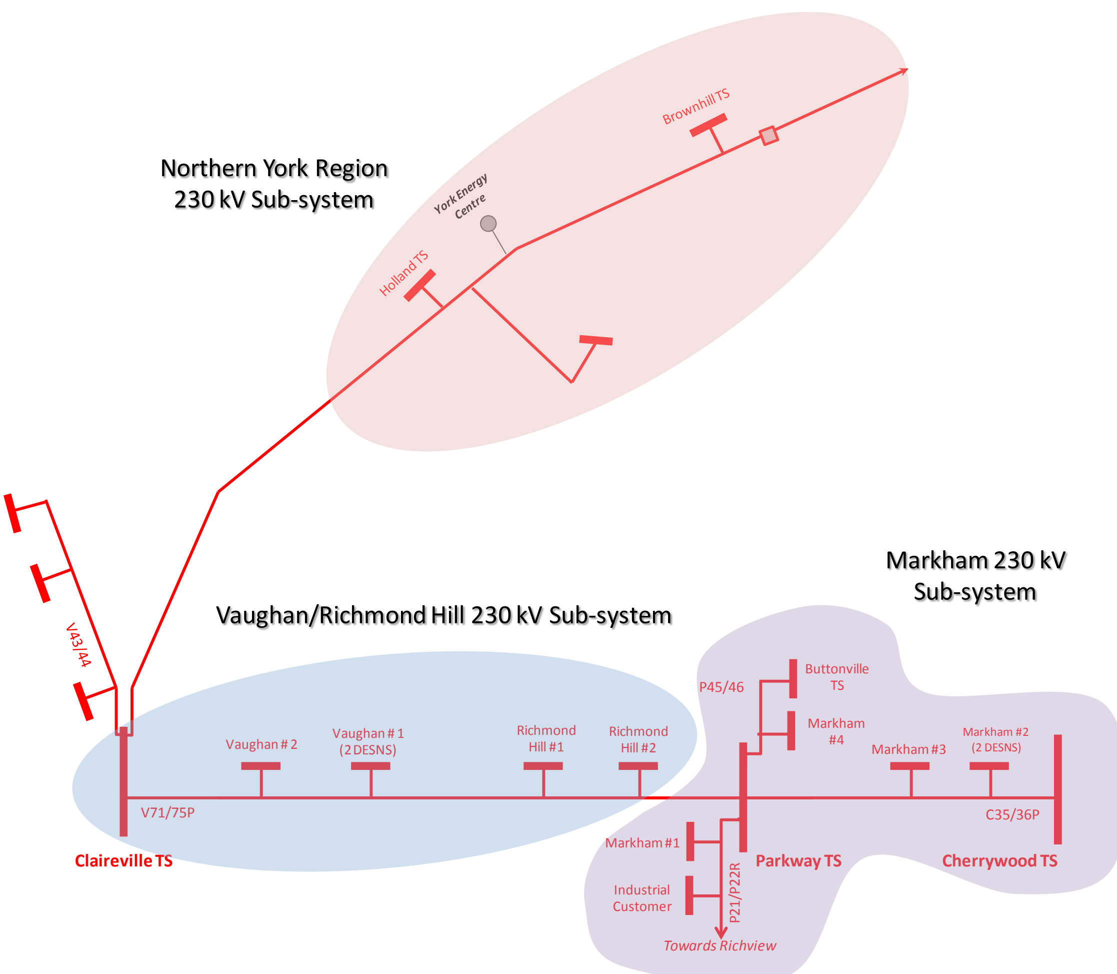


Although it is located within York Region, the Claireville-to-Kleinburg line is not included in the York Region IRRP study scope. This radial transmission line is being studied as part of the GTA West Region, as a substantial portion of the customer loads supplied from this line are located in that region. The Vaughan #3, Woodbridge and Kleinburg stations, which are connected to this line, are similarly not in scope for this IRRP.

To facilitate identification of transmission system needs based on system configuration, Southern York Region was further sub-divided in this study into two areas of focus: Vaughan/Richmond Hill and Markham. The specific electricity infrastructure supplying the resulting three sub-areas—Northern York Region, Vaughan/Richmond Hill, and Markham—are indicated in Figure 4-3.

To assess station capacity, slightly different sub-areas were defined that reflect the capability of the distribution system to transfer between stations (see Appendix B.1).

Figure 4-3: York Region Sub-Areas



* The figure is not drawn to scale

4.2 2005 Northern York Region Electricity Planning Study

In 2005, in response to a letter of direction from the OEB, the OPA led the development of an integrated planning study for Northern York Region.[9] At the time, the electricity supply infrastructure to this area had reached its limits and there was an urgent need to address customer reliability resulting from strong demand growth in Northern York Region. The planning study considered transmission, distribution, generation, and conservation solutions, and was developed with input from local stakeholders.

The resulting 2005 Northern York Region plan recommended six actions. The recommendations and their implementation status are summarized in Table 4-1.

Table 4-1: 2005 Northern York Region Integrated Plan Recommendations

Recommended Action	Implementation Status
1. Add capacitors at the Armitage TS	Completed
2. Install temporary emergency load transfer capability	Completed
3. Contract conservation resources	20 MW demand response procured (5-year term); provincial conservation efforts (ongoing)
4. Construct new Holland TS	In-service June 2009
5. Procure gas-fired generation	York Energy Centre in-service spring 2012; 230 kV switching not yet implemented
6. Plan a fourth TS to supply continued demand growth	Not yet implemented; has not been needed to date

These actions, with the exceptions noted in Table 4-1, have provided an adequate and reliable supply of electricity to Northern York Region for the last decade. The addition of a fourth TS, originally forecast to be needed in 2012, has not yet been required due to slower demand growth in Northern York Region.

A final step in the integration of YEC is the addition of 230 kV switching facilities. This action was not completed at the time YEC was developed as it was necessary to delay the facilities' design and location until the final connection details for YEC were known. When the current

[9] http://www.powerauthority.on.ca/integrated-power-system-plan/york-Region-final-recommendation-september-2005

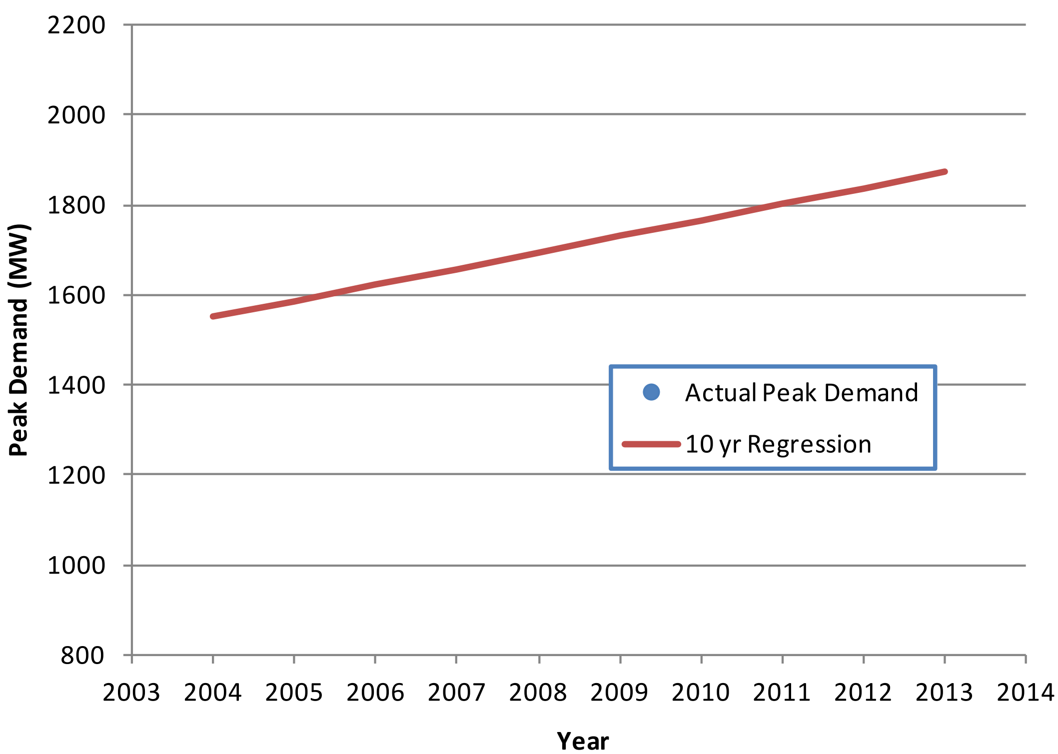
IRRP was initiated in 2011, the Working Group agreed to consider this requirement within the context and scope of the broader regional needs identified through the IRRP process.

5. Demand Forecast

5.1 Historical Demand

Over the past 10 years, York Region has experienced strong growth in electricity demand. Figure 5-1 shows the historical summer peak demand observed in the Region from 2004 to 2013. A noticeable peak in 2006 is coincident with the all-time peak in Ontario power demand, while a decline in demand in 2008 and 2009 shows the area's response to the global recession and cooler than average summer temperatures. By 2011, demand in the area exceeded pre-recession levels as a result of continued growth in the Region, and hotter than average temperatures. Over this period, electricity demand in York Region grew on average by 2.1% per year, adding over 320 MW of new electricity demand growth in 10 years.

Figure 5-1: Historical Electricity Demand in York Region



As discussed in Section 4.1, York Region can be viewed as three distinct sub-areas to facilitate understanding of load growth and system constraints that drive needs in the Region: Vaughan/ Richmond Hill, Markham, and Northern York Region. Over the past eight years, each region has experienced similar load trends, characterized by steady growth to 2006, a noticeable dip in 2008 and 2009, and a return to pre-recession load levels by 2010. In terms of overall demand, Vaughan/Richmond Hill experienced the largest increase, adding approximately 170 MW since 2004, producing an average annual growth rate of 2.4% per year. This is equivalent to the amount of load supplied by a typical transformer station. Over the same time period, Markham and Northern York Region added approximately 80 MW and 75 MW of peak demand, reflecting average annual growth rates of 1.8% and 2.0%, respectively.

The areas with the highest growth in demand were the four regional Centres: Vaughan Metropolitan Centre, Richmond Hill/Langstaff Gateway Centre, Markham Centre, and Newmarket Centre.[10] At the same time, land re-zoning and associated new development have pushed the urban boundaries of Vaughan, Richmond Hill, and Markham increasingly northward.

5.2 Demand Forecast Methodology

Regional electricity needs are driven by the limits of the infrastructure supplying an area, which is sized to meet peak demand requirements. Therefore, regional planning typically focuses on growth in regional-coincident peak demand. Energy adequacy is usually not a concern of regional planning, as the region can generally draw upon energy available from the provincial electricity grid and provincial energy adequacy is planned through a separate process.

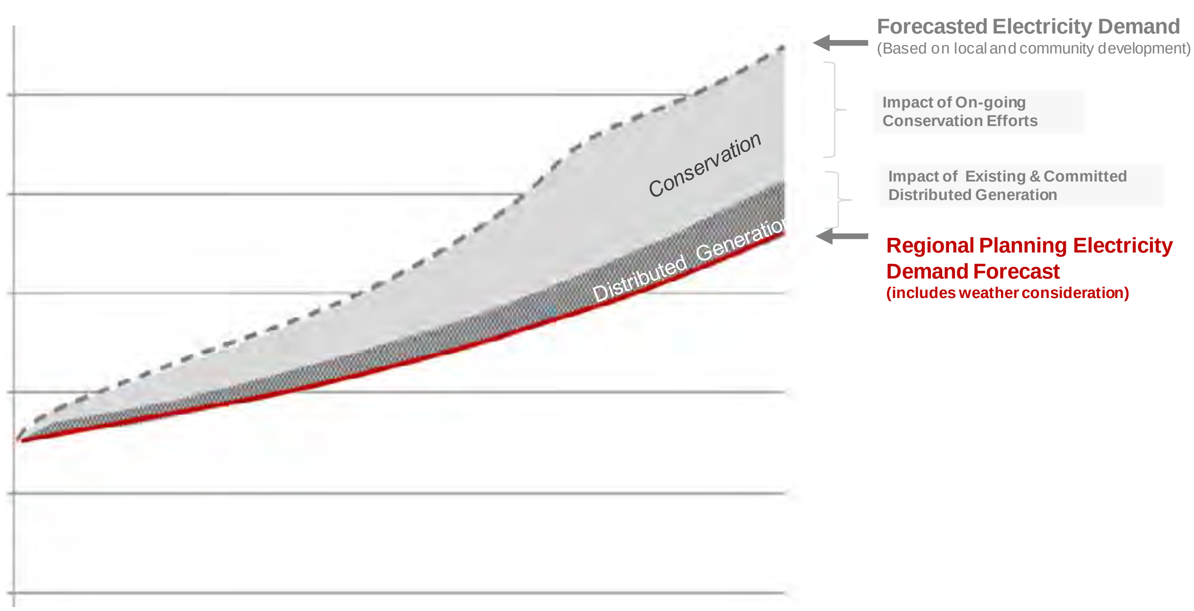
For the near and medium term, from 2014 to 2023, a regional peak demand forecast was developed as shown in Figure 5-2. Gross demand forecasts, assuming normal-year weather conditions, were provided by the LDCs. The LDCs' forecasts are based on growth projections included in regional and municipal plans, which in turn reflect the province's Places to Grow policy. These forecasts were then modified to produce a planning forecast — i.e., they were adjusted to reflect the peak demand impacts of provincial conservation targets and DG contracted through provincial programs such as FIT and microFIT and to reflect extreme

[10] York Region, Vision 2051 http://www.york.ca/wps/wcm/connect/yorkpublic/a6d9d1ce-0813-4376-a593-daccf2b7fd6e/vision+2051.pdf?MOD=AJPERES

weather conditions. The planning forecast was then used to assess any growth-related electricity needs in the Region.

Using a planning forecast that is net of provincial conservation targets is consistent with the province's Conservation First policy. However, this assumes that the targets will be met and that the targets, which are energy-based, will produce the expected local peak demand impacts. An important aspect of plan implementation will be monitoring the actual peak demand impacts of conservation programs delivered by the local LDCs and, as necessary, adapting the plan.

Figure 5-2: Development of Demand Forecasts



For the long-term outlook, from 2024 to 2033, two demand forecast scenarios were developed to reflect the greater uncertainty associated with forecasting this far into the future.

A higher-growth scenario was developed to reflect continued development in York Region consistent with the projections associated with the province's Places to Grow policy. This forecast scenario is also consistent with the growth assumptions associated with the long-term municipal plan projections. As with the near-term forecast, the provincial conservation targets up to 2033 are deducted from the gross demand projections to produce a planning forecast net of conservation.

A lower-growth scenario was developed consistent with the growth assumptions embodied in the government's LTEP. The low-growth scenario represents a future with lower electricity demand growth, due to higher electricity prices, increased electricity conservation, and lower energy intensity of the economy.

Additional details related to the development of the demand forecasts are provided in Appendix A.

5.3 Gross Demand Forecast

For the purposes of this study, each of the three LDCs serving the York Region study area prepared a summer peak demand forecast over the 20-year planning horizon. Information on known developments expected to contribute to demand growth in each service territory was included in the near-term portion of the forecast, while general trends expected for future growth were used for the later years. These gross demand forecasts were developed under coincident, median-weather assumptions, and then adjusted to extreme weather conditions by the IESO.

Overall, strong growth is expected to continue throughout York Region. Based on the LDCs' gross demand forecasts, the entire study area is expected to grow by over 1,000 MW of peak demand over the next 20 years, with an average annual growth rate of 2.5%, not including the impacts of conservation or DG. On a sub-area basis, Vaughan/Richmond Hill and Markham are expected to see the most growth with 397 MW and 422 MW of gross demand growth forecast between 2014 and 2033, reflecting average annual growth rates of 2.1% and 3.1%, respectively. Northern York Region is expected to add 264 MW, growing at approximately 2.3% per year.

The continued high growth shown in these forecasts are consistent with the *Places to Grow Growth Plan for the Greater Golden Horseshoe* (2013 consolidation),[11] which projects an additional 557,000 people living in York Region in 2031 compared to 2011. This represents an average annual population increase of 2.2%, per year, though population growth cannot be directly correlated to growth in electricity demand. Other factors, such as the presence of new or intensified commercial areas, and saturation of high-energy-consuming end uses such as air conditioning, substantially contribute to demand for electricity during peak summer hours.

[11] https://www.placestogrow.ca/index.php?option=com_content&task=view&id=359&Itemid=12

York Region's Vision document projects that the growing population will largely drive development in the Region's urban areas, including the four regional centres of Vaughan, Richmond Hill/Langstaff Gateway, Markham and Newmarket, as well as the regional corridors of Yonge Street, Highway 7, and portions of Davis Drive and Green Lane.

While LDC information is considered the most reliable for producing location-specific near-term forecasts, longer-term forecasts carry greater uncertainty. In order to test a range of potential outcomes for the long term, the IESO produced a regional forecast scenario based on provincial growth factors and related planning initiatives, including the conservation targets described in the 2013 LTEP, (see Conservation Section 5.4, below as an alternate scenario). This forecast scenario projects growth rates on a regional, rather than station basis. These growth rates were applied across the study area beginning in 2023 to produce an alternate long-term forecast.

The gross demand forecasts for each station are provided in Appendix A.1.4.

5.4 Conservation Assumed in the Forecast

Conservation plays a key role in maximizing the useful life of existing infrastructure and maintaining reliable supply. Conservation is achieved through a mix of program-related activities including behavioral changes by customers and mandated efficiencies from building codes and equipment standards. These approaches complement each other to maximize conservation results. The conservation savings forecast for York Region have been applied to the gross peak demand forecast, along with DG resources, to determine the net peak demand for the Region.

In December 2013 the Ministry of Energy released a revised LTEP, which outlined a provincial conservation target of 30 TWh of energy savings by 2032. In order to represent the effect of these targets within regional planning, the IESO developed an annual forecast for peak demand savings based on the provincial energy savings target, which it expressed as a percentage of demand in each year. These percentages were applied to the LDCs' demand forecasts to develop an estimate of the peak demand impacts from the provincial targets in York Region. The resulting conservation assumed in the high-growth scenario is shown in Table 5-1. The above conservation forecast methodology was not applied in developing the low-growth forecast scenario. This is because the low-growth scenario already accounts for the anticipated impact of the 2032 conservation targets in its overall growth rate assumptions. Additional conservation forecast details are provided in Appendix A.2.

Table 5-1: Peak Demand Savings from 2013 LTEP Conservation Targets in York Region

Year	2015	2017	2019	2021	2023	2025	2027	2029	2031	2033
Savings (MW)	26	43	87	133	171	217	264	312	363	396

It is assumed that existing demand response ("DR") resources already accounted for in the base year will continue. Savings from potential future DR resources are not included in the forecast and are instead considered as possible solutions to identified needs.

5.5 Distributed Generation Assumed in the Forecast

In addition to conservation resources, DG in York Region is also anticipated to offset peak demand requirements. The introduction of the *Green Energy and Green Economy Act, 2009*, and the associated development of Ontario's FIT program, has increased the significance of distributed renewable generation in Ontario. This generation, while intermittent in nature, contributes to meeting the electricity demands of the province.

In developing the planning forecast, the effects of DG contracted but not yet in service in the Region as of February 2014, the latest information available when the forecast was developed, were included. The effects of projects that were already in-service by 2013 were not included as they are already embedded in the actual demand which is the starting point for the forecast. Future DG uptake was not included and is instead considered as an option for meeting identified needs.

Province-wide, as of February 2014, the date when the forecast assumptions were developed, the FIT program had contracted over 4,500 MW of new renewable generation. Within the York Region study area, a total of 70 MW of FIT applications had active contracts as of February 2014, all from solar photovoltaic ("PV") technologies. The installed capacity of these generation resources were adjusted to the expected solar output at the time of summer peak, which amounts to 34% of the total installed capacity. This is based on the solar capacity contribution values obtained from the IESO's 2014 Methodology to Perform Long Term Assessments.[12]

Each project's capacity contribution was subtracted from the peak demand at the TS to which it was connected, beginning in the project's anticipated in-service year. Additionally, only contracted projects which were not yet in service during the base year were accounted for in forecasts. This was done since LDCs relied on observed peak to build their forecasts, and actual demand would have already been affected by any in service DG projects.

In addition to renewable energy projects contracted through the FIT program, over 5 MW of Combined Heat and Power ("CHP") projects were accounted for in the forecast, as acquired through the OPA CHPSOP program. These projects were assumed to have a 100% capacity factor. Keele Valley Generating Station ("GS"), a landfill gas generation facility in York Region, was not included in the forecast as its fuel supply is diminishing. Moreover, as it is an existing distributed generation facility, its contribution to peak demand is embedded in actual demand data.

Additional details of the regional demand reductions from province-wide DG programs are provided in Appendix A.3.

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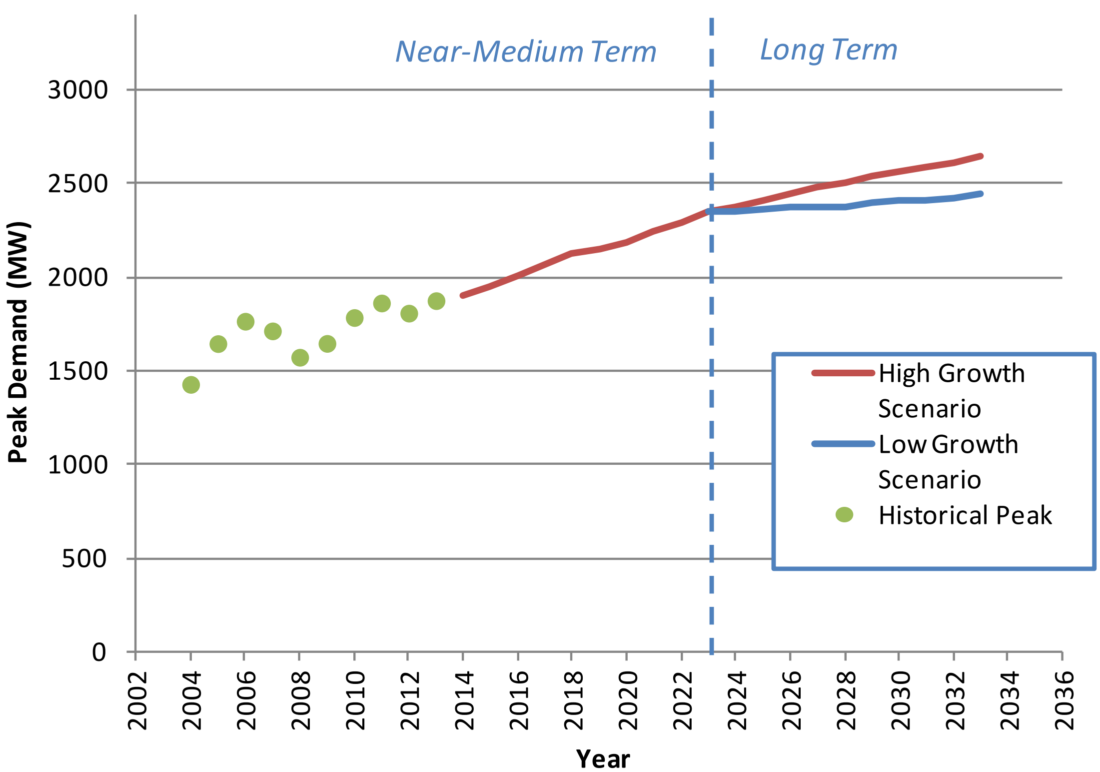
[12] See http://www.ieso.ca/Documents/marketReports/Methodology_RTAA_2014feb.pdf , page 16.

5.6 Planning Forecasts

After taking into consideration the combined impacts of conservation and DG, a 20-year planning forecast was produced based on the LDCs' demand forecasts which includes both a high-growth forecast which takes into consideration the Places to Grow growth plan, and a second low-growth net demand forecast considers the provincial LTEP. The final forecasts were also adjusted to account for typical station loading and operational practice, as defined by PowerStream.

Figure 5-3 shows the high-growth and low-growth forecast scenarios, along with historic demand in the area.

Figure 5-3: York Region Planning Forecast



The high-growth forecast assumes a total of 396 MW of new savings from conservation targets across York Region over the next 20 years. Combined with the effects of DG and existing conservation programs, the high-growth forecast assumes 40% of anticipated load growth is met through these measures, reducing the average annual growth rate from 2.5% to 1.8%.

Under the low-growth scenario, which includes conservation impacts in its underlying growth assumptions, the longer-term net growth rate averages 0.4% per year from 2024 to 2033.

Further details of the planning forecast scenarios are provided in Appendix A.4.

6. Needs

Based on the demand forecasts, system capability, and application of provincial planning criteria, the York Region Working Group identified electricity needs in the near, medium and long term. This section describes the identified needs for these three time horizons in York Region.

6.1 Need Assessment Methodology

Provincial planning criteria were applied to assess the capability of the existing electricity system to supply forecast electricity demand growth in York Region over the next 20 years. These criteria are discussed in Section 6.1.1 below. The practical application of these criteria to identify three broad categories of needs was conducted as follows:

- Step-down station capacity needs were identified by comparing forecast demand growth in three sub-areas (Northern York Region, Vaughan/Richmond Hill, and Markham) to the 10-day Limited Time Rating ("LTR"), or thermal capacity, of the existing stations in the area, to determine the net incremental requirement for transformation capacity in each sub-area. This was done at the sub-area rather than the TS level in recognition of the capability of the distribution system to transfer loads among nearby stations. The three sub-areas were defined to reflect this capability (see Appendix B.1).
- Supply capacity requirements were assessed using PSS/E, a power flow simulation tool, to analyze the capability of the existing system, including transmission and local generation infrastructure, to supply load growth. Technical system assumptions used in the power flow studies are detailed in Appendix B.2.
- Provincial criteria were applied to identify areas with a need to address the impacts of potential major supply interruptions. The amount of customer load supplied from specific circuits before and after potential major outages, and the capability to restore interrupted loads following a major outage, either through transmission system switching or transfers on the distribution system, were assessed in accordance with these criteria.

6.1.1 Ontario Resource and Transmission Assessment Criteria

The IESO's ORTAC,[13] the provincial standard for assessing the reliability of the transmission system, was applied to assess supply capacity and reliability needs.

ORTAC includes criteria related to assessment of the bulk transmission system, as well as the assessment of local or regional reliability requirements. The latter criteria are of relevance to this study and guided the technical studies performed in assessing the electricity system needs in York Region. They can be broadly categorized as addressing two distinct aspects of reliability: (1) providing supply capacity, and (2) limiting the impact of supply interruptions.

With respect to supply capability, ORTAC specifies that the transmission system must be able to provide continuous supply to a local area under specific transmission and generation outage scenarios. The performance of the system in meeting these conditions is used to determine the load meeting capability (LMC) of an area for the purpose of regional planning. The LMC is the maximum load that can be supplied in the local area with no interruptions in supply or, under certain permissible conditions, with limited controlled interruptions as specified by ORTAC. Further details of the application of these criteria to the York Region electricity system are provided in Appendix B.3.1.

With respect to supply interruptions, ORTAC requires that the transmission system be designed to minimize the impact to customers of major outages, such as a contingency on a double-circuit tower line resulting in the loss of both circuits, in two ways: by limiting the amount of customer load affected; and by restoring power to affected load within a reasonable timeframe. Specifically, ORTAC requires that no more than 600 MW of load be interrupted in the event of a major outage involving two elements. Further, load lost during a major outage is to be restored within the following timeframes:

- All load lost in excess of 250 MW must be restored within 30 minutes;
- All load lost in excess of 150 MW must be restored within four hours; and
- All load lost must be restored within eight hours.

For the load loss and restoration criteria, ORTAC includes provisions whereby a request for exemption may be made to the IESO.

[13] http://www.ieso.ca/imoweb/pubs/marketadmin/imo_req_0041_transmissionassessmentcriteria.pdf

6.2 Near-Term Needs

Several needs have been identified that either exist today, or are forecast to arise within the next five years in York Region. The near-term needs are concentrated in two distinct geographical areas. In Northern York Region and Vaughan, separate capacity and reliability needs have been considered together by the Working Group as it was recognized that they can be addressed through common solutions involving improvements to the 230 kV system running north from Claireville toward Minden. Other needs related to the system configuration of the Parkway Belt, which supplies customer loads in Richmond Hill and Vaughan, are addressed separately. The discussion of near-term needs that follows thus deals with these two areas distinctly.

6.2.1 Claireville-to-Minden System Near-Term Needs

The near-term needs arising in Vaughan and Northern York Region related to the Claireville-to-Minden system are summarized in Table 6-1. These needs are considered together due to common electricity system infrastructure.

Table 6-1: Claireville-to-Minden System Near-Term Electricity Needs

Need		Description	Timing
Transformer Station Capacity		Net demand growth in Vaughan is forecast to exceed the limits of the combined transformer stations in the area, with most new demand growth occurring near the northern boundaries of the City of Vaughan	2017
System Supply Capability		Net peak demand is forecast to exceed the 650 MW supply capability of the transmission system + local generation	2021
Impact of Supply Interruptions	Load Security	Net peak demand is forecast to exceed the ORTAC load security limit of 600 MW	2018
	Restoration	System not capable of meeting ORTAC restoration criteria in Northern York Region	Today

The first three needs—transformer station capacity, supply capability and load security—are each a consequence of forecast demand growth exceeding current system limits.

There is substantial demand growth forecast for the City of Vaughan in the next few years, as land re-zoning toward the northern boundary of the city has created opportunities for development. Based on forecast demand in this area, net of provincial conservation targets and DG, the capability of the existing stations in the Vaughan area will be exceeded in 2017. PowerStream has begun development of a new station in this area, Vaughan #4 MTS, to address this need.

The location of the new station was discussed among the Working Group, and it was agreed that it should connect to the Claireville-to-Minden line, due to the location of demand growth and lack of viable alternatives. Support for this connection location was documented in a letter from the OPA to PowerStream dated December 14, 2012.[14]

With the additional demand growth in Vaughan likely connecting to the Claireville-to-Minden line, a need for supply capacity was identified. To assess this need, the combined demand growth on this system, including the Armitage, Holland and Brown Hill transformer stations as well as the new station in Vaughan, was compared against the supply capability of the existing system. This system consists not only of the Claireville-to-Minden transmission line (B82/83V), but also the York Energy Centre, a local supply source. Based on application of ORTAC criteria to assess thermal and voltage limits, the combined supply capability of this system today is 650 MW, based on thermal limitations (see Appendix B.3.2).

In addition, it is necessary to consider the ORTAC load loss criteria, which specify that no more than 600 MW of load can be interrupted following a major outage involving two transmission elements. As this criterion is more limiting than the supply capability limit described above, the LMC of this system is defined as 600 MW.

Forecast net peak demand on the Claireville-to-Minden line is expected to reach 600 MW in 2018. Moreover, with a new TS planned to connect to this system, it will be necessary to ensure that the system has adequate capability to supply the station. There is therefore a need to increase the LMC on B82/83V to accommodate load growth in the near term, in order to coordinate with the development of additional TS capacity.

In addition to the growth-related needs described above, there is also a need to improve the capability of the system to restore customer loads following a major outage in Northern York

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[14] OPA letter to PowerStream dated December 14, 2012 re: Siting Vaughan #4 MTS: http://www.ieso.ca/Documents/Regional-Planning/GTA_North/Vaughan4%20MTS%20Letter%20-2012-12-14.pdf

Region. Based on current demand levels, in the event of a major outage on the Claireville-to-Minden line, up to 500 MW of peak load in Northern York Region would be interrupted. York Energy Centre can assist with load restoration by providing a local supply source, however, as there are currently no fast-acting isolating devices (e.g., motorized disconnect switches or breakers) on the system that could quickly isolate a fault, the amount of time required to restore loads does not meet ORTAC criteria. Based on current manual fault isolation capability, at least 250 MW of load in Northern York Region does not meet the ORTAC 30-minute restoration criteria today. As demand grows in the area, the severity of this need will increase.

As with any radial line, in the event of a major outage on the Armitage Tap (the approximately 7 km section of B82/83V supplying Armitage TS), options for restoring loads are limited. Using existing distribution ties, about 65 MW of load at Armitage can be restored through transfers to the Holland TS within a 4-hour timeframe. However, about 280 MW of load at the Armitage station would not meet the ORTAC 30-minute or 4-hour restoration criteria. All load can be restored within eight hours by installing a temporary by-pass around the faulted section.

6.2.2 Parkway Belt Near-Term Needs

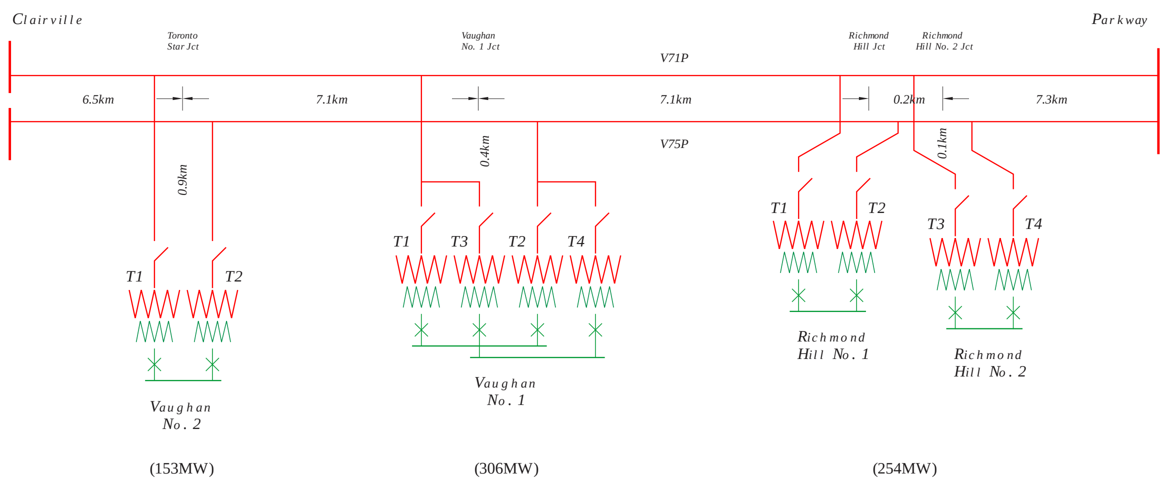
The near-term needs arising in Vaughan and Northern York Region related to the Parkway Belt are summarized in Table 6-2. These needs are considered together due to common electricity system infrastructure.

Table 6-2: Parkway Belt Near-Term Electricity Needs

Need		Description	Timing
Impact of Supply Interruptions	Load Security	Net peak demand exceeds the ORTAC load security limit of 600 MW	Today
	Restoration	System not capable of meeting ORTAC 30-minute criterion	Today

A large portion of the customer loads in Vaughan and Richmond Hill are supplied by stations connected to a double-circuit 230 kV transmission line extending between the Parkway and Claireville stations (the "Parkway-to-Claireville line"). This line is situated on the Parkway Belt corridor, which also includes two 500 kV transmission lines comprising a critical pathway for bulk power transfers across the northern GTA. The two 230 kV circuits on this corridor, V71/75P, were classified as “dual-function” in Hydro One’s most recent rate application,[15] as they not only supply local customer loads, but also provide a parallel path to the 500 kV network supporting the bulk power system.

Figure 6-1: Existing Configuration of the Parkway-to-Claireville Line



Five step-down transformer stations are supplied by the Parkway-to-Claireville line, providing power to residential, commercial and industrial customers served by PowerStream (see Figure 6-1). These stations are fully utilized and under peak demand conditions supply up to 715 MW of customer demand. Currently, as there are no fast-acting sectionalizing devices on these circuits, in the event of a major outage involving the loss of both circuits, ORTAC load security and restoration criteria cannot be met. Specifically:

- ORTAC permits no more than 600 MW of load to be interrupted upon the loss of two transmission elements. Under peak demand conditions, with five stations currently supplied from the Parkway-to-Claireville line, 715 MW of load would be lost during a major outage involving both circuits on this line.
- ORTAC requires that, in the event of a major outage, all load lost in excess of 250 MW be restored within 30 minutes. There is, at present, sufficient load transfer capability on the distribution system to restore about 115 MW of the Parkway-to-Claireville load within

[15] http://www.hydroone.com/RegulatoryAffairs/Documents/EB-2012-0031/Exhibit%20G/G2-01-01.pdf

30 minutes. The remaining amount of peak load that cannot be restored to meet the 30-minute criterion is 330 MW, calculated as follows:

Total load interrupted	715 MW
minus 250 MW allowed by criteria	-250 MW
minus distribution transfer capability	-135 MW
amount of load not meeting 30-min criteria	**330 MW**

Hydro One has confirmed that a line crew would be able to manually isolate the faulted section of this line within a maximum of four hours to allow sufficient load to be restored to satisfy the ORTAC 4-hour restoration criterion. Hydro One has also confirmed that if emergency repairs were required to allow all of the load supplied from this line to be restored, that these could be completed within eight hours to satisfy the ORTAC 8-hour restoration criterion.

6.3 Medium-Term Needs

In the medium term (2019-2023), with continued demand growth in York Region as forecast, additional needs are expected to arise as early as 2021 as growth begins to exceed the capability of the Region's infrastructure (including the enhancements included in the near-term plan).

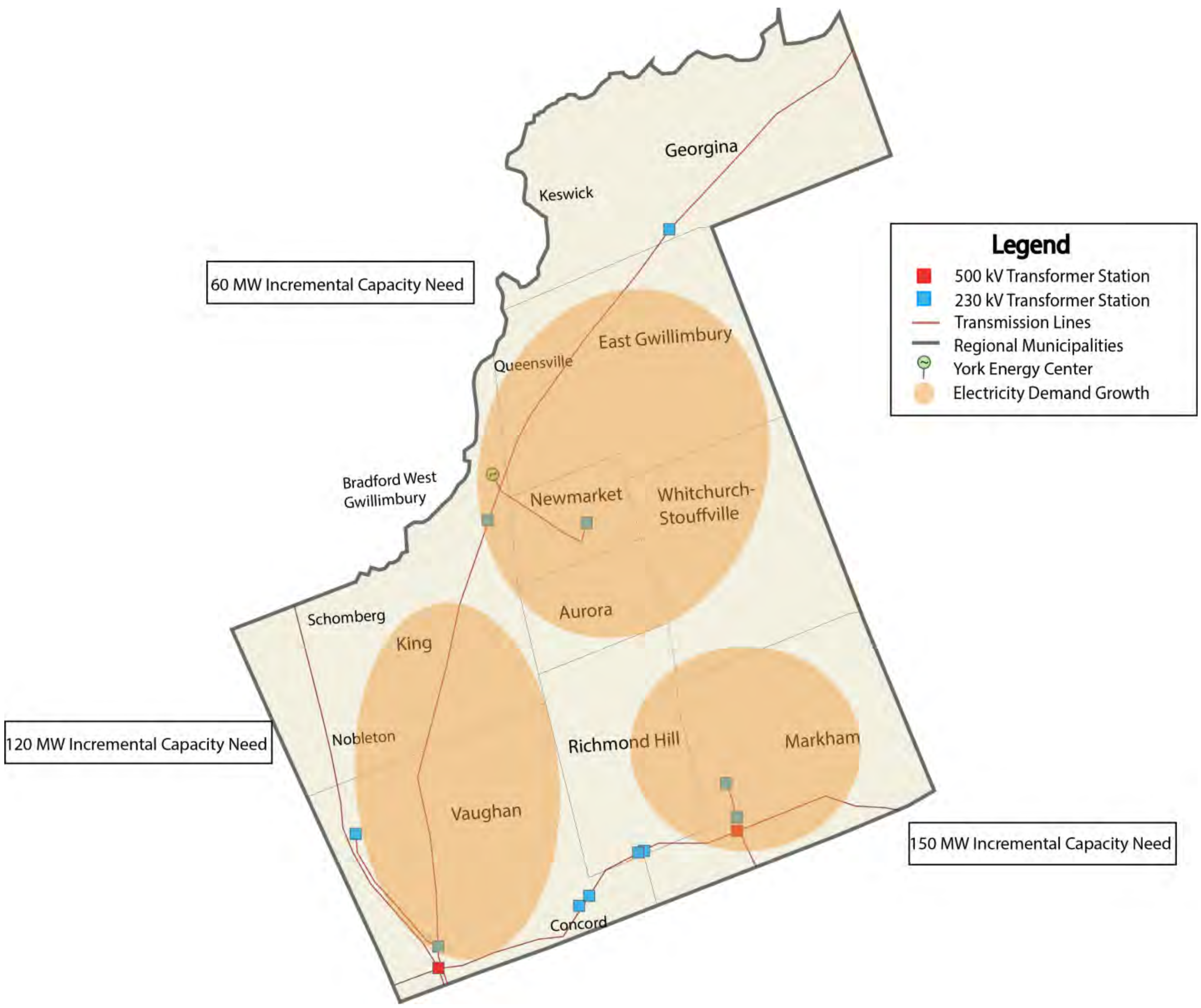
The amount of forecast demand growth beyond that which can be reliably supplied with existing transformer stations, including the new station in Vaughan that is part of the near-term plan detailed in Section 7.2, is shown by sub-area in Figure 6-2. In each sub-area, between 60 and 150 MW of demand growth, net of provincial conservation targets and DG, is expected to require additional supply.

The expected timing of these needs, based on the current forecasts, is 2021-2022 in Markham and 2023-2024 in both Vaughan and Northern York Region.

Based on current forecasts, new stations could initially be added to the existing transmission system without reinforcement, however in the long term the capability of the system to supply these stations would be exceeded (see Section 6.4).

An additional consideration is that not only is growth forecast to exceed the supply capacity in this timeframe, but with continued urbanization the majority of new growth is expected to be located far from existing electricity supply points. For example, in Southern York Region, the majority of forecast development is located 10 km or more to the north of the Parkway Belt, the major transmission supply to this area. If new stations were located near existing transmission infrastructure, rather than near the load, lengthy distribution lines would need to be constructed in order to bring supply to customers. In either case, it will be necessary to develop a plan to address the longer-term system needs in coordination with planning to address the station limits.

Figure 6-2: Incremental Transformation Capacity Needs (2019-2023)



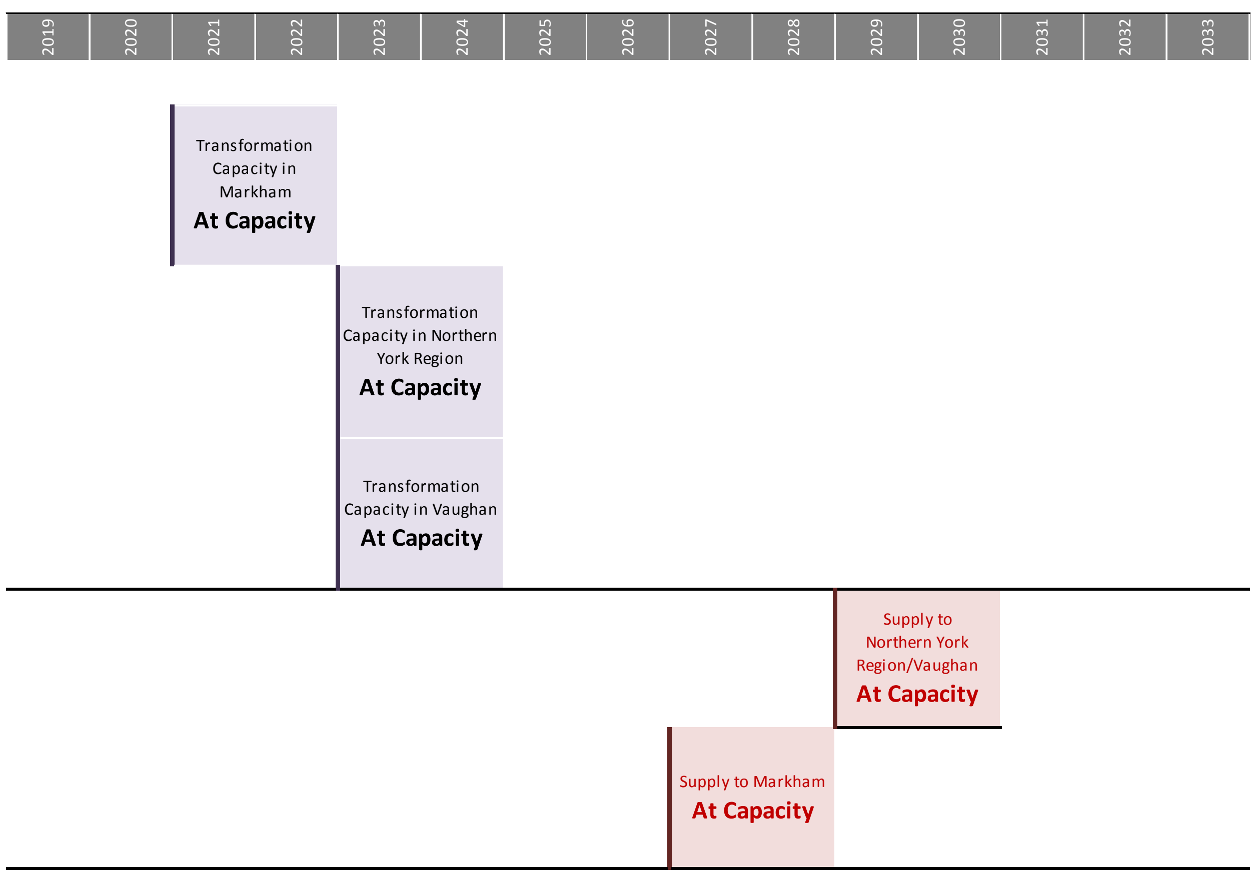
6.4 Long-Term Needs

In the long term (2024-2033), continued growth in the Region is expected to exceed the capability of the transmission system supplying the area. To assess needs in the long term, two demand forecast scenarios were considered: a low-growth and a high-growth forecast (see Section 5.6). The high-growth scenario points to significant demand growth requiring a major expansion of supply capability in the mid-to-late 2020s. In the low-growth scenario, fewer needs arise. The long-term needs are discussed for each forecast scenario below.

6.4.1 High-Growth Scenario

Under the high-growth scenario, continued strong demand growth in York Region would begin to exceed the capability of the existing electricity supply infrastructure around 2027. As shown in Figure 6-3, in addition to the transformer capacity needs identified as arising in the medium term (see Section 6.3), the transmission system is also expected reach its limits around 2027-2028 in Markham, when the Parkway-to-Buttonville line will become overloaded, and around 2029-2030 on the Claireville-to-Minden line when that system will reach its LMC.

Figure 6-3: High-Growth Scenario: Timing of Medium- and Long-Term Needs



These need dates are based on the assumption that any new stations would be sited near existing transmission supply points. Specifically, it is assumed that a new station in Markham would be sited at the existing Buttonville station site, and that new stations in Vaughan and

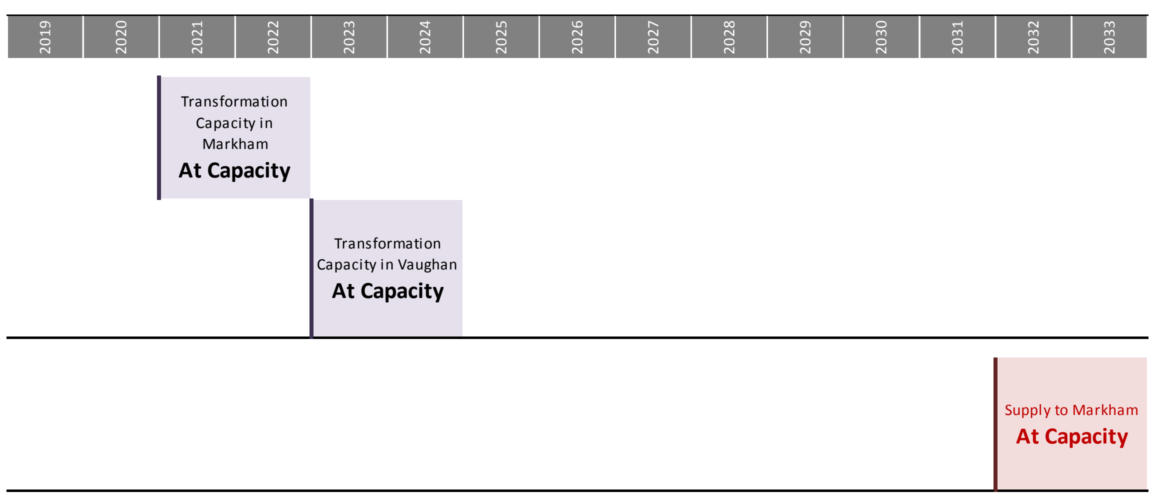
Northern York Region would be sited along the Claireville-to-Minden corridor. Should new stations be sited away from the existing infrastructure, additional transmission connection lines would be required, and the timing to bring them into service would be concurrent with the stations.

As noted in Section 6.3, a plan will need to be developed to address the transmission system limits in coordination with planning to address the medium-term station limits.

6.4.2 Low-Growth Scenario

Under the low-growth scenario, there are fewer needs arising in the long term. In this scenario, while station capability would continue to be exceeded in Markham and in Vaughan, in Northern York Region demand would stabilize within the capacity of existing station limits.[16]

Figure 6-4: Low-Growth Scenario: Timing of Medium- and Long-Term Needs



With the slower pace of growth in this scenario, transmission system capacity would continue to be adequate until around 2032 in Markham, and until sometime after the end of the study period in the Claireville-to-Minden system (see Figure 6-4). Nonetheless, the addition of new stations in Markham and Vaughan would still require planning the system to fully utilize them.

[16] Although the demand in Northern York Region would slightly exceed the area's station capacity in the medium term (around 2023-2024), under the low-growth scenario conservation would subsequently contain demand so that an additional station would not be necessary in this sub-area. See Appendix B for details.

The location of new stations could also impact the timing and extent of the long-term system needs under this scenario.

7. Near-Term Plan

The plan to address the near-term electricity needs of York Region consists of specific actions and projects that are currently underway. As described in Section 6.1, the near-term needs are expected to arise in 2017 (see Section 6.2). The near-term plan has been in development since 2012, with projects formally handed off to PowerStream and Hydro One in 2012 and 2013 respectively so that they can be in service in time to meet the needs.[17] Each of these projects is undergoing the established project development procedures (e.g., EA process).

This section describes the alternatives that were considered in developing the near-term plan for York Region, provides details of and rationale for the recommended plan, and outlines an implementation plan.

7.1 Alternatives for Meeting Near-Term Needs

In developing the near-term plan, the Working Group considered a range of integrated options. Factors that were considered in comparing alternatives included feasibility, cost, and consistency with long-term needs and options in York Region. In addition, solutions that maximize the use of existing infrastructure were given priority.

The following sections detail the alternatives that were considered, and comments on their performance in the context of the criteria described above.

7.1.1 Conservation

Conservation was implicitly considered as the first alternative to meet the needs through the development of a planning forecast that includes the peak-demand effects of the provincial conservation targets, along with contracted DG (see Sections 5.4 and 5.5).

Additional conservation beyond the targeted amounts included in the demand forecast could theoretically assist in meeting growth-related needs, such as the need for transformation capacity in Vaughan, and the need to provide additional LMC in the Claireville-to-Minden system. The conservation and DG resources included in the forecast for the stations in this area amount to 136 MW, or 38% of the forecast demand growth, during the first 10 years of the

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[17] OPA Letter to PowerStream re: Siting Vaughan #4 MTS:
http://www.ieso.ca/Documents/Regional-Planning/GTA_North/Vaughan4%20MTS%20Letter%20-2012-12-14.pdf
OPA Letter to Hydro One - York Region:
http://www.ieso.ca/Documents/Regional-Planning/GTA_North/OPA-Letter-Hydro-One-York-Subregion.pdf

study. In order to meet the capacity needs with conservation, an additional almost 50 MW of peak-demand reductions, incremental to the current LTEP conservation target, would be required by 2017. Moreover, to continue to meet these needs with conservation over time, additional peak demand savings equivalent to all further demand growth thereafter would also be necessary. By the end of 10 years, this would mean that a total of approximately 150 MW of peak demand savings from conservation would be necessary by 2023, incremental to the LTEP conservation target. Given the timing of the transformation and supply capacity needs (a solution needs to be in place by 2017), the magnitude of the transformation and supply capacity needs relative to the LTEP conservation target, and the challenges experienced by LDCs thus far in meeting the peak-capacity targets set for the 2011-2014 period,[18] the Working Group agreed that additional conservation was not a viable option to meet these needs.

Furthermore, for needs related to meeting ORTAC load restoration and load security criteria, conservation is not a feasible alternative, as these needs are driven by the configuration of the transmission and distribution systems, and are not related to demand growth. Therefore, the Working Group did not consider additional conservation as an alternative to address load restoration times in Northern York Region, nor the load restoration or load security needs on the Parkway Belt.

In summary, while additional conservation beyond the established targets was not considered as an alternative to meet the Region's near-term needs, the success of the near-term plan is dependent on the achievement of the peak-demand savings associated with meeting the LTEP conservation target. Efforts in the near-term should be focused on ensuring that these savings materialize. Therefore, monitoring conservation efforts to ensure that this goal is met are included as a recommendation in the near-term plan.

7.1.2 Local Generation

While in general local generation has the potential to meet both supply capacity and load restoration needs, this alternative was ruled out by the Working Group for meeting the near-term needs. For the Claireville-to-Minden system needs, a large local generation facility, York Energy Centre, is already in place, however without associated switching facilities its full capability cannot currently be utilized to meet local needs. Therefore, the Working Group

[18] See "Conservation and Demand Management Report – 2013 Results: EB-2010-0215" (http://www.ontarioenergyboard.ca/oeb/_Documents/EB-2010-0215/CDM%20Summary%20Report%20-%202013%20Results_20141217.pdf)

focused on alternatives that would maximize the use of this existing local resource, enabling it to assist in meeting regional needs, rather than providing additional generation.

In the Parkway Belt system, local generation could assist with restoration if properly sited and integrated, however given the density of this urban area this option was ruled out by the Working Group based on feasibility concerns.

In addition, because local generation would contribute to the overall generation capacity for the province, the generation capacity situation at the provincial level must be considered. Currently, the province has a surplus of generation capacity, and no new capacity is forecast to be needed until the end of the decade at the earliest. This was an additional consideration in ruling out local generation for meeting the near-term needs.

7.1.3 Transmission and Distribution

A number of transmission and distribution, or "wires" alternatives were considered by the Working Group to meet the near-term needs. These alternatives are described for the Claireville-to-Minden and Parkway Belt need areas below.

7.1.3.1 Claireville-to-Minden Alternatives

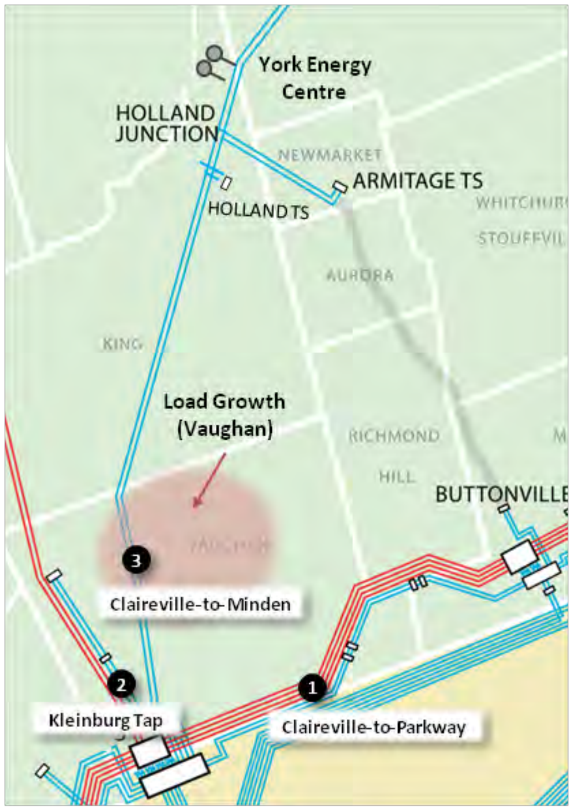
In addition to constructing a new station in Vaughan to supply demand growth, three "wires" alternatives to meet the needs in this area were considered: (1) finding an alternate location to site the Vaughan #4 MTS; (2) constructing a new transmission line; and (3) adding switching facilities in Northern York Region.

Alternate Siting of Vaughan #4 Station

As the connection of a new station in Vaughan to the Claireville-to-Minden line would trigger the need to increase the LMC of this system, the Working Group considered whether this could be avoided by finding an alternate supply point for this station. Two other potential transmission supply points in addition to the Claireville-to-Minden line were considered as shown in Figure 7-1: the Parkway-to-Claireville line; and the Claireville-to-Kleinburg line. These options, however, were rejected based on distribution and transmission considerations. From a distribution perspective, the Claireville-to-Minden supply point is preferred because the centre of forecast load growth to be supplied by the new station is near the northern boundary of the City of Vaughan. The Claireville-to-Minden line passes directly through this area, allowing the station to be optimally located to minimize distribution system expansion. The

Parkway-to-Claireville line and the Claireville-to-Kleinburg line are respectively located approximately 10 km to the south and 6 km to the west of this area of growth. Siting Vaughan #4 MTS near these supply points would require extensive distribution expansion in areas with limited available road allowances.

Figure 7-1: Potential Supply Points for Vaughan #4 MTS



From a transmission perspective, all three of the potential supply points have limitations that would prevent them from supplying a new station without transmission system reinforcement.

- **Claireville-to-Minden:** As described in Section 6.2.1, siting the station on the Claireville-to-Minden line would trigger a need to increase the LMC of this system.
- **Parkway-to-Claireville:** Siting the station on the Parkway-to-Claireville line would exacerbate the load loss and restoration needs described in Section 6.2.2. Connecting Vaughan #4 MTS to this line would add approximately 150 MW of customer demand to this system, bringing the total load that could be interrupted in a major outage to 850 MW.
- **Claireville-to-Kleinburg line:** With three transformer stations already connected to this 230 kV double circuit radial supply, the Claireville-to-Kleinburg line does not have sufficient supply capacity to supply another TS based on thermal limitations.

Furthermore, this line does not currently meet ORTAC restoration criteria. Adding Vaughan #4 MTS to this line would require transmission reinforcement to address the thermal limitations and would exacerbate the existing load restoration need.

As a result, the Working Group concluded that the existing transmission infrastructure does not provide a suitable alternative for supplying the Vaughan #4 station.

New / Upgraded Transmission Line(s)

Another alternative is providing a new transmission supply to the area. This could be accomplished by upgrading lines along existing transmission corridors, or by establishing a new corridor. This alternative was rejected for the purpose of meeting the near- to medium-term needs on the basis of cost, environmental impact, the substantial lead time required to develop this alternative, and the availability of alternatives that maximize the use of existing infrastructure.

New Switching Facilities in Northern York Region

The final alternative considered to address the near-term needs in the Claireville-to-Minden system is to add new switching facilities in Northern York Region, including in-line breakers and motorized disconnect switches. This alternative was recommended by the Working Group as it meets all of the needs identified in this area, maximizes the use of the existing transmission and local generation infrastructure in the area, can be brought into service by 2017, and is less costly than other alternatives.

The addition of switching facilities was noted in the 2005 Northern York Region electricity plan, and in the IESO's System Impact Assessment for the York Energy Centre, as a necessary step in integrating the local generation. However, it was not pursued immediately as the location and scope of the equipment could not be determined until the final connection point for YEC was determined. This alternative is thus also a required step in completing the implementation of the 2005 Northern York Region plan. The recommended scope of this project is described in more detail in Section 7.2.3 below.

7.1.3.2 Parkway Belt Alternatives

Four "wires" alternatives were considered as potential means of addressing the load loss and restoration needs on the Parkway Belt: (1) a new transmission line; (2) in-line circuit breakers; (3) creating a permanent open point on the Parkway Belt; and (4) in-line circuit switchers.

New Transmission Line

An option involving the construction of a new radial transmission line westward from the Parkway station and the reconnection of the Richmond Hill 1 & 2 stations to this line would limit the maximum amount of load that would be interrupted to 460 MW. While this option would satisfy the load security criterion, it would not be able to meet the load restoration criteria. It was also the most costly option considered. The Working Group therefore decided that it should be eliminated from further consideration.

In-line Circuit Breakers

Installing two new in-line circuit breakers would satisfy the load security and load restoration criteria, however, it would require development of a new switching station in a densely developed urban area. This alternative was eliminated from consideration by the Working Group based on its cost and concerns about the feasibility of development given the density of the area.

Creating a Permanent Open Point

Creating a permanent open point on the Parkway-to-Claireville line, separating it into two radial lines emanating from the Parkway and Claireville stations, was discussed by the Working Group. Similar to the transmission line option, this would address the load security need but would still leave some load unable to meet the 30-minute load restoration criteria. However, as this alternative would also have a serious negative impact on the reliability of the bulk transmission system, it was rejected by the Working Group.

In-line Circuit Switchers

The installation of in-line circuit switchers on the Parkway Belt circuits would meet the load restoration requirements of ORTAC but would not address the load security criterion. While the circuit switchers would not be capable of clearing a fault, meaning that the entire load supplied from the Parkway-to-Claireville line would be interrupted in response to a fault, the circuit switchers would enable the circuits to be rapidly sectionalized following a fault, permitting as much load as possible to be restored rapidly (expected to be under 15-minutes) from the healthy sections of the Claireville-to-Parkway circuits. This option was recommended by the Working Group.

The Working Group considered whether to install two circuit switchers (one on each circuit) or four (two on each circuit). The option involving two circuit switchers is capable of meeting the ORTAC 30-minute criterion. While the addition of the incremental two circuit switchers would increase the ability to further sectionalize the line and allow additional load to be restored within 30 minutes, concerns were raised about the viability of the arrangement due to the added complexity of the protective relaying scheme. Due to these concerns, together with the limited benefit that the installation of the two additional circuit switchers would provide at a significant increase in the cost, the Working Group decided that this option should not be pursued.

7.2 Recommended Near-Term Plan

Based on the evaluation of alternatives discussed above, the Working Group recommends the actions described below to meet the near-term electricity needs of York Region. Successful implementation of this plan will address the Region's electricity needs until the early-to-mid 2020s.

The first element of the near-term plan is implementation of targeted conservation and DG. To address reliability needs and to supply residual load growth in Vaughan, three transmission projects are also recommended. The development of these "wires" projects is currently underway, in accordance with letters from the former OPA in 2012 and 2013,[19] and they will also become part of a Regional Infrastructure Planning (RIP) process to be initiated by Hydro One as an outcome of this IRRP.

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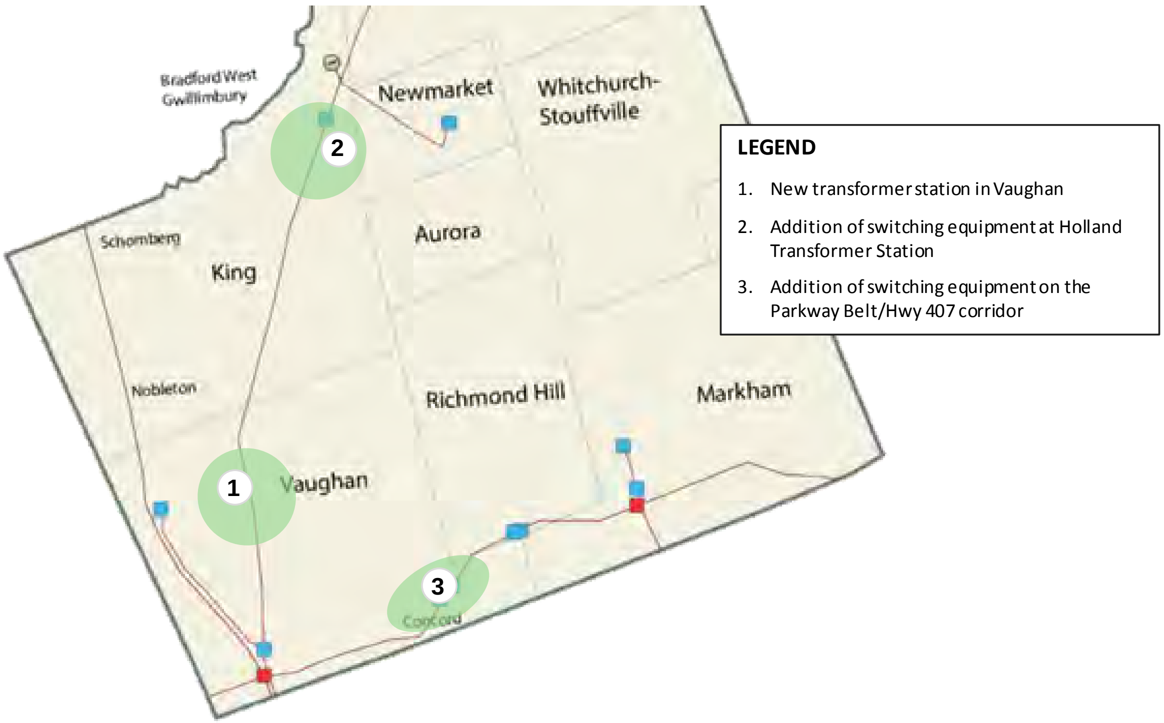
[19] OPA Letter to PowerStream re: Siting Vaughan #4 MTS:
http://www.ieso.ca/Documents/Regional-Planning/GTA_North/Vaughan4%20MTS%20Letter%20-2012-12-14.pdf
OPA Letter to Hydro One - York Region:
http://www.ieso.ca/Documents/Regional-Planning/GTA_North/OPA-Letter-Hydro-One-York-Subregion.pdf

Figure 7-2: Transmission Projects included in York Region Near-Term Plan



7.2.1 Conservation

As achieving demand reductions associated with the conservation targets is a key element of the near-term plan, the Working Group recommends that LDCs' conservation efforts be focused as much as possible on measures that will provide peak-demand reductions. Monitoring of conservation success, including measurement of peak demand savings, will be an important element of the near-term plan, and will also lay the foundation for the long-term plan by reviewing the performance of specific conservation measures in the Region and assessing potential for further conservation efforts. A discussion of the LDCs' conservation plans is provided in Appendix C.1.

7.2.2 Vaughan #4 MTS

To address the need for additional TS capacity in Vaughan, the Working Group recommends development of a new transformer station. Named "Vaughan #4 MTS", this new station is currently being developed by PowerStream, with a targeted in-service date of 2017. An EA has been completed and a site at 5400 Kirby Road in northern Vaughan has been selected for the location of the station. The Working Group provided its support for the connection of this station on the Claireville-to-Minden line in 2012.[20]

7.2.3 Switching Facilities at the Holland Station

To improve the LMC of the Claireville-to-Minden system, and to enable ORTAC load restoration criteria to be met in Northern York Region, the following measures are recommended by the Working Group: the installation of two in-line breakers and associated motorized disconnect switches at the Holland property and; the design and implementation of a Load Rejection ("L/R") scheme for the Claireville-to-Minden system. Hydro One is currently developing this project.

Implementation of these measures will address most of the near and medium-term needs of the area. The Claireville-to-Minden system will be able to supply 850 MW of customer demand,[21] which is sufficient to supply forecast demand growth until the mid-to-late 2020's, and the impact of supply interruptions will be mitigated in Northern York Region, although some of the loads at the Armitage station may require additional measures to meet ORTAC restoration criteria if the Armitage Tap were lost.

The switching facilities to be installed as part of this project consist of two in-line breakers and six motorized disconnect switches. The location and configuration of this equipment has been discussed in detail with the York Region Working Group and the proposed design is shown in Figure 7-3.

This configuration was developed based on preliminary site and cost information, as well as system studies to assess project benefits. The proposed configuration was selected to allow the new infrastructure to be sited on Hydro One's existing Holland property, thus avoiding the need to establish new right-of-ways or obtain additional land.

The breakers will sectionalize B82/83V, maximizing the supply capability afforded by York Energy Centre and addressing the ORTAC load security requirement. Together, the breakers and the switches will also improve the time required to restore loads after a major outage on the

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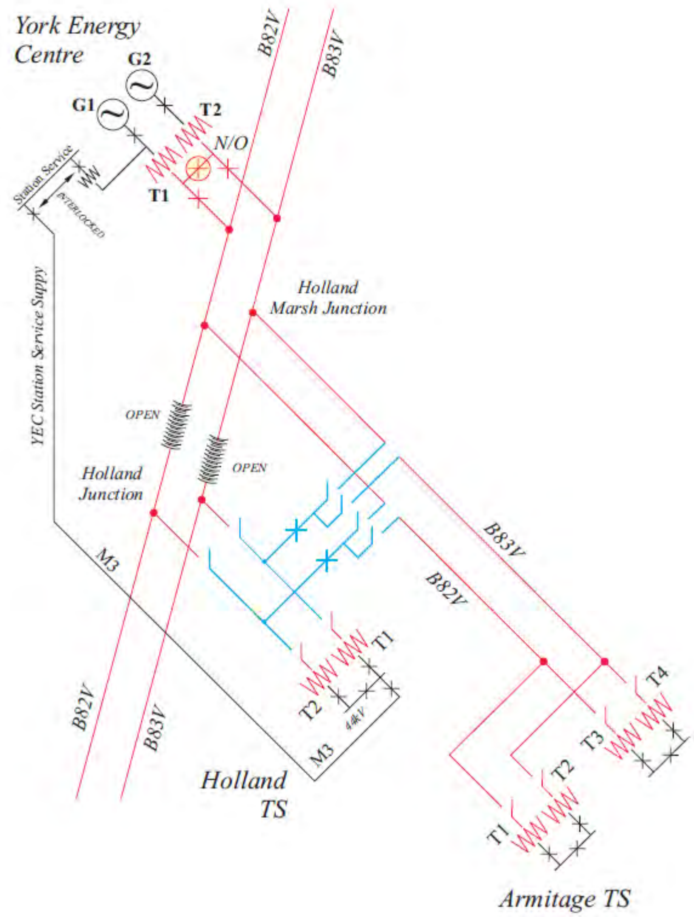
[20] OPA Letter to PowerStream re: Siting Vaughan #4 MTS:
http://www.ieso.ca/Documents/Regional-Planning/GTA_North/Vaughan4%20MTS%20Letter%20-2012-12-14.pdf
[21] Supporting details are provided in Appendix B.3.3.

Claireville-to-Minden line to within 30 minutes, allowing the area to meet ORTAC restoration criteria following a major outage.[22]

Figure 7-3: Proposed Switching Facilities



The assessment of the supply capability of the Claireveille-to-Minden system is based on application of ORTAC criteria governing permissible transmission and generation outage scenarios. To facilitate implementation of the supply capability afforded by application of the criteria, a L/R scheme, a type of special protection system ("SPS"), is required and would be armed under those contingency/outage conditions when L/R is permitted by ORTAC. As there are currently no L/R facilities in place to address contingencies on the Claireville-to-Minden

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[22] The proposed configuration will improve restoration times following a major outage on the main section of B82/83V, allowing ORTAC criteria to be met. Following a major outage on the Armitage Tap, loads at Armitage TS may still not meet ORTAC criteria. However, because the switches make restoration of loads at Holland TS possible, additional distribution transfer capability to the Holland station could address Armitage load restoration needs in the event of a major outage on the Armitage Tap.

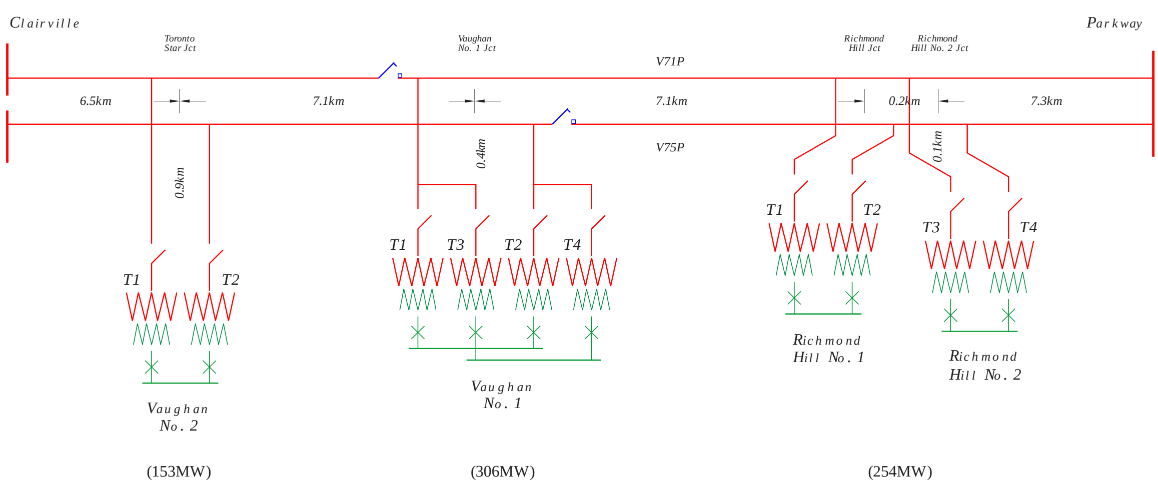
system, a L/R scheme must be developed by Hydro One with input from the IESO and the affected LDCs, in conjunction with the development of the Holland switching facilities.

7.2.4 Parkway Circuit Switchers

To address the Parkway Belt reliability needs, the Working Group recommends proceeding with installation of two in-line circuit switchers on the Parkway-to-Claireville line. While this alternative will not address the ORTAC load loss criterion, it will enable the load restoration criteria to be met. In effect, this means that, in the event of a major outage involving both of the 230 kV Parkway circuits, all load would be interrupted initially, but a significant portion of the load could be restored within 15 to 30 minutes. In the Working Group's opinion, this option strikes a reasonable balance between cost, reliability improvement, feasibility and other considerations.

The Working Group has discussed the scope of this project and has determined that, to enable the restoration needs to be met, the circuit switchers must be installed in the configuration depicted in Figure 7-4.

Figure 7-4: Two Circuit Switchers in Staggered Configuration on the Parkway-to-Claireville Line



Hydro One is proceeding with development of this project, with a targeted in-service date of spring 2018.

7.3 Implementation of Near-Term Plan

To ensure that the near-term electricity needs of York Region are addressed, it is important that the near-term plan recommendations be implemented in a timely manner. The specific actions and deliverables associated with the near-term plan are outlined in Table 7-1, along with their recommended timing, and the parties with lead responsibility for implementation. The development of the new station in Vaughan and the switching facilities at the Holland station are already underway.

The York Region Working Group will continue to meet at regular intervals during the implementation phase of this IRRP to monitor developments in the Region and to track progress toward these deliverables.

Table 7-1: Implementation of Near-Term Plan for York Region

Recommendation	Action(s)/Deliverable(s)	Lead Responsibility	Timeframe
1. Implement conservation and DG	Develop CDM plans	LDCs	May 2015
	Implement LDC CDM programs	LDCs	2015-2020
	Conduct EM&V of programs, including peak-demand impacts, and provide results to Working Group	IESO	annually
	Continue to support provincial DG programs	LDCs/IESO	ongoing
2. Develop new station in Vaughan	Design, develop and construct new station in northern Vaughan	PowerStream	In-service spring 2017
3. Add switching facilities at Holland	Design, develop and construct new switching facilities and load rejection scheme at the Holland station site	Hydro One	In-service spring 2017
4. Install in-line circuit switchers on Parkway 230 kV transmission line	Design, develop and construct circuit switchers on the Parkway Belt	Hydro One	In-service spring 2018

8. Medium and Long-Term Plan

In the medium and long term, the outlook for York Region's electricity system depends on the forecast assumptions made. Under the high-growth scenario, the Region could reach its capacity to supply growth beginning in the early-to-mid 2020s, with TS capacity and subsequently transmission system capability exceeded across the Region, and with specific needs arising in Markham, Richmond Hill and Vaughan (see Sections 6.3 and 6.4.1). At that time, assuming actual demand growth progresses according to this forecast scenario, there will be a need for major new electricity supply in the Region. Under the low-growth scenario, however, the needs are more modest and are focused in Southern York Region, but could still require significant infrastructure investment (see Section 6.4.2). Because decisions on solutions to meet the medium-term needs will have an impact on the long-term needs in the area, planning for the medium- and long-term needs must be coordinated, and are discussed together in this section.

The approach to developing medium- and long-term electricity plans is somewhat different than for near-term plans. For needs arising in the near term, specific projects must be committed in order to ensure that they are available in time to ensure that customer reliability is maintained. For needs arising in the medium and long term, there is an opportunity to develop and explore a broader set of options, as specific projects do not need to be committed immediately. Instead, the focus is on identifying possible approaches to meeting medium- and long-term needs, including alternatives that are not currently in widespread use but which show promise for the future, and identifying preliminary actions to develop alternatives, monitor growth, and engage with communities and stakeholders. This approach is designed to: maintain flexibility; avoid committing ratepayers to investments before they are needed; provide adequate time to assess the success of current and future potential of conservation measures in the Region; test emerging technologies; engage with all communities and stakeholders; coordinate with any municipal or community energy planning ("MEP/CEP") activities; and, lay the foundation for informed decisions in the future.

An important consideration in developing a medium/long-term plan is recognizing the timeframe within which decisions will need to be committed. This involves integrating the projected timing of needs with the expected lead time to bring alternatives into service. To enable fair consideration of all possible alternatives, this latter consideration is driven by the longest lead time among all the possible alternatives. This is usually associated with new major transmission infrastructure, which typically requires 5-7 years to bring into service, including conducting development work, seeking regulatory and other approvals, and constructing the facilities.

Based on the expected timing of the medium- and long-term needs in York Region, and the 5-7 year lead time for infrastructure alternatives, the Working Group expects that, if demand growth follows the high-growth scenario, a decision on the long-term plan will likely be required around 2018. Therefore, it is recommended that demand growth be monitored closely as part of the implementation of this IRRP and, if necessary, that the IRRP be revisited ahead of the 5-year schedule mandated by the OEB's regional planning process.

The following sections describe various approaches for meeting the medium- and long-term electricity needs of York Region, and lay out recommended actions to develop the medium/long-term plan and their implementation.

8.1 Approaches to Meeting Medium- and Long-Term Needs

In recent years, a number of trends, including technology advances, policy changes supporting DG, greater emphasis on conservation as part of electricity system planning, and increased community interest and desire for involvement in electricity planning and infrastructure siting, are changing the landscape for regional electricity planning. Traditional, "wires" based approaches to electricity planning may not be the best fit for all communities. New approaches that acknowledge and take advantage of these trends should also be considered.

To facilitate discussions about how a community might plan its future electricity supply, three conceptual approaches for meeting a region's long-term electricity needs provide a useful framework (see Figure 8-1). Based on regional planning experience across the province over the last 10 years, it is clear that different approaches are preferred in different regions, depending on local electricity needs and opportunities, and the desired level of involvement by the community in planning and developing its electricity infrastructure.

Figure 8-1: Approaches to Meeting Medium- and Long-Term Needs

The three approaches are as follows:

- **Delivering provincial resources**, or "wires" planning, is the traditional regional electricity planning approach associated with the development of centralized electric power systems over many decades. This approach involves using transmission and distribution infrastructure to supply a region's electricity needs, taking power from the provincial electricity system. This model takes advantage of generation that is planned at the provincial level, with generation sources typically located remotely from the region. In this approach, utilities (transmitters and distributors) play a lead role in development.
- The **Centralized local resources** approach involves developing one or a few large, local generation resources to supply a community. While this approach shares the goal of providing supply locally with the community self-sufficiency approach below, the emphasis is on large central-plant facilities rather than smaller, distributed resources.
- The **Community self-sufficiency** approach entails an emphasis on meeting community needs largely with local, distributed resources, which can include: aggressive conservation beyond provincial targets; demand response; distributed generation and storage; smart grid technologies for managing distributed resources; integrated heat/power/process systems; and electric vehicles ("EV"). While many of these applications are not currently in widespread use, for regions with long-term needs (i.e., 10-20 years in the future) there is an opportunity to develop and test these options

before commitment of specific projects is required. The success of this approach depends on early action to explore potential and develop options; it also requires the local community to take a lead role. This could be through a MEP/CEP process, or an LDC or other local entity taking initiative to pursue and develop options.

The intent of this framework is to identify which approach should be emphasized in a particular region. In practice, certain elements of electricity plans will be common to all three approaches and there will necessarily be some overlap between them. For example, provincially mandated conservation targets will be an element in all regional electricity plans, regardless of which planning approach is adopted for a region. As well, it is likely that all plans will contain some combination of conservation, local generation, transmission, and distribution elements. Once a decision on the basic approach is made, the plan is developed around that approach, which affects the relative balance of conservation, generation, and "wires" in the plan.

Details of how these three approaches could be developed to meet the specific medium- and long-term needs of York Region are provided in the following sections.

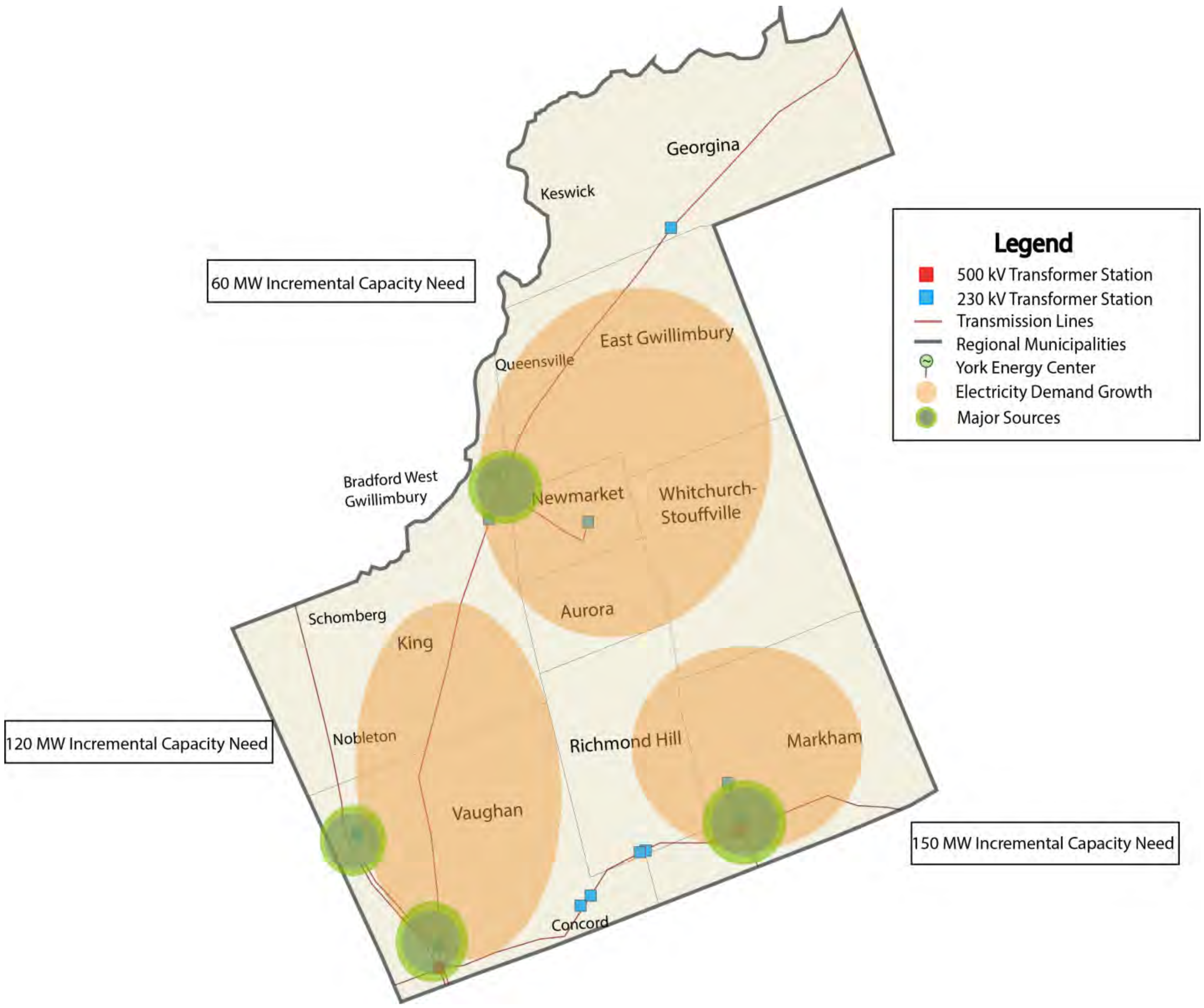
8.1.1 Delivering Provincial Resources

Under a "wires" based approach, which is the traditional approach taken to address regional electricity needs, the medium- and long-term needs of York Region would be met primarily through transmission and distribution system enhancements. If the substantial needs forecast under the high-growth scenario arise, this could necessitate major new transmission development to deliver power from the major sources supplying the area—the transformation facilities at the Claireville, Parkway and Cherrywood stations on the Parkway Belt, and the York Energy Centre in Northern York Region—to where the power is needed. These supply sources are indicated, along with the areas of need, in Figure 8-2.

A number of possible "wires"-based solutions could meet the medium- and long-term needs of the Region, including different route alternatives, as well as different possible balances between transmission and distribution infrastructure. Standard planning practices give preference to solutions that make use of existing utility corridors, or that involve development of new joint-use corridors for linear infrastructure. For example, Hydro One is currently conducting an EA for a new joint use corridor that would follow the MTO's development of the GTA West 400-series highway expansion. A section of this corridor is located in Vaughan, and could provide the basis for one possible "wires"-based approach to meeting long-term needs in York Region.

The costs of various "wires" solutions would depend not only on the specific infrastructure involved, but the cost of providing energy at the provincial system level to meet regional needs must also be accounted for.

Figure 8-2: Potential Transmission Supply Sources to Meet Medium- and Long-Term Needs: High-Growth Scenario



8.1.2 Large, Localized Generation

Addressing York Region's medium- and long-term needs primarily with large local generation would require that the size, location and characteristics of local generation facilities be consistent with the needs of the Region. As the medium- and long-term needs call for additional capacity during times of peak demand, large generation solutions would need to be capable of being dispatched when needed, and to operate at an appropriate capacity factor.

This would mean that peaking facilities, such as simple-cycle gas turbine ("SCGT") technology, would likely be more cost-effective than technologies designed to operate over a wider range of hours, or that are optimized to a host facility's requirements.

As the medium- and long-term growth requirements are forecast to arise in different areas of York Region, it is likely that more than one large local generation source would be required to meet the Region's needs. In some areas, generation may not be a technically feasible solution due to the nature of the needs, or the availability of sites for large generation sources. A centralized generation approach for York Region would likely involve multiple plants distributed in areas where they can feasibly meet localized needs, complemented by "wires" solutions in areas where generation is not technically feasible.

The cost of centralized generation options would depend on the size and technology of the units chosen, as well as the degree to which they can also contribute to a provincial capacity or energy need. "Wires" infrastructure required to address needs that cannot be met with generation, or to integrate centralized generation sources, would also be included in the economic assessment.

8.1.3 Community Self-Sufficiency

Addressing the medium- and long-term needs of York Region through a "community self-sufficiency" approach requires leadership from the community to identify opportunities and deploy solutions. As this approach relies to a great degree on emerging technologies, there will be a need to develop and test solutions to establish their potential and cost-effectiveness so that they can be appropriately assessed in future regional plans.

In York Region, there is strong community interest in this approach, as evidenced by municipalities and LDCs taking the lead in identifying and developing opportunities. These initiatives are described below, and additional details are provided in Appendix D.

Municipal and Community Energy Plans

A Municipal or Community Energy Plan ("MEP" or "CEP") is a comprehensive long-term plan to improve energy efficiency, reduce energy consumption and greenhouse gas ("GHG") emissions. A number of municipalities across the province are undertaking MEPs to better understand their local energy needs, identify opportunities for energy efficiency and clean energy, and develop plans to meet their goals. Municipal Energy Plans take an integrated approach to energy planning by aligning energy, infrastructure and land use planning.

In York Region, the Town of East Gwillimbury completed a CEP in 2009,[23] and the Chippewas of Georgina Island First Nation is currently developing a CEP for their community. In addition, three municipalities in York Region are currently initiating Municipal Energy Planning processes: Newmarket, Markham, and Vaughan. The IESO and the LDCs serving these municipalities are participants in the working groups developing these plans, which are currently in the early stages of engagement. These initiatives are expected to be completed in 2016. Recommendations from these processes will help inform the next regional planning cycle by identifying community preferences, and specific local opportunities.

Newmarket-Tay and PowerStream

Newmarket-Tay Power and PowerStream are working together on an initiative to develop community self-sufficiency options in their service areas. The goal is to address future growth challenges through the use of new forms of customer engagement, new technologies and imaginative new solutions – in effect "to create a next-generation Ontario Supply Model".

This initiative targets the Long-Term Supply Planning Horizon or, as it has been referred to, "2020 & Beyond" because of the time required to pioneer, test and implement new technological solutions.

Under the overarching authority of the IESO, Newmarket-Tay and PowerStream will lead the engagement efforts in other communities and will play a key role in identifying members of the public to participate in a LAC (see Section 9). They will also play a critical integration and liaison role with closely related planning processes such as MEPs.

Newmarket-Tay and PowerStream's objectives are to successfully meet future customer demand and growth across York Region by developing and critically assessing the feasibility of new technologies and solutions, while at the same time:

- addressing regional electricity infrastructure and business (employment) needs
- satisfying system optimization and cost management objectives consistent with the asset management strategies of the utilities

[23] http://www.eastgwillimbury.ca/Asset3785.aspx?method=1

- pioneering new technologies and solutions showcasing the strategic vision and direction of the utilities.

Their plan involves the following elements:

- Develop a stakeholder engagement strategy and target groups
- Develop a liaison strategy (e.g., leadership, information and networking strategies)
- Identify promising technologies & solutions
- Recruit technology partners
- Recruit stakeholders
- Commission demonstration projects to prove technologies and identify integration and operational challenges
- Develop an "Innovation Cluster"[24]
- Incorporate proven solutions into utility asset plans.

The technology solutions are not limited to but will consider the following:

- Advanced fuel cell technologies (residential and commercial/industrial scale applications using alternative fuels to produce domestic hot water, heating and electricity)
- Advanced storage technologies – particularly in combination with fuel cells
- Aggressive demand response programs – particularly residential and small commercial demand response programs enabled by aggregators
- Aggressive conservation programs targeted at residential consumers and enabled by next-generation home area networks[25]
- Integration of EV technologies including charging and storage capabilities, especially for high EV penetration area applications
- Enhanced renewable generation opportunities enabled by next-generation storage technologies, such as lower cost batteries offering novel chemistries and greater storage efficiencies
- Micro-grid and micro-generation technologies coupled with next-generation storage technologies, such as micro-grids incorporating battery storage, photovoltaics (solar panels) and wind energy sources, integrated with energy management systems ("EMS")

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[24] An "Innovation Cluster" is a grouping of independent enterprises, such as innovative start-ups (small, medium or large) and research organizations, specializing in a particular field, sector or Region. They are designed to stimulate innovative activity by promoting intensive interactions, sharing of facilities, and knowledge and expertise exchange, thus contributing to effective networking, technology transfer and dissemination of information amongst the group members.

[25] Home area networks are home energy management systems with remote monitoring and control capabilities providing enhanced energy management and oversight (e.g., demand response, outage notification, power quality and voltage monitoring).

- Combined Heat and Power (CHP) opportunities
- Renewed consideration of the Load Serving Entity/aggregator market model. Any decision to pursue this policy alternative would require prior assessment and approval of government and regulatory authorities and agencies.

The LDCs recognize significant risks associated with this strategy, the most crucial being the necessity to successfully meet the growth in electricity demand with new and unproven load management and storage technologies. Other key risks include demonstrating consumer value, cost recovery certainty for innovative technologies and the associated risk of asset stranding, risk/reward incentives and technological obsolescence as a causal factor for asset replacement.

PowerStream's recently implemented micro-grid field trial offers a glimpse of the potential for distribution systems to operate autonomously whether connected to or disconnected from the normal electrical supply. The micro-grid has the potential to deliver improved reliability and power quality as well as improved efficiency and load factor. Further, it has the ability to perform system control functions specifically targeting customer requirements as well as enabling system optimization through peak shaving (load shifting), price arbitrage and new technology integration (e.g. electric vehicles). PowerStream's micro-grid demonstrates operational risk mitigation and provides feedback on the feasibility, scalability and cost effectiveness for this emerging technology.

Hydro One Distribution

Hydro One is exploring a variety of program offerings that provide customer and electricity system benefits through energy efficiency, behavioural changes, load displacement, load shifting, demand response, and energy storage. Hydro One is willing to collaborate with local electricity utilities and gas utilities to develop programs and implement projects that will be cost-effective and benefit the greater electricity system.

8.2 Recommended Actions and Implementation

A number of alternatives are possible to meet the Region's long-term needs. While specific solutions do not need to be committed today, it is appropriate to begin work now to gather information, monitor developments, engage the community, and develop alternatives, to support decision-making in the next iteration of the IRRP. The long-term plan sets out the near-term actions required to ensure that options remain available to address future needs if and when they arise.

The recommended actions and deliverables for the long-term plan are outlined in Table 8-1, along with their recommended timing, and the parties with lead responsibility for implementation are assigned.

The York Region Working Group will continue to meet at regular intervals during the implementation phase of this IRRP to monitor developments in the Region and to track progress toward these deliverables.

Table 8-1: Implementation of Near-Term Actions in Support of Medium- and Long-Term Plan for York Region

Recommendation	Action(s)/Deliverable(s)	Lead Responsibility	Timeframe
1. Undertake engagement	Establish Local Advisory Committee (LAC)	IESO/LDCs	fall 2015
	Develop engagement plans with LAC input	LDCs	Q3-Q4 2015
	Undertake public/community engagement	LDCs	2015-2017
	Engage with First Nation communities	IESO	2015-2017
2. Develop community-based solutions	Commence near-term actions required to support the overarching plan for the evaluation and implementation of new technologies and solutions	PowerStream/ Newmarket-Tay Power	2015-2017
	Identify CDM potential[26]	IESO	2016
3. Continue ongoing work to establish future transmission corridor through Peel, Halton Hills, and northern Vaughan	Conduct EA for future-use corridor	Hydro One	2015-2018
	Work with relevant municipal, regional and provincial entities	IESO/Hydro One	2015-2018
4. Monitor load growth, CDM achievement, and DG uptake	Prepare annual update to the Working Group on demand, conservation and DG trends in the area, based on information provided by Working Group	IESO	annually
5. Initiate the next regional planning cycle early, if needed	Based on results of monitoring (see recommendation 4), commence the next Regional planning cycle in advance of the OEB-mandated schedule, if needed, to enable sufficient time to develop options	IESO	as required

[26] See Appendix C.2.

9. Community, Aboriginal and Stakeholder Engagement

Community engagement is an important aspect of the regional planning process. Providing opportunities for input in the regional planning process enables the views and preferences of the community to be considered in the development of the plan, and helps lay the foundation for successful implementation. This section outlines the engagement principles. It also addresses activities undertaken to date for the York Region IRRP and those that will take place to discuss the long-term needs identified in the plan and obtain input in the development of options.

A phased community engagement approach has been developed for the York Region IRRP based on the core principles of creating transparency, engaging early and often, and bringing communities to the table (see Figure 9-1). These principles were articulated as a result of the IESO's outreach with Ontarians to determine how to improve the regional planning process and they are now guiding the IRRP outreach with communities.

Creating Transparency

To start the dialogue on the York Region IRRP and build transparency in the planning process, a number of information resources were created for the plan. A dedicated web page was created on the IESO (former OPA) website to provide a map of the regional planning area, information on why the plan was being developed, the Terms of Reference for the IRRP, and a listing of the organizations involved. Information was also was posted on the websites of the Working Group members. A dedicated email subscription service was also established for the York IRRP where communities and stakeholders could subscribe to receive email updates about the IRRP.

Engaging Early and Often

The first step in the engagement of the York Region IRRP was providing information to the municipalities and First Nation communities in the planning area. Presentations were made to the York Region municipal planners and Chief Administrative Officers ("CAOs") and during these meetings, key topics of discussion included confirmation of the growth projections, discussion of the near- and long-term needs identified in the Region, a review of the identified near-term projects including those that have already begun due to timing requirements, and a discussion of the possible approaches to address long-term needs. The identified next steps included monitoring and providing input into the Region's corridor development activities as well as the regional Official Plan review. The presentations and information were well received and form the foundation for building broader engagement and transparency in the development of the York IRRP.

Figure 9-1: York Region IRRP Community Engagement Process

Creating Transparency:

Creation of York IRRP Information Resources

- Dedicated York IRRP web page created on IESO (former OPA) website providing background information, the IRRP Terms of Reference and listing of the Working Group members
- Dedicated web page added to Hydro One website, and information posted on Newmarket Hydro and PowerStream websites
- Self-subscription service established for York IRRP for subscribers to receive regional specific updates
- Status: complete

Engaging Early and Often:

Municipal , First Nation & Métis Outreach

- Presentation and discussion with York Region Municipal Planners
- Presentation and discussion with York Region CAOs
- Information provided to First Nation communities who may have an interest in the planning area
- Information provided to Métis Nation of Ontario
- Status: initial outreach complete; dialogue to continue

Bringing Communities to the Table:

Broader Community Outreach

- Presentation at Municipal Councils, First Nation communities & Métis Nation of Ontario as requested
- Webinar to discuss electricity needs, near-term solutions and formation of a LAC
- Formation of LAC to discuss long-term needs and local community engagement plan
- Broader community outreach to be undertaken; feedback from this phase on community values and preferences will inform the decisions to be made in the next planning cycle
- Concurrent engagement by PowerStream and Hydro One on near-term projects
- Status: beginning in May 2015; no time limit

The link between the York Region IRRP and the development of several MEPs in York Region was also identified as an opportunity. As a result, a staff member from the IESO and representatives from the LDCs are part of the Vaughan, Markham and Newmarket MEP Stakeholder Advisory Committees and will act as a bridge in the continued development of the IRRP and the MEPs to further add value by coordinating local and provincial priorities.

Similarly, the IESO will work with the Chippewas of Georgina Island First Nation to ensure the results of their CEP, once complete, are included in the on-going IRRP discussion.

Moving forward, engagement will continue on both the IRRP and the related near-term projects. For the projects identified as part of the near-term plan, PowerStream and Hydro One will undertake engagements on individual projects as needed. Information on these project-level engagements will be provided on the organization's website and will also be listed on the York IRRP main webpage.

Bringing Communities to the Table

Engagement on the IRRP will continue with a broader community discussion about the medium- and long-term needs identified in the regional plan. This engagement will begin with a webinar hosted by the working group to discuss the plan and initiate discussion of possible medium- and long-term options, including opportunities related to achieving community self-sufficiency. Presentations on the York Region IRRP will also be made to Municipal Councils and First Nation communities on request.

To further continue the dialogue, a York Region LAC will be established as an advisory body to the York Region IRRP Working Group. The purpose of the committee is to establish a forum for members to be informed of the regional planning process. Their input and recommendations, information on local priorities, and ideas on the design of community engagement strategies will be considered throughout the engagement and planning processes. The LAC meetings will be open to the public and meeting information will be posted on the IESO website. Information on the formation of the York Region LAC is available on the York Region IRRP main webpage.

Strengthening processes for early and sustained engagement with communities and the public were introduced following an engagement held in 2013 with 1,250 Ontarians on how to enhance regional electricity planning. This feedback resulted in the development of a series of recommendations that were presented to, and subsequently adopted by the Minister of Energy.

Further information can be found in the report entitled “Engaging Local Communities in Ontario’s Electricity Planning Continuum” available on the IESO website.[27]

Information on outreach activities for the York Region IRRP can be found on the IESO website and updates will be sent to all subscribers who have requested updates on the York Region IRRP.

[27] http://www.powerauthority.on.ca/stakeholder-engagement/stakeholder-consultation/ontario-Regional-energy-planning-review

10. Conclusion

This report documents an IRRP that has been carried out for York Region, a sub-region of the GTA North OEB planning region.[28] The IRRP identifies electricity needs in the Region over the 20-year period from 2014 to 2033, recommends a plan to address near-term needs, and identifies actions to develop alternatives for the medium and long term.

Implementation of the near-term plan is already underway. LDCs are developing CDM plans consistent with the Conservation First policy and infrastructure projects are being developed by PowerStream and Hydro One. These infrastructure projects will become part of a Regional Infrastructure Plan (RIP) to be conducted by Hydro One as an outcome of this IRRP.

To support the development of the medium- and long-term plan, a number of actions have been identified to develop alternatives, engage with the community, and monitor growth in the Region and responsibility for these actions has been assigned to appropriate members of the Working Group. Information gathered and lessons learned as a result of these activities will inform development of the next iteration of the IRRP for York Region.

The planning process does not end with the publishing of this IRRP. Communities will be engaged in the development of the options for the medium and long term. In addition, the York Region Working Group will continue to meet regularly throughout the implementation of the plan to monitor progress and developments in the area, and will produce annual update reports that will be posted on the IESO website. Of particular importance, the Working Group will track closely the expected timing of the needs that are forecast to arise in the medium and long term. If demand grows as forecast, it may be necessary to revisit the plan as early as 2017 in order to respect the lead time for the development of alternatives. If demand growth slows or conservation achievement is higher than forecast, the plan may be revisited according to the OEB-mandated 5-year schedule. This outcome would allow more time to develop alternatives and to take advantage of advances in technology in the next planning cycle.

[28] A second sub-Region addressing the Claireville-to-Kleinburg transmission line is being addressed as part of the West GTA Region.

YORK REGION
INTEGRATED REGIONAL RESOURCE PLAN - APPENDICES

Part of the GTA North Planning Region | April 28, 2015

ieso
Independent Electricity System Operator

York Region IRRP

Appendix A: Demand Forecasts

Appendix A: Demand Forecasts

This Appendix provides details of the methodology and data used to develop the demand forecasts for the York Region IRRP, including the gross demand forecasts provided by LDCs, conservation and distributed generation assumptions, and detailed planning forecasts.

A.1 Gross Demand Forecasts

Appendices A.1.1 through A.1.3 were prepared by the LDCs and describe their methodologies to prepare the gross demand forecast used in this IRRP. Gross demand forecasts by station are provided in Appendix A.1.4.

A.1.1 PowerStream's Gross Demand Forecast Methodology

PowerStream is jointly owned by the municipalities of Barrie, Markham and Vaughan, and is the second largest municipally-owned electricity distribution company in Ontario. PowerStream provides power and related services to more than 370,000 customers residing or owning businesses in communities located immediately north of Toronto and in Central Ontario. PowerStream serves communities including Alliston, Aurora, Barrie, Beeton, Bradford West, Gwillimbury, Markham, Penetanguishene, Richmond Hill, Thornton, Tottenham and Vaughan, as well as Collingwood, Stayner, Creemore and Thornbury through a partnership with the Town of Collingwood in the ownership of Collus PowerStream.

This study focuses only on the York Region area. PowerStream's service territory in York Region is composed of three distinct municipal districts (Vaughan, Markham and Richmond Hill) that have 28 kV distribution lines, as well as an Aurora district that has a 44 kV sub-transmission system. Aurora is supplied by five 44 kV feeders originating from Armitage TS in Newmarket.

The electric load forecast is one of the key drivers of PowerStream's planning activities. The primary purpose of the electricity load forecast is to address the key questions of: when, where, why and how much electricity will be required on the PowerStream system to allow PowerStream to evaluate planning alternatives and to ensure that there is sufficient capacity on the system to supply customers in a reliable and cost effective manner.

The reference level forecast was performed using two different methods of forecasting to determine if there was some convergence to a forecast load at the end of the study period, specifically:

- past system peak performance and trend (statistical) analysis; and
- end-use analysis using the latest information available from municipal reports.

The reference level forecast takes into account impacts from growth, weather, DG and conservation as follows:

Growth

Four municipalities (Markham, Richmond Hill, Vaughan and Aurora) projected the residential and non-residential development in their development charge background studies. These developments are the main drivers of electrical load growth in the PowerStream service territory. PowerStream's annual residential and non-residential load growths were forecast by multiplying unit usage for residential and watts per square foot for non-residential development. The annual projected load is expressed as a percentage of the existing load. The total growth over the forecast horizon is averaged out to an annual growth rate. The growth rate is also adjusted according to current market conditions.

Weather

PowerStream's summer system peaks invariably coincide with hot weather conditions (high temperatures). While other factors may be playing a part, peak demands are being driven largely by the use of air conditioning. Prolonged periods of hot weather present the biggest challenge to the reliability of PowerStream's distribution system when a significant number of customers are using their home and workplace air conditioners simultaneously, and diversity of operation between customers is lost.

Since long-term weather cannot be forecast, weather scenarios (normal and extreme summer) are created based on historical weather data.

Historical electrical peaks are weather normalized to account for weather impact.

An electricity distribution system should be able to maintain the supply to customers not only under normal weather, but also under extreme weather conditions. Electrical load forecasts under normal summer weather are created and provided to the IESO. Electrical load forecasts under extreme weather are produced by IESO utilizing algorithms.

Conservation and Demand Management (CDM)

PowerStream's load forecast is performed using the current year's actual peak (weather normalized) as a starting point. The impact of CDM programs in the previous years has been reflected in the actual peak.

PowerStream's CDM Strategy 2011 to 2014 Report has been filed and approved by the OEB. To meet its CDM target, PowerStream (including areas the utility serves outside of York Region) will achieve a 90 MW reduction in peak demand from 2011 to 2014.

PowerStream has a new target for post 2014. The new target is to achieve 535.4 GWh of energy savings persisting to 2020 by 2020.

The forecast provided by PowerStream does not include the impacts of conservation from 2014 onward. Conservation assumptions were developed by the IESO and applied to PowerStream's load forecast.

Distributed Generation (DG)

PowerStream will build new capacity when and where load is projected to occur. If DG is located near the load growth, it can reduce the need for new capacity. Thus, PowerStream can defer investments in wire-delivery facilities by relying on DG, at least for a short period of time, if not indefinitely.

PowerStream's load forecast is performed using the current year's actual peak (weather normalized) as a starting point. The impact of existing DG has been reflected in the actual peak.

The IESO will apply the effective impact of future DG on PowerStream's load forecast.

A.1.2 Newmarket-Tay Distribution Ltd. Gross Forecast Methodology

Introduction

Newmarket-Tay Power Distribution Ltd. ("NT Power") owns and operates the electricity distribution system within its OEB licensed service area, which is the Town of Newmarket including small areas bordering the municipalities of King and East Gwillimbury, in the Regional Municipality of York (Newmarket Service Area), as well as the Simcoe County communities of Port McNicoll, Victoria Harbour and Waubaushene, which are part of the Township of Tay (Tay Service Area). For the purpose of this study, the focus is only on the Newmarket Service Area. NT Power serves approximately 26,000 Residential and General Service customers within the Newmarket Service Area.

Community in Transition

The Town of Newmarket has been designated as an Urban Growth Centre under the Province of Ontario's Places to Grow strategy and as an area where future growth and intensification is to be directed. The Yonge St. and Davis Dr. corridors have been identified as one of four Regional Centres in the York Region Official Plan.

The Town of Newmarket is currently planning for the revitalization of Newmarket's Urban Centers which will shape the future of the community. The town has recently adopted a new Secondary Plan that sets ambitious targets for population and employment growth within its centres and corridors - primarily along Yonge St. and Davis Dr. The Secondary Plan will result in increased density (e.g., population and jobs) to meet the minimum density provisions of the Growth Plan (200 persons and jobs per hectare) and the Region of York Official Plan growth policies. For the purpose of this study, NT Power used the projections that meet provincial and regional planning requirements as developed by the Town of Newmarket through the Secondary Plan process.

Forecast Municipal Growth Rate Basis of Load Forecast

In developing the forecast, NT Power relied upon a combination of past historical growth, as well as ongoing discussions with planning staff of both the Town of Newmarket and the Region of York. The Region of York's approved official plan with forecast projected growth is the basis of this load forecast with further analysis associated with Newmarket's Secondary Plan. For the current load forecast the coincident peak data from 2013 has been used as the base for the load forecast. In developing the load forecast several factors must be considered and evaluated to determine potential growth within the service area. The electric load forecast is one of the key drivers of NT Power's planning activities at both the distribution planning level and overall supply requirements from the bulk wholesale transmission system.

Base Forecast: Trend and End Use Analysis

Trend Analysis uses historical consumption of electricity demand to predict future requirements. A combination of timeframes (5, 10, 15 years) is used to determine potential demand increases as compared to forecast growth. Regular updating and review is completed on an annual basis.

A second analysis is completed based on customer end use. As stated above, the Town of Newmarket is a community in transition with the primary focus for future growth centered on the Yonge St. and Davis Dr. corridors. The Town of Newmarket expects to achieve population and employment growth targets through increased density and vertical development. This anticipated significant increase in land-use intensification, as well as the complete renewal of the commercial sector, will provide the biggest impact on load growth over the forecast period.

The end-use analysis methodology considers that the demand for electricity is dependent on what it is used for. An analysis is completed on end-use usage and demand is subsequently allocated between residential and industrial/commercial/institutional ("ICI") type demand. Using standard historical usage data per end-use customer provides a basis to forecast expected demand with load growth across both residential and industrial ICI demand.

A.1.3 Hydro One Distribution Gross Forecast Methodology

Hydro One Distribution services the areas of York Region that are not serviced by other LDCs via four step-down transformer stations from 230 kV to 44 kV. This area includes the Chippewas of Georgina Island First Nation. The stations are Armitage TS, Holland TS, Brown Hill TS, and Kleinburg TS.

The reference level forecast is developed using macro-economic analysis, which takes into account the growth of demographic and economic factors. The forecast corresponds to the expected weather impact on peak load under average weather conditions, known as weather-normality. Furthermore, the forecast is unbiased such that there is an equal chance of the actual peak load being above or below the forecast. In addition, local knowledge, information regarding the loading in the area within the next two to three years, is utilized to make minor adjustments to the forecast.

A.1.4 Gross Forecasts, by Sub-Area and Station

Table A-1: Gross Demand Forecasts (MW)

NORTHERN YORK REGION	2014	2015	2016	2017	2018	2019	2020	2021	2022	2023	2024	2025	2026	2027	2028	2029	2030	2031	2032	2033
Gross Load (normal weather)																				
Holland TS	128	131	134	137	141	143	147	150	154	157	161	164	168	171	175	178	181	183	185	187
Armitage TS	277	284	290	298	305	312	319	327	335	344	350	358	365	372	380	387	395	401	408	414
Brown Hill TS	78	80	83	86	89	92	95	98	102	105	109	112	116	120	124	128	133	137	141	146

VAUGHAN/RICHMOND HILL	2014	2015	2016	2017	2018	2019	2020	2021	2022	2023	2024	2025	2026	2027	2028	2029	2030	2031	2032	2033
Gross Load (normal weather)																				
Richmond Hill MTS	238	238	238	238	238	238	238	238	238	238	238	238	238	238	238	238	238	238	238	238
Vaughan 1 MTS	290	310	327	356	373	396	421	447	473	500	520	540	562	582	603	619	636	653	669	687
Vaughan 2 MTS	143	143	143	143	143	143	143	143	143	143	143	143	143	143	143	143	143	143	143	143
Vaughan 3 MTS	143	143	143	143	143	143	143	143	143	143	143	143	143	143	143	143	143	143	143	143

*All new PowerStream growth in Vaughan area was assigned to Vaughan 1/1E, the newest station

MARKHAM	2014	2015	2016	2017	2018	2019	2020	2021	2022	2023	2024	2025	2026	2027	2028	2029	2030	2031	2032	2033
Gross Load (normal weather)																				
Buttonville TS	112	131	131	143	143	143	143	143	143	143	143	143	143	143	143	143	143	143	143	143
Markham 1 MTS	84	76	76	76	76	76	76	76	76	76	76	76	76	76	76	76	76	76	76	76
Markham 2 MTS	95	95	95	95	95	95	95	95	95	95	95	95	95	95	95	95	95	95	95	95
Markham 3 MTS	178	189	189	189	189	189	189	189	189	189	189	189	189	189	189	200	189	189	189	189
Markham 4 MTS	74	76	100	115	143	168	193	218	244	272	292	312	331	353	375	382	409	426	444	461

*All new PowerStream growth in Markham area was assigned to Markham 4 MTS, the newest station

A.2 Conservation

The forecast conservation savings included in the demand forecasts for the York Region IRRP were derived from the provincial conservation forecast, which aligns with the conservation targets described in the 2013 LTEP: "Achieving Balance: Ontario's Long-Term Energy Plan". The LTEP set an electrical energy conservation target of 30 TWh in 2032, with about 10 TWh of the energy savings coming from codes and standards ("C&S"), and the remaining 20 TWh from energy efficiency ("EE") programs. The 30 TWh energy savings target will also lead to associated peak demand savings. Time-of-Use ("TOU") rate impacts and Demand Response resources are focused on peak demand reduction rather than energy savings and, as such, are not reflected in the 30 TWh energy target and are considered separately in forecasting.

To assess the peak demand savings from the provincial conservation targets, two demand forecasts are developed. A gross demand forecast is produced that represents the anticipated electricity needs of the province based on growth projections, for each hour of the year. This forecast is based on a model that calculates future gross annual energy consumption by sector and end use. Hourly load shape profiles are applied to develop province-wide gross hourly demand forecasts. Natural conservation impacts are included in the provincial gross demand forecast, however the effects of the planned conservation are not included. A net hourly demand forecast is also produced, reflecting the electricity demand reduction impacts of C&S, EE programs, and TOU. The gross and net forecasts were then compared in each year to derive the peak demand savings. In other words, the difference between the gross and net peak demand forecasts is equal to the demand impacts of conservation at the provincial level.

The above methodology was used to derive the combined peak demand savings, which was further broken down to three categories as shown in Table-1. Peak demand savings associated with load shifting in response to TOU rates were estimated using an econometric model based on customers' elasticity of substitution and the TOU price ratio. The remaining peak savings were allocated between C&S and EE programs based on their energy saving projections, with about 1/3 attributed to C&S and 2/3 to EE programs.

The resulting peak demand savings in each year are represented as a percentage of total provincial peak demand in Table A-2, using 2013 as a base year.

Table A-2: Peak Demand Savings from Provincial Conservation Targets (% of load)

	2014	2015	2016	2017	2018	2019	2020	2021	2022	2023	2024	2025	2026	2027	2028	2029	2030	2031	2032	2033
C&S	0.0%	0.2%	0.5%	0.6%	1.1%	1.6%	1.9%	2.3%	2.5%	2.6%	2.8%	2.9%	3.1%	3.6%	4.1%	4.4%	4.8%	5.1%	5.4%	5.4%
TOU	0.2%	0.3%	0.4%	0.4%	0.4%	0.4%	0.4%	0.4%	0.4%	0.4%	0.4%	0.4%	0.4%	0.4%	0.4%	0.4%	0.4%	0.4%	0.4%	0.4%
EE programs	0.5%	0.8%	1.0%	1.1%	1.3%	2.1%	3.1%	3.2%	3.6%	4.2%	5.0%	5.3%	5.8%	6.0%	6.5%	6.6%	6.9%	7.4%	7.8%	7.8%
Total	0.8%	1.3%	1.9%	2.2%	2.7%	4.1%	5.4%	5.9%	6.5%	7.1%	8.1%	8.6%	9.3%	10.0%	11.0%	11.4%	12.1%	12.8%	13.5%	13.5%

These percentages were applied to the gross demand forecasts provided by the York Region LDCs at the transformer station level to determine the peak demand savings assumed in the planning forecast. This allocation methodology relies on the assumption that the peak demand savings from provincial conservation will be realized uniformly across the province. Actions recommended in the York Region IRRP to monitor actual demand savings, and to assess conservation potential in the Region, will assist in developing region-specific conservation assumptions going forward.

Existing DR resources are included in the base year and gross demand forecasts. Additional DR resources can be considered as potential options to meet regional needs.

A.2.1 Conservation Assumptions by Sub-Area and Station

The following tables show the expected peak demand impact of provincial energy targets at each transformer station, developed according to the methodology described in Appendix A.2 above, for the purposes of the high-growth forecast.

Table A-3: Conservation Assumptions (MW)

NORTHERN YORK REGION	2014	2015	2016	2017	2018	2019	2020	2021	2022	2023	2024	2025	2026	2027	2028	2029	2030	2031	2032	2033
Conservation (normal weather)																				
Holland TS	1	2	3	3	4	6	8	9	10	11	13	14	16	17	19	20	22	23	25	25
Armitage TS	2	4	6	6	8	13	17	19	22	24	28	31	34	37	42	44	48	51	55	56
Brown Hill TS	1	1	2	2	2	4	5	6	7	7	9	10	11	12	14	15	16	18	19	20

VAUGHAN/RICHMOND HILL	2014	2015	2016	2017	2018	2019	2020	2021	2022	2023	2024	2025	2026	2027	2028	2029	2030	2031	2032	2033
Conservation (normal weather)																				
Richmond Hill MTS	2	3	5	5	7	10	13	14	15	17	19	21	22	24	26	27	29	31	32	32
Vaughan 1 MTS	2	4	6	8	10	16	23	26	31	35	42	47	52	58	66	71	77	84	91	93
Vaughan 2 MTS	1	2	3	3	4	6	8	8	9	10	12	12	13	14	16	16	17	18	19	19
Vaughan 3 MTS	1	2	3	3	4	6	8	8	9	10	12	12	13	14	16	16	17	18	19	19

MARKHAM	2014	2015	2016	2017	2018	2019	2020	2021	2022	2023	2024	2025	2026	2027	2028	2029	2030	2031	2032	2033
Conservation (normal weather)																				
Buttonville TS	1	2	2	3	4	6	8	8	9	10	12	12	13	14	16	16	17	18	19	19
Markham 1 MTS	1	1	1	2	2	3	4	4	5	5	6	7	7	8	8	9	9	10	10	10
Markham 2 MTS	1	1	2	2	3	4	5	6	6	7	8	8	9	10	10	11	11	12	13	13
Markham 3 MTS	1	3	4	4	5	8	10	11	12	13	15	16	18	19	21	23	23	24	26	26
Markham 4 MTS	1	1	2	2	4	7	10	13	16	19	24	27	31	35	41	44	49	55	60	63

A.3 Distributed Generation

As of February 2014, the IESO (former OPA) had awarded 82 MW of DG contracts within the York Region study area. Of these, 22 MW had already reached commercial operation. Since LDCs were producing their demand forecasts to align with actual peak demand, any DG already in service during the most recent year's peak hour would already be accounted for in gross forecasts. As a result, only contracts for projects which had not yet reached commercial operation at the time the forecasts were produced needed to be incorporated.

Contract information provided the rated (installed) capacity, generation fuel type (solar and natural gas), connecting station, and maximum commercial operation date ("MCOD") for each project. For the purposes of this study, it was assumed that all active contracts would be connected on their MCOD. This was a conservative assumption, as some attrition would normally be expected from a field of over 130 contracts. While natural gas projects can be assumed to contribute their full installed capacity during summer peak, local weather conditions can greatly impact the contribution of solar projects to meeting demand. For the York Region IRRP, the IESO relied upon the summer Solar Capacity Contribution ("SCC") values, as described in section 3.2.2 of the 2014 Methodology to Perform Long Term Assessments[1] (copied below):

> Monthly Solar Capacity Contribution (SCC) values are used to forecast the contribution expected from solar generators. SCC values in percentage of installed capacity are determined by calculating the simulated 10-year solar historic median contribution at the top 5 contiguous demand hours of the day for each winter and summer season, or shoulder period month. As actual solar production data becomes available in future, the process of picking the lower value between actual historic solar data, and the simulated 10-year historic solar data will be incorporated into the SCC methodology until 10-years of actual solar data is accumulated, at which point the simulated solar data will be phased out of the SCC calculation.

Based on the current methodology, summer peak SCCs of 34% were assumed. After consideration of anticipated peak contribution of each contract, the total effective capacity for all active, unconnected DG contracts was estimated on a station by station basis. Consideration

[1] http://www.ieso.ca/Documents/marketReports/Methodology_RTAA_2014feb.pdf

was also given to anticipated in-service year, to ensure the effect of the project is not observed until the MCOD date. The final DG forecast is shown in Appendix A.3.1.

A.3.1 Distributed Generation Assumptions by Sub-Area and Station

The following tables show the expected peak demand impact of DG contracts which were active as of February 2014, but which had not yet reached commercial operation. These contributions were subtracted from the gross demand forecasts on a station by station basis.

Table A-4: Distributed Generation Assumptions (MW)

NORTHERN YORK REGION	2014	2015	2016	2017	2018	2019	2020	2021	2022	2023	2024	2025	2026	2027	2028	2029	2030	2031	2032	2033
Distributed Generation																				
Holland TS	0.32	0.78	0.78	0.78	0.78	0.78	0.78	0.78	0.78	0.78	0.78	0.78	0.78	0.78	0.78	0.78	0.78	0.78	0.78	0.78
Armitage TS	2.38	2.66	2.66	2.66	2.66	2.66	2.66	2.66	2.66	2.66	2.66	2.66	2.66	2.66	2.66	2.66	2.66	2.66	2.66	2.66
Brown Hill TS	10.2	10.5	10.5	10.5	10.5	10.5	10.5	10.5	10.5	10.5	10.5	10.5	10.5	10.5	10.5	10.5	10.5	10.5	10.5	10.5

VAUGHAN/RICHMOND HILL	2014	2015	2016	2017	2018	2019	2020	2021	2022	2023	2024	2025	2026	2027	2028	2029	2030	2031	2032	2033
Distributed Generation																				
Richmond Hill MTS	0.00	0.60	0.60	0.60	0.60	0.60	0.60	0.60	0.60	0.60	0.60	0.60	0.60	0.60	0.60	0.60	0.60	0.60	0.60	0.60
Vaughan 1 MTS	0.10	1.86	1.86	1.86	1.86	1.86	1.86	1.86	1.86	1.86	1.86	1.86	1.86	1.86	1.86	1.86	1.86	1.86	1.86	1.86
Vaughan 2 MTS	0.58	1.09	1.09	1.09	1.09	1.09	1.09	1.09	1.09	1.09	1.09	1.09	1.09	1.09	1.09	1.09	1.09	1.09	1.09	1.09
Vaughan 3 MTS	0.00	0.45	0.45	0.45	0.45	0.45	0.45	0.45	0.45	0.45	0.45	0.45	0.45	0.45	0.45	0.45	0.45	0.45	0.45	0.45

MARKHAM	2014	2015	2016	2017	2018	2019	2020	2021	2022	2023	2024	2025	2026	2027	2028	2029	2030	2031	2032	2033
Distributed Generation																				
Buttonville TS	0.24	0.30	0.30	0.30	0.30	0.30	0.30	0.30	0.30	0.30	0.30	0.30	0.30	0.30	0.30	0.30	0.30	0.30	0.30	0.30
Markham 1 MTS	0.25	0.86	0.86	0.86	0.86	0.86	0.86	0.86	0.86	0.86	0.86	0.86	0.86	0.86	0.86	0.86	0.86	0.86	0.86	0.86
Markham 2 MTS	3.47	3.51	3.51	3.51	3.51	3.51	3.51	3.51	3.51	3.51	3.51	3.51	3.51	3.51	3.51	3.51	3.51	3.51	3.51	3.51
Markham 3 MTS	2.65	3.08	3.08	3.08	3.08	3.08	3.08	3.08	3.08	3.08	3.08	3.08	3.08	3.08	3.08	3.08	3.08	3.08	3.08	3.08
Markham 4 MTS	0.00	0.07	0.07	0.07	0.07	0.07	0.07	0.07	0.07	0.07	0.07	0.07	0.07	0.07	0.07	0.07	0.07	0.07	0.07	0.07

A.4 Planning Forecasts

Two planning level forecasts were developed for the York IRRP: a high-growth forecast; and a low-growth forecast.

The high-growth forecast is the primary forecast used for carrying out system studies, and was based on gross demand forecast by LDCs within their service territories. The underlying growth projections upon which this forecast is based are consistent with municipal growth plans, which in turn are in alignment with *Places to Grow, the Provincial Growth Plan for the Greater Golden Horseshoe*. The LDC forecasts were adjusted by the IESO to account for the anticipated peak demand impacts of provincial energy targets, the effect of contracted distributed generation, and effect of extreme weather conditions.

The low-growth forecast was prepared by the IESO by applying the percentage annual growth rates predicted by the demand forecast model underlying the LTEP for the broader Central Ontario and GTA zones, and applying these growth rates uniformly across the load centres. Because York Region overlaps with both of these zones, the growth rate for the Toronto zone was used for Southern York Region (roughly corresponding with the municipalities of Vaughan, Richmond Hill, Markham, and Buttonville), and the growth rate for Central Ontario was used for Northern York Region (roughly corresponding with the municipalities of Whitchurch-Stouffville, Georgina, East Gwillimbury, Newmarket, and King).[2] Zonal growth rates were prepared based on direction provided in the 2013 LTEP, and they account for anticipated peak demand impacts of new Conservation programs. Because this forecast does not allow for variations in growth levels within a planning area, and instead applies the same growth rate across a large zone, this forecast does not provide the same precision or benefits of local knowledge as the high-growth forecast. As a result, this forecast was used as a long term (2024-2033) sensitivity scenario, to account for the lower level of certainty associated with development plans prepared over a decade in advance. Since this forecast made use of a percentage growth factor, it was required to assume a starting value for station demand in 2023. In order to align this long term forecast with the common near/mid-term forecast, the high-growth forecast was used as the starting point.

[2] The northern and southern sub-regional boundaries in this study are based on electrical boundaries and do not correspond directly with the municipal boundaries.

In both forecasts, the final demand allocated to PowerStream stations was adjusted to account for load transfers and typical station loading practices. This ensures that a station already at full capacity would continue at full utilization, even if incremental peak demand reducing measures (conservation and DG) would have produced a net decrease in load. The IESO worked with PowerStream to understand and implement transfers consistent with their expected operation.

The final high-growth and low-growth forecasts are provided in Appendices A.4.1 and A.4.2, respectively.

A.4.1 High-Growth Planning Forecast by Sub-Area and Station

Table A-5: High-Growth Planning Forecast (MW)

NORTHERN YORK REGION Net Load (Extreme)	2014	2015	2016	2017	2018	2019	2020	2021	2022	2023	2024	2025	2026	2027	2028	2029	2030	2031	2032	2033
Holland TS	134	136	138	142	144	145	146	149	152	154	156	158	160	162	164	166	168	168	169	170
Armitage TS	289	294	299	306	312	314	317	324	330	336	338	344	349	352	356	361	365	368	371	377
Brown Hill TS	72	74	76	79	81	83	85	88	90	93	95	98	101	104	107	110	113	116	119	123

VAUGHAN/RICHMOND HILL Net Load (Extreme)	2014	2015	2016	2017	2018	2019	2020	2021	2022	2023	2024	2025	2026	2027	2028	2029	2030	2031	2032	2033
Richmond Hill MTS	254	254	254	254	254	254	254	254	254	254	254	254	254	254	254	254	254	254	254	254
Vaughan 1 MTS	287	306	306	306	306	306	306	306	306	306	306	306	306	306	306	306	306	306	306	306
Vaughan 2 MTS	153	153	153	153	153	153	153	153	153	153	153	153	153	153	153	153	153	153	153	153
Vaughan 3 MTS	153	153	153	153	153	153	153	153	153	153	153	153	153	153	153	153	153	153	153	153
Vaughan 4 MTS	0	0	24	47	69	83	97	119	140	160	170	185	200	212	222	233	241	248	256	272

MARKHAM	2014	2015	2016	2017	2018	2019	2020	2021	2022	2023	2024	2025	2026	2027	2028	2029	2030	2031	2032	2033
Net Load (Extreme)																				
Buttonville TS	153	153	153	153	153	153	153	153	153	153	153	153	153	153	153	153	153	153	153	153
Markham 1 MTS	81	81	81	81	81	81	81	81	81	81	81	81	81	81	81	81	81	81	81	81
Markham 2 MTS	101	101	101	101	101	101	101	101	101	101	101	101	101	101	101	101	101	101	101	101
Markham 3 MTS	202	202	202	202	202	202	202	202	202	202	202	202	202	202	202	202	202	202	202	202
Markham 4 MTS	24	42	62	89	112	125	137	158	178	198	207	220	232	244	255	265	273	279	287	303

A.4.2 Low-Growth Forecast by Sub-Area and Station

Table A-6: Low-Growth Planning Forecast (MW)

NORTHERN YORK REGION	2023	2024	2025	2026	2027	2028	2029	2030	2031	2032	2033
Net Load (Extreme)	(Places to Grow)										
Holland TS	154	153	153	153	153	152	152	152	152	152	152
Armitage TS	336	334	334	334	333	332	332	332	331	330	333
Brown Hill TS	93	93	93	93	92	92	92	92	92	92	92

VAUGHAN/RICHMOND HILL	2023	2024	2025	2026	2027	2028	2029	2030	2031	2032	2033
Net Load (Extreme)	(Places to Grow)										
Richmond Hill MTS	254	254	254	254	254	254	254	254	254	254	254
Vaughan 1 MTS	306	306	306	306	306	306	306	306	306	306	306
Vaughan 2 MTS	153	153	153	153	153	153	153	153	153	153	153
Vaughan 3 MTS	153	153	153	153	153	153	153	153	153	153	153
Vaughan 4 MTS	160	162	168	173	177	179	186	190	194	198	210

MARKHAM	2023	2024	2025	2026	2027	2028	2029	2030	2031	2032	2033
Net Load (Extreme)	(Places to Grow)										
Buttonville TS	153	153	153	153	153	153	153	153	153	153	153
Markham 1 MTS	81	81	81	81	81	81	81	81	81	81	81
Markham 2 MTS	101	101	101	101	101	101	101	101	101	101	101
Markham 3 MTS	202	202	202	202	202	202	202	202	202	202	202
Markham 4 MTS	198	200	207	213	218	220	228	234	238	242	256

York Region IRRP

Appendix B: Needs Assessment

Appendix B: Needs Assessment

This Appendix provides information on the methodology and data used to assess needs in the York Region IRRP.

B.1 Station Capacity Assessment

In order to assess the need for additional transformer station capacity, planning forecasts were compared to the 10-day limited time rating ("LTR") of the stations in the Region. In order to account for transfer capability between adjacent stations, three groupings of stations were considered:

- **Northern York Region:** Holland TS, and Armitage TS.[3]
- **Vaughan:** Vaughan #1, #2, and #3 stations for the near term; in the medium and long term, the new Vaughan #4 station was also assumed to be available.
- **Markham/Richmond Hill:** Markham #1, #2, #3, and #4 stations, Richmond Hill MTS, and Buttonville TS.

For each of these station groupings, the combined capacities of the stations were compared against the combined planning forecasts at the included stations to determine when new station capacity is likely to be needed.

B.1.1 Near-Term Station Capacity Assessment (2014-2018)

In the near term, station capacity is forecast to be exceeded beginning around 2016 in Vaughan. There is adequate station capacity in Markham/Richmond Hill and Northern York Region in the near term.

Subareas	Combined Station LTR (MW)	Near-Term Planning Forecast 2014-2018 (MW)				
		2014	2015	2016	2017	2018
Markham/Richmond Hill	**944**	815	833	853	880	903
Northern York Region	**485**	423	430	437	448	456
Vaughan	**612**	593	612	636	659	681

[3] Brown Hill TS is not included in the Northern York Region group due to its distance from the Holland and Armitage stations. Brown Hill TS has adequate station capacity to accommodate forecast growth throughout the 20-year planning period.

B.1.2 Medium and Long-Term Station Capacity Assessment (2019-2033): High-Growth Scenario

Under the high-growth scenario, station capacity is forecast to be exceeded in Markham/Richmond Hill beginning around 2021, and in Northern York Region and Vaughan around 2023.

Sub-areas	Combined Station LTR (MW)	High-Growth Scenario 2019-2033 (MW)														
		2019	2020	2021	2022	2023	2024	2025	2026	2027	2028	2029	2030	2031	2032	2033
Markham/Richmond Hill	**944**	916	928	949	969	989	998	1011	1023	1035	1046	1056	1064	1070	1078	1094
Northern York Region	**485**	459	463	473	481	490	494	502	509	515	520	527	533	536	540	547
Vaughan	**765**	695	709	731	752	772	782	797	812	824	834	845	853	860	868	884

B.1.3 Medium and Long-Term Station Capacity Assessment (2019-2033): Low-Growth Scenario

Under the low-growth scenario, station capacity is forecast to be exceeded in Markham/Richmond Hill beginning around 2021, and in Vaughan around 2023. Station capacity is expected to be adequate throughout the study period in Northern York Region under this scenario.

Sub-areas	Combined Station LTR (MW)	Low-Growth Scenario 2019-2033 (MW)														
		2019	2020	2021	2022	2023	2024	2025	2026	2027	2028	2029	2030	2031	2032	2033
Markham/Richmond Hill	**944**	916	928	949	969	989	991	998	1004	1009	1011	1019	1025	1029	1033	1047
Northern York Region	**485**	459	463	473	481	490	487	488	487	486	484	485	484	483	482	485
Vaughan	**765**	695	709	731	752	772	774	780	785	789	791	798	802	806	810	822

B.2 System Load Flow Base Case Setup and Assumptions

The system studies for this IRRP were conducted using PSS/E Power System Simulation software. The reference PSS/E case was adapted from the 2015 base case that was produced by the IESO for the 2010 Northeast Power Coordinating Council ("NPCC") Review. This load flow includes all eight Bruce nuclear units and the new 500 kV double-circuit line between the Bruce Complex and Milton SS. All the units at Darlington are assumed to be in-service, and all of the units at the Pickering generating station are assumed to be unavailable due to their scheduled retirement as early as 2015. Summer ambient conditions of 35 □C and 4 km/hr wind for overhead transmission circuits were assumed in this study. For transformers, 10-day LTRs are respected under post-contingency conditions.

In additional to the bulk system assumptions, the base case includes the following recent changes and specific characteristics of the York Region system:

- Both units at York Energy Centre (YEC)—G1 and G2—were included in the study. Under YEC's current connection configuration, the bus tie between G1 and G2 is normally open and does not have the capability to provide backup under N-1 contingency conditions.
- Due to declining gas feedstock from the landfill site that is its fuel source, the output of the Keele Valley Generating Station is uncertain, particularly in the later years of the study. Therefore, this facility was assumed to be out of service.
- Des Joachim GS and southbound flows on the North-South Tie Interface contribute to the area supply at the northern end of the Claireville-to-Minden system. For this study, the North-to-South flow was assumed to be about 1,530 MW, and the output of Des Joachim GS was assumed to be 280 MW (~78% of installed capacity).
- All capacitor banks at Armitage TS, Holland TS, Beaverton TS and Lindsay TS were assumed to be in service.

B.3 Load Meeting Capability of the Claireville-to-Minden System

B.3.1 Application of Planning Criteria

In the Claireville-to-Minden system, supply capacity is provided by both the transmission system, as well as the two generating units at York Energy Centre.

In accordance with ORTAC, the system must be designed to provide continuous supply to a local area under specific transmission and generation outage scenarios. The ORTAC criteria governing supply capacity for local areas are presented in Table B-1. For areas with local generation, such as the Claireville-to-Minden system, ORTAC gives credit to the supply capacity provided by local generation by allowing controlled load rejection as an operational measure under specified outage conditions.

The performance of the system in meeting these conditions is used to determine the supply capability of an area for the purpose of regional planning. Supply capability is expressed in terms of the maximum load that can be supplied in the local area with no interruptions in supply or, under certain permissible conditions, with limited controlled interruptions as specified by ORTAC.

Table B-1: ORTAC Supply Capacity Criteria for Systems with Local Generation

Pre-contingency		Contingency[1]	Thermal Rating	Maximum Permissible Load Rejection
All transmission elements in-service	Local generation in-service	N-0	Continuous	None
		N-1	LTE[2]	None
		N-2	LTE[2]	150 MW
	Local generation out-of-service	N- 0	Continuous	None
		N-1	LTE[2]	150 MW[3]
		N-2	LTE[2]	>150 MW[3] (600 MW total)

1. N-0 refers to all elements in-service; N-1 refers to one element (a circuit or transformer) out of service; N-2 refers to two elements out of service (for example, loss of two adjacent circuits on same tower, breaker failure or overlapping transformer outage),N-G refers to local generation not available (for example, out of service due to planned maintenance).
2. LTE: Long-term emergency rating. 50-hr rating for circuits, 10-day rating for transformers.
3. Only to account for the capacity of the local generating unit out of service

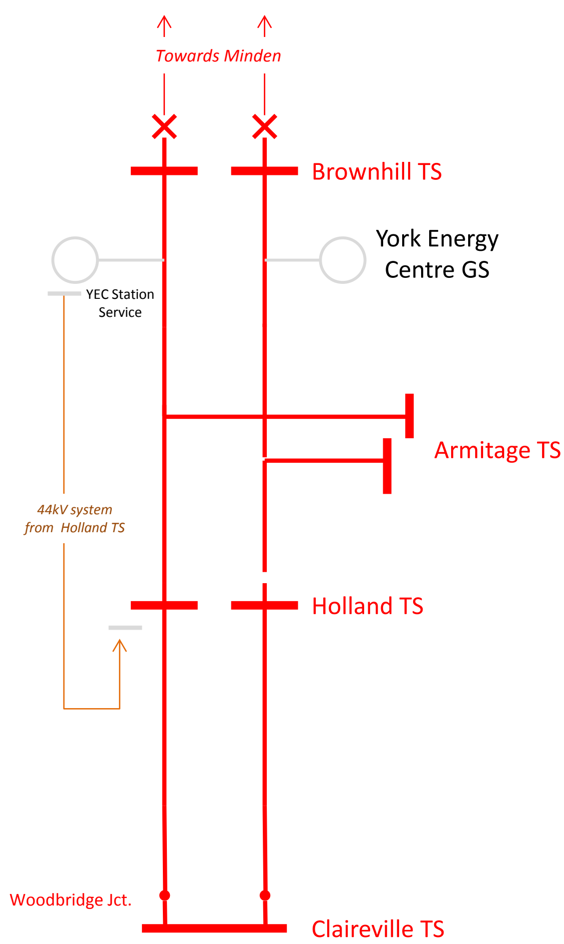
B.3.2 Existing System

The Claireville-to-Minden system, shown in Figure B-1, was assessed under applicable transmission and generation outage scenarios, and load security criteria, as defined by ORTAC. The Load Meeting Capability (LMC) of the system is defined by the most limiting contingency or criterion identified through this assessment.

The LMC of the existing Claireville-to-Minden system, which consists of the 230 kV double-circuit transmission line carrying the circuits B82V and B83V, as well as the local generation at York Energy Centre, is 600 MW. This is defined by the ORTAC load security criterion, which specifies that no more than 600 MW may be lost by configuration in a contingency involving two system elements. Currently, with no isolating devices on the system between Claireville and Brown Hill, this is the most limiting criterion on this system.

While not currently limiting, the supply capability of the system based on contingency analysis is only slightly higher than the load security limit. The next most limiting contingency is a thermal limitation on the section of B82V or B83V between Holland and Claireville following an outage involving the companion circuit. This contingency would limit the supply capability of the Clairieville-to-Minden system to 650 MW.

Figure B-1: Existing Claireville-to-Minden System Configuration

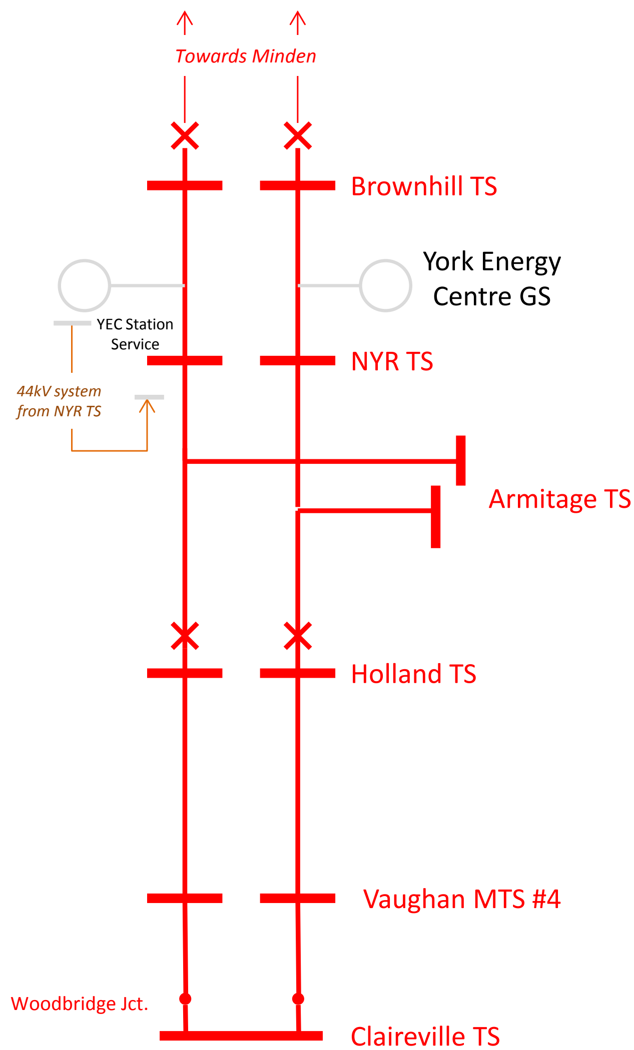


B.3.3 With Addition of In-Line Breakers at Holland TS

The installation of two in-line breakers at the Holland station site, along with motorized disconnect switches and a Load Reduction (L/R) scheme, is part of the recommended near-term plan for York Region (see Figure B-2). The in-line breakers will address the 600 MW load loss limit by sectionalizing the line. In combination with the L/R scheme, the breakers will also increase the supply capability of the system. The new LMC on the Claireville-to-Minden system with these enhancements will be 850 MW. The most limiting contingency defining this LMC is an outage on B82V between the Brown Hill and Holland stations while the YEC unit connected to B83V is unavailable. Under these conditions, the section of B83V north of the breakers would be thermally limited.

The station service supply arrangement for YEC has an impact on the capability of the Claireville-to-Minden system. Currently, its primary supply is through a 44 kV feeder originating at Holland TS. In determining the LMC described above, it was assumed that, as load growth in Northern York Region progresses to the point that a new station is required, the station would be connected north of the in-line breakers, and the station service supply for YEC would be reconnected to that station. If the YEC station service were to continue to be supplied from Holland TS the LMC of the Claireville-to-Minden system would be limited to approximately 700-750 MW.

Figure B-2: Claireville-to-Minden System Configuration after Addition of Holland Switching Facilities



York Region IRRP

Appendix C: Conservation

Appendix C: Conservation

This Appendix includes descriptions provided by the LDCs of their conservation plans, and describes efforts planned to assess conservation potential going forward. In addition to LDC programs, the Chippewas of Georgina Island First Nation have participated in the IESO's Aboriginal Conservation Program.

C.1 LDC Conservation Plans

The following summaries were provided by LDCs to introduce their CDM Plans for the years 2015-2020, required as part of the Conservation First Framework for 2015-2020. LDCs are required to submit their CDM Plans to the IESO by April 30, 2015. Additional details can be found on each LDC's respective website.

C.1.1 PowerStream

On December 18, 2014, PowerStream submitted its 2015-2020 CDM Plan to the IESO. The plan outlines how it will achieve the new conservation target of 535 GWh over 2015 to 2020.

The plan includes a comprehensive mix of conservation programs to be made available to various types of customers including residential, commercial and industrial customers. Many of the Province-Wide CDM programs designed and funded by the IESO under the 2011-2014 framework will continue to be available under the 2015-2020 framework. PowerStream anticipates that these existing provincial programs, along with some planned enhancements, will continue to contribute the majority of savings within the program portfolio. The plan also calls for new and innovative local programs to supplement the provincial programs.

The annual CDM savings forecast over 2015-2020 was developed at a program level based on inputs from several sources including: CDM achievable potential study conducted by the IESO, PowerStream's historical CDM results, market research, input from third party consultants and CDM management staff. The key steps in developing the CDM savings forecast were as follows:

Step 1 – Provincial Programs. Savings were forecast by estimating the annual participation levels (e.g. number of projects or participants) for each continuing Provincial Program and multiplying the participation forecast by the average savings per project achieved in the program historically.

Step 2 – Anticipated Enhancements to Provincial Programs. Energy savings for anticipated enhancements to the Provincial Programs during the 2015-2020 timeframe were developed based on a review of similar program design elements in other jurisdictions. Based on steps 1 and 2, PowerStream estimates that Provincial Programs (including planned enhancements) will contribute energy savings amounting to about 64% of its 6-year CDM target.

Step 3 – New Programs. In its CDM Plan submission to the IESO, PowerStream identified five concepts for new CDM programs. The detailed program design and business cases for these programs are yet to be developed and approved by the IESO. For the purposes of its CDM Plan, PowerStream made a high level estimate of potential energy savings based on a review of similar programs in other jurisdictions. The delivery costs for the programs were then estimated by multiplying the forecast energy savings by the 'budget rates' (i.e., $310/MWh for residential programs; $240/MWh for non-residential programs) used by the IESO in allocating PowerStream its overall CDM delivery budget of $140.7 million.

Step 4 – Shortfall. Based on all planned CDM programs (current provincial programs, planned enhancements to provincial programs, and new programs), PowerStream estimates achieving about 75% of its 2020 CDM target. In its CDM Plan, PowerStream has identified 131 GWh (25% of target) as a current shortfall. PowerStream plans to achieve 100% of its IESO-allocated target and will continue to explore and develop new program ideas for addressing this shortfall.

PowerStream's 2015-2020 conservation targets are being built into the development of the IRRP and RIP for GTA North, as well as PowerStream's Distribution System Plan. PowerStream is also actively supporting the City of Vaughan and the City of Markham with their Community Energy Plans, by providing data and by participating on advisory committees.

C.1.2 Newmarket-Tay Power

Conservation and demand management will play a significant role in meeting future load growth within York Region. Conservation and demand management targets established in the 2013 LTEP are a key component of the near-term plan for York Region. Based on the success and lessons learned from the initial 2011-2014 CDM framework, Newmarket-Tay Power Distribution is currently preparing a detailed CDM plan for the second CDM framework 2015-2020. Efforts will be focused as much as possible on measures that provide peak demand reduction.

Newmarket-Tay Power Distribution Ltd. will be an active participant in all provincial programs for residential, commercial and industrial sectors. Additional targeted efforts will be directed towards those programs that offer a higher degree of impact on demand reduction. Programs such as the Feed-in-Tariff, (FIT) Demand Response (DR) and Combined Heat and Power (CHP) are expected to have the largest impact towards achieving success. The potential evolution of existing microFIT program to a net metering program outlined in the Conservation First document may prove to be a mechanism to increase customer participation in this area of demand reduction. Newmarket-Tay Power Distribution is reviewing an opportunity to proceed with various pilots to increase customer participation in this area.

The provincial Conservation First policy provides a clear mandate to significantly increase the focus on conservation. Ontario's vision is to invest in conservation first, before new generation, where cost-effective.

As outlined in the Conservation First policy, CDM savings can be achieved in a range of ways:

- Energy efficiency: Using more energy efficient technology that consumes less electricity, such as LED lighting. Building codes and product efficiency standards help improve the energy efficiency of new buildings and appliances.
- Behavioural changes: Increasing awareness and encouraging different behaviour to reduce energy use, for example through social benchmarking.
- Demand management: Reducing or shifting consumption away from peak times, using time-of-use pricing with smart meters and programs like Peaksaver PLUS® and Demand Response 3.
- Load displacement: Reducing load on the grid by enabling customers to improve the efficiency of their energy systems by recovering waste heat or generating electricity required to meet their own needs.

To help meet its conservation goals under the new Conservation First framework in Ontario for 2015-2020, Newmarket-Tay has teamed up with other LDCs of similar size to create a company called CustomerFirst to assist with the design and delivery of conservation programs.

By working together, CustomerFirst member utilities will find efficiencies in the delivery of conservation programs and this will lead to cost savings for electricity customers. Through collaboration and sharing of resources and expertise, CustomerFirst will look for innovative conservation programs including programs designed specifically for the Newmarket-Tay region. With increased customer participation in cost-effective programs that are available to all customer types and sectors, Newmarket-Tay along with the other members of CustomerFirst will continue to put conservation first and realize conservation savings that will contribute to the supply plan for the York Region.

C.1.3 Hydro One Distribution

The Government of Ontario has identified CDM as the most cost-effective electricity supply option. Hydro One has been actively delivering CDM programs since 2005 and will look to build on its efforts over the years to provide its most comprehensive CDM offerings to date during the 2015-2020 Conservation First framework. While Hydro One will be working diligently towards achieving an ambitious 2020 energy savings target as part of the new Conservation First framework, it also recognizes the need and significance of delivering peak demand savings.

Hydro One will make CDM programs available to each of its customer segments, including low-income and First Nations customers. Hydro One is participating in a number of utility working groups developing enhancements to existing CDM programs. Once implemented, these program enhancements will help to drive both higher levels of participation and deeper savings opportunities for program participants. In addition to Province-Wide CDM programs, Hydro One also plans on developing local and regional CDM programs that will aim to help customers save on their bills and defer investments in its asset infrastructure.

As per the CDM Requirement Guidelines for Electricity Distributers released by the OEB on December 19, 2014,[4] Hydro One's distribution planning will incorporate its CDM plans at the outset of the planning process. Thus, distribution investments to increase the system capacity will only be implemented as the regional solution where CDM is not a viable option.

C.2 Conservation Potential

The IESO is currently undertaking an Achievable Potential Study to develop of an updated forecast for conservation potential in Ontario. The Study will be used to inform:

- the 2015-2020 Conservation First Framework mid-term review, including developing aggregate and LDC-specific achievable potential estimate in 2020;
- the short-term and long-term planning and program design; and

[4] CDM Requirement Guidelines for Electricity Distributors EB-2014-0278:
http://www.ontarioenergyboard.ca/oeb/_Documents/Regulatory/CDM_Guidelines_Elec_Distributors_20141219.pdf

- the 2016 Long Term Energy Plan (LTEP), including developing 20-year provincial economic potential and achievable potential estimates.

The study is scheduled for to be completed by June 1, 2016. Local consumption and conservation potential information is expected to be collected, with finer granularity than has previously been available, through this study. For example, achievable potential will be estimated by sub-sector and end use for each LDC. With this information, the IESO and LDCs will be in a better position to address identified needs in York Region in the next iteration of the plan.

York Region IRRP

Appendix D: Development of Community Based Solutions

Appendix D: Development of Community Based Solutions

This Appendix includes sections provided by the LDCs describing their view on developing community-based solutions.

D.1 Newmarket-Tay and PowerStream

As outlined in foregoing sections of this report, York Region is one of the fastest growing areas in Ontario, and the GTA, with forecast electricity load growth of 2-3% annually over the next 20 years (600 MW). In the absence of offsetting load reduction initiatives the construction of substantial new generation, transmission and distribution supply infrastructure will be required.

Siting new electricity supply infrastructure has become a contentious and difficult exercise with various stakeholders citing concerns with regards to the transparency of the process and opportunities for input.

Moreover, identifying representative participants from different customer segments, developing their knowledge of integrated supply planning considerations, effectively incorporating their input, and completing the required work in time to meet growing electricity demand requirements is not without challenge.

In direct response to these concerns a new approach designated "Community Self-Sufficiency" has been developed. The goal of Community Self-Sufficiency is to address these challenges through the use of new forms of customer engagement, new technologies and imaginative new solutions – in effect "To create a next-generation Ontario Supply Model".

This initiative targets the Long-Term Supply Planning Horizon or, as it has been referred to, "2020 & Beyond" because of the time required to pioneer, test and implement new technological solutions.

Under the overarching approval authority of the IESO, Newmarket-Tay and PowerStream will lead the engagement efforts in our communities. We will play a key role in identifying members of the public to participate in Local Advisory Committees as well playing a critical integration & liaison role with closely related planning processes such as the Municipal Energy Plans.

Our objectives are to successfully meet customer demand and growth across York Region throughout the supply planning period:

- While addressing regional electricity infrastructure and business (employment) needs;
- While satisfying system optimization and cost management objectives consistent with the asset management strategies of the utilities: and
- While pioneering new technologies and solutions showcasing the strategic vision and direction of our utilities.

Our Plan at a Glance:

- Develop stakeholder engagement strategy
- Develop liaison strategy
- Identify promising technologies & solutions
- Recruit technology partners
- Recruit stakeholders
- Commission test bed facility
- Develop "Innovation Cluster"
- Incorporate proven solutions into utility asset plans.

The technology solutions are not limited to but will consider the following:

- Advanced fuel cell technologies
- Advanced storage technologies – particularly in combination with fuel cells
- Aggressive DR programs – particularly Residential and Small Commercial Demand Response programs enabled by Aggregators
- Aggressive Conservation programs targeted at Residential Consumers and enabled by next-generation Home Area Networks
- Battery Electric Vehicle storage capabilities, especially for load intensification cluster applications
- Enhanced Renewable Generation opportunities enabled by next-generation storage technologies
- Micro-Grid and Micro-Generation technologies coupled with next-generation storage technologies
- Combined Heat and Power (CHP) opportunities
- Renewed consideration of the Load Serving Entity/Aggregator market model.

There are significant risks associated with this strategy, the most crucial being the necessity to successfully meet the growth in electricity demand with new and unproven load management and storage technologies.

Other key risks include demonstrating consumer value, cost recovery certainty for innovative technologies and the associated risk of asset stranding, risk/reward incentives and technological obsolescence as a casual factor for asset replacement.

PowerStream's recently implemented micro-grid field trial offers a degree of risk mitigation as it does provide a means to evaluate and provide feedback on the feasibility, scalability and cost effectiveness for new and experimental technologies.

D.2 Hydro One Distribution

Hydro One is exploring a variety of program offerings that provide customer and electricity system benefits through energy efficiency, behavioural changes, load displacement, load shifting, demand response, and energy storage. Hydro One is willing to collaborate with local electricity utilities and gas utilities to develop programs and implement projects that will be cost-effective and benefit the greater electricity system.