Electricity Planning in York Region

City of Vaughan - Committee of the Whole (Working Session)

May 8, 2017

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ATTACHMENT 1

Objectives

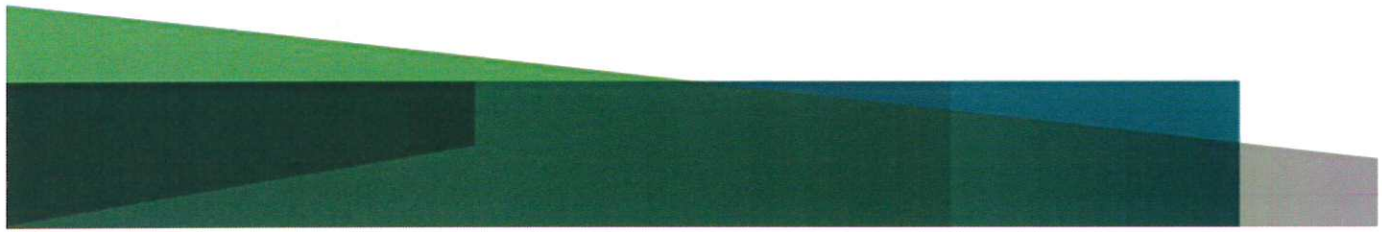
Provide an overview of the regional electricity planning process and electricity infrastructure

Discuss the longer-term electricity needs and options in Vaughan-Northern York Region

Discuss how community-based energy solutions are being considered in regional electricity planning and on-going initiatives/pilots

PART 1

ELECTRICITY PLANNING ACTIVITIES IN YORK REGION



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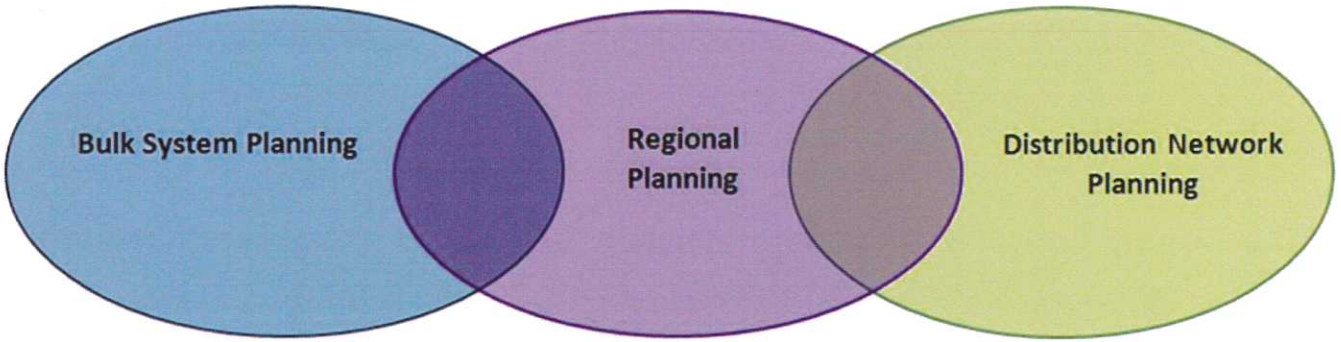
Types of Electricity Planning



Addresses provincial electricity system needs and policy directions	**Integrates** local electricity priorities with provincial policy directions & system needs	**Examines** local electricity needs and priorities at the community-level
Ministry of Energy	IESO	
IESO	Transmitters	Local Distribution Companies
Asset Owners (e.g. Transmitter, Large Generators)	Local Distribution Companies	

First Nations, Métis, municipalities and industry stakeholders

Key Participants

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Scope of Regional Electricity Planning

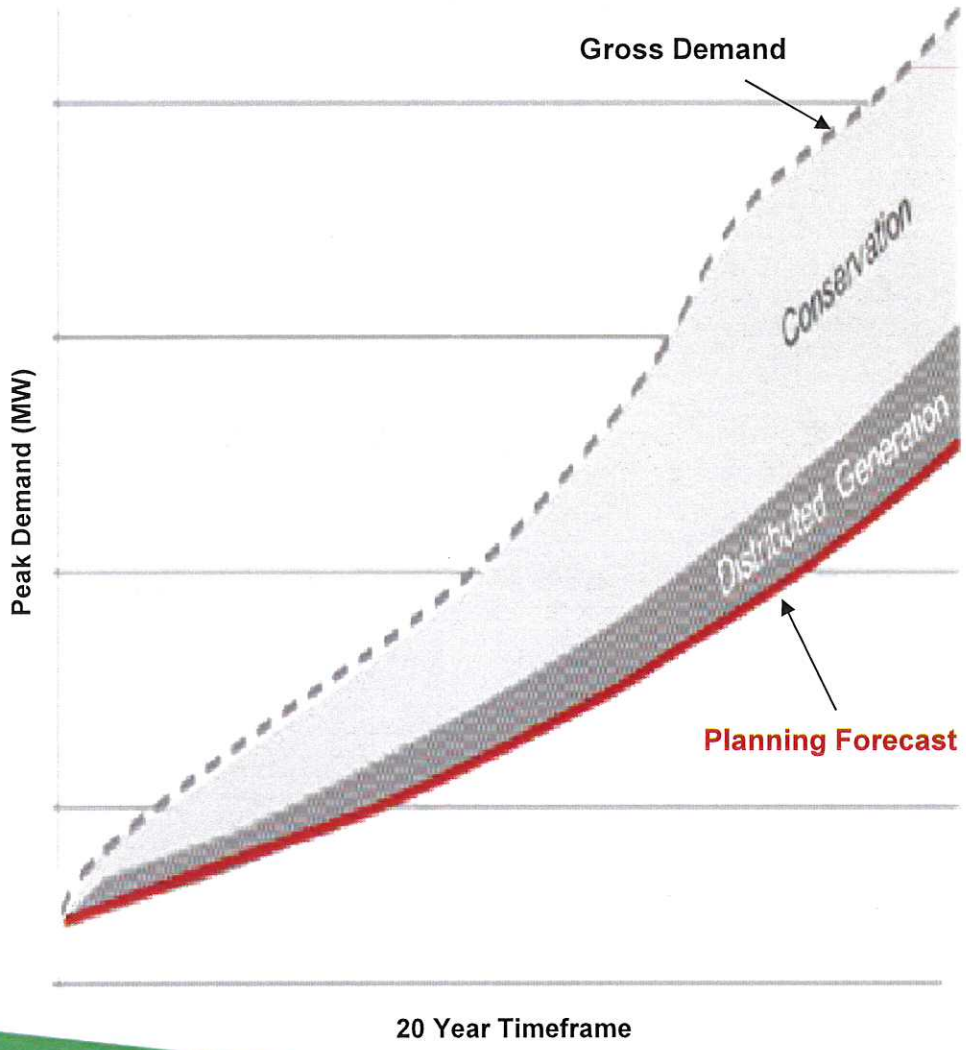
- A process for identifying and meeting electricity needs for a region
  - Carried out by local utilities, transmitter and the IESO ("Technical Working Group")
  - Revisit at a minimum every five years

- Key Outcomes - A 20-Year Electricity Plan
  - Work with communities to understand the electricity needs and local priorities
  - Identify need for infrastructure, generation, conservation programs and/or innovative solutions
  - Layout a near-term implementation plan and long-term roadmap

- Project-related considerations are beyond the scope of regional planning. Projects identified in the plan will still need to consider, as part of the development process:
  - Project details/specifications and siting/routing
  - Approval processes (e.g. environmental assessment, regulatory approval)
  - Project-Level Stakeholder and Community Engagement
  - Consultation with Indigenous peoples
  - Project Funding and Cost-Allocation

- Connection assessment of generation resources for procurement programs, such as the Feed-in-Tariff and, the Large Renewable Procurement, are beyond the scope of regional planning.
  - Generation projects participating in procurement programs will be assessed according the rules and specifications of the procurement programs.

Planning Forecast Assumptions



1. Gross Peak Demand Forecast (MW)
(Provided by local distribution companies and transmission connected customers based on local economic development and growth assumptions outlined in municipal plans)

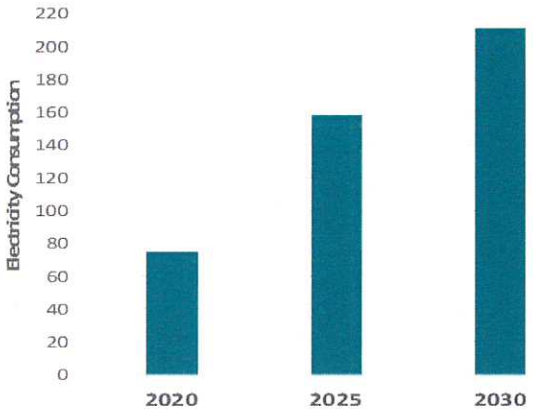
2. Expected Peak Demand Savings from Provincial Energy Conservation Targets
(Includes impact of new codes and standards and programs/pilots outlined in local utilities' conservation plan)

3. Expected Peak Demand Contribution from Existing and Contracted Distributed Energy Resources
(Future distributed energy resources uptake is instead considered as an option for meeting identified needs)

Planning Forecast - *Used to assess the electricity needs over the 20 –year period*

(Take into consideration the gross demand forecast scenarios, estimated peak demand savings from provincial energy conservation targets, and existing and contracted DG)

Identify electricity needs



Provide a Safe, Reliable Source of Electricity to Support Growth

Minimize Impact of Power Outages

Replace Aging Infrastructure

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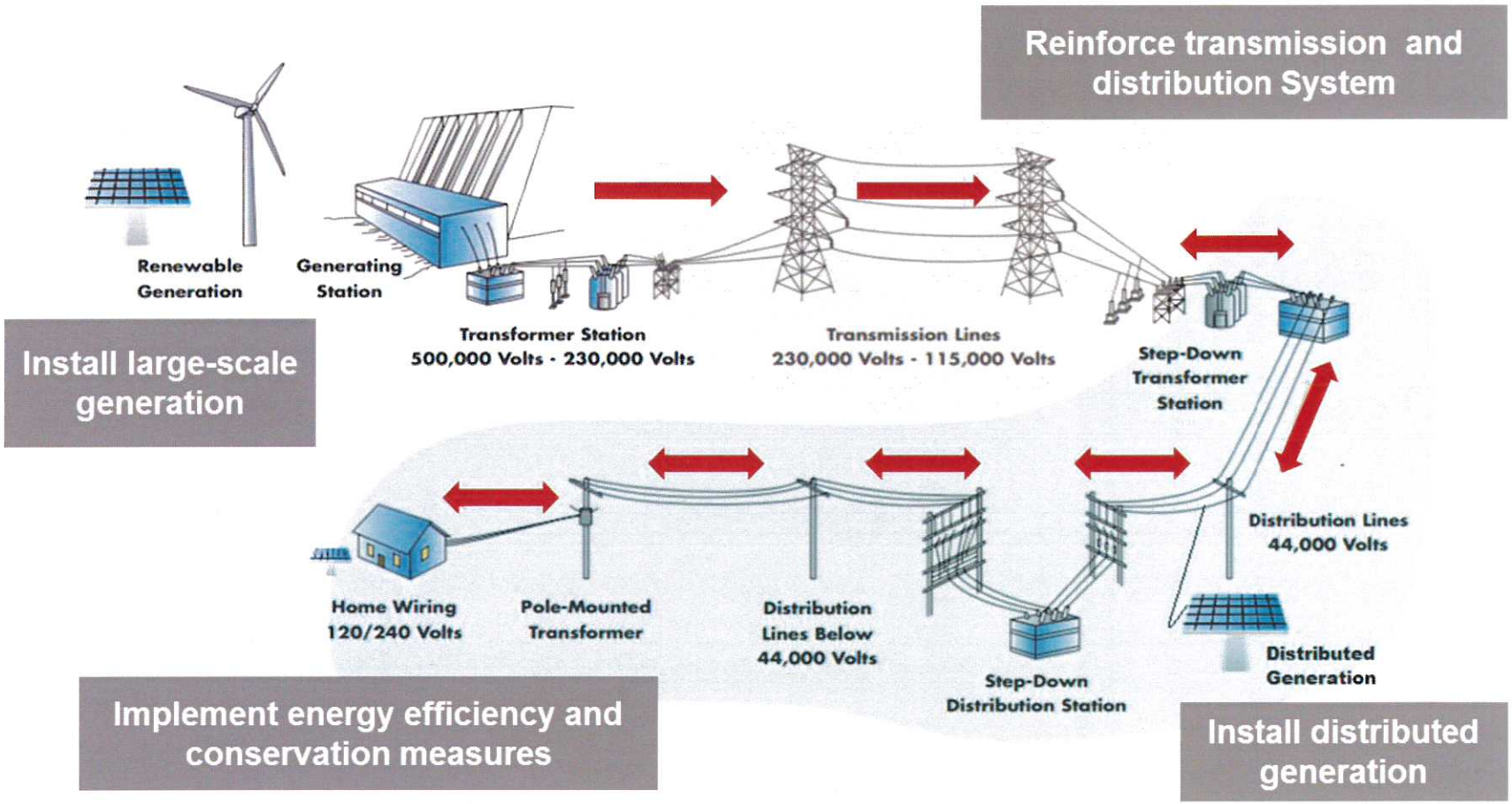
Different approaches to address electricity needs



The electricity plan typically includes a combination of the different types of approaches

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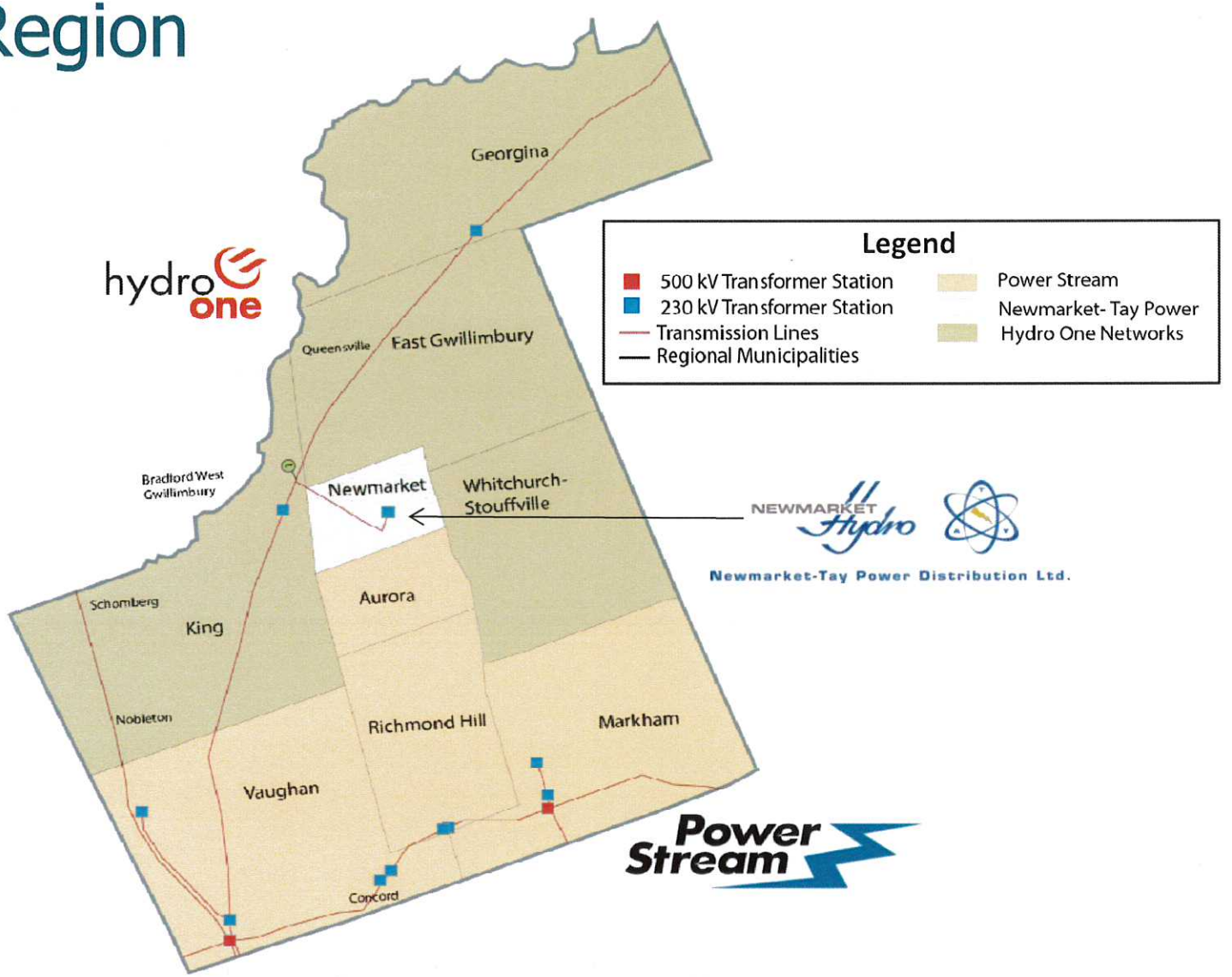
York Region



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Planning Activities Since 2005

2005 Northern York Region Study

Implemented recommended actions

- York Energy Centre
- Holland Station
- Demand Response
- On-going Conservation efforts

2015 York Region Integrated Regional Resources Plan

Implementing near-term plan

- Conservation efforts
- New station in Vaughan
- Switching facilities at Holland
- Switching facilities along Parkway/407 Hwy
- System reinforcements to support growth in Markham-Richmond Hill

Identified longer-term needs

- Growth will exceed the Vaughan-Northern York Region's electricity system's capability.

Inform

Seek input from Local Advisory Committee and affected communities

Lessons learned from pilots and studies

Next iteration of the York Region Integrated Regional Resources Plan

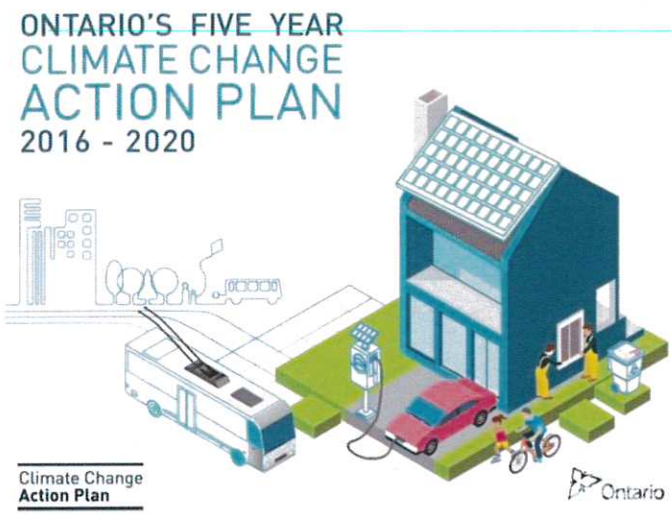
Incorporate input from LAC and affected communities

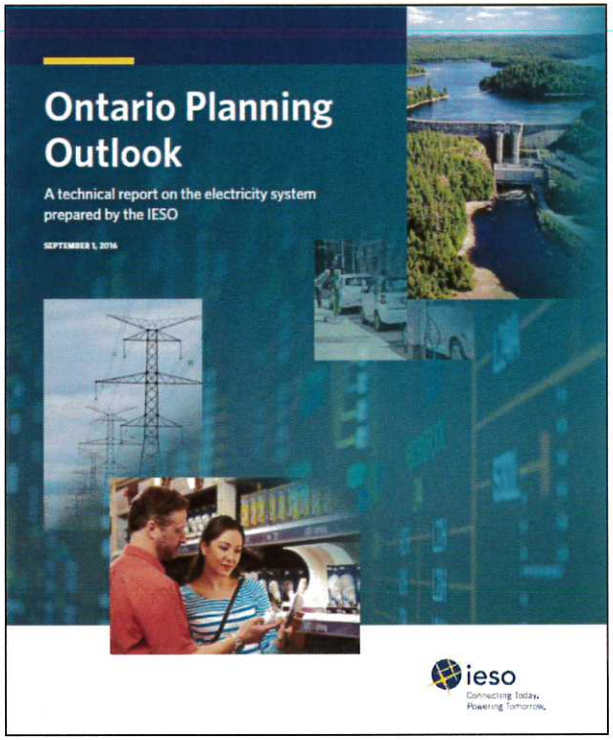
- Solutions required to support growth in Vaughan-Northern York Region

Require input from the local community

2005 2015 2017

Outlook: Trends and Policy Directions





PLACES TO GROW

BETTER CHOICES. BRIGHTER FUTURE.

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Community Energy Planning (CEP)

- Many communities are currently in the process of developing community energy plans
  - Newmarket and Vaughan have Council-approved Municipal Energy Plans
  - Vaughan's MEP is a collection of GHG emission reduction actions and is not an integrated energy plan that identifies community-based energy solutions (E.g., Renewable generations)

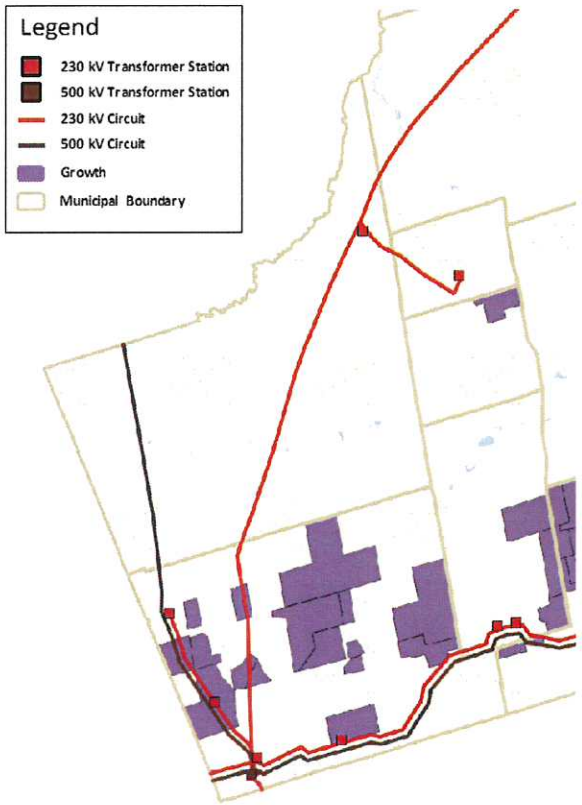
- While regional planning focuses on maintaining adequacy of electricity supply, CEP process takes a broader perspective.
  - CEP includes all fuels, such as transportation, natural gas and electricity, and has different goals, including net zero energy, electrification, greenhouse gas reduction and reducing emissions

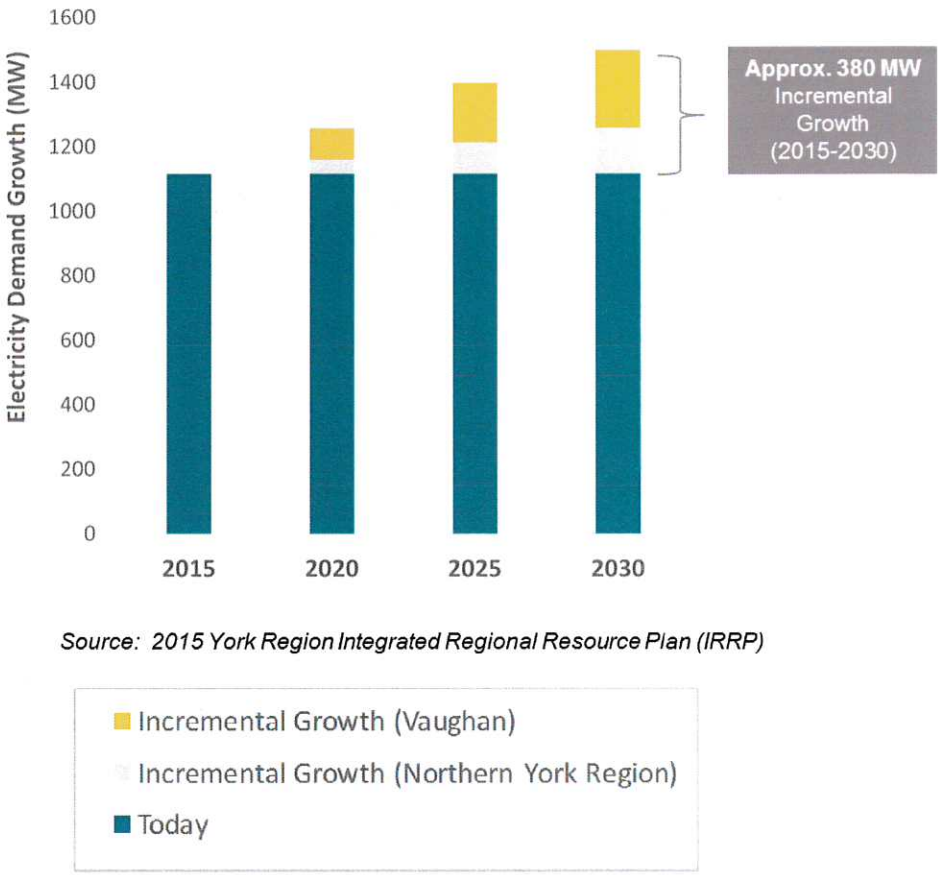
- Energy conservation assumptions are consistent in both CEP and regional planning
  - Includes impact of new codes and standards and programs/pilots outlined in local utilities' conservation plan

- Coordination between CEP and regional planning processes can benefit regional plans by providing local input on opportunities to develop community-based solutions.
  - Local perspectives help provincial system planners to identify these opportunities

Vaughan and Northern York Region Electricity Demand Growth

Continued growth in Vaughan and Northern York Region over the next 20 years.





Source: 2015 York Region Integrated Regional Resource Plan (IRRP)

Note: The incremental growth shown already accounts for the demand savings from on-going conservation efforts

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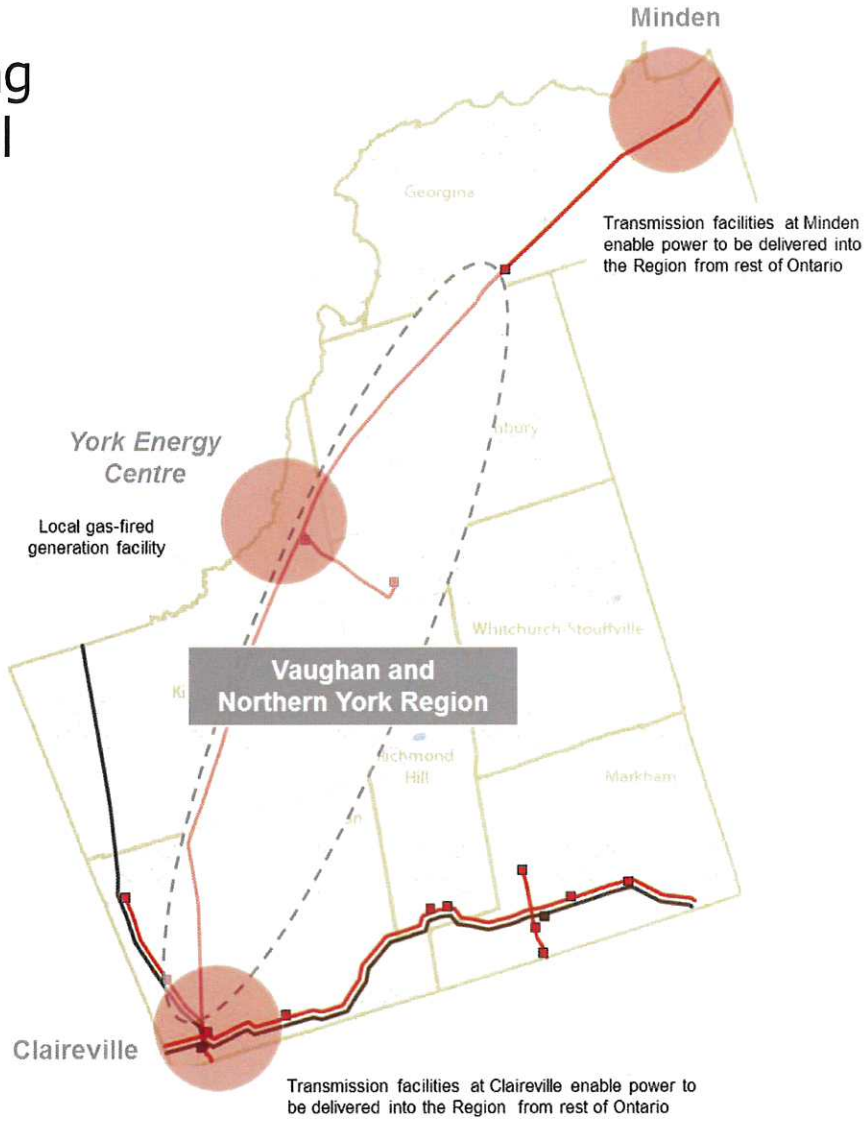
Even with on-going conservation efforts, all three main sources supplying Vaughan and Northern York Region will reach their capacity by mid 2020s.

Sources of electricity supply (At Capacity) by mid 2020s



Vaughan and Northern York Region

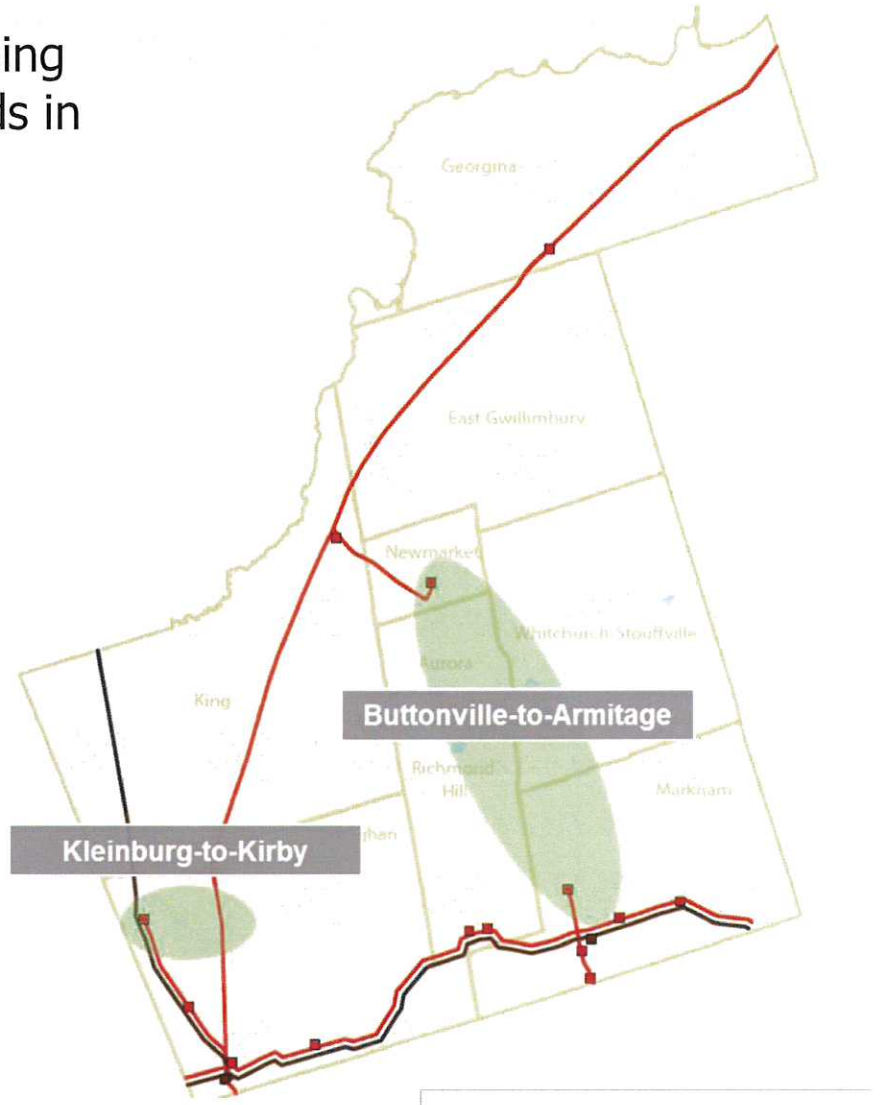
Options Development

- Given the timing, communities may explore opportunities to defer the need for a few years using community-based solutions.
  - Require input from communities to determine the potential and feasibility

- Reinforcement of the electricity system may eventually be required given the magnitude of the growth.
  - Options to reinforce the system should be examined and considered
  - A system reinforcement plan for this area will need to be included in the next iteration of York Region IRRP, which is expected to be initiated in 2017

Two system reinforcement options are being considered to address the electricity needs in Vaughan and Northern York region

- Both options will require 2 transformer stations and a combination of transmission and distribution lines
- Options are being developed in consideration of existing (e.g. Buttonville-Armitage) and future infrastructure corridors (e.g. West GTA Corridor)
- Details related to these options will need to be examined
- Technical Working Group will continue to discuss these options with the LAC and affected communities in future meetings



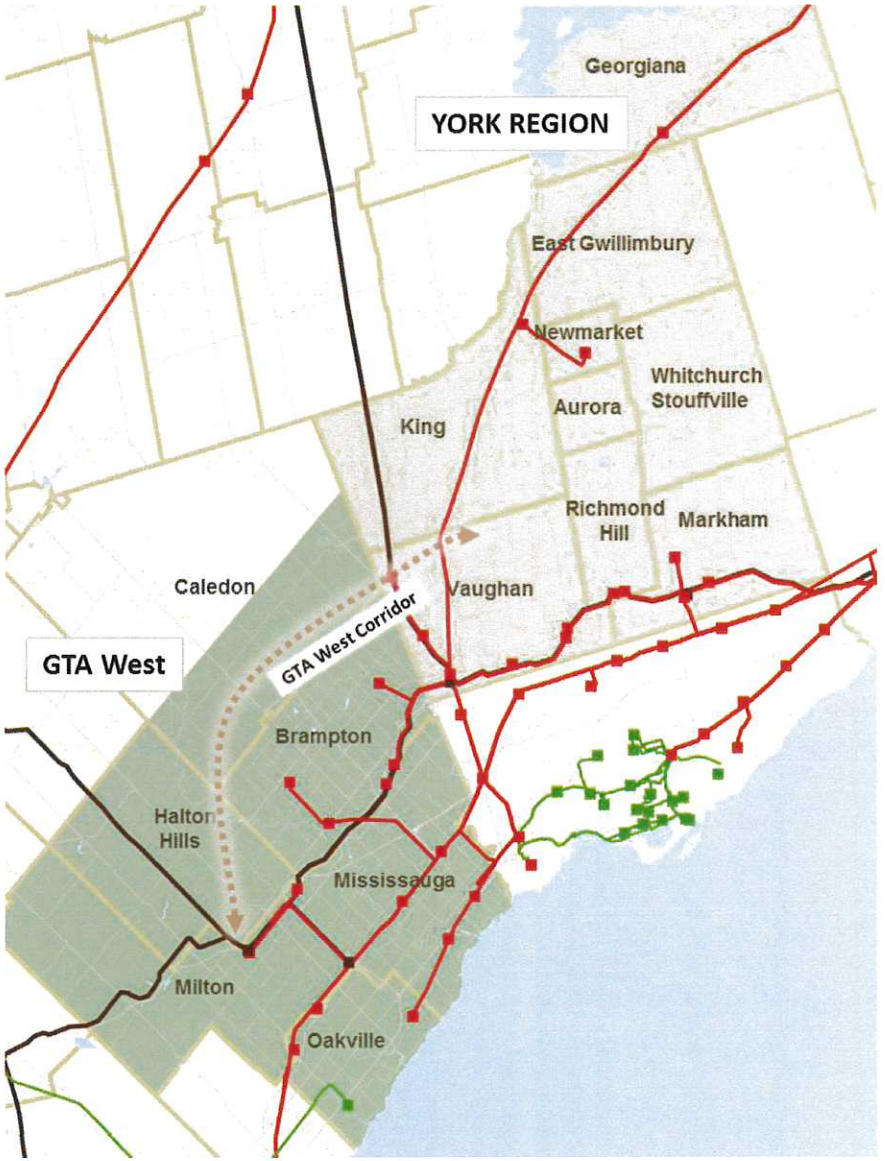
GTA West Corridor

- Proposed new transportation corridor, intended to link Vaughan with Milton. Process has been paused since December 2015 pending review.

- Transmission system reinforcements along the GTA West corridor/Kleinburg area can potentially address both Northwest GTA and Vaughan-Northern York Region needs.

- Needs in Northwest GTA:
  - Provide additional capacity to supply two new stations in North Brampton and South Caledon within the 20 years
  - Minimize the impact of supply interruptions in the Kleinburg area

The needs and options for York Region and Northwest GTA will be examined in a coordinated manner.



Next Steps

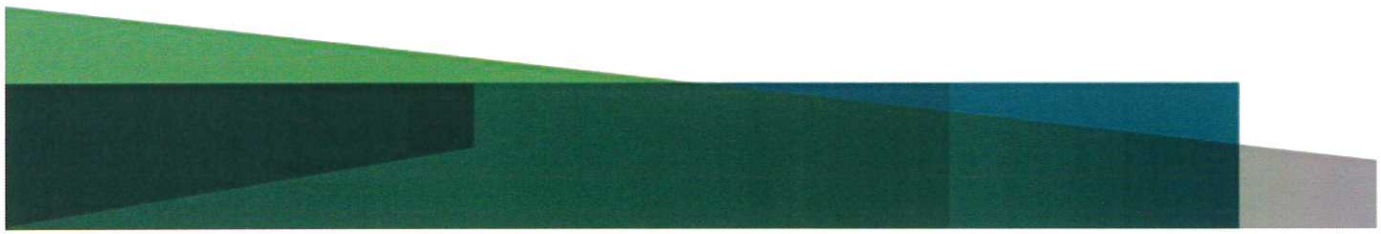
- Working Group will work with the Local Advisory Committee and affected communities to identify opportunities to defer the longer-term needs using community-based solutions.
  - The development of community-based solutions will be the focus of future LAC meetings.

- The Working Group will also continue to discuss potential system reinforcements options with the LAC and affected communities.
  - The needs and options for Vaughan-Northern York Region and Northwest GTA will be examined in a coordinated manner.

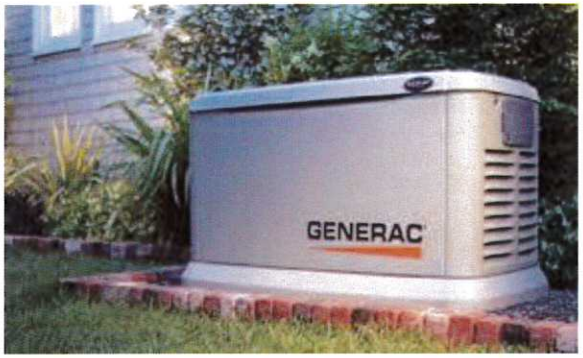
- Input from LAC and affected communities will be incorporated into the next iteration of York Region IRRP, which is expected to be initiated in 2017.

PART 2

COMMUNITY-BASED ENERGY SOLUTIONS AND REGIONAL PLANNING



Community-Based Energy Solutions / Distributed Energy Resources (DERs) – Examples

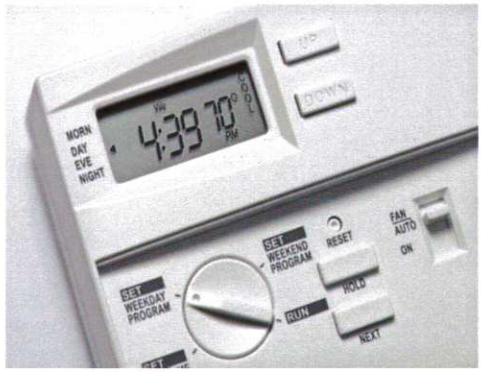


Gas-fired Generators

Microgrids

Energy Storage

Combined Heat & Power



Residential Demand Response

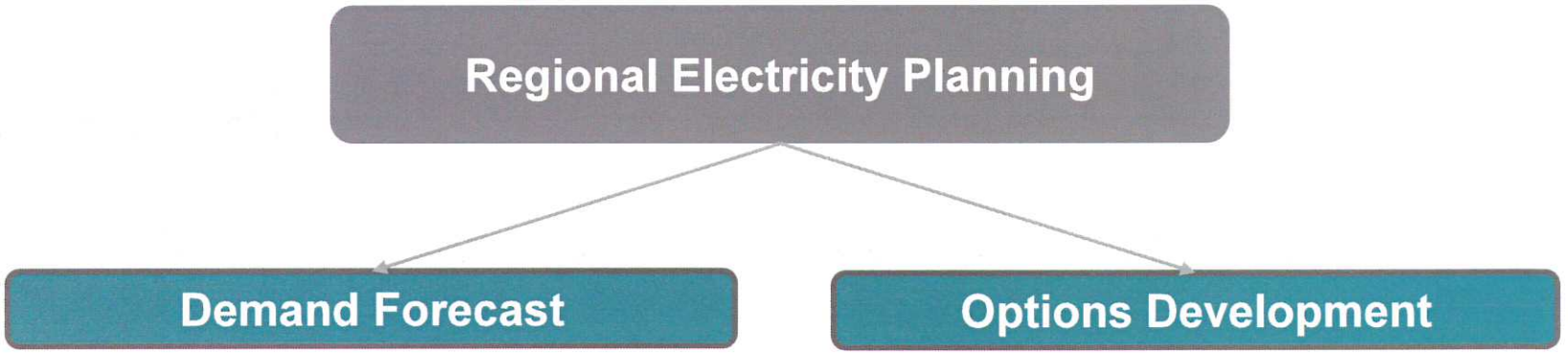
Renewable Generation

Current Technology Characteristics

Technology	Characteristics						
	Capacity	Energy	Operating Reserve	Load Following	Frequency Regulation	Contribution to Provincial Winter Peak	Contribution to Provincial Summer Peak
Conservation	Yes	Yes	No	No	No	Depends on Measure	Depends on Measure
Demand Response	Yes	No	Yes	Yes	Limited	60-70%	80-85%
Solar PV	Limited	Yes	No	Limited	No	3-5%	20-35%
Wind	Limited	Yes	No	Limited	No	20-30%	11%
Bioenergy	Yes	Yes	Yes	Limited	No	85-90%	85-90%
Storage	Yes	No	Yes	Yes	Yes	Depends on technology/ application	Depends on technology/ application
Waterpower	Yes	Yes	Yes	Yes	Yes	67-75%	63-71%
Natural Gas	Yes	Yes	Yes	Yes	Yes	95%	89%

Source: 2016 Ontario Planning Outlook

How do we consider DERs in Regional Electricity Planning?



- ✓ Demand savings from Provincial Energy Conservation Targets
- ✓ Existing and contracted DERs
- ✓ Community Energy Plans (e.g., Energy Efficiency Targets, district energy, CHPs)

- ✓ As an alternative to transmission and distribution solutions, DERs can provide a local source of supply for communities
- ✓ Options are evaluated based on a number of factors:
  - Needs (Energy, Capacity, End of Life, Resilience)
  - Technical feasibility
  - Cost-benefits
  - Regulatory and implementation considerations
  - Land-use considerations and community input

DERs and Regional Planning: Opportunities & Challenges

Opportunities

- Decline in cost of technology
- Increased customer choice and engagement
- Electrification and Climate Change Policies
- Community Energy Plans
- Extreme Events and System Resilience

Challenges

- Limited information on the cost and feasibility of implementing DER in a specific local area
- Limited tools/processes to assess the impact of DERs on transmission and distribution system
- No mechanism to target DER projects to areas where they are needed
- No clear regulations on cost responsibility for DER options to meet regional needs
- No provincial need for additional energy or capacity in the near-term
- Care must be taken to ensure that DER solutions do not result in stranded assets or higher costs

In partnership with local utilities, the IESO is engaging in a number of pilots and studies to better understand costs and feasibility of developing distributed energy resources in a local area

Residential Solar-Storage Pilot and Feasibility Study:

York Region

- The IESO and Alectra Utilities conducted a study looking at the feasibility and cost of implementing residential solar-storage technology in Markham, Richmond Hill and Vaughan.

- Results from the study will help us:
  - Better understand to what extent community-based solutions could defer the need for electricity infrastructure in York Region
  - Facilitate future discussions with LAC and affected communities on community-based solutions

- Refer to Alectra's presentation for more details

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POWER.HOUSE UPDATE

May 8, 2017

MICROGRID - Residential Scale

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POWER HOUSE

SAVE Money

PROTECT Against Outages

GENERATE Your Own Power

Power Stream

Introducing
POWER.HOUSE.

Power your home with solar...
even after the sun goes down!

Program Details:

- 20 homes pilot in Markham, Richmond Hill, Vaughan, Barrie
- Customer pays $3500 upfront costs and $20 monthly service fee
- Costs and benefits to be shared between customer and utility
- Offering, first time in Ontario, Net Metering on Time-of -Use
- No-worry system; owned, operated and maintained by PowerStream
- Installation over 2-3 days
- System commissioned and dispatch model programmed by PowerStream

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SAVE Money

PROTECT Against Outages

GENERATE Your Own Power

POWER. HOUSE.

Solar Integrated System (SIS)

Hybrid Inverter

Solar Charge Controller

Gateway Computer

Protection & Isolation

Battery + BMS

NEMA Enclosure

Other Installed Components

Solar Integrated System (SIS)

Battery Disconnect Switch

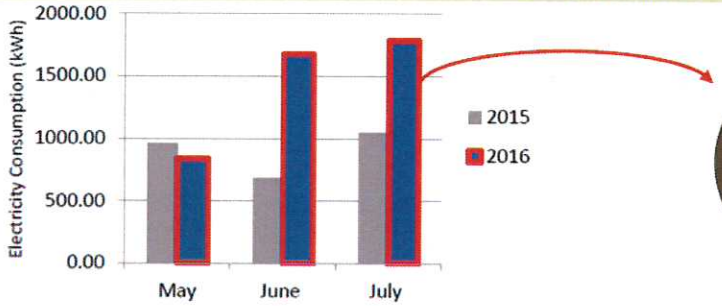
Arc Fault Circuit Interrupter (2 string)

PV Disconnect Switch

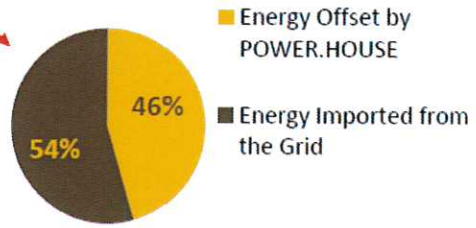
Rooftop Solar

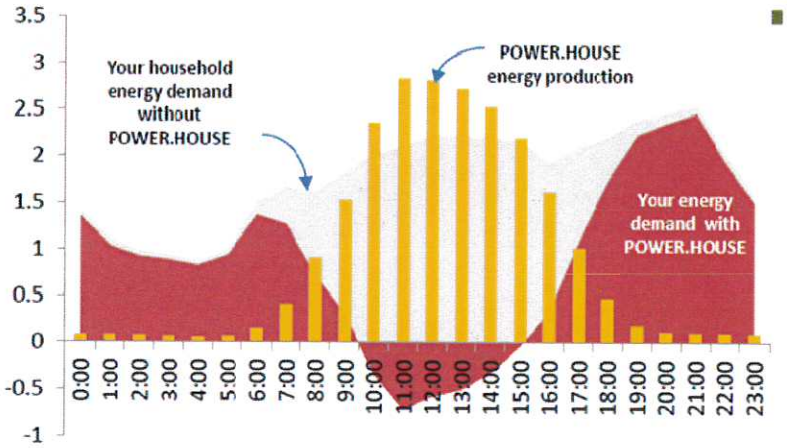
Actual Savings for a POWER.HOUSE Customer
May to July 2016

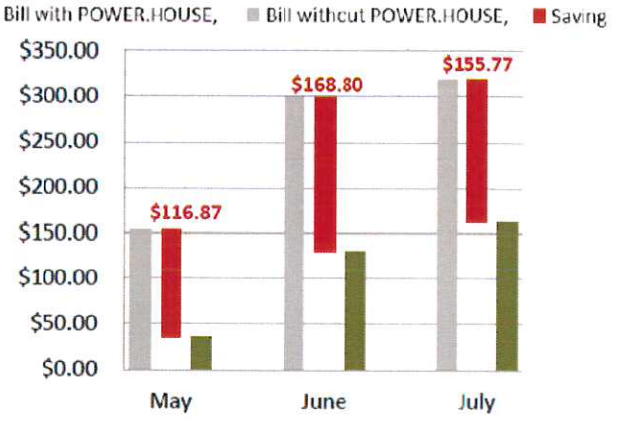
This graph compares your household consumption pattern for the same quarter last year (2015).



This graph breaks down your household consumption into what is imported from the utility grid vs. what was offset by your POWER.HOUSE unit.



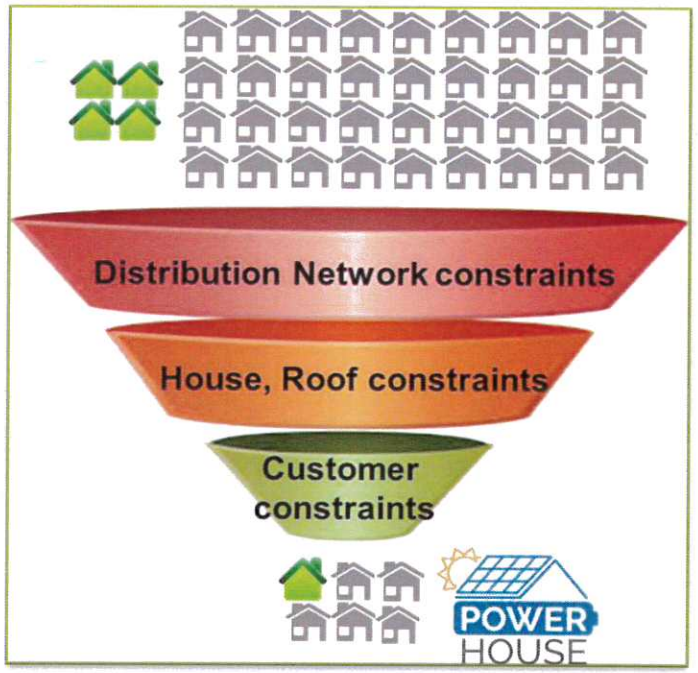




Your total saving in this quarter = 441.44 $ (57.3 %)

This quarter, POWER.HOUSE Program participants enjoyed a total of 20.87 hours of power outage protection. *

POWER.HOUSE Feasibility Study



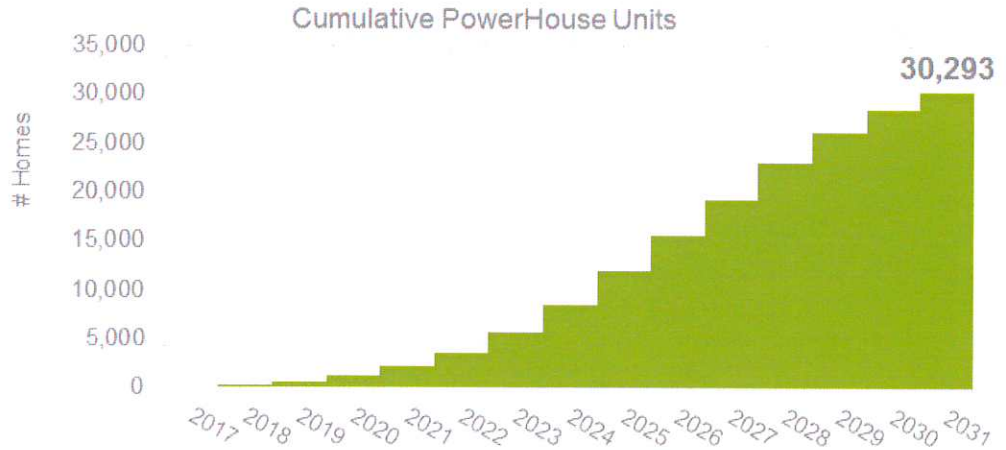
POWER.HOUSE Feasibility Study (PowerStream, IESO)

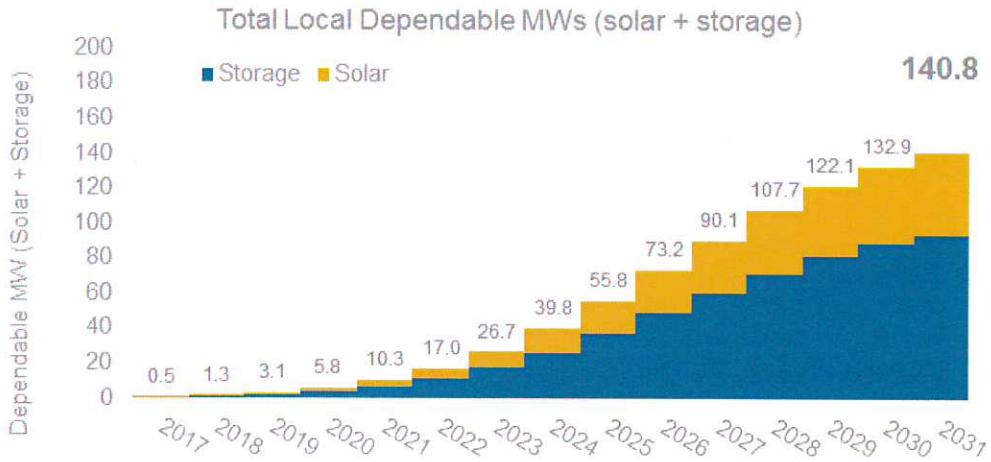
- In partnership with IESO
- Utility owned Residential Solar, Storage solution with VPP capabilities
- Specific to York Region- Markham, Richmond Hill and Vaughan
- Time frame for adoption: 15 years

Study Highlights

- ✓ High degree of involvement and collaboration with IESO, PowerStream, and other supporting staff
- ✓ POWER.HOUSE can feasibly reach meaningful uptake within the study period (2016-2031) - **30,000 units and 140 local dependable MW**
- ✓ POWER.HOUSE can defer at least 2 years of local transmission/distribution investment in late 2020 timeframe
- ✓ Team worked with IESO to understand technical needs and demonstrated the technical capabilities and customer value
- ✓ Team worked with IESO to understand the "societal" business case and demonstrated positive results
- ✓ Identified barriers and catalysts required to support widespread adoption

Program Structure and Uptake





Program Offer:

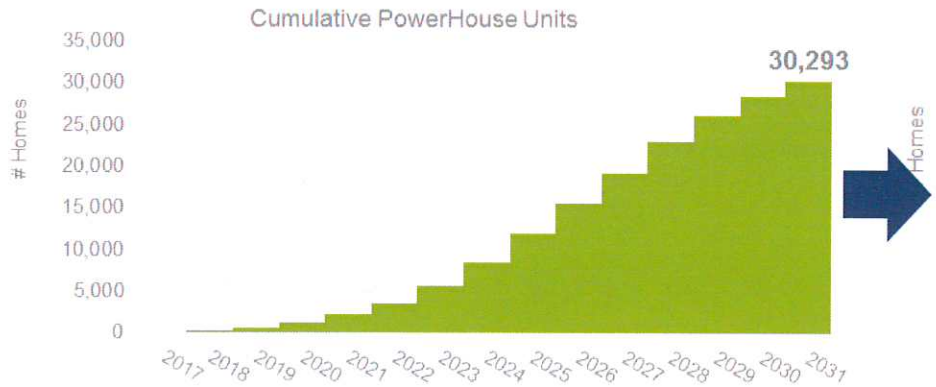
Single Family Home

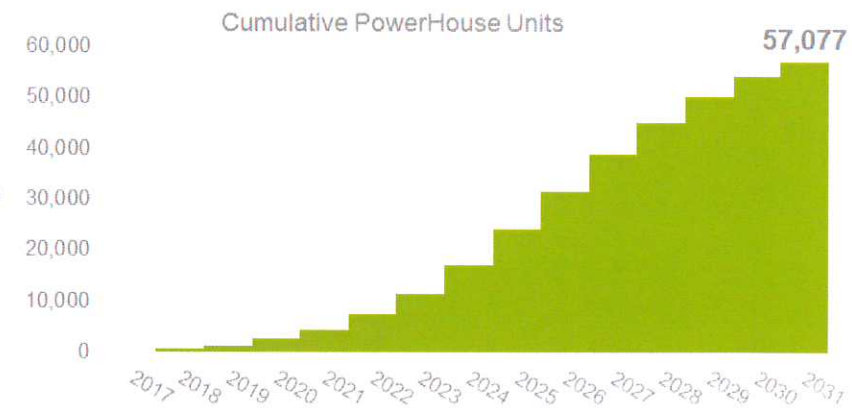
- 5 kW Solar/11.64 kWh battery
- 8 – 10 MWh average annual load
- $4,500 up front
- $80/month for 10 years
- Average nominal bill savings + reliability benefit of $1,800/year
- Payback between 4 and 5 years

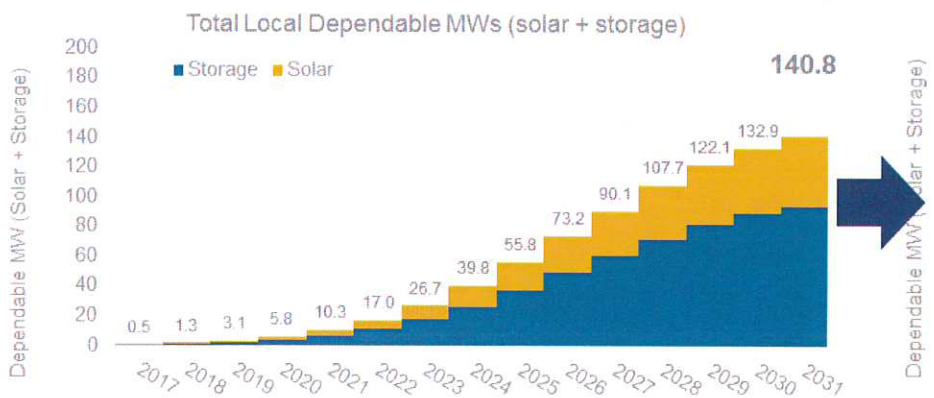
Semi/Row Home

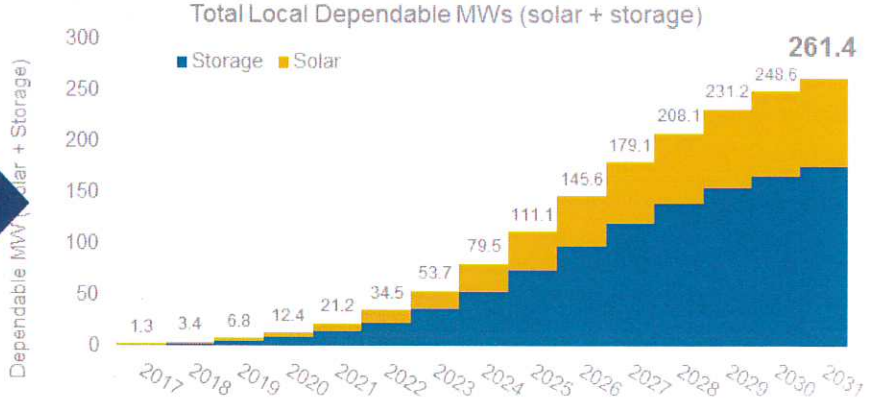
- 3 kW Solar/7.7 kWh battery
- 4 – 6 MWh average annual load
- $3,500 up front
- $55/month for 10 years
- Average nominal bill savings of $1,100/year
- Payback between 5 and 6 years

Program Structure and Uptake









Aligned with IESO OPO

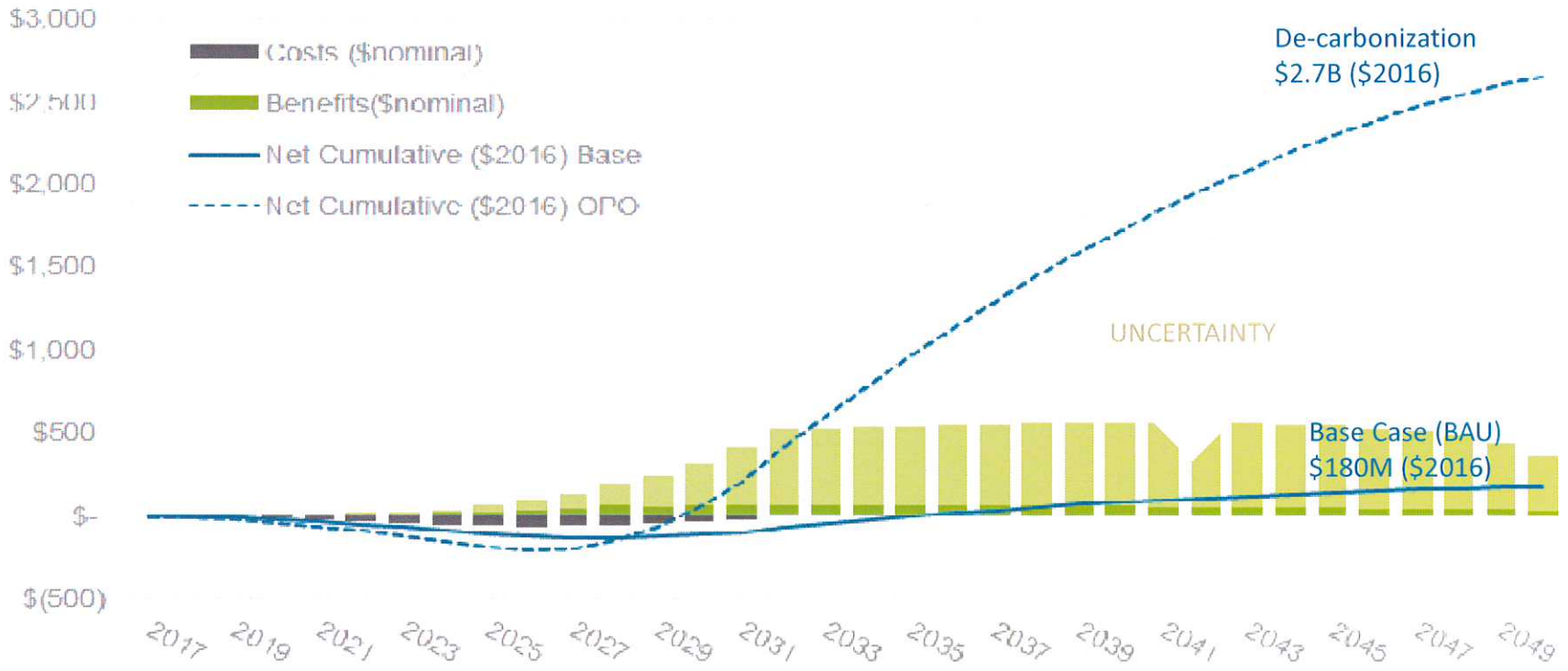
Scenario B

Scenario D4

Program Uptake Increases under OPO Deep De-carbonization Scenario (D4)

NPV- LTEP (Societal) Perspective

- **When considering all units installed, there is a positive NPV from a societal perspective**



New units installed
Costs decline over time

Accruing benefits over life of the units

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Discover the possibilities

Open Discussions

May 8, 2017

Local Achievable Potential Study

Toronto, Barrie-Innisfil, Parry Sound-Muskoka area

- Local achievable potential studies are currently underway or will be initiated for Toronto, Barrie-Innisfil, and Parry Sound-Muskoka
  - These studies are funded by the IESO Conservation Fund, but are led by the local utilities

- The results from these studies will help the IESO and LDCs to:
  - Better understand the achievable conservation and demand management potential in these local areas
  - Inform the development of solutions and planning scenarios

- The study will be tailored to the specific characteristics of the local area and will examine a wide range of options, including:
  - Incentive adders to existing conservation programs
  - New conservation programs
  - New Demand Response program
  - Behind the Meter Generation
  - Energy Storage

Local Demand Response Pilot

County of Brant and the City of Brantford

- In 2016, the IESO, with input from the Brant area Local Distribution Companies, initiated the development of the Brant Local Demand Response (DR) Pilot

- The pilot is intended to help the IESO and LDCs:
  - Test the use of DR to assist with local capacity needs
  - Provide interim capacity relief, if needed, until additional capacity provided by transmission reinforcements are in place in 2019 in the Brant area

Potential Areas for Coordination: Community Energy Planning and Regional Planning Activities

- A number of communities across the province are in the process of developing community energy plans

- The IESO is currently participating in the community energy planning process in multiple municipalities, including Region of Waterloo, York Region (e.g., Markham, Vaughan), Oakville and Durham

- Potential areas for greater coordination include:
  - Right-of-Way/services and transportation corridor planning
  - Infrastructure siting
  - Housing energy efficiency standards
  - Community-level cogeneration or district energy based conservation
  - Funding/cost-sharing issues

Other Initiatives

- Energy storage pilot project in Newmarket
- Penetanguishene Microgrid Project
- Residential solar storage pilots (e.g., Oshawa PUC, Veridian Connections)
- Opportunities for targeted conservation programs
- Other Initiatives

York Region Electricity Plan – Next Steps:

DER Options to Address Longer-Term Needs in York Region

Needs:

- By the mid 2020s, growth in Northern York Region/Vaughan will exceed the electricity system's capability

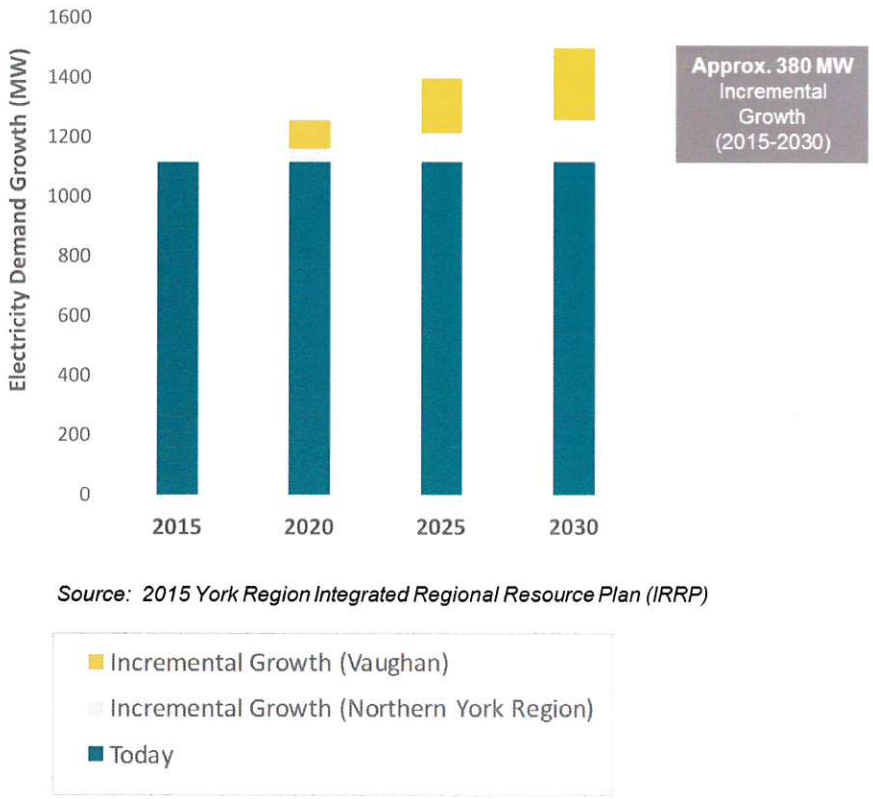
Options Evaluation:

- To what extent can community-based energy solutions be a cost-effective and reliable option to defer the longer-term needs?

Next Steps for the Working Group & LAC members:

- Examine the cost and feasibility of implementing "*specific* " initiatives in York Region:
  - Power.House Feasibility Study
  - York-Specific Pilots (e.g., CHP, targeted conservation, demand response) and local achievable potential study

- Incorporate input from the communities
  - Community Energy Plans
  - Community-based solutions and Initiatives



Source: 2015 York Region Integrated Regional Resource Plan (IRRP)

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