

Planning to Meet the Needs of Ontario's Electricity System

Northeast Regional Electricity Forum
November 22, 2018

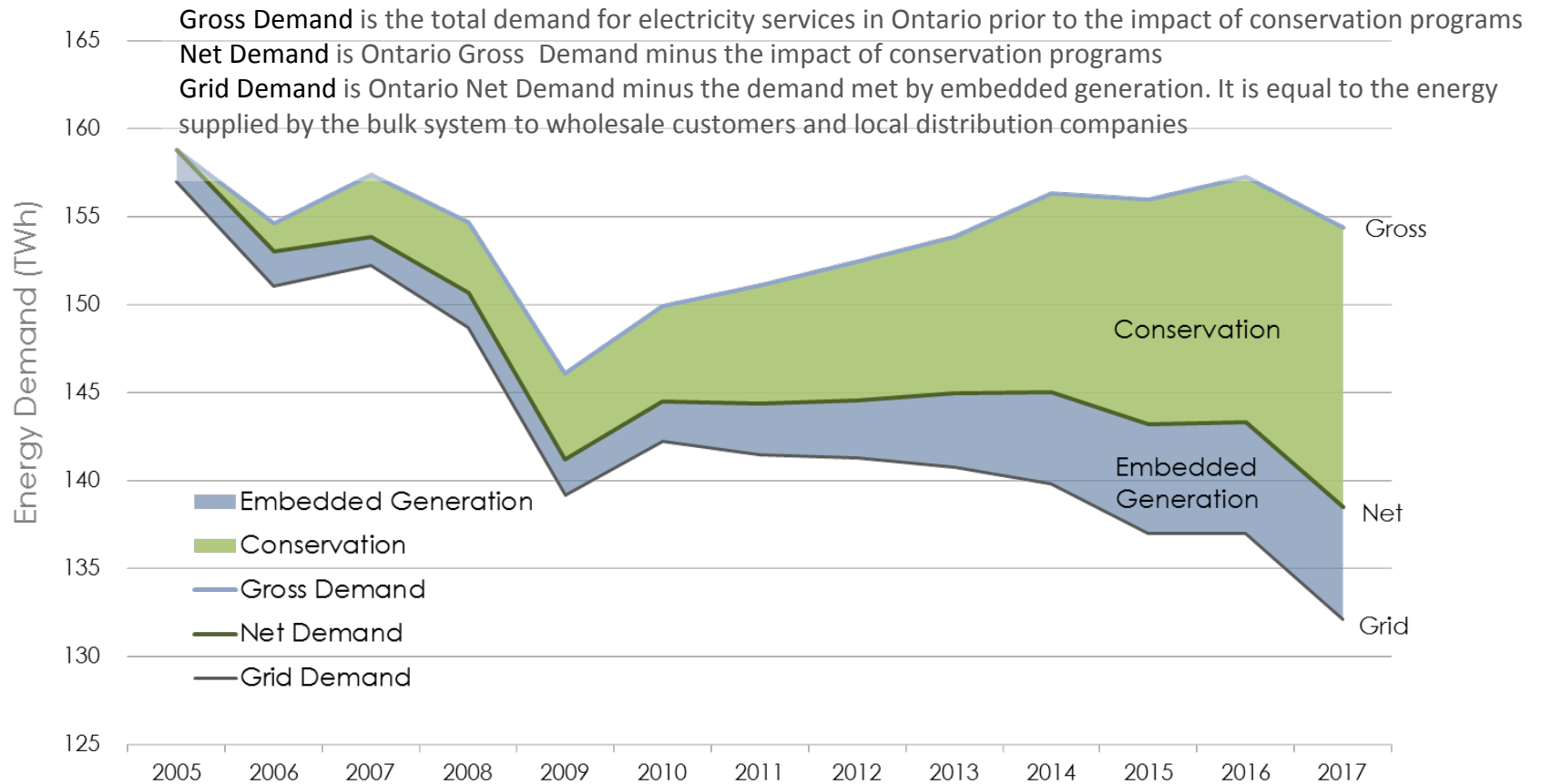
Overview

- To provide communities and stakeholders with an update on the IESO's electricity planning outlook
- To facilitate a discussion on how Provincial system needs and community energy planning can align
 - What are the current/future barriers and opportunities faced in managing local community energy initiative?
 - Is there anything the IESO should take into consideration to help shape future electricity planning for the province?

Load and conservation forecast

Historical demand: 2005 – 2017

- Energy demand has been on a declining trend over the past decade, driven by changes to the economy, conservation savings, and embedded generation.

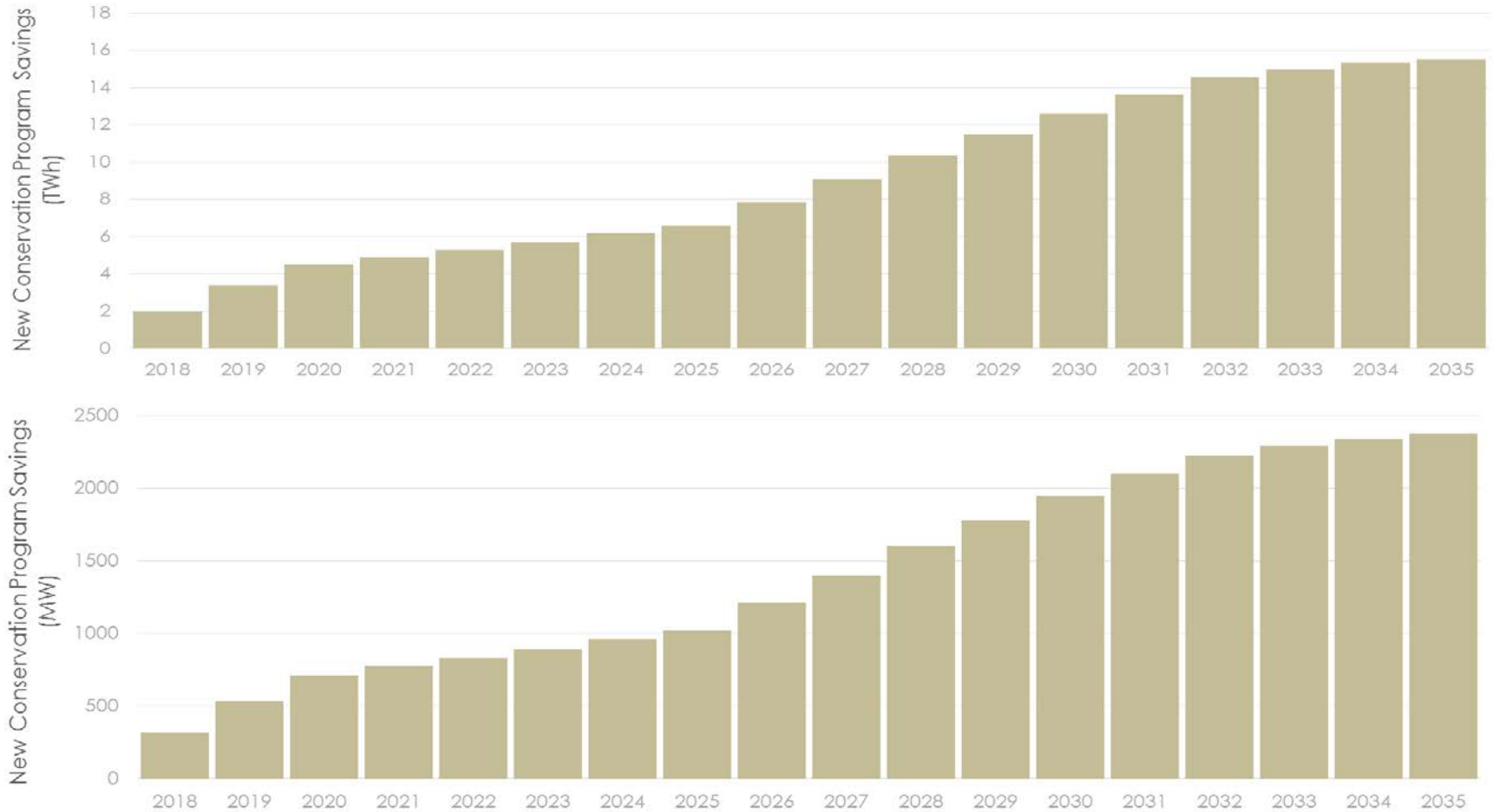


Key drivers considered for electricity demand

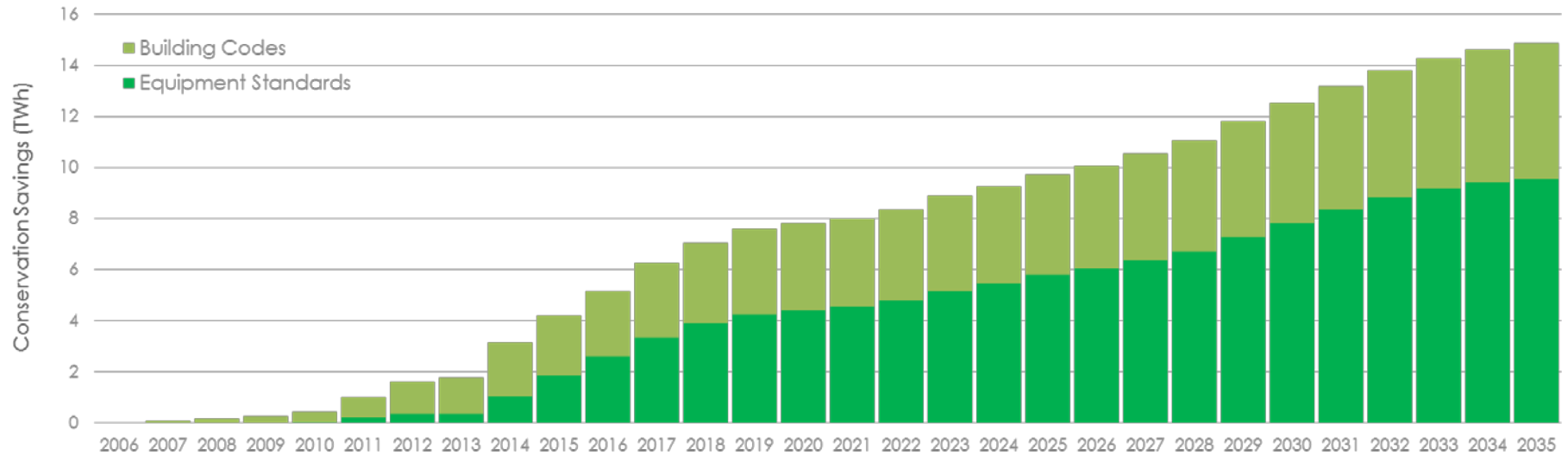
- **Major economic drivers:**
 - Residential households
 - Commercial floor space
 - Gross Domestic Product (Real GDP, manufacture GDP, service sector GDP)
 - Industrial output/activities
- **Electricity price and natural gas price forecast:**
 - High electricity price results in greater natural efficiency uptake
 - Rate design impacts – annualized price effect of the Industrial Conservation Initiative is included in the sector price forecast
- **Conservation forecast**
 - Energy efficiency programs
 - Codes and standards
- **Distributed energy forecast**
 - Net Metering uptake
 - Customer Based Generation

Long-term conservation forecast

- New, future conservation programs represent about 15 TWh energy savings and 2,400 MW of peak demand savings by 2035.
- Between 2018 to 2035, we see incremental conservation savings from new programs, which is in addition to incremental savings from codes and standards.



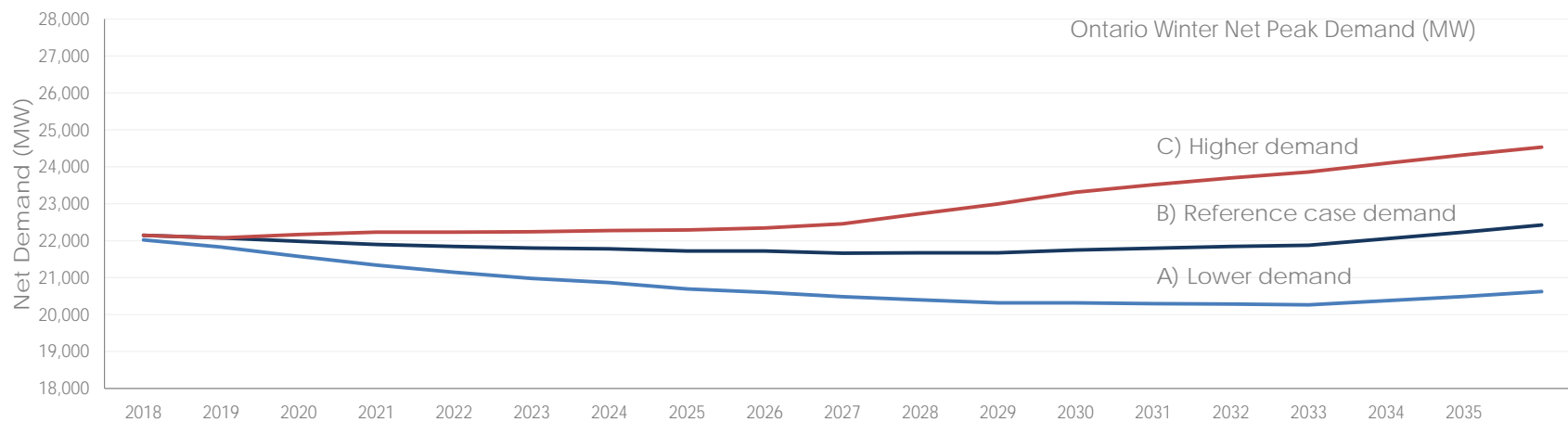
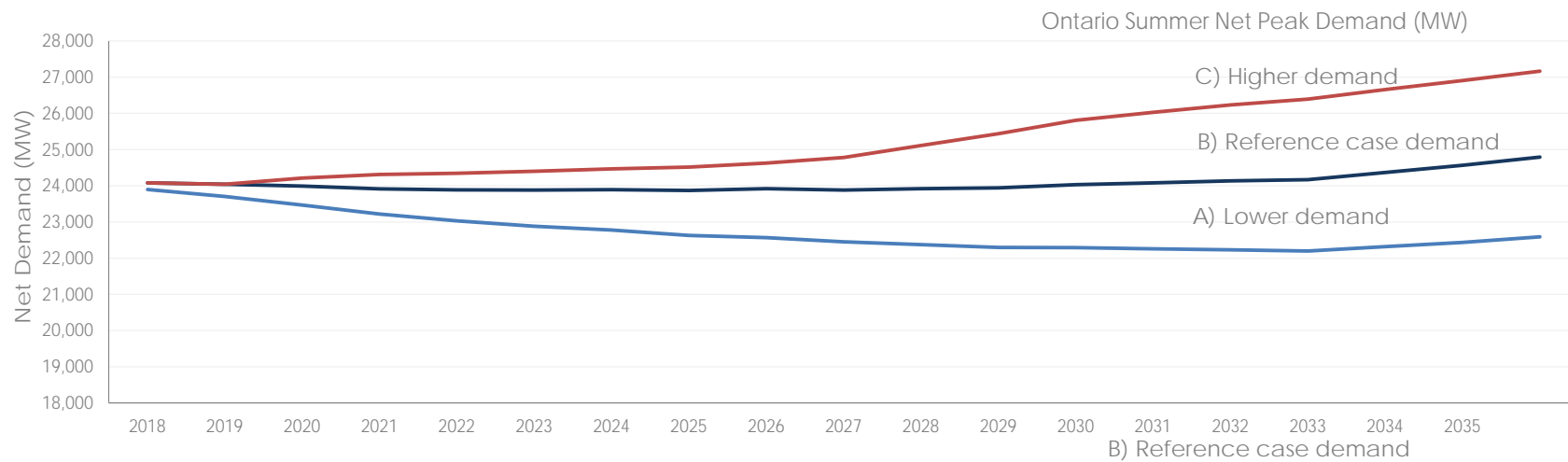
Factoring in codes and standards



- An effective energy efficiency tool that embeds energy savings in buildings and equipment upgrades and requires no incremental electricity fees.
- Savings from codes and standards are forecasted to be approx. 15 TWh by 2035.
- Methodology of estimating savings from codes and standards
 - Codes and standards savings estimates are based on the expected improvement in the codes for new and renovated buildings and for specified end uses through the regulation of minimum efficiency standards for equipment.
 - The IESO estimates savings to be attributed to codes and standards by comparing the gross forecast to the forecast adjusted for the impacts of regulations.

Demand outlooks: Summer and Winter Peak

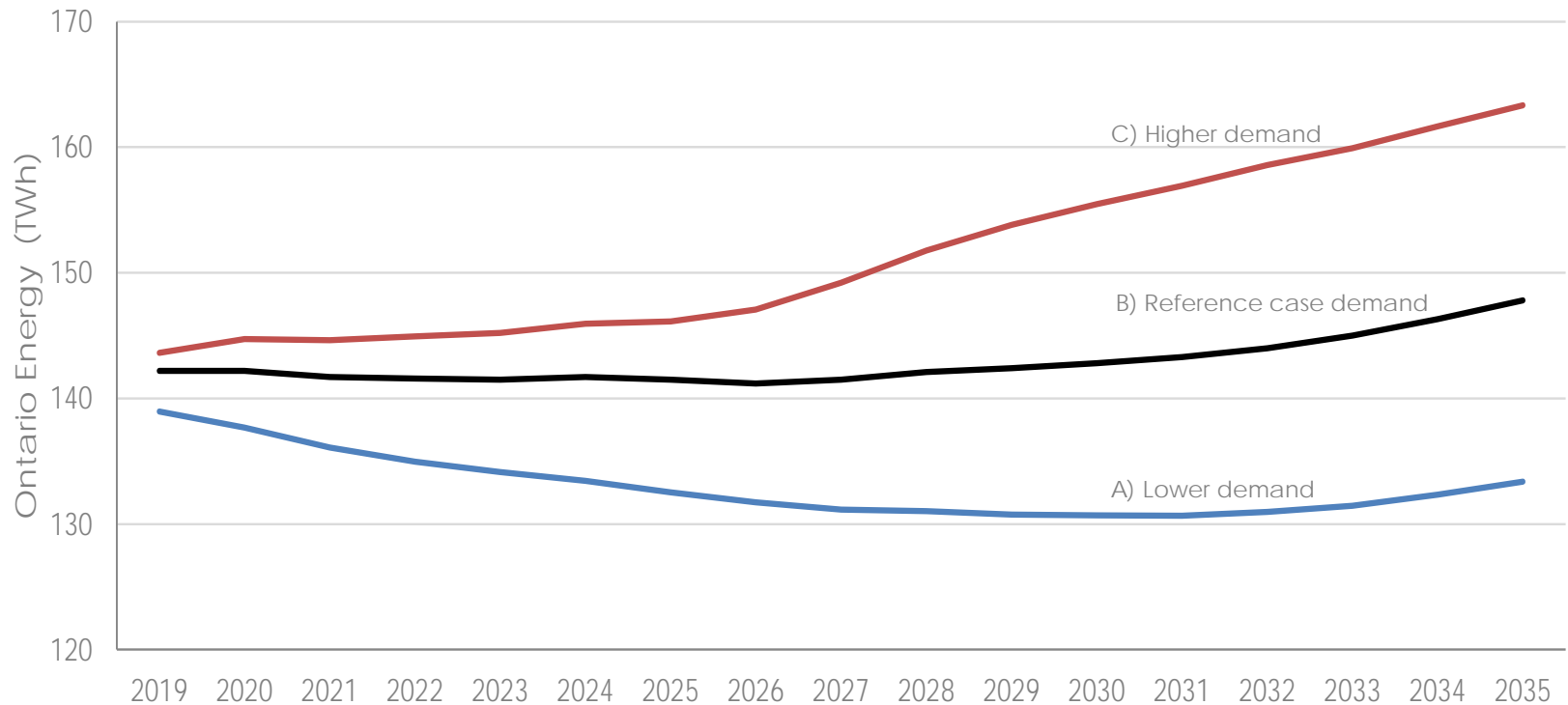
- Electricity demand, after the impact of conservation savings, is the starting point for addressing future system needs. The 2016 OPO Demand Outlook B is used for the Reference Case.



The above demand outlooks reflect 1,000 MW of ICI in the summer at the time these outlooks were developed. The current impact of ICI is estimated to be 1,400 MW.

Demand outlooks: Energy demand

- Uncertainties affect the energy demand forecast. Besides the reference case, a lower and a higher demand energy forecast are shown.



Uncertainties impacting demand

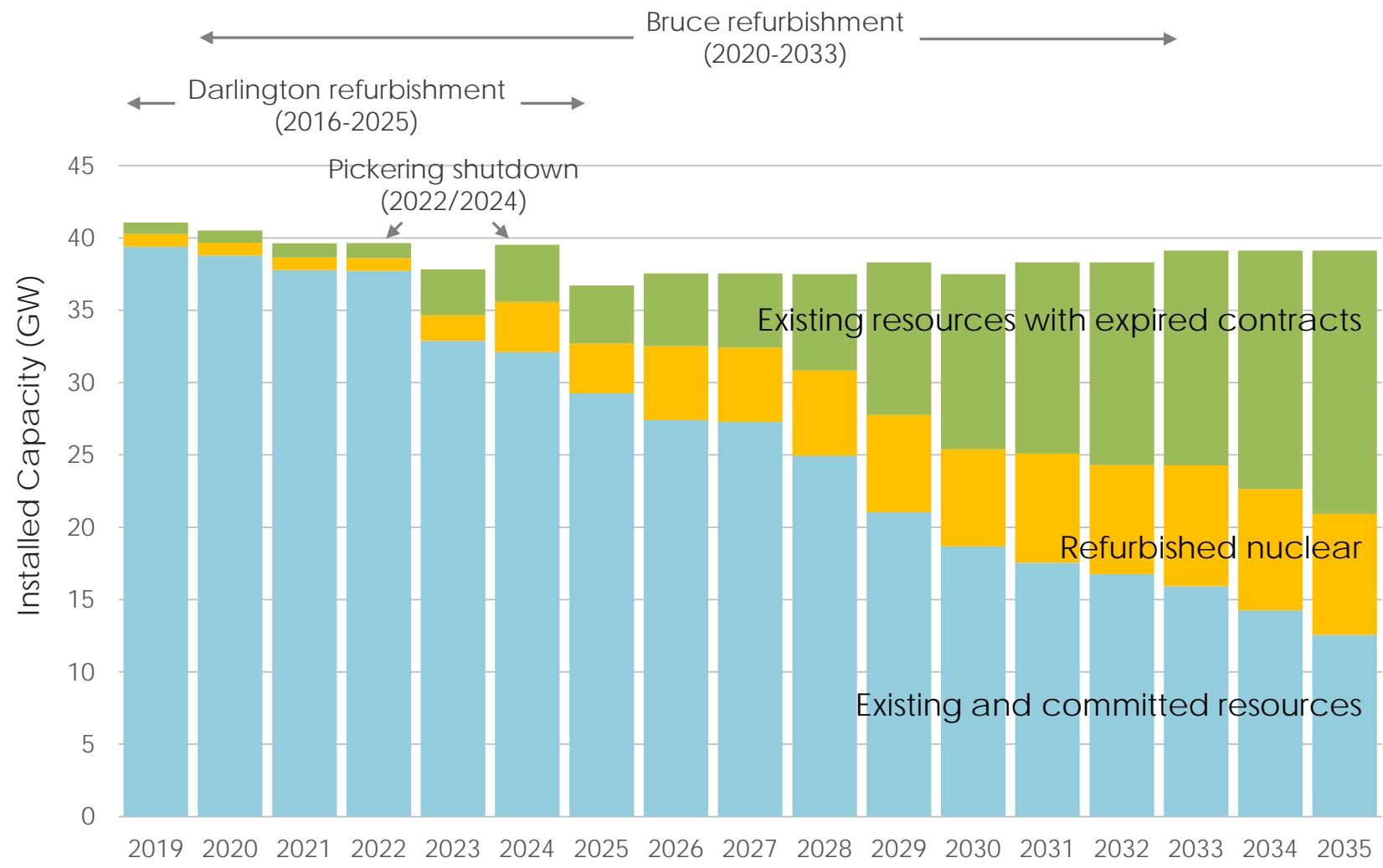
Various uncertainties will impact the demand outlook. The current economic outlook indicates that the downside uncertainties outweigh the upside uncertainties.

Uncertainty	Details	Change in Demand	Relative Impact
Trade barriers on various industries	Tariffs on Aluminium, Iron and Steel, and potentially the Auto sector will have a negative impact on load. Ripple effects of these tariffs could cascade throughout the economy.	Down	<i>Medium</i>
Impact of Industrial Conservation Initiative	Changes to ICI (reducing or increasing eligibility) and rates structure will play a significant role in forecasting demand.	Up or down	<i>Medium to High</i>
Heat pumps	Air Source Heat Pump and Ground Source Heat Pump programs funded through GreenON are closed. It is less likely that significant heating fuel switching is going to happen in the near and mid-term.	Down	<i>Small</i>
Other programs or policies that affect demand	There are a myriad of programs/policies that could change the demand outlook. These include conservation frameworks/targets, electrification, and GHG reduction.	Up or Down	<i>Small to Medium</i>
Other economic uncertainties	Demand forecasts are based on economic growth and population projections. Unexpected events like recessions or trade barriers could lead to lower demand.	Up or Down	<i>Small to Medium</i>
Growth in industrial and agricultural sectors	Projected rapid greenhouse expansion in Leamington (500+MW of winter load growth expected in 2020) and development of the Ring of Fire will drive the load up in local areas.	Up	<i>Small to Medium</i>
Distributed energy resources (DER)	Output from DERs offsets the need for supply from the province-wide system. This is creating new opportunities and challenges for the electricity sector	Down	<i>Small to Medium</i>

Resource adequacy outlook

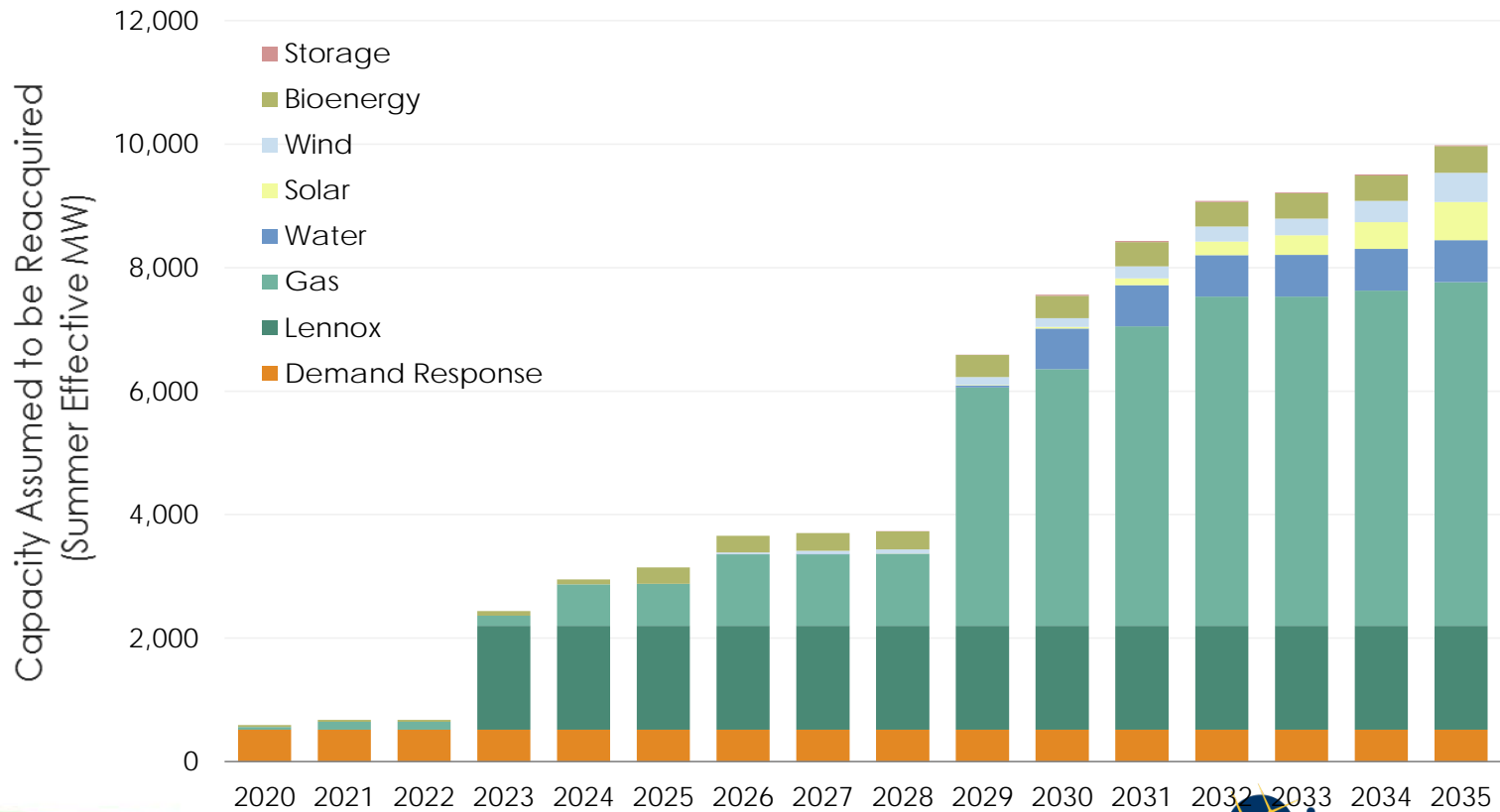
Ontario installed capacity outlook by commitment type

- Significant resource turnover is expected in the coming years driven by nuclear retirements and refurbishments and contracted facilities reaching end of commercial agreements.



Resources with expired contracts

- Approximately 2,000 contracts representing 18,000 MW of installed capacity - which is equivalent to about 10,000 MW of available capacity at time of peak – will expire by 2035.
 - Expectation is that reliability products are continued to be provided by those existing resources.
- Although 21,000 microFIT contracts reach term, they represent a significantly smaller share of installed capacity totalling about 190 MW. There is uncertainty in the availability of microFIT resources post contract expiration.
- About 600 MW available peak capacity expires in 2020 growing to 2,400 MW in 2023 following the expiration of Lennox’s contract. This grows to 6,600 MW by 2029 as gas facilities reach contract term.

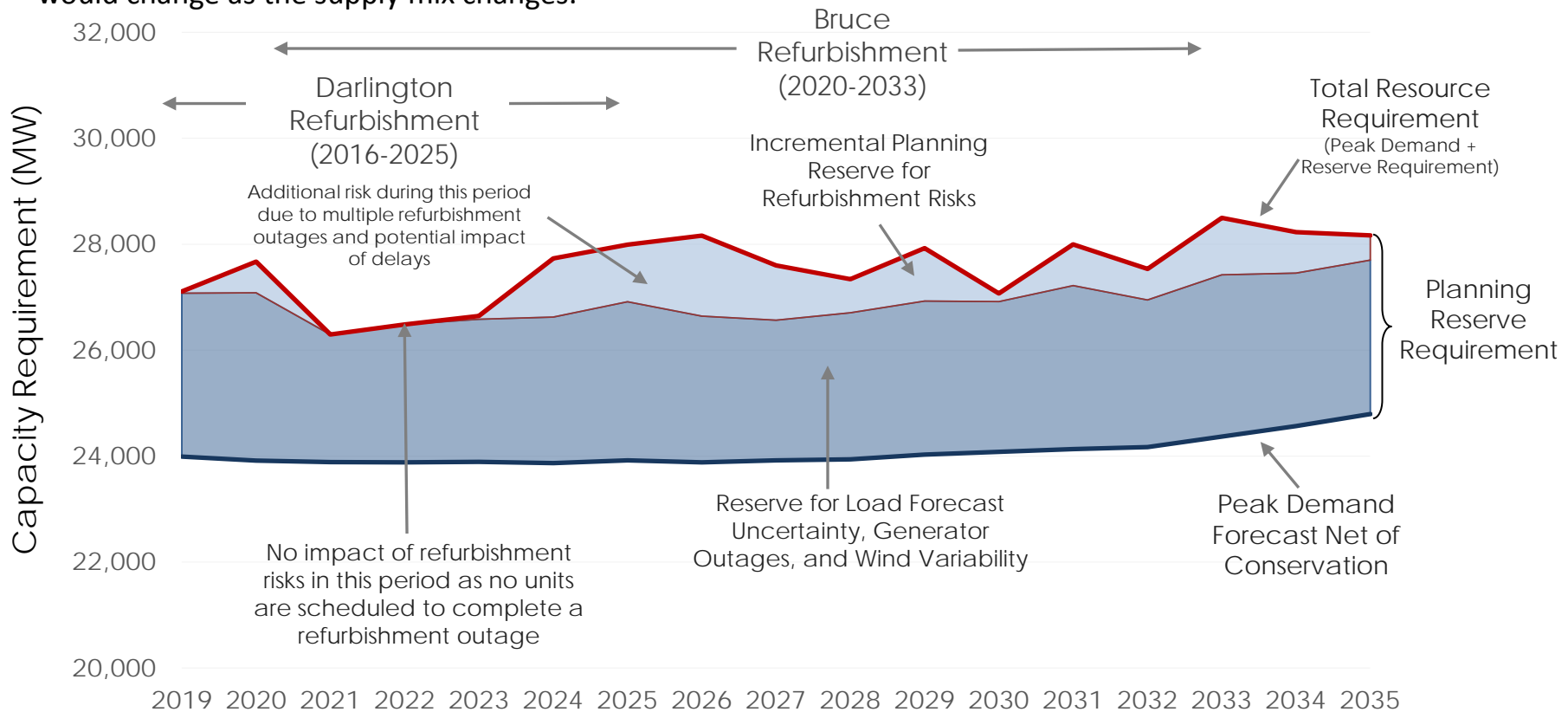


Assessing the planning reserve requirement

- The reserve requirement is the amount of supply above forecasted peak demand that must be planned for to ensure there is sufficient supply to meet demand under a range of demand side and supply side risks.
 - It reflects the characteristics of the demand and supply mix. Changes to the supply mix can change the amount of reserve required.
 - Determined by performing a probabilistic assessment of anticipated capacity and forecast load.
- Reliability standards - NPCC Directory #1 and ORTAC Section 8 - require that the IESO maintain enough capacity such that the loss of load expectation (LOLE) – i.e. the likelihood of supply falling short of demand – is no greater than 0.1 days/year across the range of demand/supply side risks.
 - The 0.1 day/year LOLE criterion is sometimes characterized as “one day in ten years”.
- Risks considered in the IESO’s assessment include load forecast uncertainty due to weather and generator forced outages per NPCC requirements.
 - NPCC also allows for consideration of other risks deemed appropriate by the System Planner.
 - In addition to load forecast uncertainty and generator outages, the IESO includes an incremental planning reserve required to cover wind variability and nuclear refurbishment performance risks (impact of nuclear refurbishment return-to-service delays and nuclear unit performance degradation just before and after refurbishment).

The planning reserve requirement

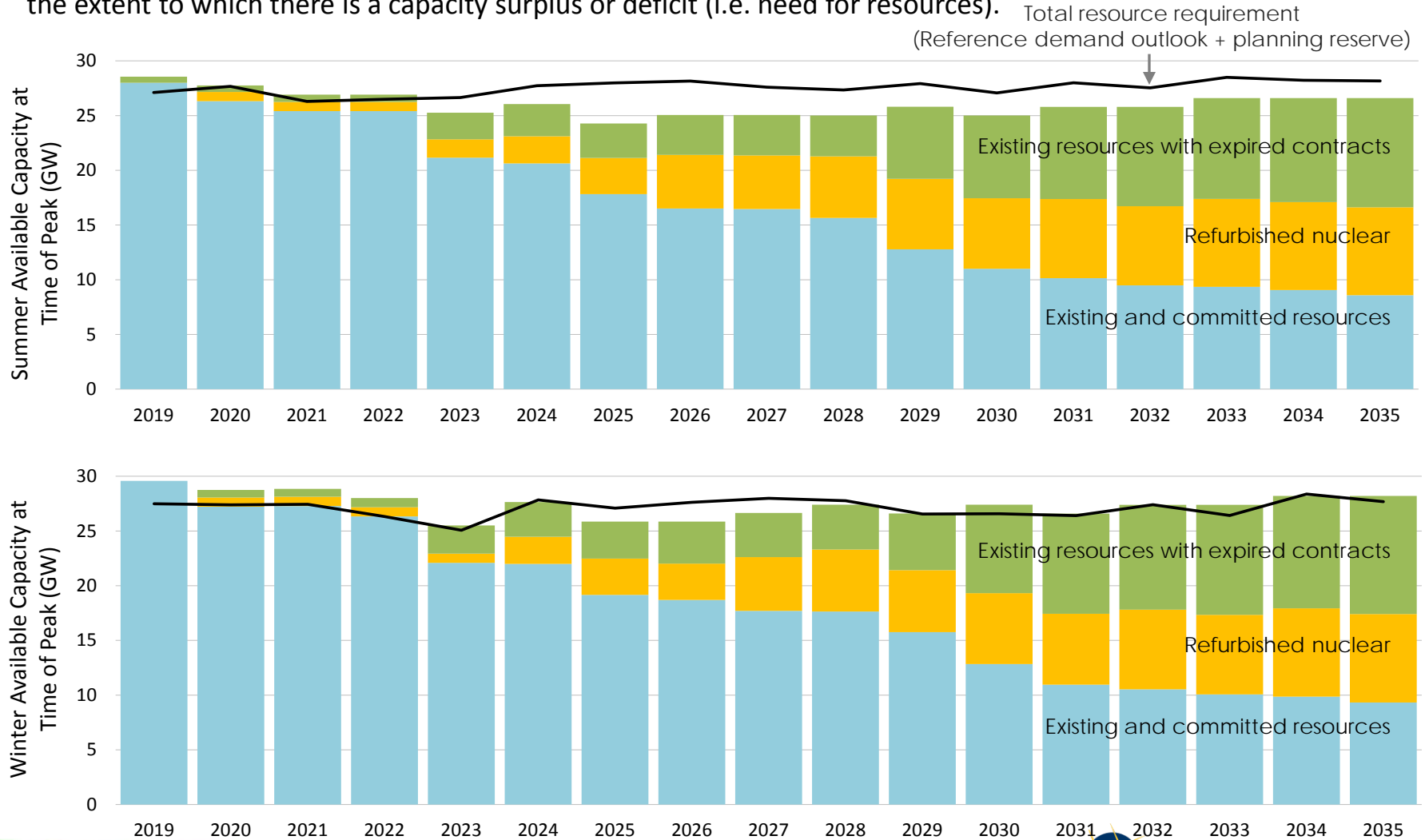
- The planning reserve reflects load forecast uncertainty, generator forced outages, wind variability, and nuclear performance uncertainty.
- Year-to-year variations in total requirements are a function of the availability of resources in each year and the likelihood of those resources being available to meet electricity demand.
- Changes to the supply mix would affect the amount of reserve required. Thus, the total resource requirement would change as the supply mix changes.



- The IESO publishes the reserve requirement for the next 5 years annually in the Ontario Reserve Margin report.

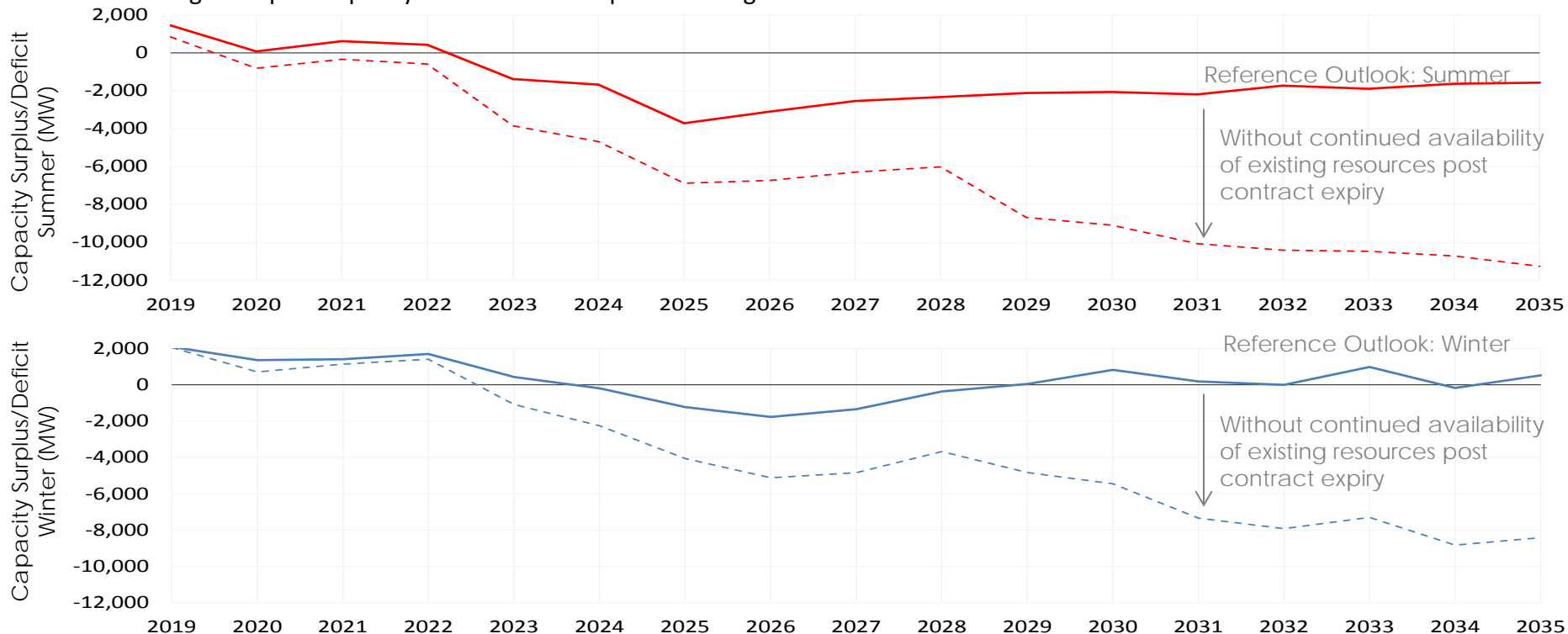
Available capacity compared to the total resource requirement

- Resources do not operate at their maximum capacity when needed. Available capacity at the time of peak demand is assessed to determine adequacy.
- The total resource requirement is compared to the resources available at the time of peak demand to determine the extent to which there is a capacity surplus or deficit (i.e. need for resources).



Capacity adequacy outlook (surplus/deficit): Reference demand outlook, with continued availability of existing resources with expiring contracts

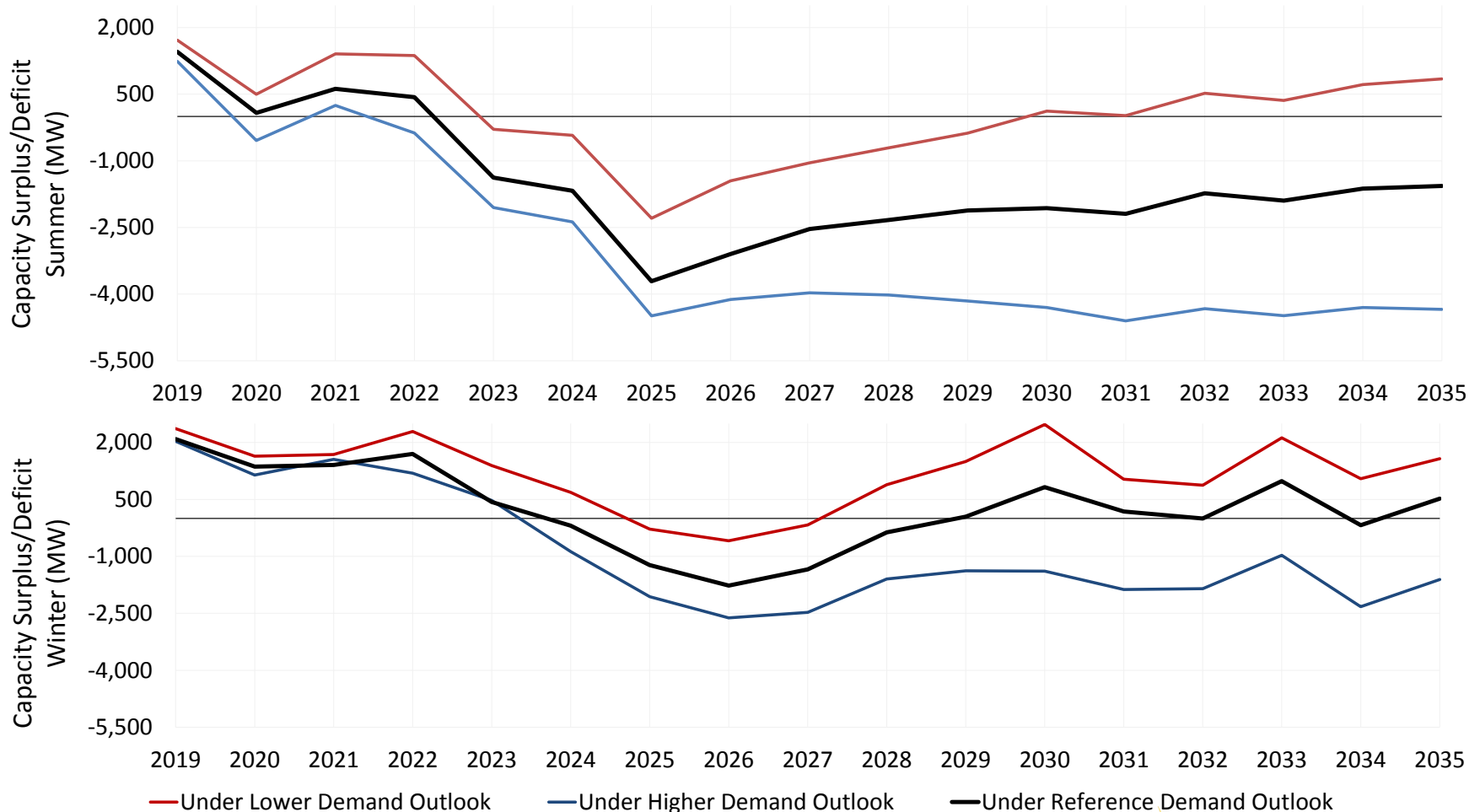
- In the reference outlook, a need for new capacity of about 1,400 MW emerges in 2023. The need increases to 3,700 MW in 2025 before plateauing to about 2,000 MW over the long-term. This assumes that capacity from existing resources continues to be available post contract which helps to defer and reduce the need for new capacity.
- Long-term capacity need primarily driven by Pickering retirement.
- Continuing to acquire capacity from demand response through the auction can meet needs to 2023.



Capacity Surplus (+)/Deficit (-) (MW)	2019	2020	2021	2022	2023	2024	2025	2026	2027	2028	2029	2030	2031	2032	2033	2034	2035
Summer Adequacy: Reference Outlook	1,454	81	622	433	-1,377	-1,673	-3,711	-3,099	-2,536	-2,330	-2,118	-2,065	-2,192	-1,729	-1,895	-1,625	-1,566
Summer Adequacy: Reference Outlook Without Existing Res.	847	-811	-335	-583	-3,844	-4,686	-6,878	-6,736	-6,292	-6,018	-8,689	-9,096	-10,077	-10,418	-10,475	-10,724	-11,273
Winter Adequacy: Reference Outlook	2,091	1,364	1,408	1,698	435	-192	-1,229	-1,770	-1,343	-366	47	825	184	-2	983	-176	523
Winter Adequacy: Reference Outlook Without Existing Res.	2,060	710	1,143	1,410	-1,085	-2,263	-4,063	-5,124	-4,838	-3,675	-4,833	-5,451	-7,344	-7,921	-7,306	-8,834	-8,419

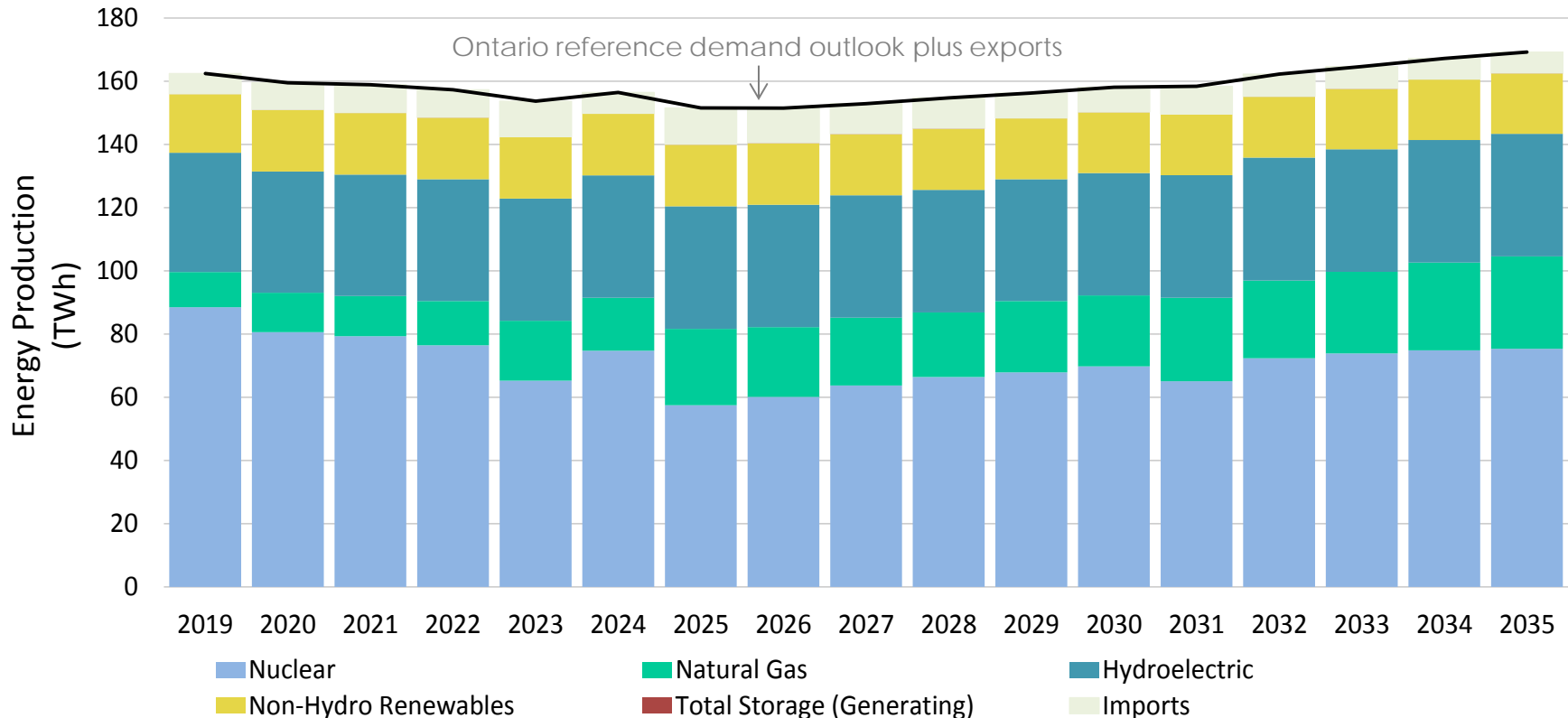
Capacity adequacy outlook (surplus/deficit): Across demand outlook scenarios, with continued availability of existing resources with expiring contracts

- Capacity needs can be lower or higher depending on the demand outlook.
- Under a lower demand outlook, the need for new resources becomes temporary in duration.



Energy adequacy outlook

- In the Reference Outlook, which assumes the continued availability of capacity from existing resources, Ontario is expected to have an adequate supply of energy to meet the energy demand forecast throughout the outlook.
- Production from natural gas-fired generation increases following Pickering retirement and during the nuclear refurbishment period.



Imports and exports reflect those that take place due to economic opportunities that exist in the real time energy market and the 2016 Ontario-Quebec Energy Sales and Energy Cycling Agreement. Reflects the continued availability of existing resources post contract expiration. Energy generated from storage is about 0.1 TWh per year between 2020 and 2035.

What are ancillary services?

- Ancillary services are those services required for the operation of the electricity system, necessary to maintain the reliability of the IESO-controlled grid.
- The transition to a more dynamic and transparent market, which includes the incremental capacity auction, requires forecasting of all reliability services (capacity, energy, and ancillary) to send transparent market signals for efficient investment decisions.
- Traditionally, in the near term, IESO has forecasted capacity and energy needs.
- The IESO currently procures a variety of ancillary services (summarized in the table below).

Ancillary Service	Ancillary Service
Operating Reserve	<ul style="list-style-type: none">• Stand-by power or demand reduction that the IESO can call on with short notice to manage an unexpected mismatch between generation and consumption.
Regulation Service	<ul style="list-style-type: none">• Acts to match generation to load and corrects variations in power system frequency. Operates on a time-scale of seconds.• Facilities vary output automatically in response to regulation signals.
Reactive Support and Voltage Control	<ul style="list-style-type: none">• Allows the IESO to maintain acceptable local reactive power and voltage levels on the grid.
Black Start	<ul style="list-style-type: none">• Helps in system restoration in the event of a system-wide blackout.• There may be a role to support future grid resiliency with the use of Black Start resources.

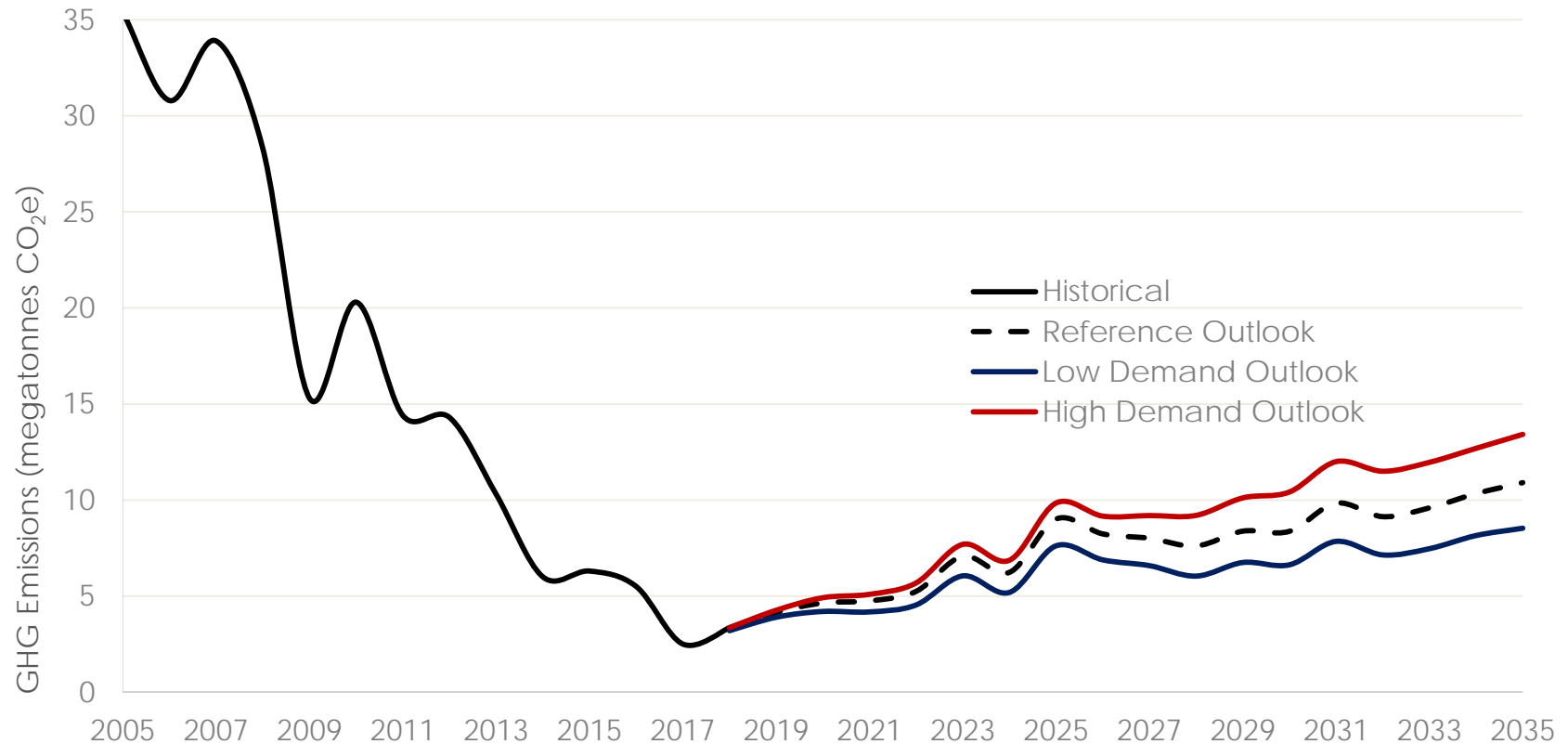
Key uncertainties impacting the resource adequacy outlook

- Various sector uncertainties will impact supply availability in the coming years.

Uncertainty	Details	Change in Capacity Need	Relative Impact
Refurbishment schedule risk (up to 1,500 MW)	An additional reserve is included in the capacity outlook to manage the risk of a delayed return to service after refurbishment. Uncertainty with respect to refurbishment schedules will remain into the 2020s.	Up or Down	<i>Large</i>
Generation retirements	Generation asset owners may revise when they plan to shutdown a plant. Will depend on condition of asset, cost of continued operation, and revenues generated. Some generation assets due to location and technical capabilities, play an important role in the system beyond providing capacity.	Up or Down	<i>Large</i>
DR Auction	DR is currently acquired through an annual auction. The December 2017 DR Auction cleared 561 MW for the 2018 summer and 712 MW for the 2018 winter commitment periods. Future auction parameters (e.g. target capacity) affect the availability of DR.	Up or Down	<i>Medium</i>
Existing assets post contract	There is limited information on the ongoing availability of generators with expired contracts. Some may participate in the Incremental Capacity Auction, while others may choose to decommission their facilities, mothball or begin operating as merchant capacity exporters.	Up or Down	<i>Small to Large</i>
Regulations	Such as with respect to environment. Can affect the extent to which a resource will continue to operate in the market.	Up	<i>Small to Large</i>

Forecast greenhouse gas (GHG) emissions

- Greenhouse gas emissions from the Ontario electricity sector have declined by more than 90% since 2005, reducing its contribution to total province-wide emissions from 17% to less than 4%
- Declining nuclear production will result in increased gas generation and greenhouse gas emissions; however, Ontario electricity sector emissions will remain well below historic levels over the next two decades
- GHG emissions vary under different demand scenarios as natural gas-fired generation adjusts to meet demand. Emissions increase by an average of 14% for the higher demand scenario and decrease by an average of 18% for the lower demand scenario.



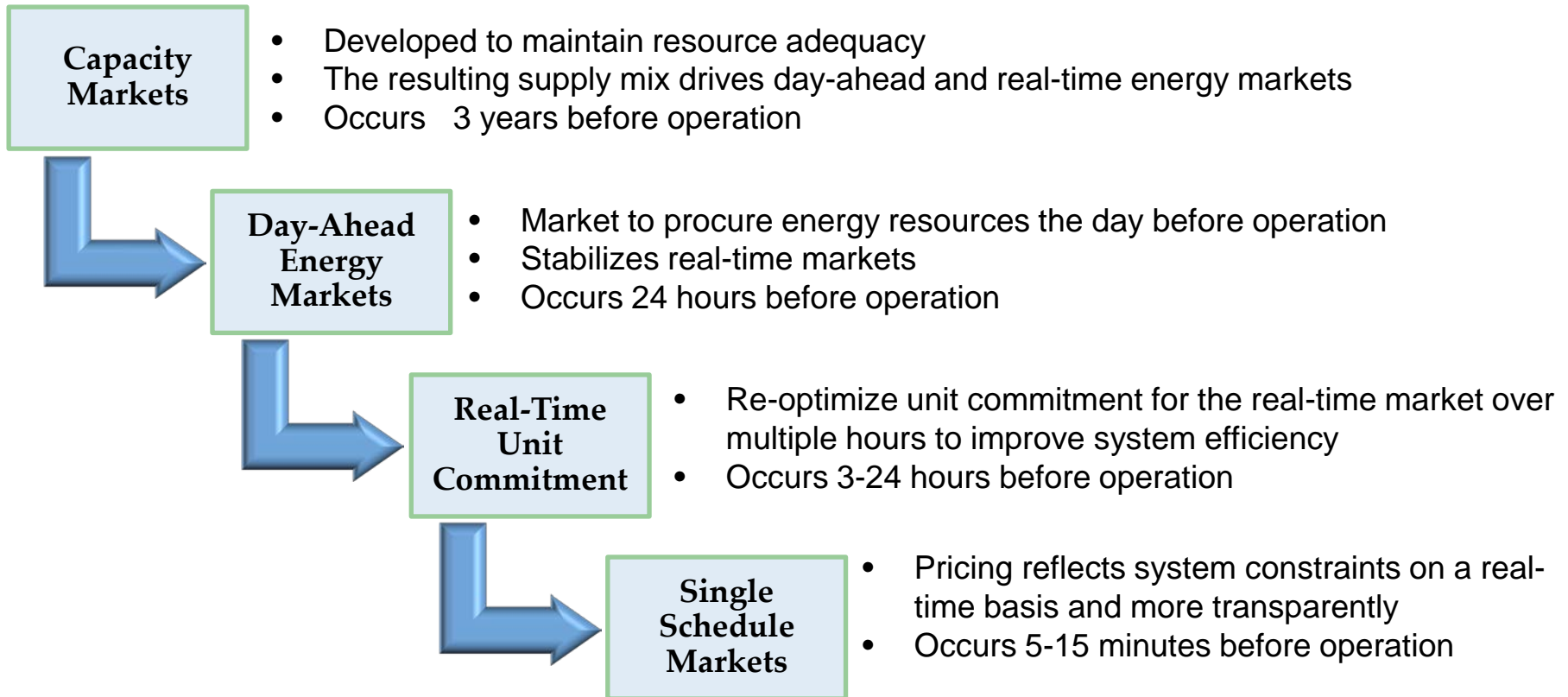
Markets for Capacity

Successful capacity markets must:

- Secure resources in the locations and timeframes that align with resource adequacy needs
- Enable participation by diverse resource types
- Allocate risk appropriately
- Provide transparent price signals
- Be supported by transparency in planning processes and predictable auctions

How the Pieces Fit Together

The four types of market structures that are used to procure, commit, and dispatch needed resources



Next Steps – Ontario Planning Outlook

- Develop an updated Demand Forecast Q1, 2019
- Develop an updated Ontario Planning Outlook, Q3,2019
 - Outlook will address uncertainty and incorporate updated policy
 - Outlook will prepare market for an interim process to meet needs in 2023
- Release annual Outlooks thereafter
- Prepare for an enduring annual Incremental Capacity Auction with reformed energy markets through the Market Renewal Program

Active engagement initiatives

- IESO is currently seeking input to help inform these important planning initiatives:
 - [Integrated Regional Resource Plan - Windsor Essex](#)
 - [Regional Planning Review Advisory Group](#)
 - [Development of an IESO Competitive Transmission Procurement Process](#)
 - [Formalizing the Integrated Bulk System Planning Process](#)
 - [Innovation Roadmap](#)
- Visit [Active Engagements](#) on the IESO website for a full list of initiatives

You are invited to share perspectives on what drives energy decisions in your community

- Today, we would like your input to better understand community perspectives
 - What are the current/future barriers and opportunities faced in managing local community energy initiatives?
 - Is there anything the IESO should take into consideration in the province's electricity planning?

Before we get started

- Reflect on what we heard today
- What does this mean for you?
- Where do we go from here?

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event code #northeastforum

Using one word, what comes to mind when you think about managing YOUR electricity needs?

Welcome to our Community Café

- Share perspectives/ideas
- Meet new people in your community
- Everyone gets a chance to speak
- Everyone listens
- Write, doodle, draw to ensure your input is shared
- Build on perspectives
- Identify common themes



Here's how it works

- Over the next 45 minutes we will share perspectives and ideas of what energy planning means to you and others at your table
- Two rounds to brainstorm opportunities, barriers and solutions to meeting your future energy needs:
 - Round #1 (25 minutes): Share, listen, write down insights
 - One volunteer needed at the end of this round at each table to host newcomers at your table; role of the host:
 - Remain at the table
 - Share insights with newcomers
 - Encourage everyone to draw/write their ideas
 - Round #2 (15 minutes): Move to a new table – dig deeper, be informed of what others are saying, generate specific ideas/solutions
- Report back

Question for Discussion

*Knowing that **community** energy initiatives contribute to meeting the grid needs at a local, regional and provincial level:*

<p>What are some opportunities that could be considered to meet your own or your communities' electricity needs?</p>	<p>Are there any potential barriers to implementing these initiatives?</p>
<p>What are some of the solutions that the sector should consider to help realize the opportunities and/or overcome the potential barriers? Be specific.</p>	

Round#1 – 25 minutes

Knowing that **community** energy initiatives contribute to meeting the grid needs at a local, regional and provincial level:

<p>What are some opportunities that could be considered to meet your own or your communities' electricity needs?</p>	<p>Are there any potential barriers to implementing these initiatives?</p>
<p>What are some of the solutions that the sector should consider to help realize the opportunities and/or overcome the potential barriers? Be specific.</p>	

End of Round #1 – Volunteer as Table Host

- One volunteer needed to host newcomers at your table
- Role of the host:
 - Remain at the table
 - Share insights with newcomers
 - Encourage everyone to draw/write their ideas

Round#2 – 15 minutes

- Host to welcome newcomers to the table
- Share discussion from round #1
- Encourage everyone to draw/write their ideas
- Continue the discussion...

What are some **opportunities** that could be considered to meet your own or your communities' electricity needs?

Are there any potential **barriers** to implementing these initiatives?

What are some of the **solutions** that the sector should consider to help realize the opportunities and/or overcome the potential barriers?
Be specific.

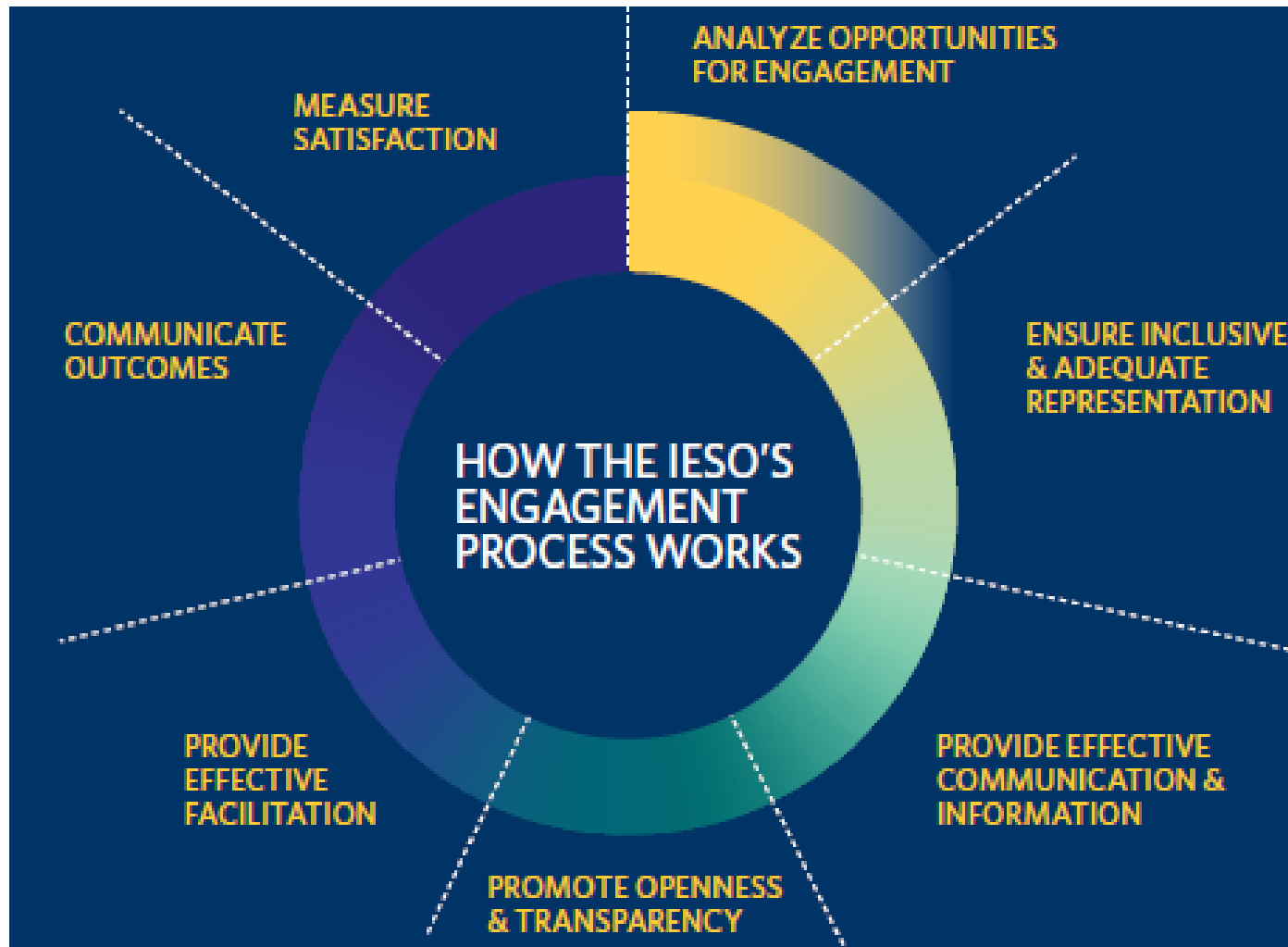
Report back

- From your discussions, share any common themes or key findings about:
 - Barriers to implementing electricity initiatives
 - Opportunities to leverage new or innovative solutions
- Were there any specific ideas/actions discussed to overcome barriers or leverage new opportunities?
- What do you need to explore these options further?

Thanks for participating in our Community Café

- Meeting notes will be published for this forum and all other regional forums
- A 2018/2019 Regional Electricity Forum report will be developed to capture themes and characteristics across the province as input for the IESO's consideration:
 - Inform the next provincial planning report
 - Identify what role, if any, the IESO can play to consider emerging opportunities at the community level and/or help to overcome any identified barriers

IESO Engagement





Ways to stay involved

- Don't miss out on updates about IESO initiatives that affect you and your community. Learn more about:
 - Planning activities in your area
 - Engagement initiatives on IESO priorities and programs, including market renewal
 - Regional electricity forums
 - Key developments in the electricity sector
- Subscribe to the IESO's weekly Bulletin to receive information at ieso.ca/subscribe.

Thank you and see you soon