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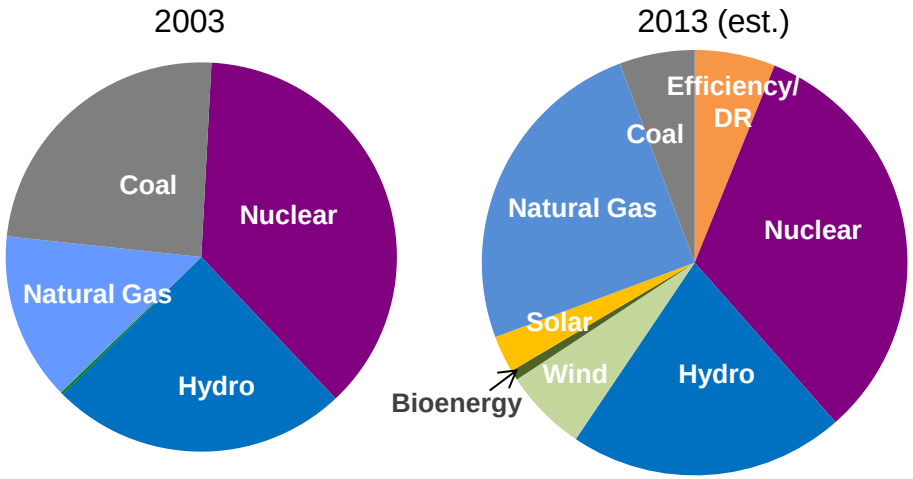
Status, Outlook and Options for Electricity Service

Presentation to PowerLogic Users Group

October 18, 2013

Ontario's supply mix has changed over the years

System Capacity in Ontario (MW)



Installed Capacity	2003		2013 (est.)	
Nuclear	11,600 MW	37%	12,900 MW	32%
Hydro	7,700 MW	25%	8,400 MW	21%
Wind	--	--	2,500 MW	6%
Bioenergy	70 MW	<1%	300 MW	1%
Solar PV	--	--	1,100 MW	3%
Natural Gas	4,400 MW	14%	10,000 MW	25%
Coal	7,500 MW	24%	2,300 MW	6%
Efficiency/DR	0 MW	0%	2,600 MW	6%
Total	*31,300 MW*	*100%*	*40,100 MW*	*100%*

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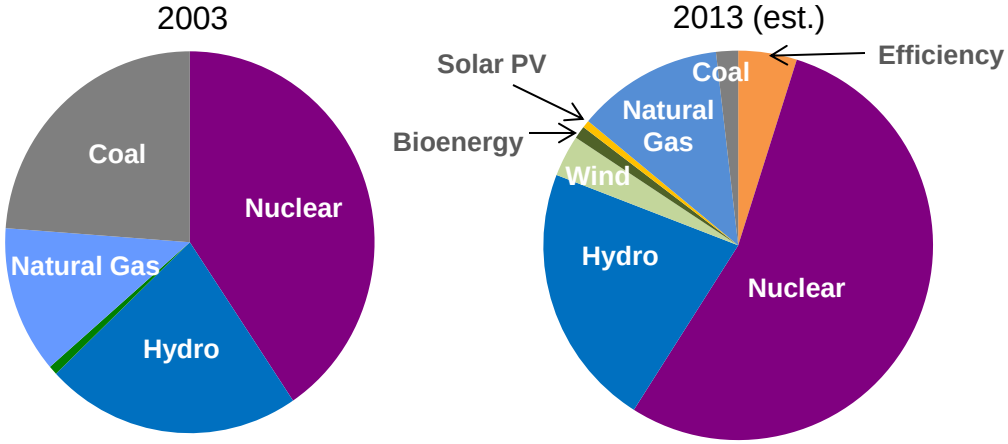
As the portfolio evolved, the amount of energy produced from different sources has also changed

Electricity Generation and Conservation in Ontario (TWh)



Energy	2003		2013 (est.)	
Nuclear	63 TWh	43%	89 TWh	54%
Hydro	35 TWh	23%	36 TWh	22%
Wind	--	--	6 TWh	3%
Bioenergy	1 TWh	<1%	2 TWh	1%
Solar PV	--	--	1 TWh	<1%
Natural Gas	12 TWh	8%	20 TWh	12%
Coal	37 TWh	25%	3 TWh	2%
Efficiency	0 TWh	0%	8 TWh	5%
Total	*148 TWh*	*100%*	*164 TWh*	*100%*
Imports	7 TWh		3 TWh	
Exports	4 TWh		16 TWh	

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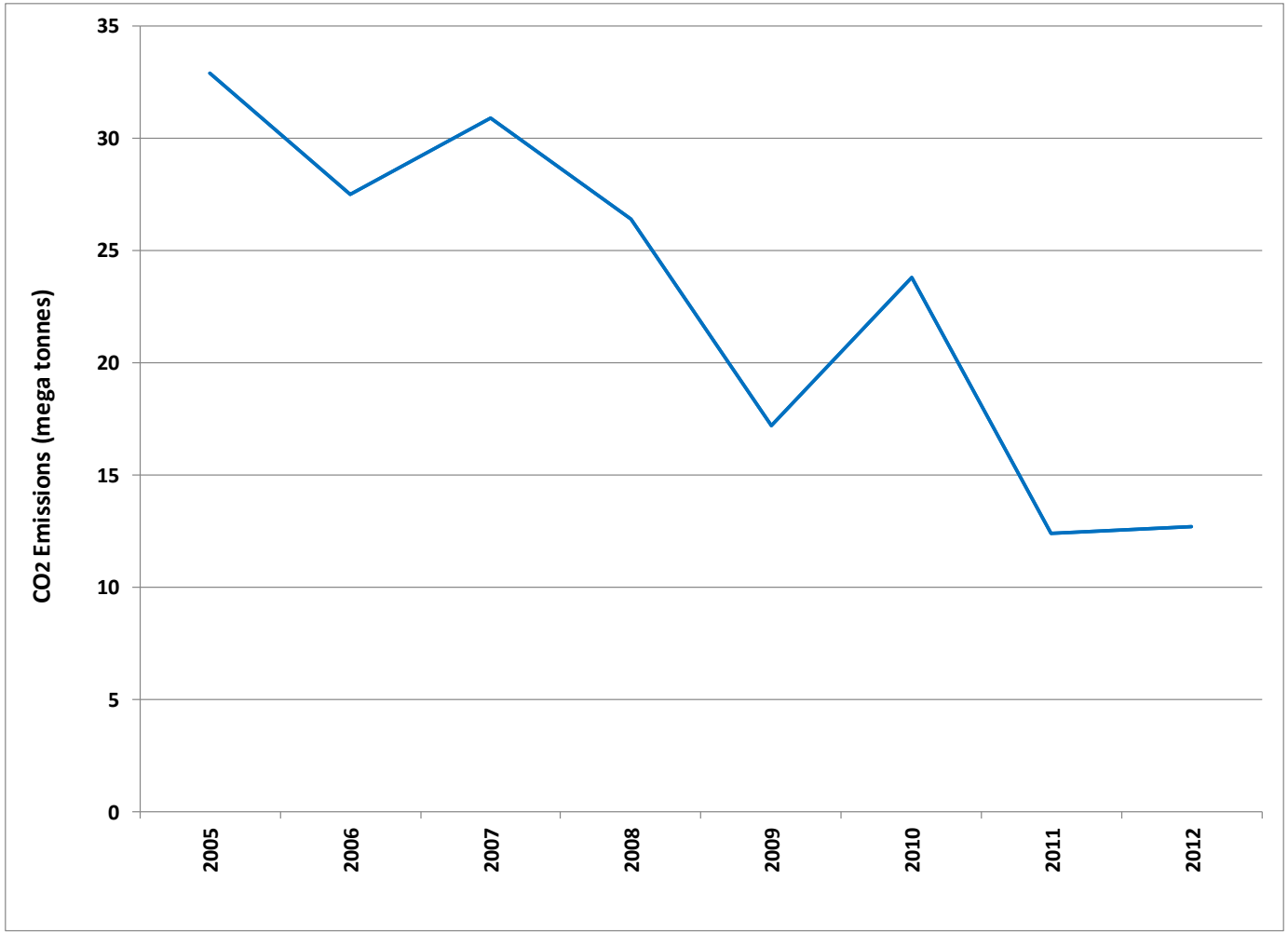
Carbon emissions from the electricity system have declined in recent years; future level of carbon emissions depends on choices subject of this consultation



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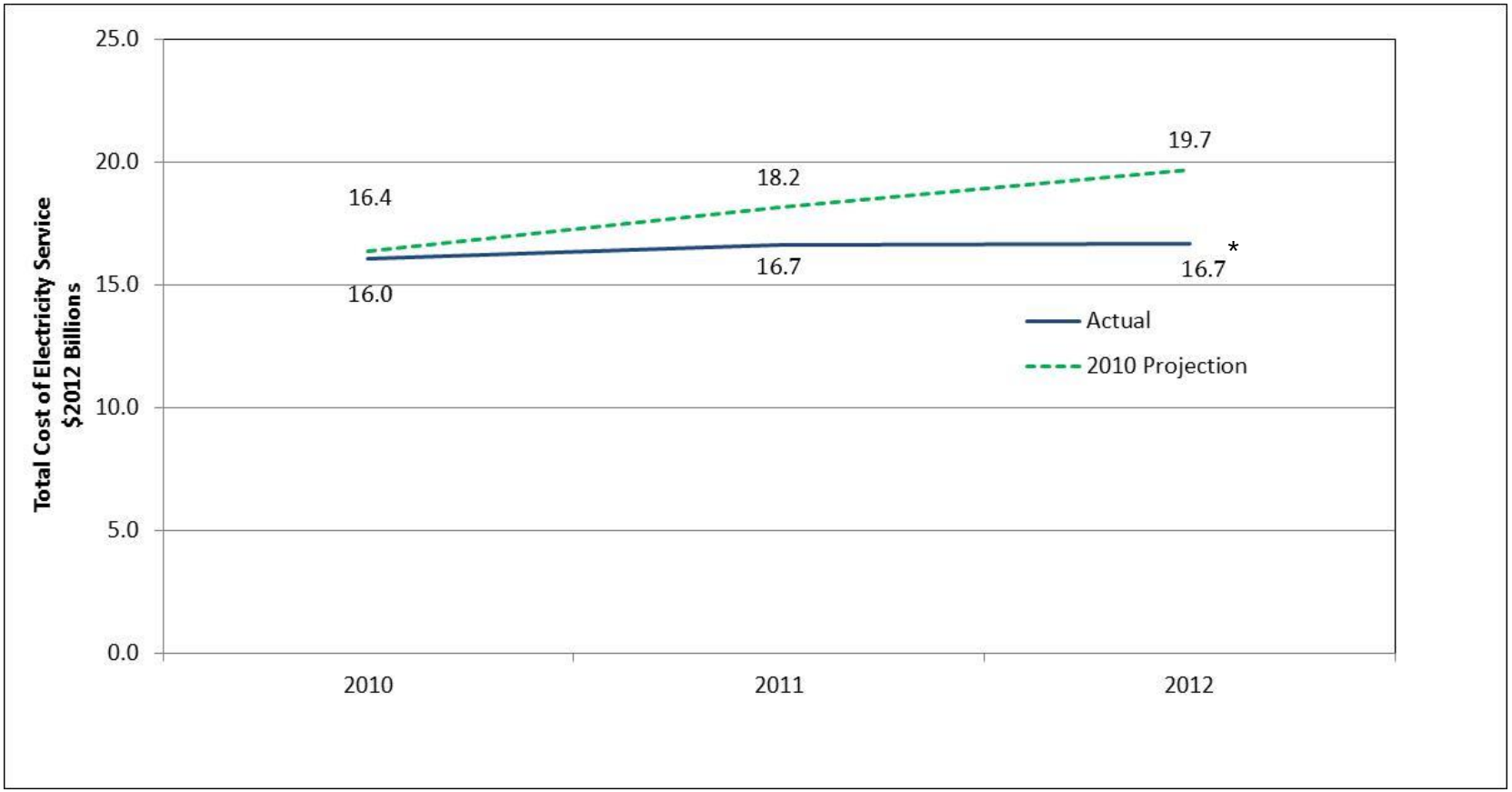
Total costs for electricity service in Ontario have increased, but less than projected in 2010; future costs depend on choices subject of this consultation



*Distribution component is an estimate

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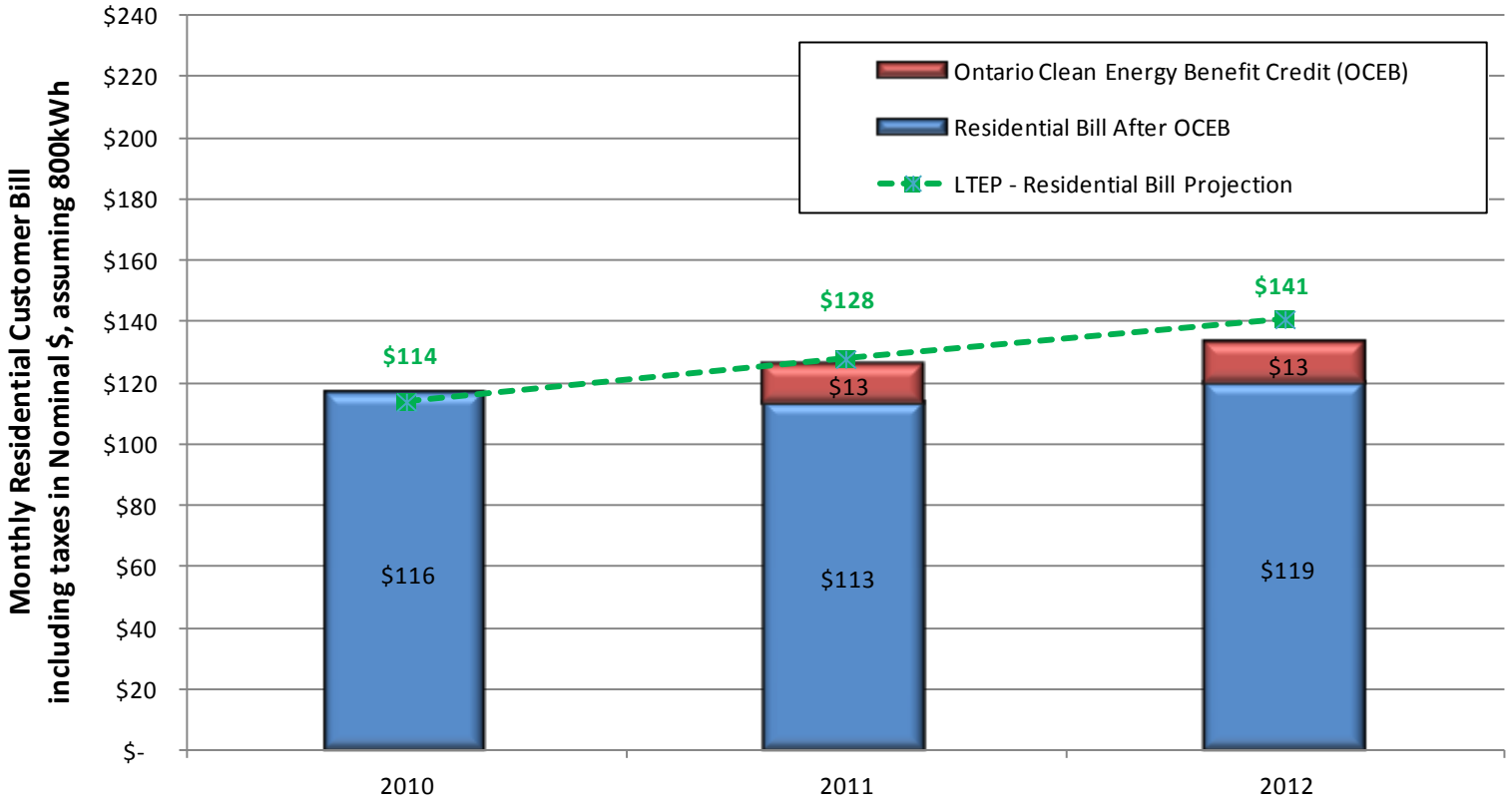
Customer bills for electricity have increased for residential customers but less than projected in LTEP 2010*



*LTEP representative bill largely based on Toronto Hydro rates, bills for customers of other utilities will be different.
For information pertaining to historical bill impacts for other LDCs refer to the following OEB links:

http://www.ontarioenergyboard.ca/OEB/_Documents/2013EDR/bill_impacts_2013.pdf
http://www.ontarioenergyboard.ca/OEB/_Documents/2012EDR/bill_impacts_2012.pdf
http://www.ontarioenergyboard.ca/OEB/_Documents/2011EDR/bill_impacts_2011.pdf

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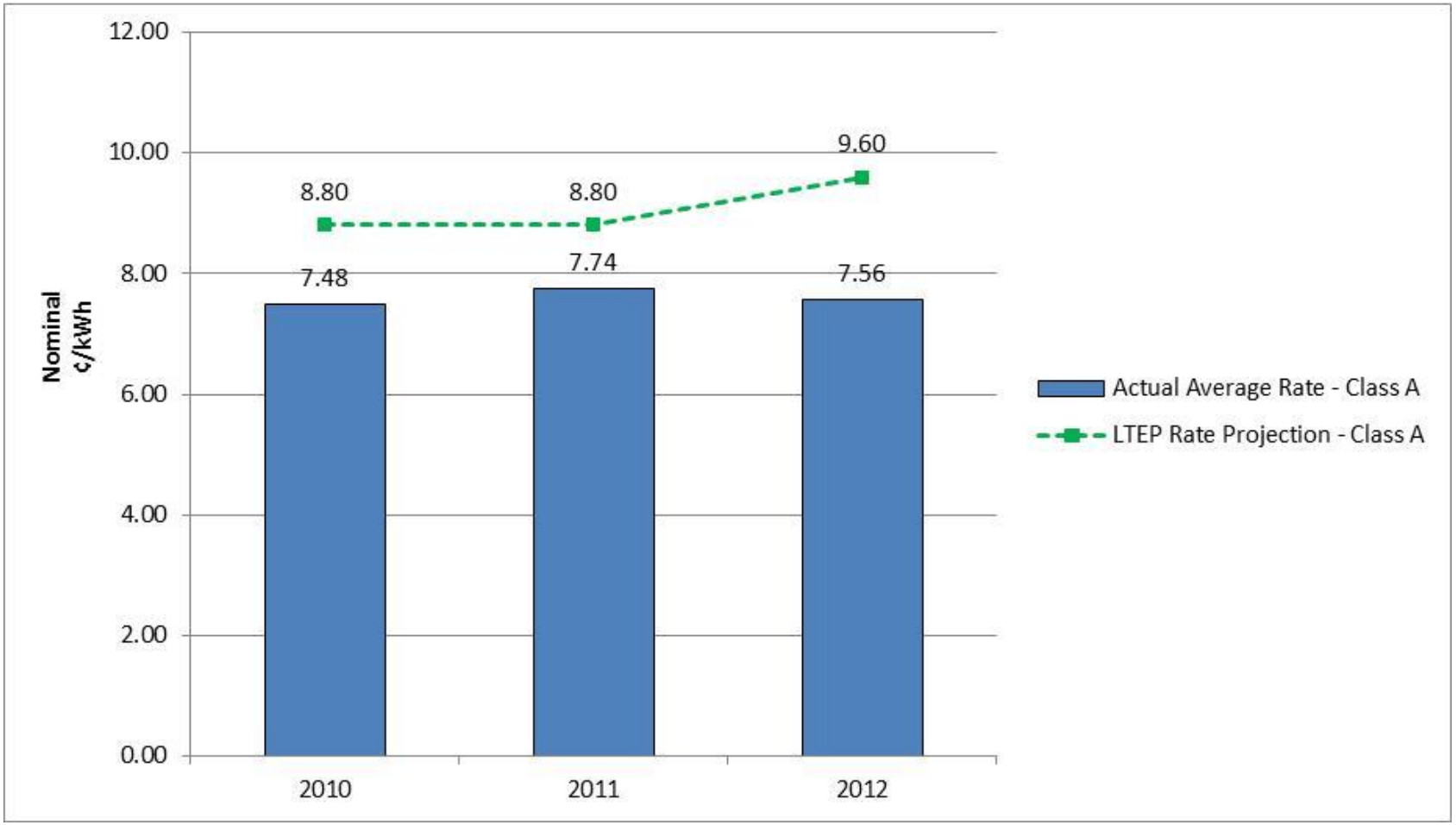
Large industrial electricity rates have declined



Note: Class A consumers are customers with a monthly peak demand over 5 MW.

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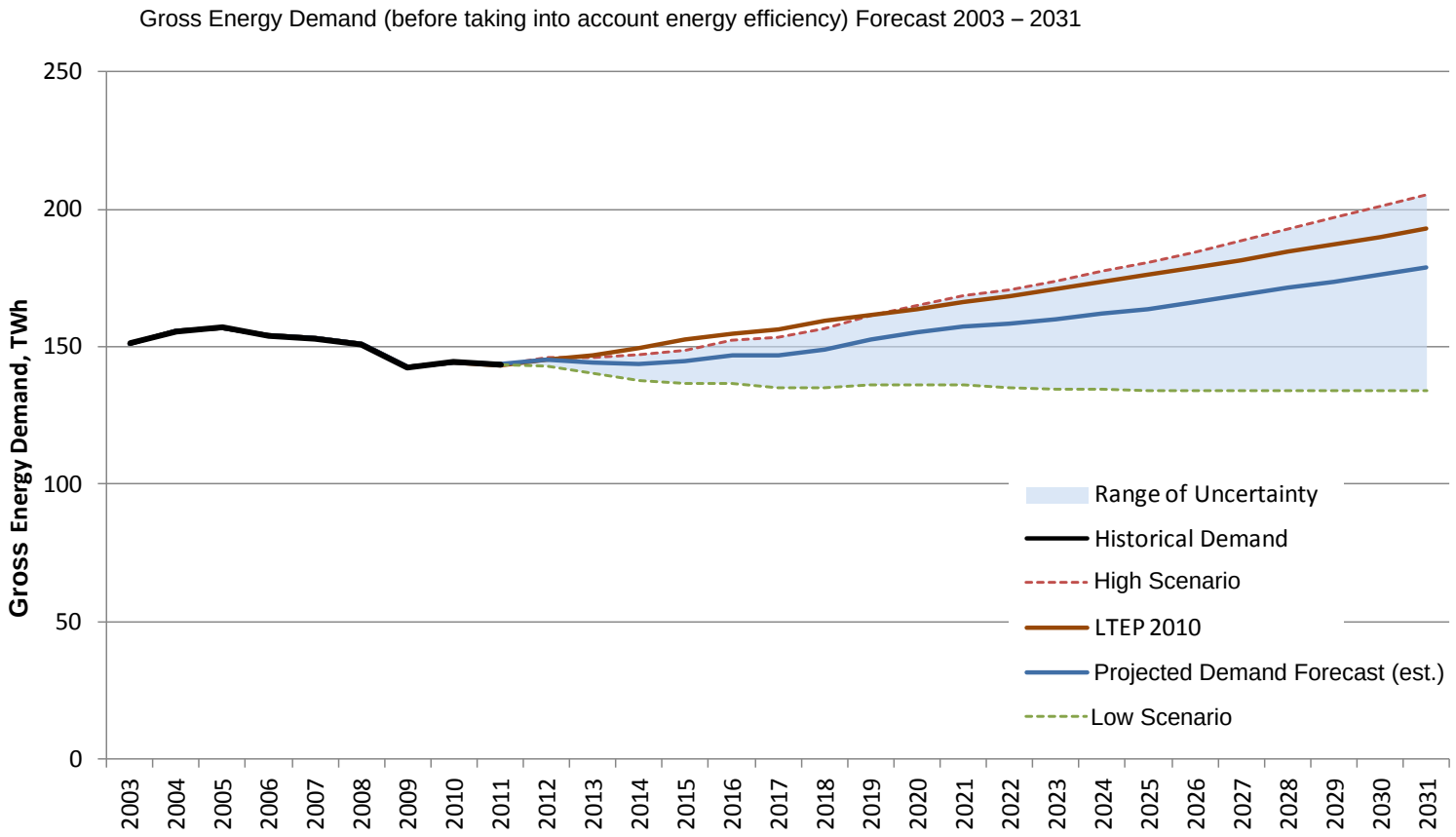
Demand forecasting is all about imagining what Ontario will look like five or ten years out

- How many people will be in Ontario, where will they live, and what will they be producing
- The nature of industrial output in Ontario (commodities, Canadian dollar, economy, U.S. markets)
- Electricity efficiency gains (consumer choices as influenced by technology, prices, market transformation, utility programs, codes and standards)
- “New”, yet to be identified, uses of electricity (transportation, home/office, carbon reduction)
- Role of electricity in the carbon strategy: substitution of electricity by other fuels or the other way around

Assumptions associated with gross demand forecast (before efficiency)

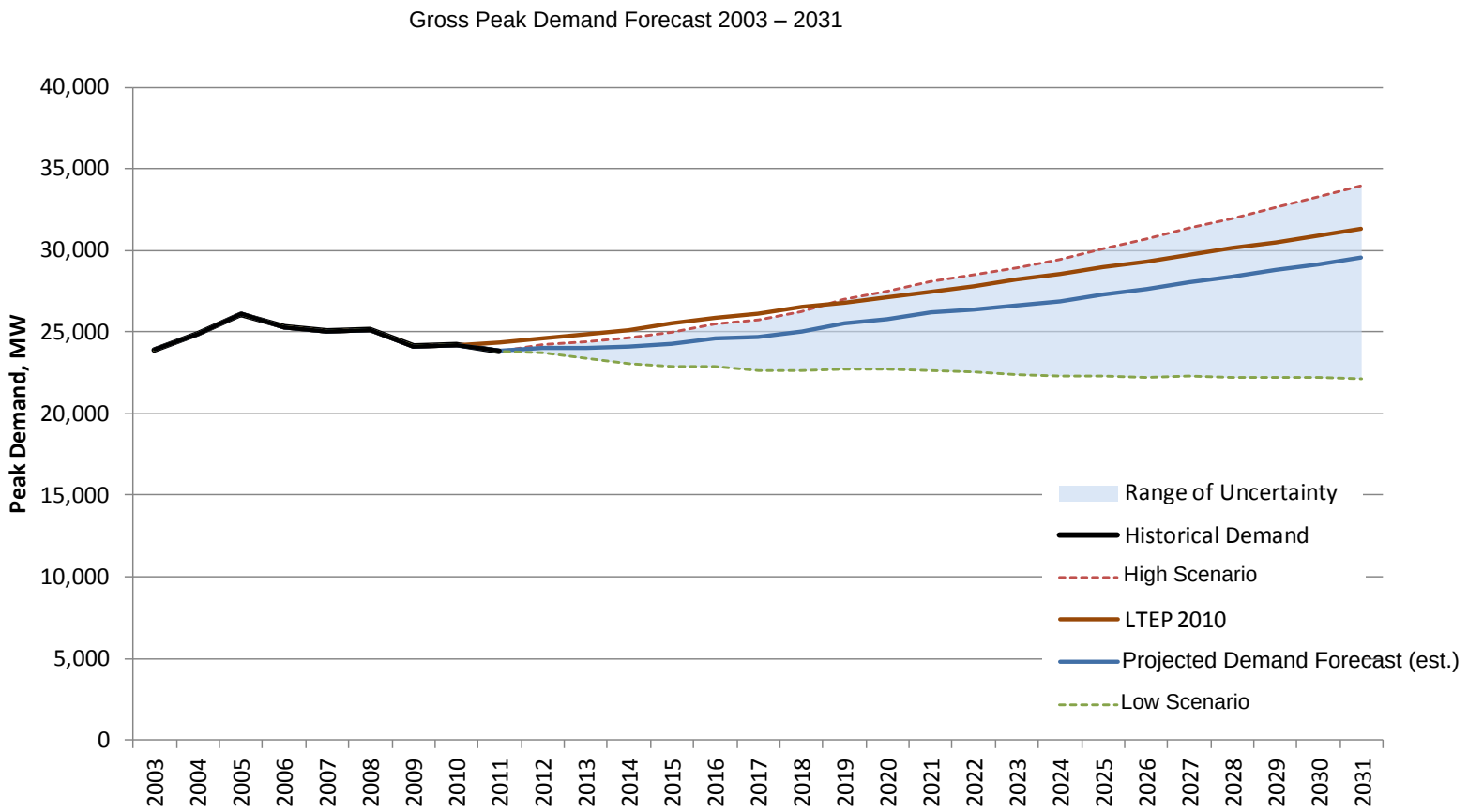
1. Growth in households and commercial floor space will be slower than in the last decade
2. The economy is forecast to grow about 2% per year
3. Price increases for electricity will put downward pressure on demand
4. Electric vehicles are assumed as one in twenty by 2020, GO transit assumptions included
5. Mining developments in the Northwest are taken into consideration

Energy demand is expected to grow slower than forecast in 2010, efficiency in end-use will reduce growth even further



Notes:
Values are presented in Appendix A.

Peak demand is lower than projected in 2010, efficiency and demand reduction measures will reduce it even further



Notes:
Values are presented in Appendix A.

A number of factors could raise or lower the amount of electricity demand

Factors that raise demand:

- lower than expected response to prices resulting in less natural efficiency
- less conservation than anticipated
- additional mining/smelting and/or chemical growth
- “new” as yet unidentified uses of electricity
- commercial data farm/server growth greater than expected
- adoption of grow lights in agricultural applications

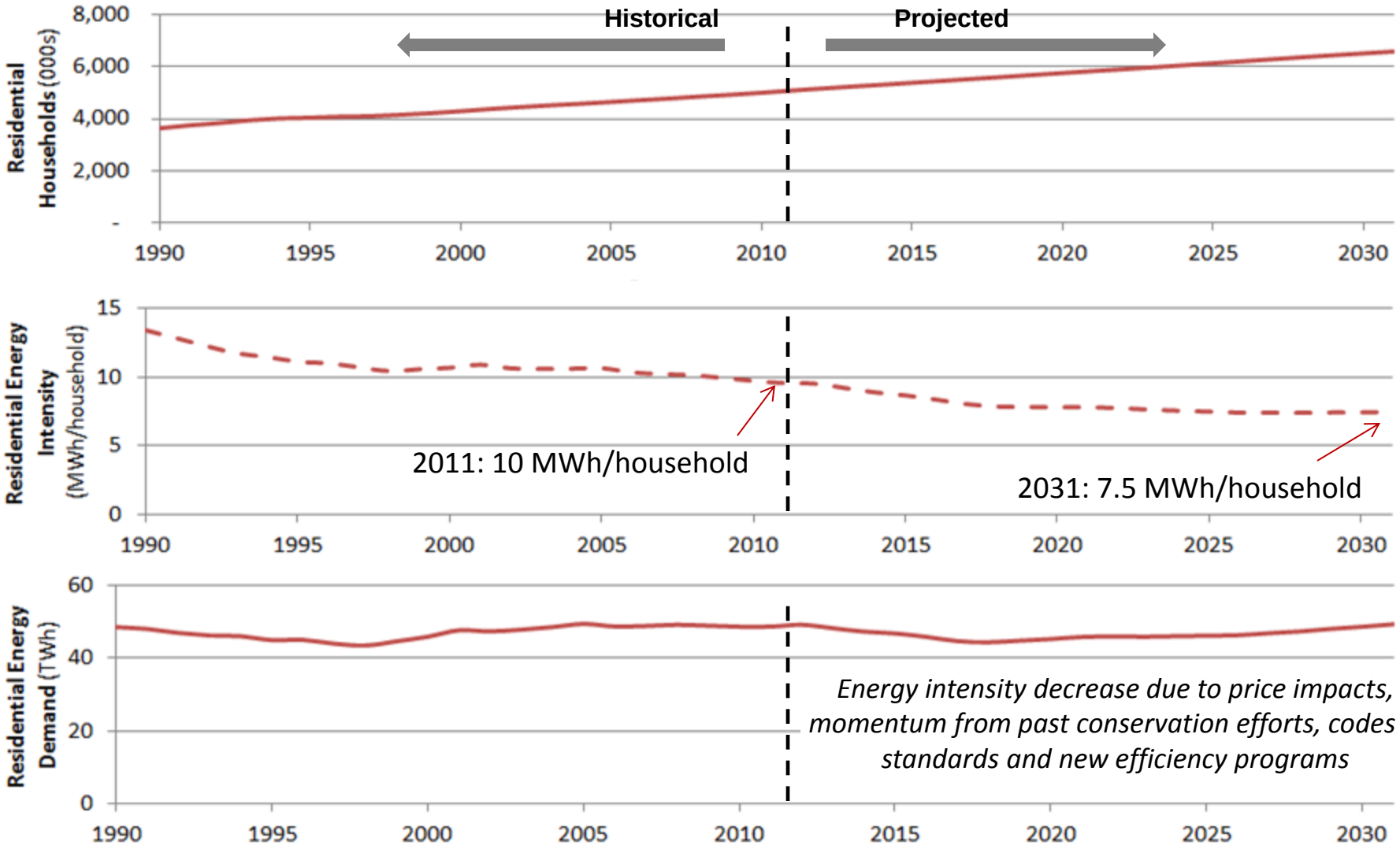
Factors that reduce demand:

- greater than expected response to higher electricity prices leading to greater efficiency uptake
- greater than expected response to higher electricity prices leading to manufacturing slowdown
- impact of continued high Canadian dollar on the manufacturing sector
- dramatic cost decrease of new efficient technologies increases penetration of these uses
- more conservation than anticipated
- less than expected mining/smelting and/or growth in chemical sector

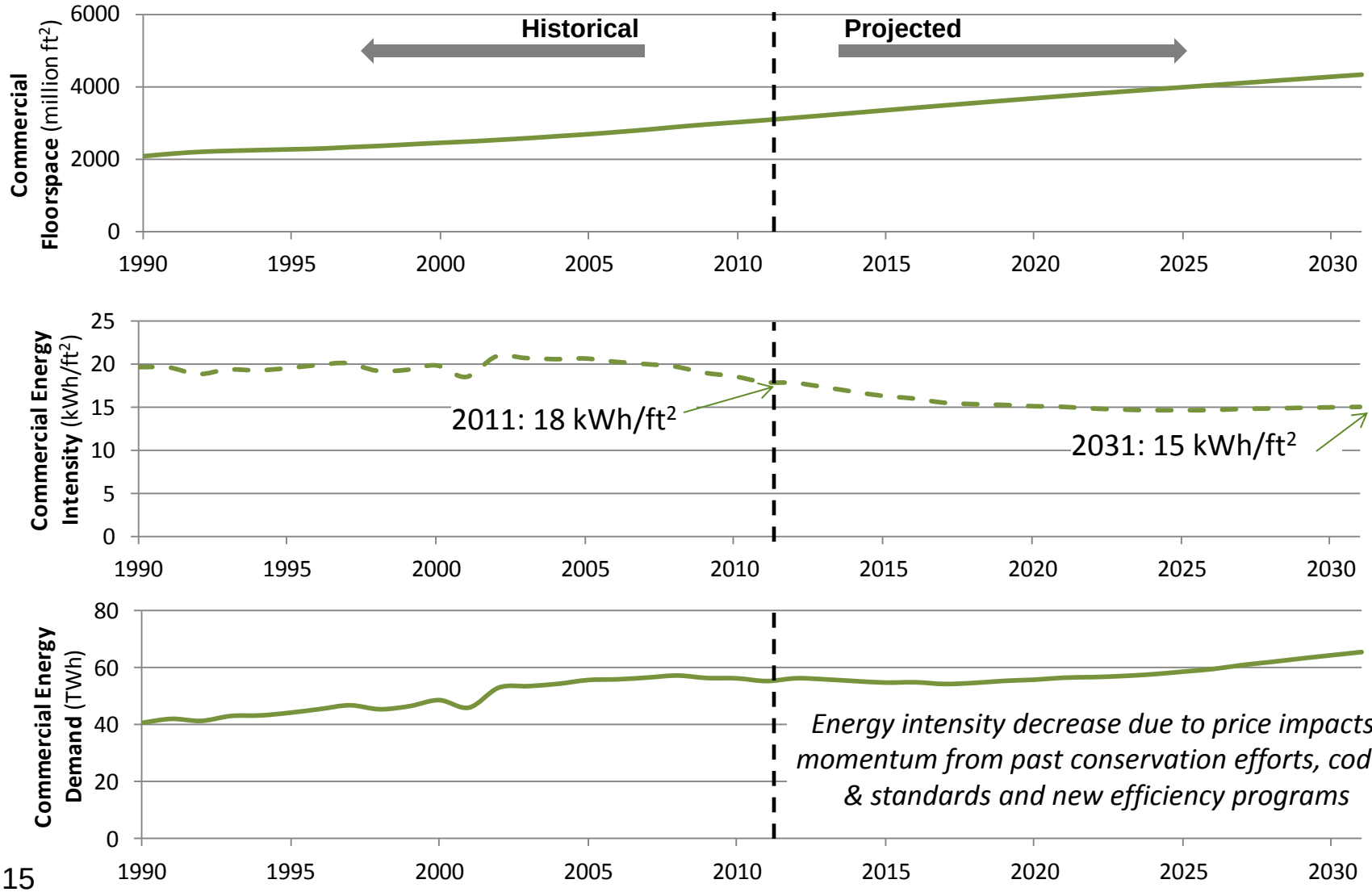
Efficiency in the use of electricity reduces need for supply

- Investments in efficiency are cost effective when they are lower in costs than alternative supply.
- Efficiency can reduce supply costs including not just generation, but also emissions, reserves, losses, transmission and distribution.
- The value of efficiency is location specific: highest in dense urban areas.
- Efficiency requires an investment by participating consumers. That investment is the major cost of efficiency measures. The incentives provided are intended to encourage customers to adopt efficiency but do not cover all the costs.
- Regulators typically adopt a set of economic assessments, now common in many jurisdictions, to evaluate the cost effectiveness of efficiency programs.
- Efficiency in end use is best projected together with the load forecast.
- These considerations illustrate the value of integrated planning.

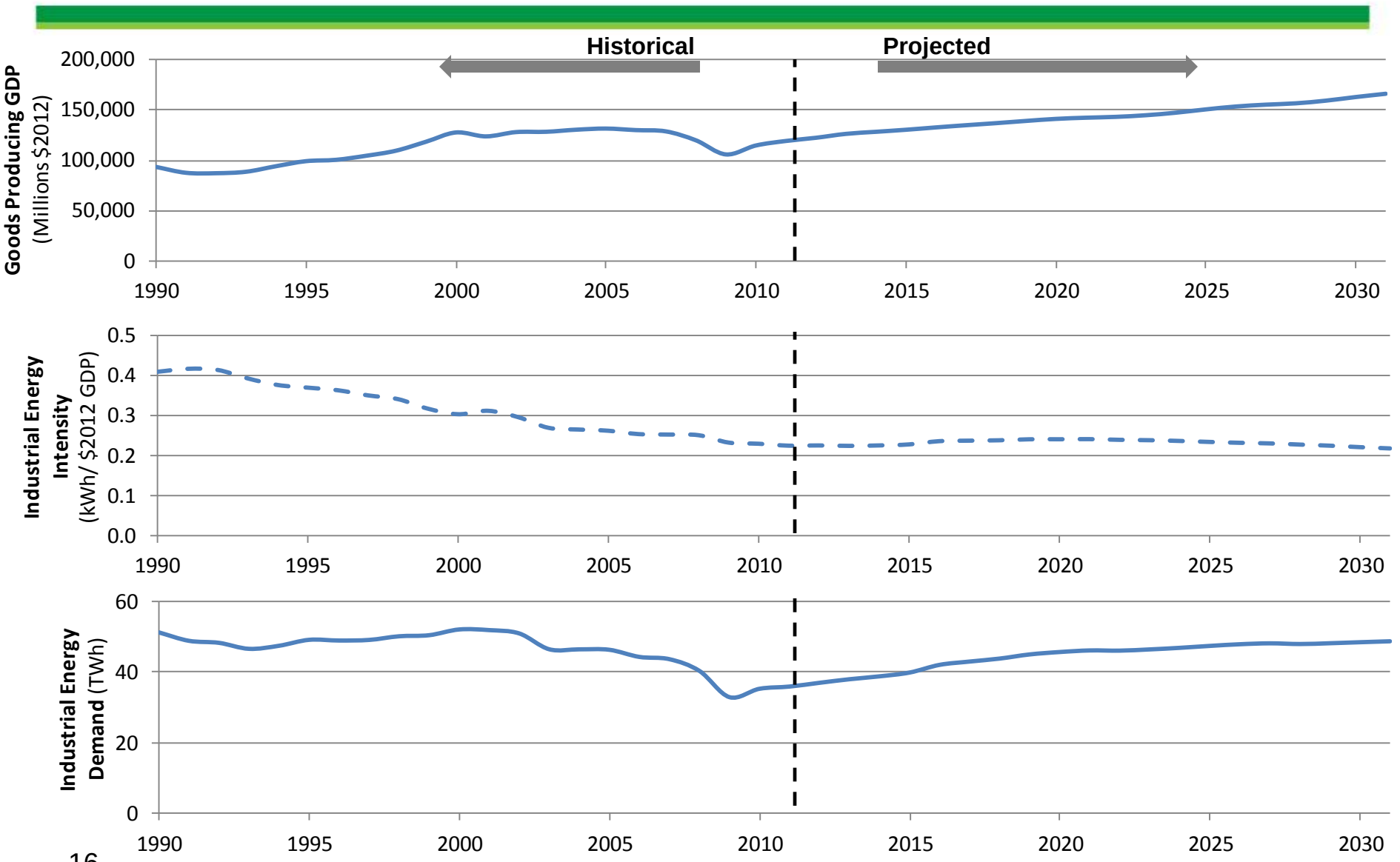
Households are increasing, energy efficiency is increasing



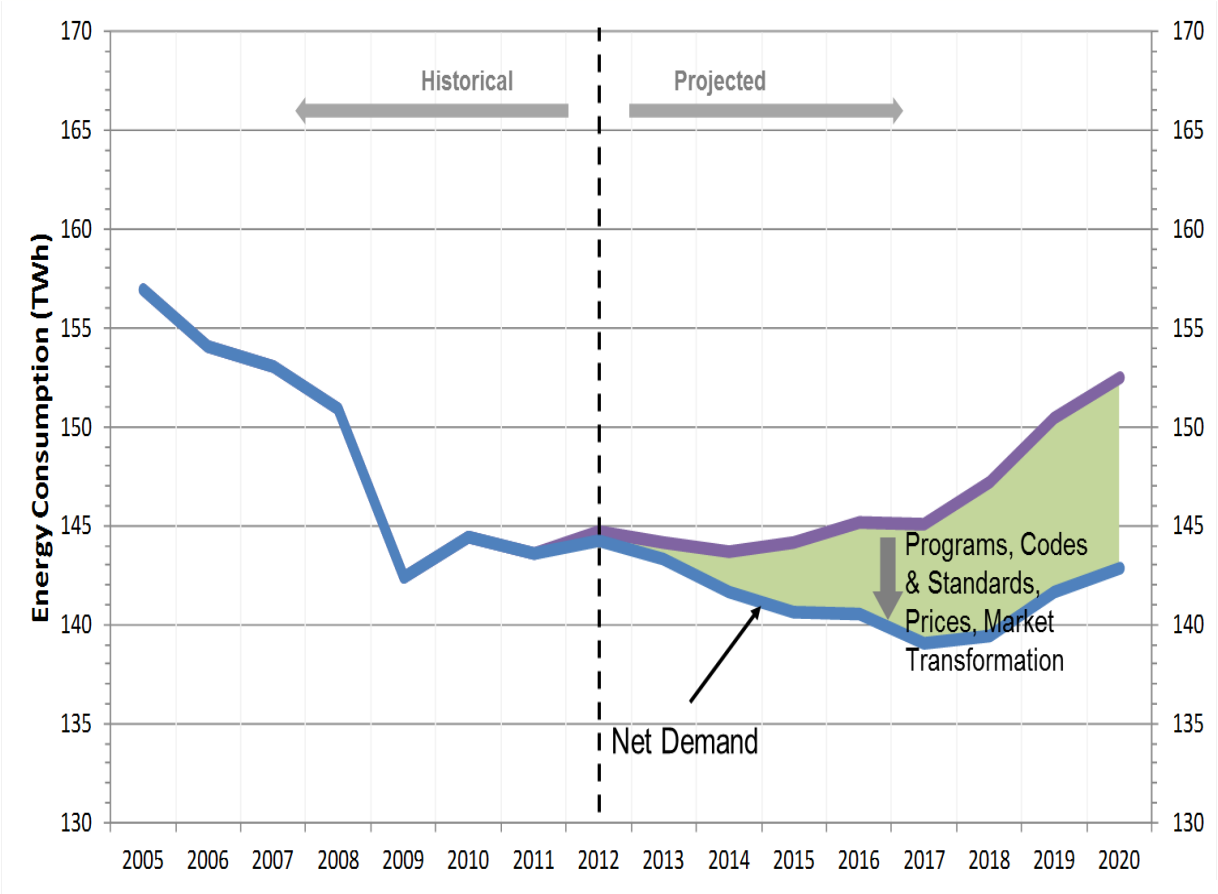
Commercial floor spaces are growing, energy efficiency is increasing



Industrial energy intensity has improved since 1990



The assumptions about efficiency reduce the expectations for demand of electricity - how best to achieve this efficiency is subject of this consultation



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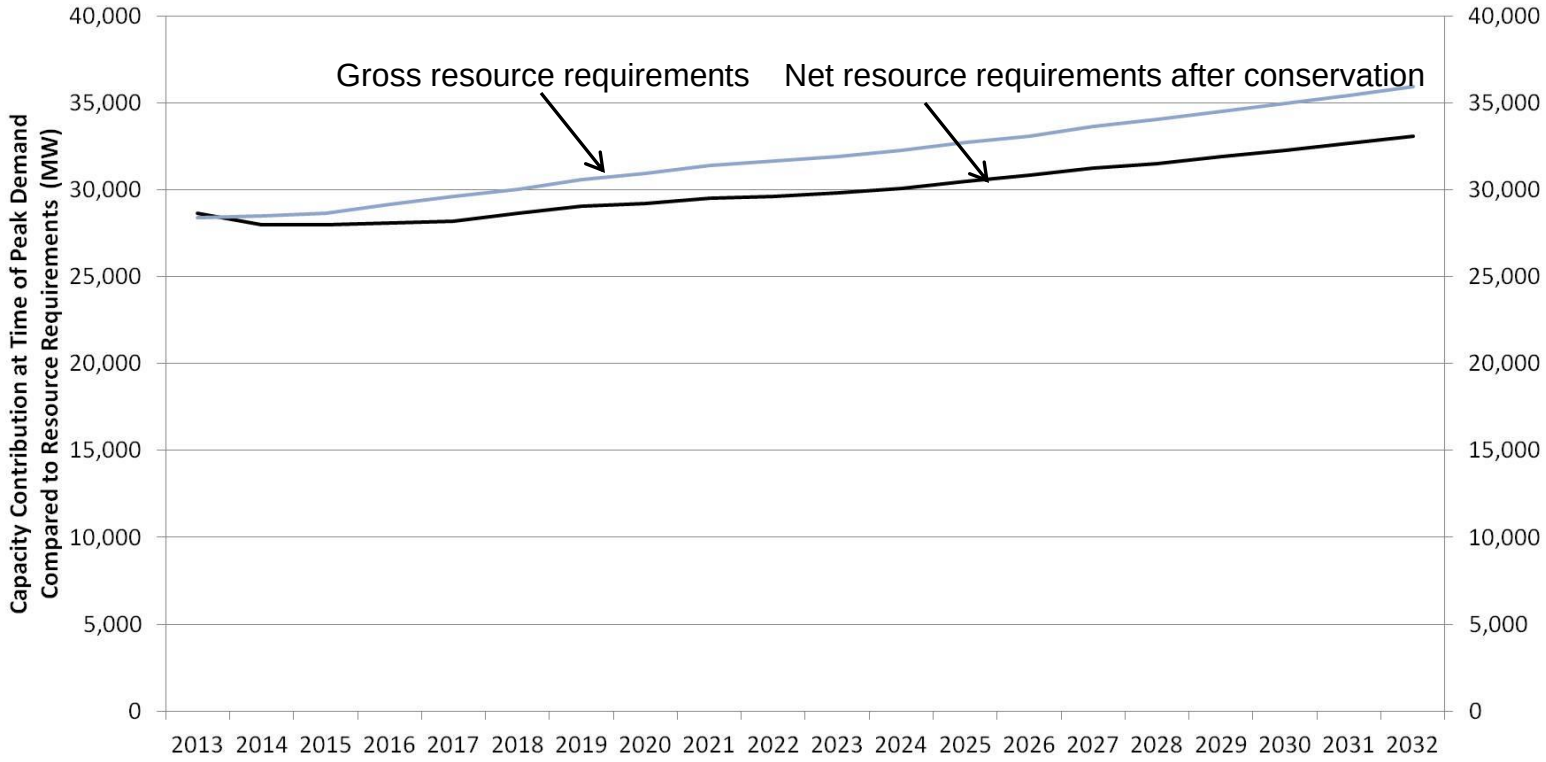
To compare supply to demand, we first account for conservation



Notes:
Resource requirements is comprised of demand plus planning reserve as required by reliability standards.
Contracted resources include contracted renewables and contracted natural gas.
Values are presented in Appendix B.

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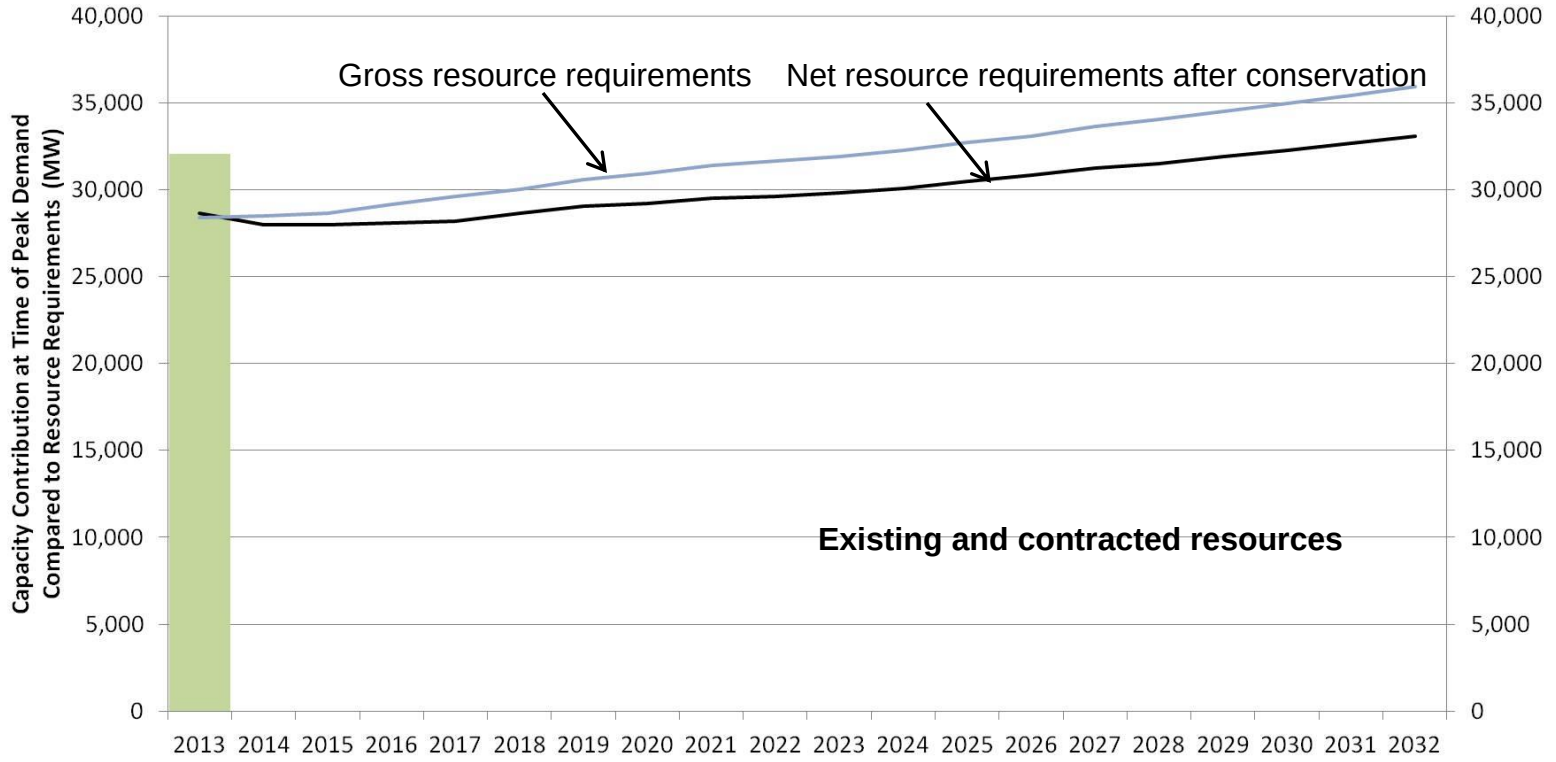
Then we build up the available supply during peak summer period, it is the capacity adjusted for summer availability



Notes:
Resource requirements is comprised of demand plus planning reserve as required by reliability standards.
Contracted resources include contracted renewables and contracted natural gas.
Values are presented in Appendix B.

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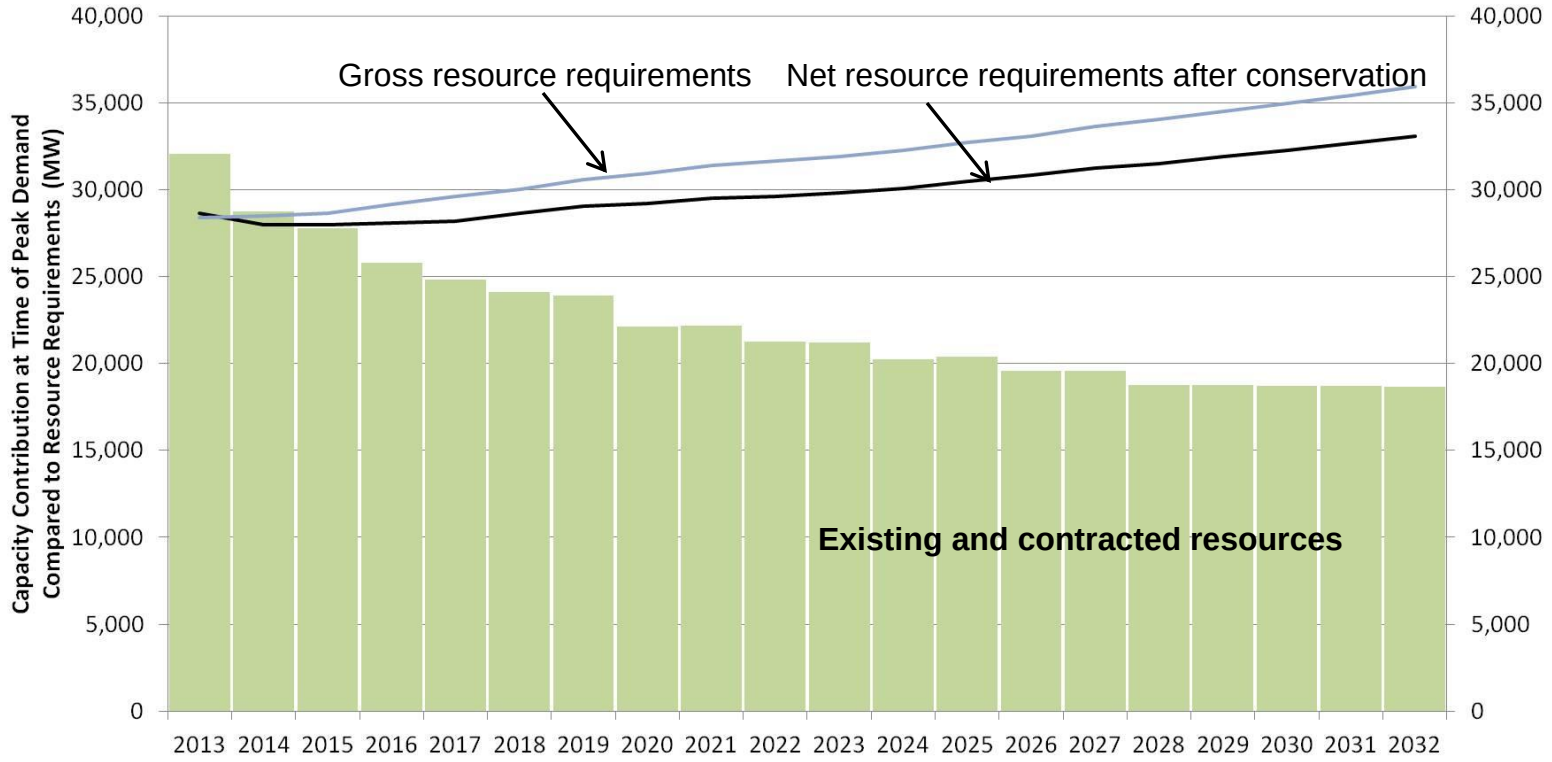
Then we see how the capacity evolves over time. The decrease is due to nuclear stations reaching end of life



Notes:
Resource requirements is comprised of demand plus planning reserve as required by reliability standards.
Contracted resources include contracted renewables and contracted natural gas.
Values are presented in Appendix B.

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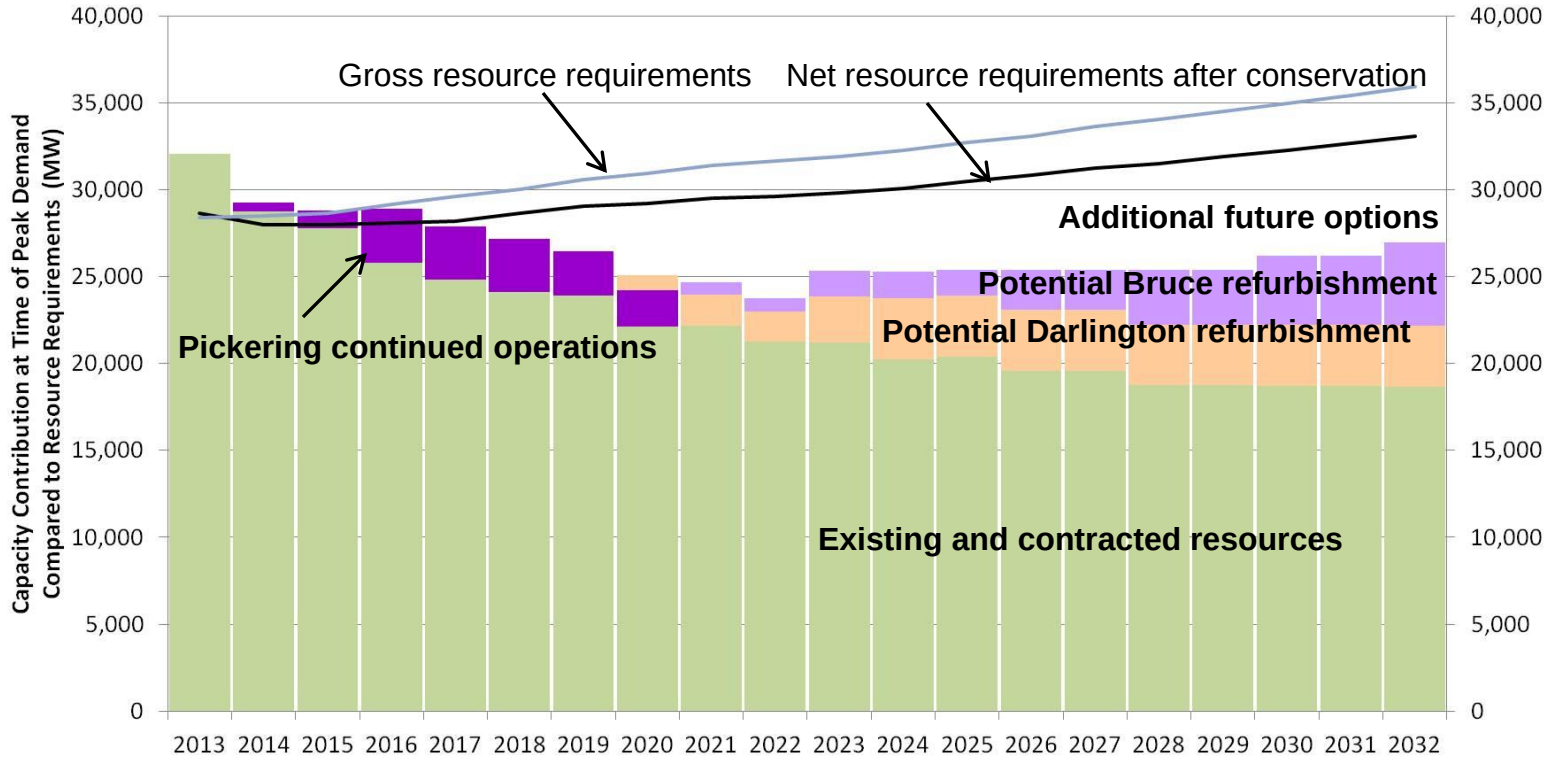
Then we add back capacity that is being planned



Notes:
Resource requirements is comprised of demand plus planning reserve as required by reliability standards.
Contracted resources include contracted renewables and contracted natural gas.
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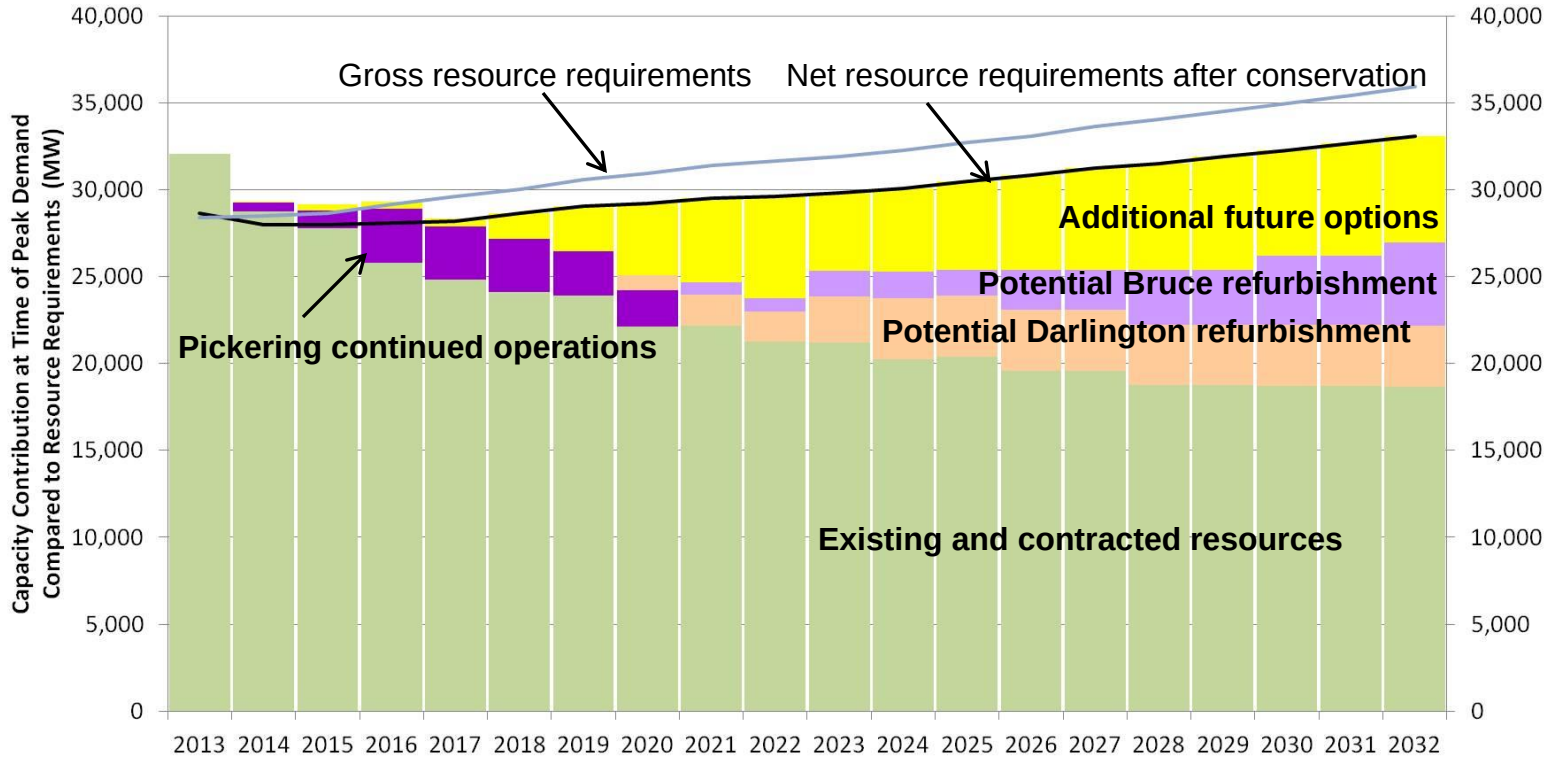
The difference shown in yellow is the gap to be planned for



Notes:
Resource requirements is comprised of demand plus planning reserve as required by reliability standards.
Contracted resources include contracted renewables and contracted natural gas.
Values are presented in Appendix B.

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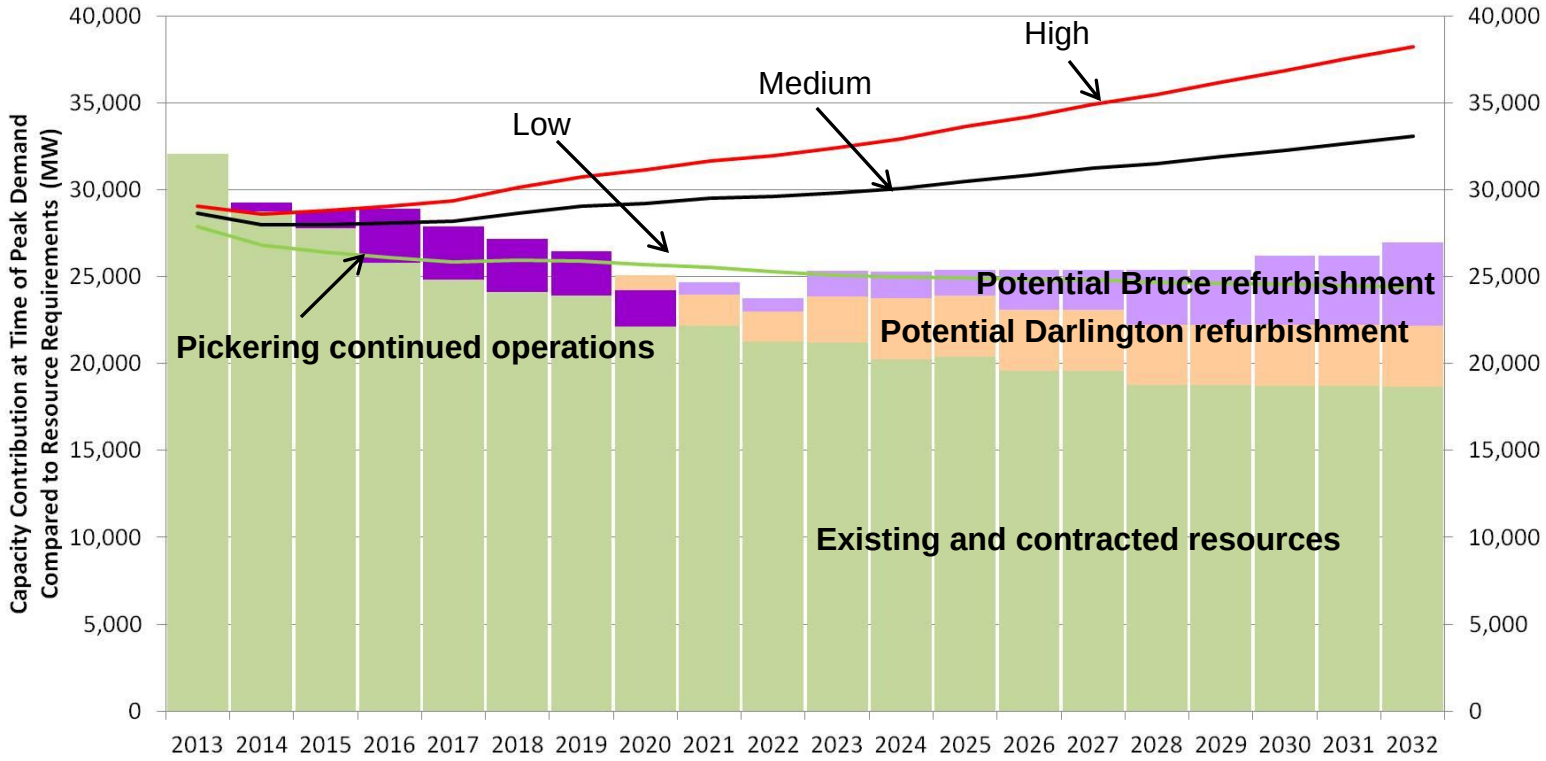
The gap can be different under different scenarios



Notes:
Resource requirements under low, medium and high scenarios are comprised of demand plus planning reserve as required by reliability standards.
Contracted resources include contracted renewables and contracted natural gas.
Values are presented in Appendix B.

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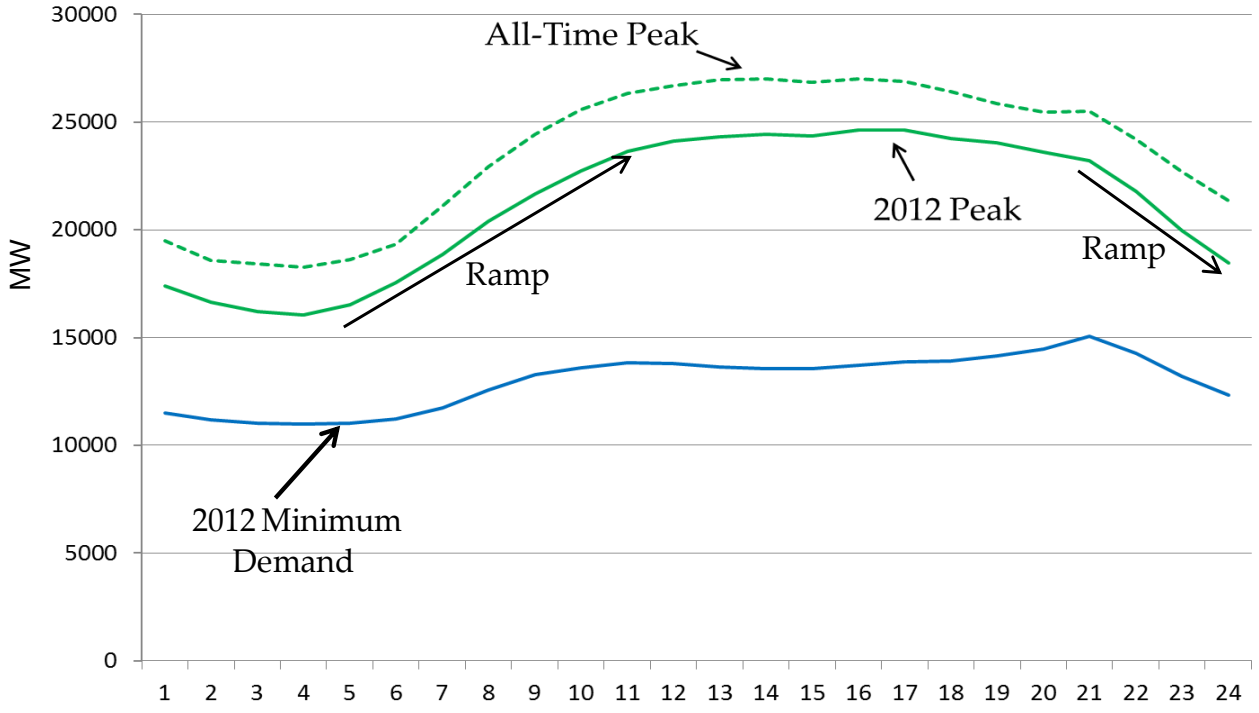
Options work together in an integrated fashion to meet customer needs

System needs and resource attributes must be taken into account when making supply decisions:

Efficiency	Energy	Capacity	System Quality	Openness

Resources must reliably and efficiently be available to balance supply and demand:



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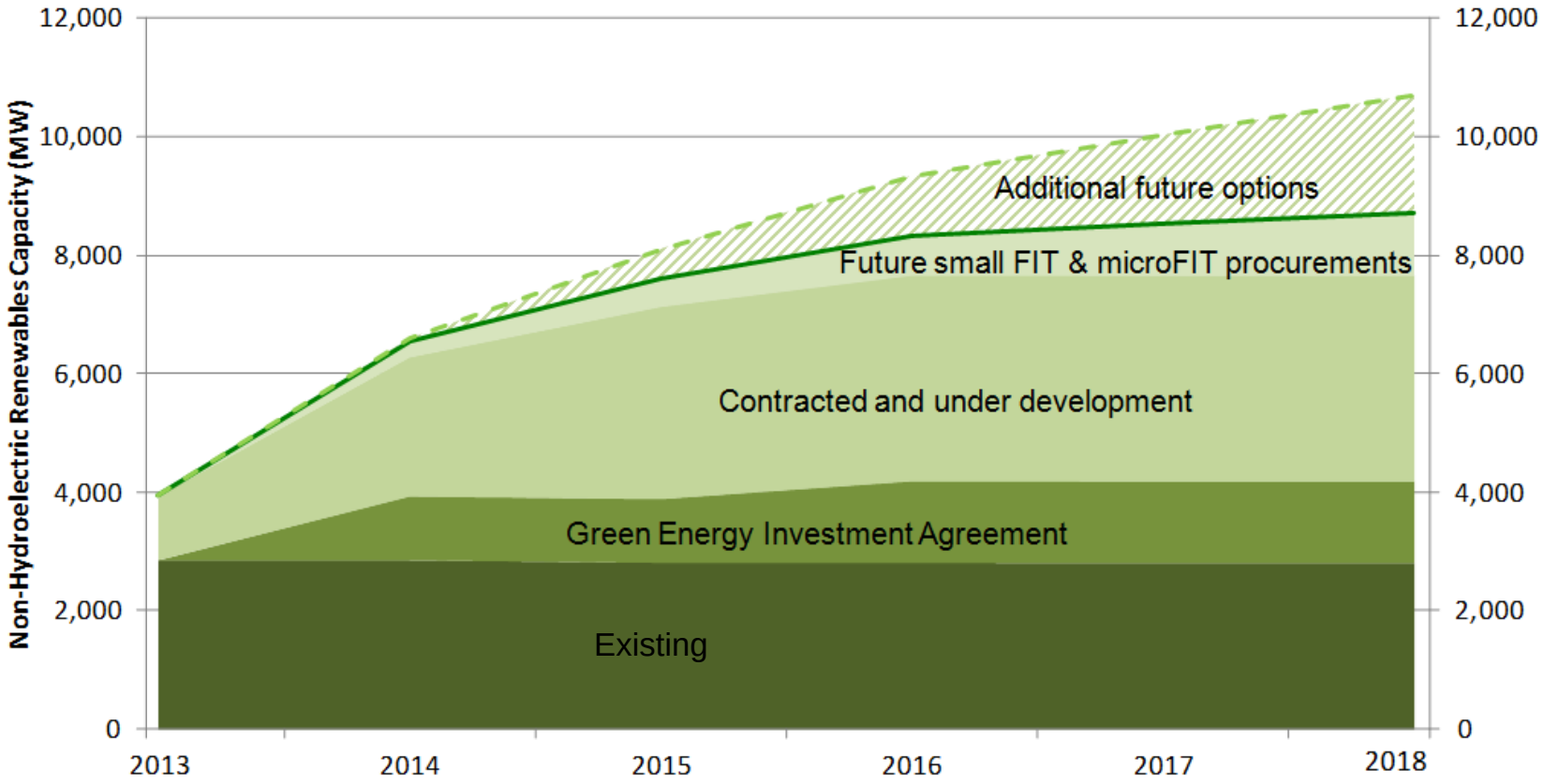
The extent and pace of further increases to hydroelectric is subject of this consultation

- Current hydroelectric fleet provides value to the electricity system
- Investments by OPG over the last decade increased capability of current fleet
  - Upgrades to existing facilities are a major contributor to improvements in hydroelectric capability
- Large projects are primarily in northern Ontario are distant, challenging to develop and require transmission upgrades
- Small projects are being explored throughout the province

The extent and pace of further increases to wind, solar, and bioenergy resources is subject of this consultation



Notes:
This diagram illustrates the components of non-hydroelectric renewables. The pace of development depends on how each of these categories evolves.
Values are presented in Appendix C.

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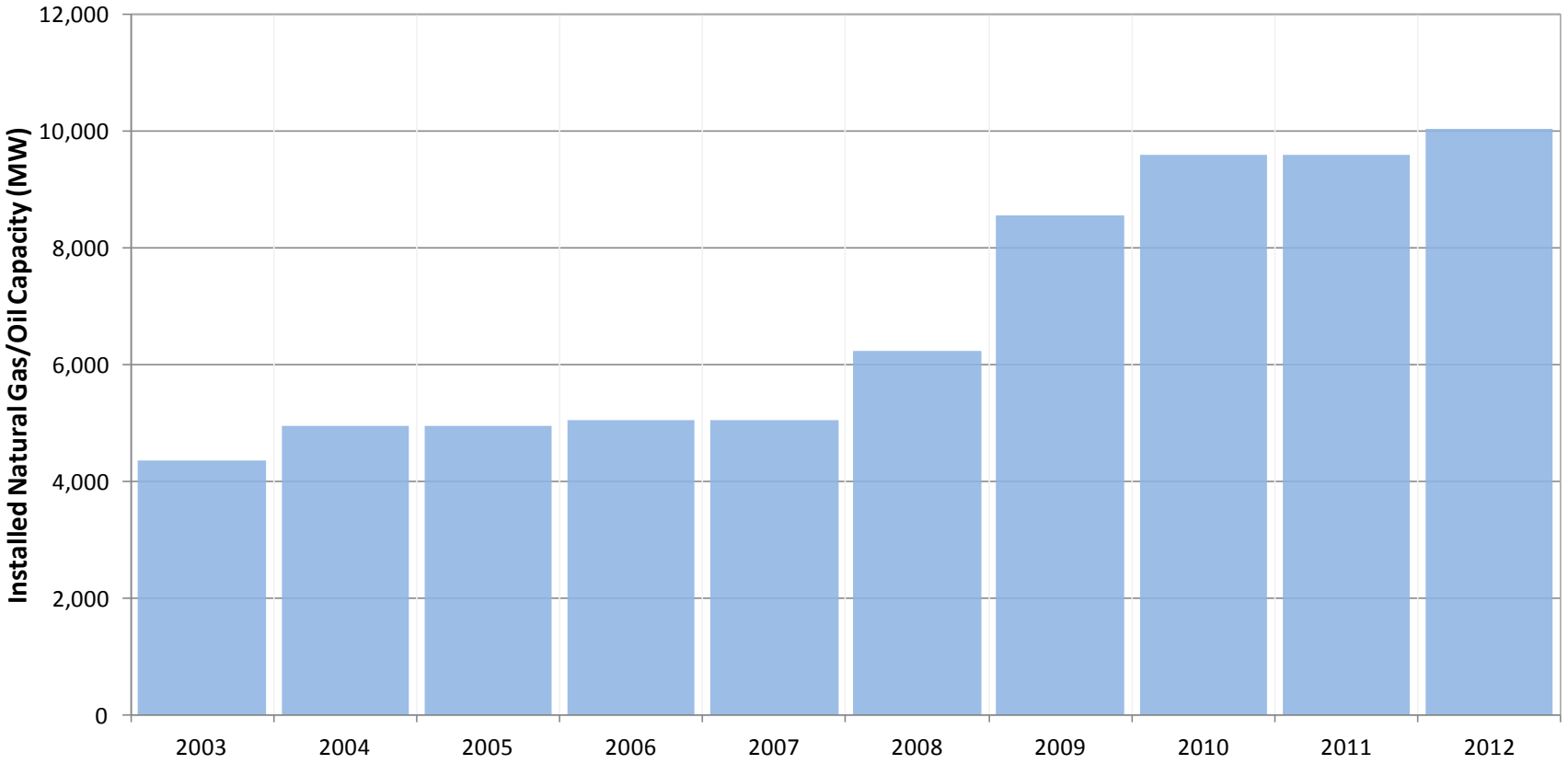
Natural gas-fired generation increased; further role of natural gas is subject of this consultation



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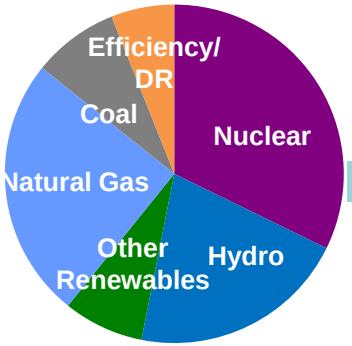
Nuclear will continue to have a large contribution to the portfolio, the outlook for nuclear depends on extent of refurbishments and new build; plans for nuclear are subject of this consultation

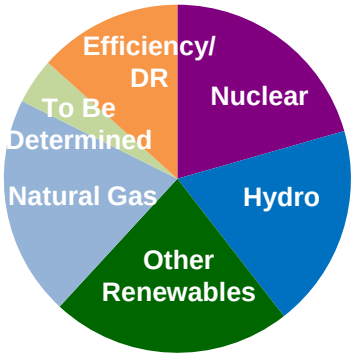
Illustration of how the supply mix differs with extent of nuclear refurbishments

	2013 (est.)	
Nuclear	12,900 MW	32%
Hydro	8,400 MW	21%
Other Renewables	3,900 MW	10%
Natural Gas	10,000 MW	25%
Coal	2,300 MW	6%
Efficiency/DR	2,600 MW	6%
Total	*40,100 MW*	*100%*



2013 (est.)

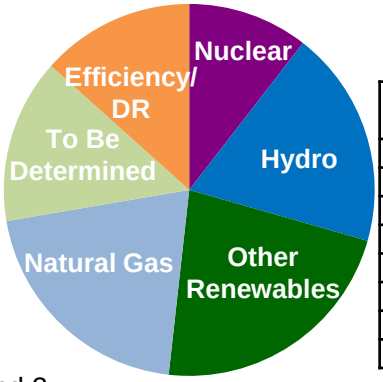
With all 10 units refurbished*



Illustrative Scenario

	Illustrative Scenario All 10 units refurbished	
Nuclear	9,900 MW	21%
Hydro	9,000 MW	19%
Other Renewables	10,700 MW	22%
Natural Gas	9,800 MW	21%
Coal	0 MW	0%
Efficiency/DR	6,400 MW	13%
To Be Determined	2,000 MW	4%
Total **	*47,900 MW*	*100%*

With only half refurbishment



Illustrative Scenario

	Illustrative Scenario Half of fleet refurbished	
Nuclear	5,000 MW	11%
Hydro	9,000 MW	19%
Other Renewables	10,700 MW	22%
Natural Gas	9,800 MW	21%
Coal	0 MW	0%
Efficiency/DR	6,400 MW	13%
To Be Determined	6,900 MW	14%
Total **	*47,900 MW*	*100%*

Notes:

*10 out of 12 nuclear units are available for refurbishments. Bruce A Units 1 and 2 were restarted and are now in commercial operation.

** Variations in MW and percentages may occur due to rounding.

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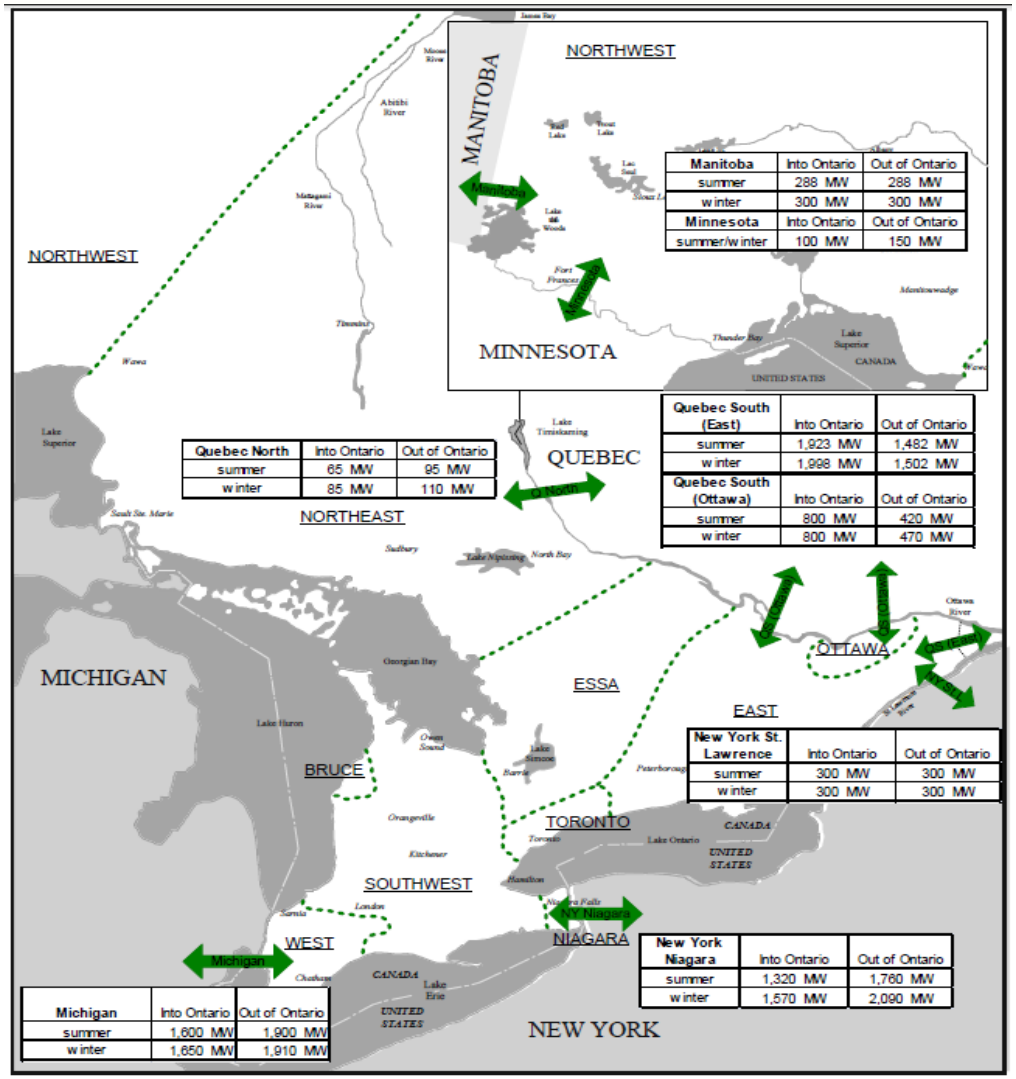
Ontario is part of a larger electricity market that actively trades electricity



Ontario's Points of Interconnection with Neighbouring Areas

Note: Interchange capacity shown is representative of capability as of 2012

Source: http://ieso.ca/imoweb/pubs/marketReports/OntTxSystem_2012nov.pdf

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Integrated solutions offer value to various regions – regional planning has a growing relevance

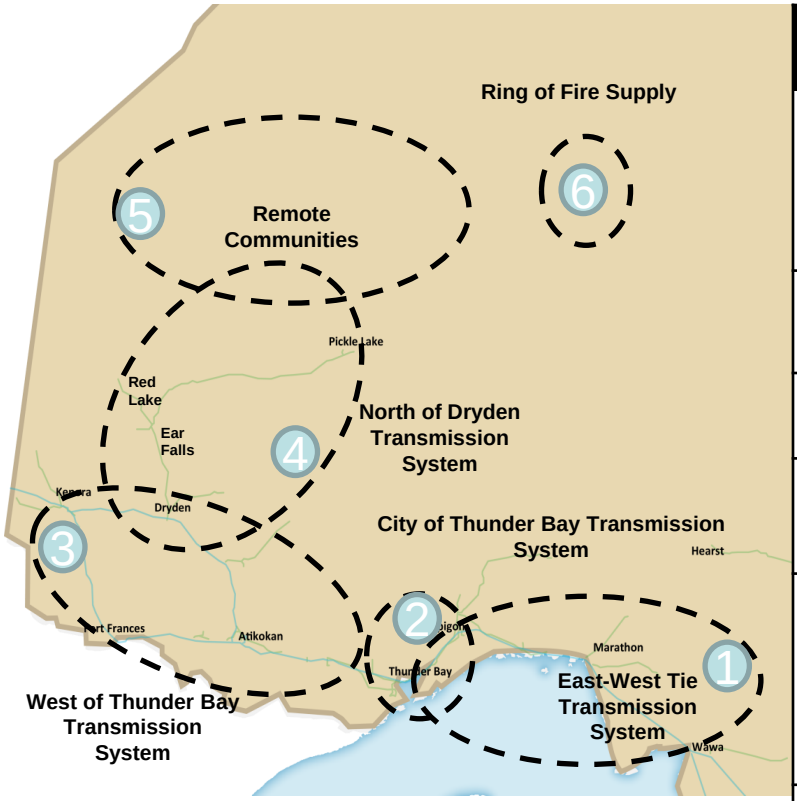
- Local Distributors are at different points in the infrastructure renewal cycle

- Areas requiring investments beyond sustaining assets typically are:
  - Experiencing growth in demand
  - Planning improvements to levels of service
  - Replacing aging infrastructure

- OPA works with IESO, LDCs, and transmitters to review short, medium, and long-term needs and options
  - Integrated review of conservation, generation and wires opportunities

- Seven regional plans are underway:
  - Northwest
  - Three in southern Ontario
  - Three around GTA

Six areas will require focus and integration within the Northwest



	Area	Status and Outcomes To-Date
1	East-West Tie	• Need for transmission development was identified as a priority project in the 2010 LTEP and a report was submitted to the OEB • The OEB is conducting a process to designate a transmitter
2	City of Thunder Bay	• A Thunder Bay area regional plan will be initiated later this year
3	West of Thunder Bay	• Need is being assessed and options are being developed
4	North of Dryden	• Regional Plan nearing final draft • Generation and transmission options assessed • Stakeholder engagement underway
5	Remote Communities	• Draft Remote Community Connection Plan Released August 2012 to the Northwest Ontario First Nations Transmission Planning Committee • Recommends connection of 20-21 communities • Community engagement almost complete • Report expected to be finalized in late 2013
6	Ring of Fire	• Supply options are detailed in Draft North of Dryden Regional Plan • Generation and transmission options assessed • Stakeholder engagement underway

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Three Southern Ontario Regions are in Focus

	Area (From more advanced to less advanced)	Status and Outcomes To-Date
1	Kitchener-Waterloo - Cambridge-Guelph ("KWCG")	• Engineering and approval work is proceeding on two near-term projects in the KWCG area: 1) The Guelph Area Transmission Refurbishment (GATR) Project 2) Installation of a second 230/115 kV autotransformer at Preston TS • These facilities will address the near-term needs in the region and provide a substantial improvement to the reliability of supply over the longer term
2	Ottawa	• Three near-term projects have been identified: 1) Replacement of two 230/115 kV autotransformers at Hawthorne TS (in progress) 2) Installation of an in-line breaker at Almonte TS 3) Transmission refurbishment to supply downtown Ottawa • A plan addressing regional supply needs for the area, as well as capacity and reliability needs for three sub-areas, is nearing completion
3	Windsor-Essex	• The OPA is updating the 2011 study, incorporating revised load forecast information and updated DG projections

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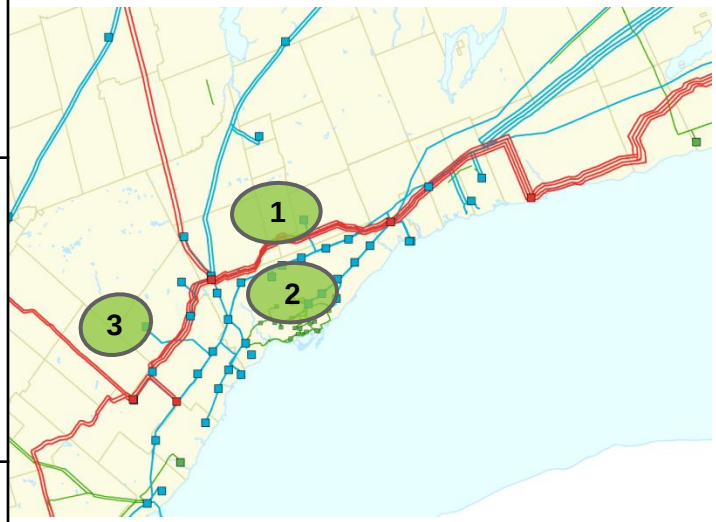
Three others around the Greater Toronto Area

	Area	Status and Outcomes To-Date
1	York Region	• Near-term projects have been identified to address load growth in this area
2	Central-Downtown Toronto	• Examining service standards for downtown core, • accounting for reinvestments in existing infrastructure, • Highlighting the significant value of efficiency measures • Exploring long-term transmission reinforcement options • Assessing potential for in city generation to enhance resiliency
3	Northwest GTA	• Early stages of initiating a regional planning process for Brampton, Halton Hills, Milton and South Caledon, involving four LDCs • High growth area with potential bulk system and regional supply capacity needs • Opportunities to coordinate long-term electrical and transportation infrastructure planning with potential for a joint use corridor



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Reference documents are available for further reading

- OPA's Supply Mix Advice report, 2005: http://www.powerauthority.on.ca/integrated-power-system-plan/supply-mix-advice

- Canadian Electricity Association's Electricity 101, 2012: http://www.electricity.ca/media/Electricity101/Electricity101.pdf

- National Renewable Energy Laboratory's Cost and Performance Assumptions for Modeling Electricity Generation Technologies, 2010: http://www.nrel.gov/docs/fy11osti/48595.pdf

- International Energy Agency's Tackling Investment Challenges in Power Generation, 2007: http://www.iea.org/publications/freepublications/publication/tackling_investment.pdf

- U.S. Energy Information Administration's The U.S. Energy Future, 2012: http://www.eia.gov/pressroom/presentations/howard_04262012.pdf

- U.S. Energy Information Administration's Annual Energy Outlook 2013: http://www.eia.gov/forecasts/aeo/pdf/0383(2013).pdf

More information related to reviewing and updating Ontario's Long-Term Energy Plan is available

To learn more about reviewing Ontario's Long-Term Energy Plan, refer to the following resources:

- Ontario Ministry of Energy's website: http://www.energy.gov.on.ca/en/ltep/
- Ontario Ministry of Energy's "Making Choices" document: http://www.energy.gov.on.ca/en/ltep/making-choices/
- Ontario Ministry of Energy's "Conservation First" document: http://www.energy.gov.on.ca/en/conservation-first/

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