

University of Ottawa | Positive Energy - Trust in Transition Workshop

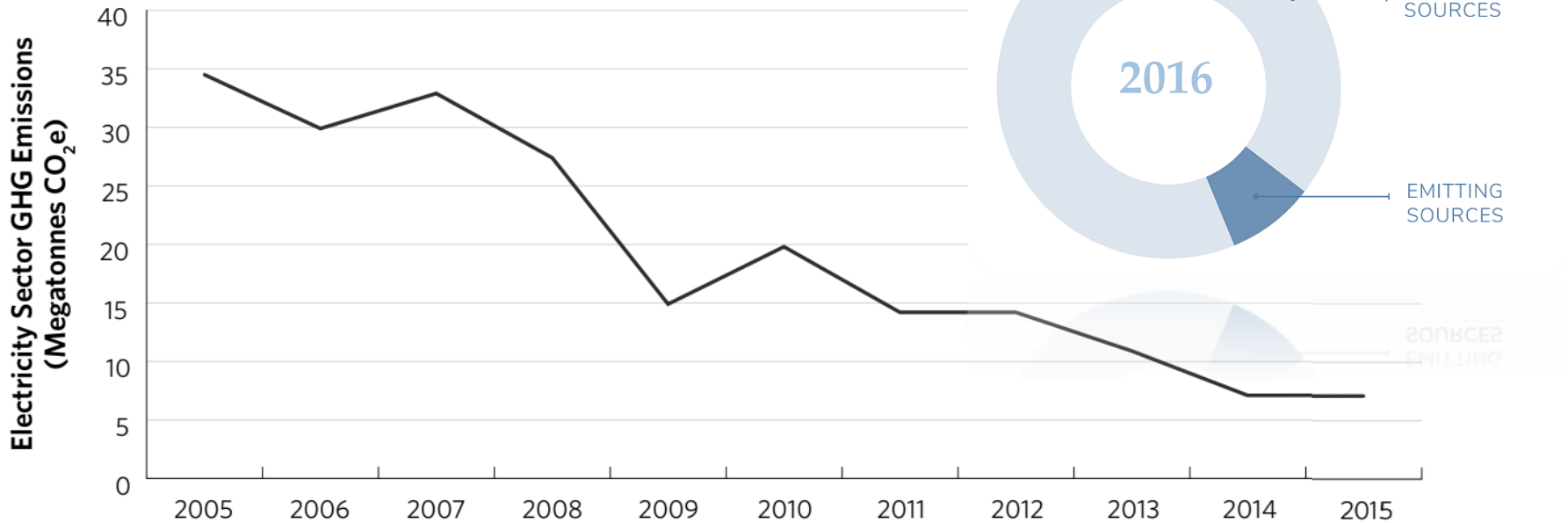
Panel 3: Reducing the Carbon Footprint of Ontario Electricity Production

Chuck Farmer

Director, Stakeholder and Public Affairs, IESO

January 24, 2018

Ontario's Electricity Sector Emissions

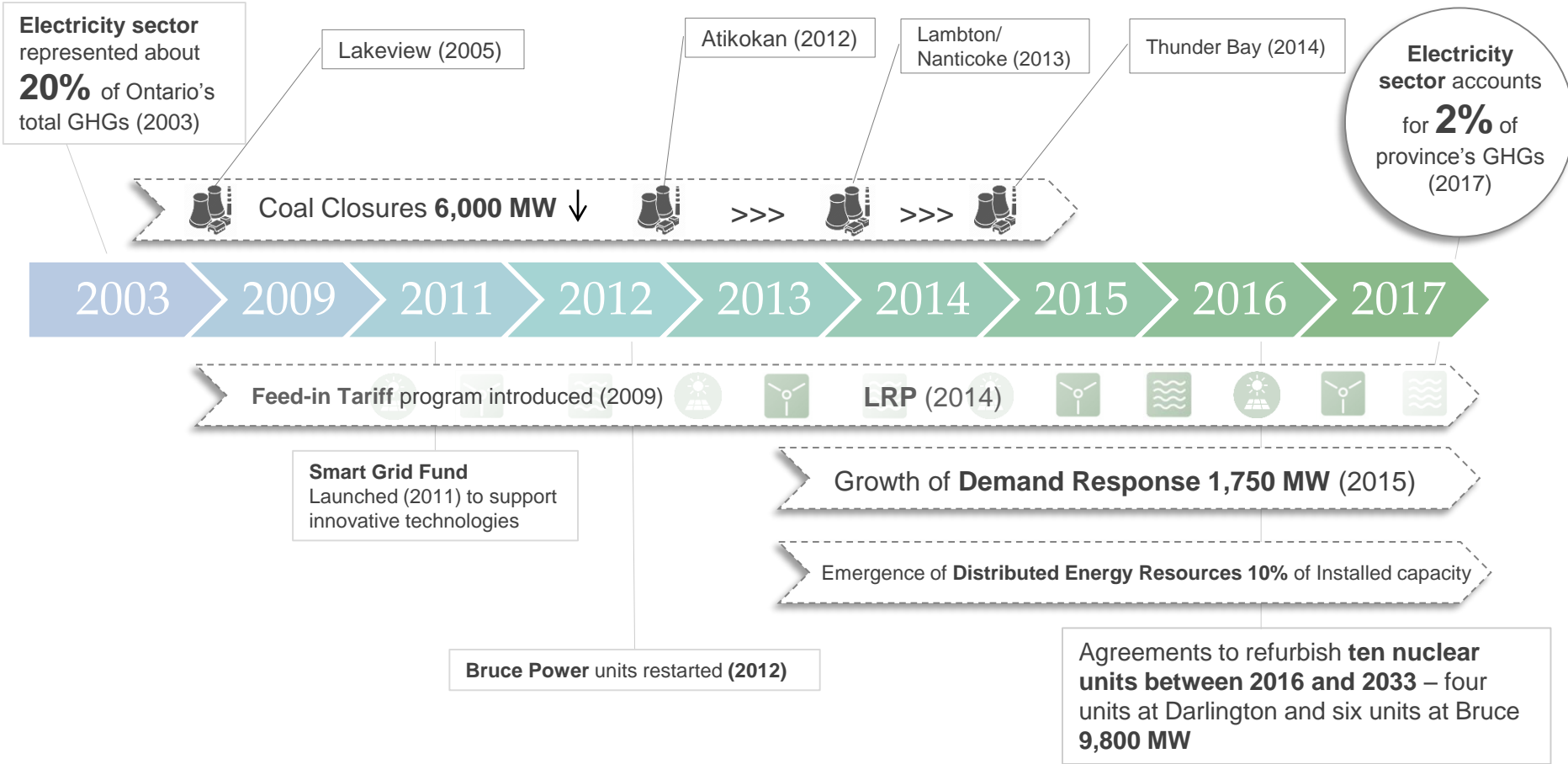


In **2016**, Ontario received:

- **50%** of its electricity from nuclear
- **30%** from renewable resources
- **10%** energy consumption reductions from conservation

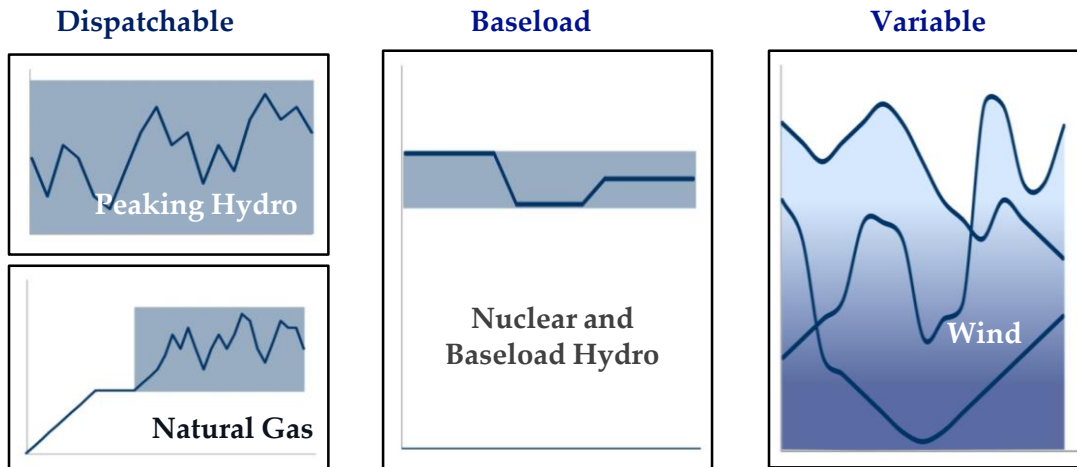


Key Milestones in Ontario's Supply mix evolution



Maintaining Reliability in a Rapidly Changing Sector

Each generation type has its own unique operating characteristics:



NEED

- ❑ Improved forecasting capabilities (Tx and Dx)
- ❑ New ways to get additional flexibility from existing resources
- ❑ Examining news technologies through pilots (Power House)
- ❑ Improved tools, processes, modelling and training
- ❑ Regulation service resources

FACTORS

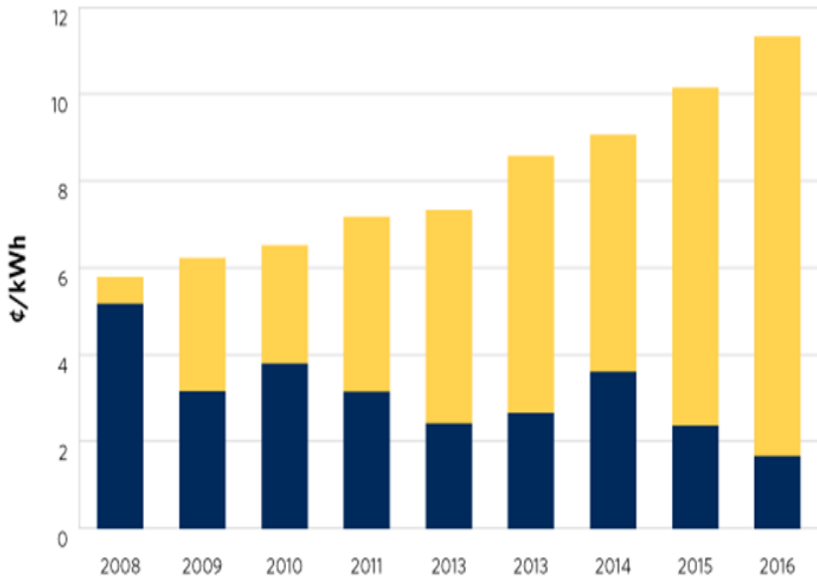
elimination of coal-fired units | integration of system connected renewable energy | increase in small-scale, local generation | emergence of new technologies (storage, smart grid applications) | changing demand patters

Maintaining Reliability in a Rapidly Changing Sector

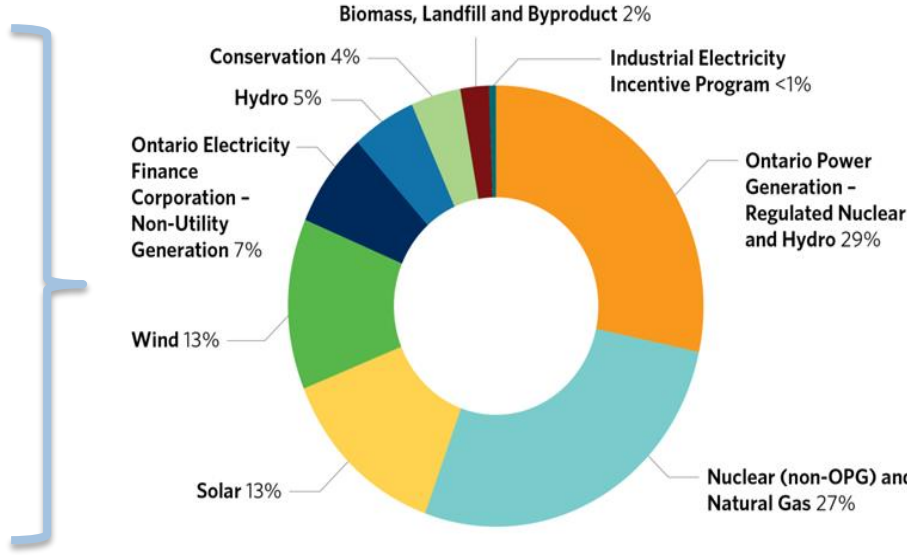
The IESO has developed tools and processes to ensure reliability

- ❑ IESO's **Renewables Integration Initiative** (2013) improved visibility, forecast and control
- ❑ IESO's 2016 '**Operability Study**' showed that Ontario needs greater flexibility from resources
- ❑ **Ancillary Services**, which help ensure the reliable operation of the power system
 - **Regulation Service** - match total system generation to total system load and correct for variations in power system frequency
 - **Certified Black Start Facilities** - help system reliability by being able to restart their generation facility with no outside source of power
 - **Reactive support** and **voltage control service** - contracted from generators and allows the IESO to maintain acceptable reactive power and voltage levels on the grid
 - **Reliability must-run (RMR)** - contracts used to ensure the reliability by allowing the IESO to call on the registered facility under contract to produce electricity if it is needed

Electricity pricing trends and global adjustment contributors

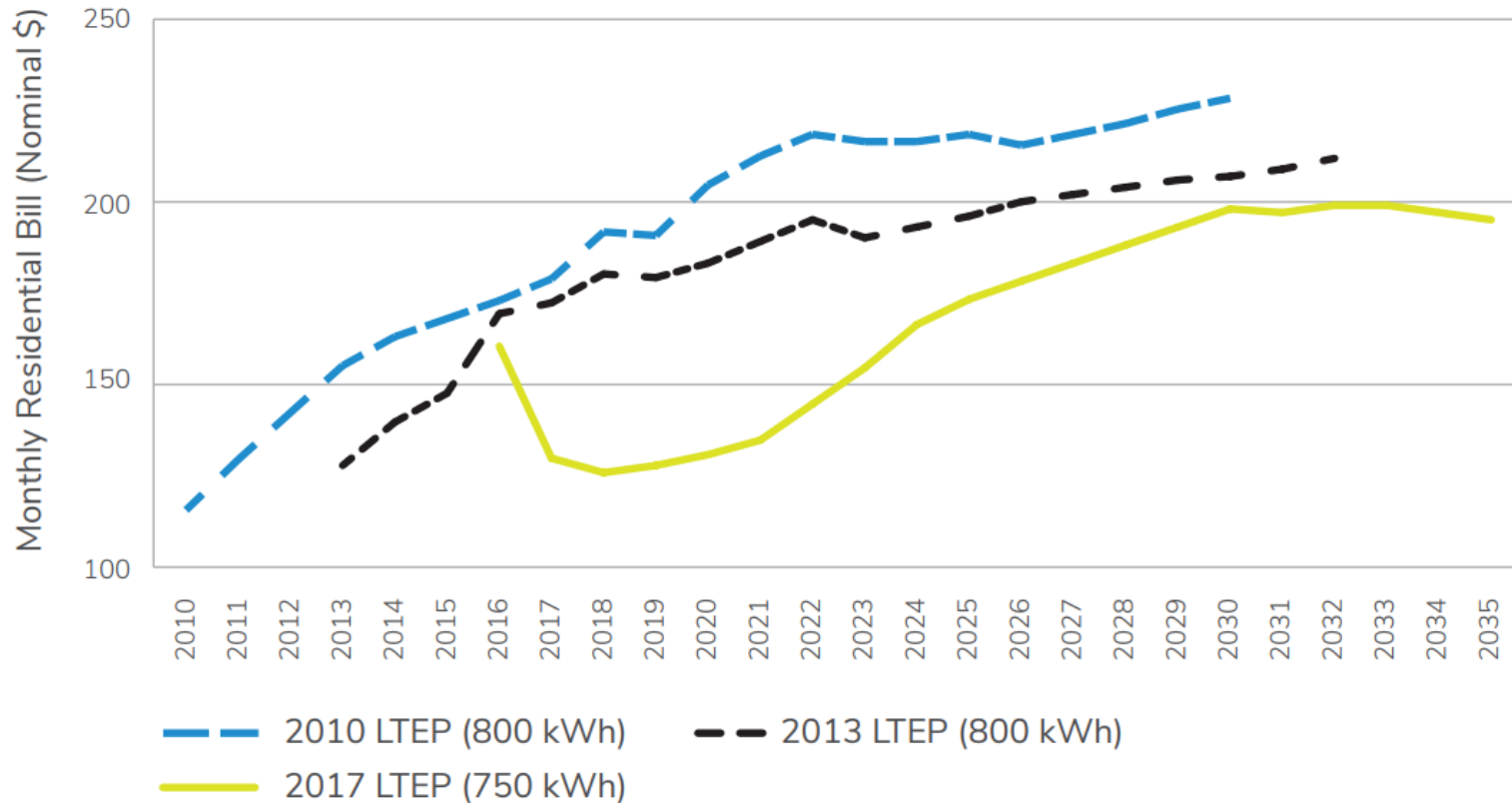


■ Average Global Adjustment
■ Average weighted Ontario Energy Price (kWh)



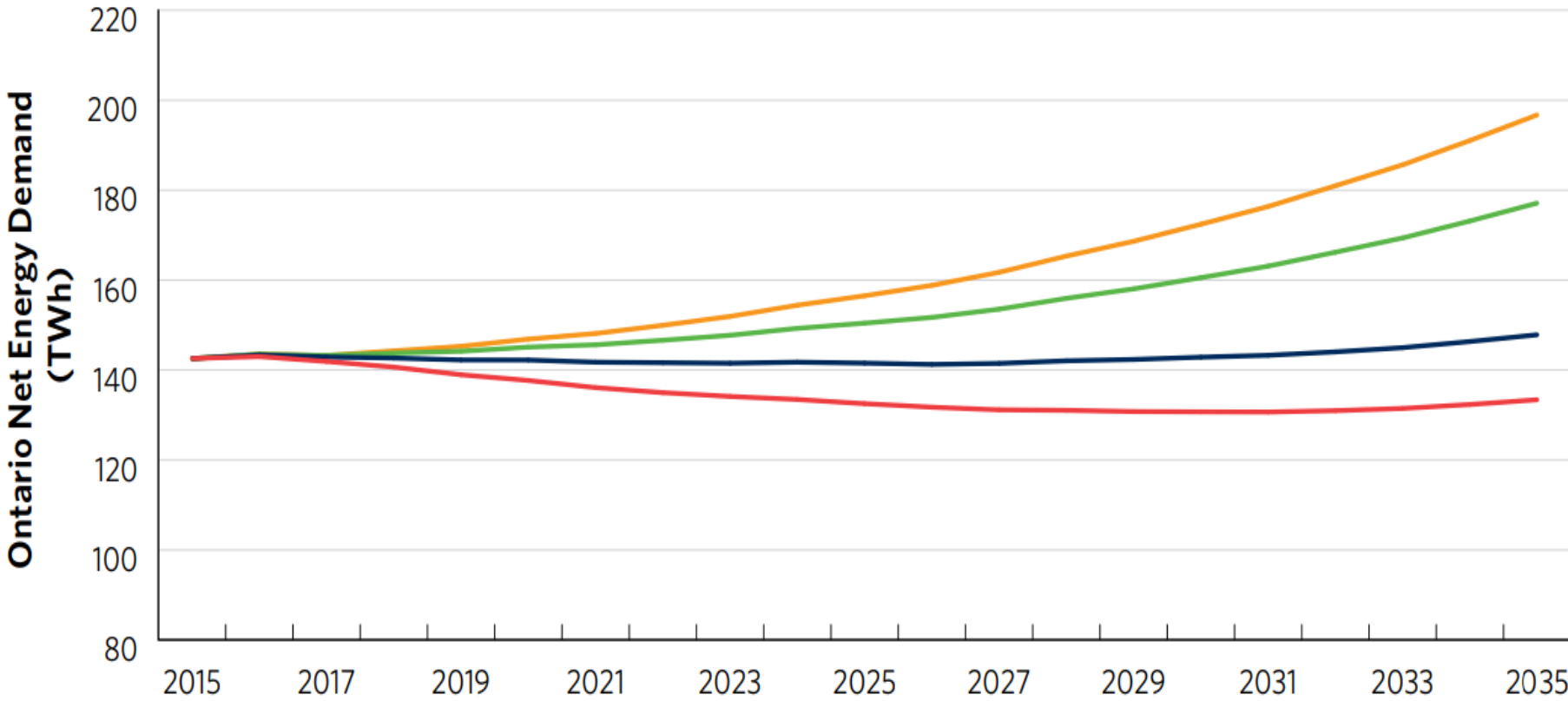
Price Outlooks

Electricity Price Outlook – Residential Consumers

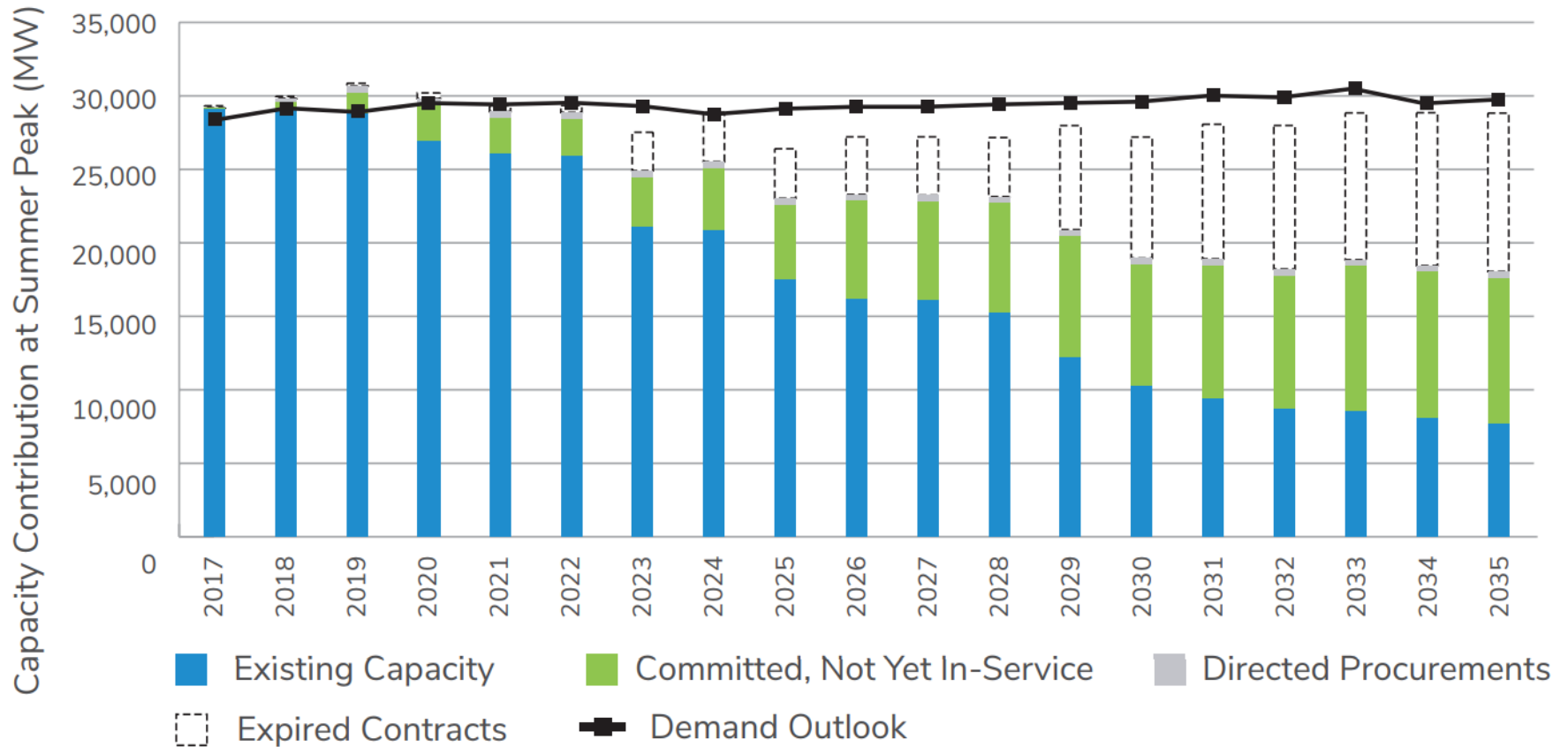


Variability of Demand

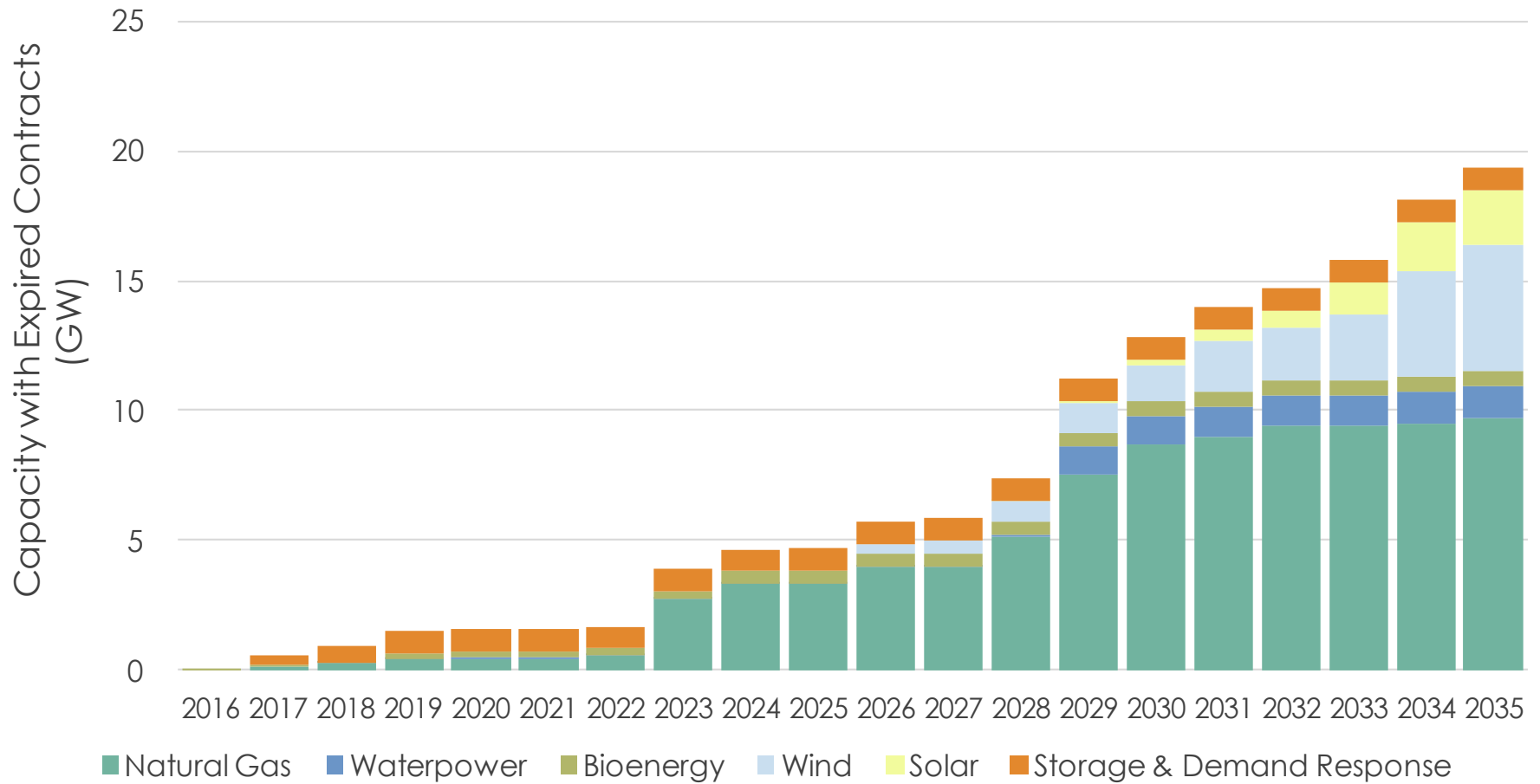
- Outlook A
- Outlook B
- Outlook C
- Outlook D



Supply Availability – looking ahead

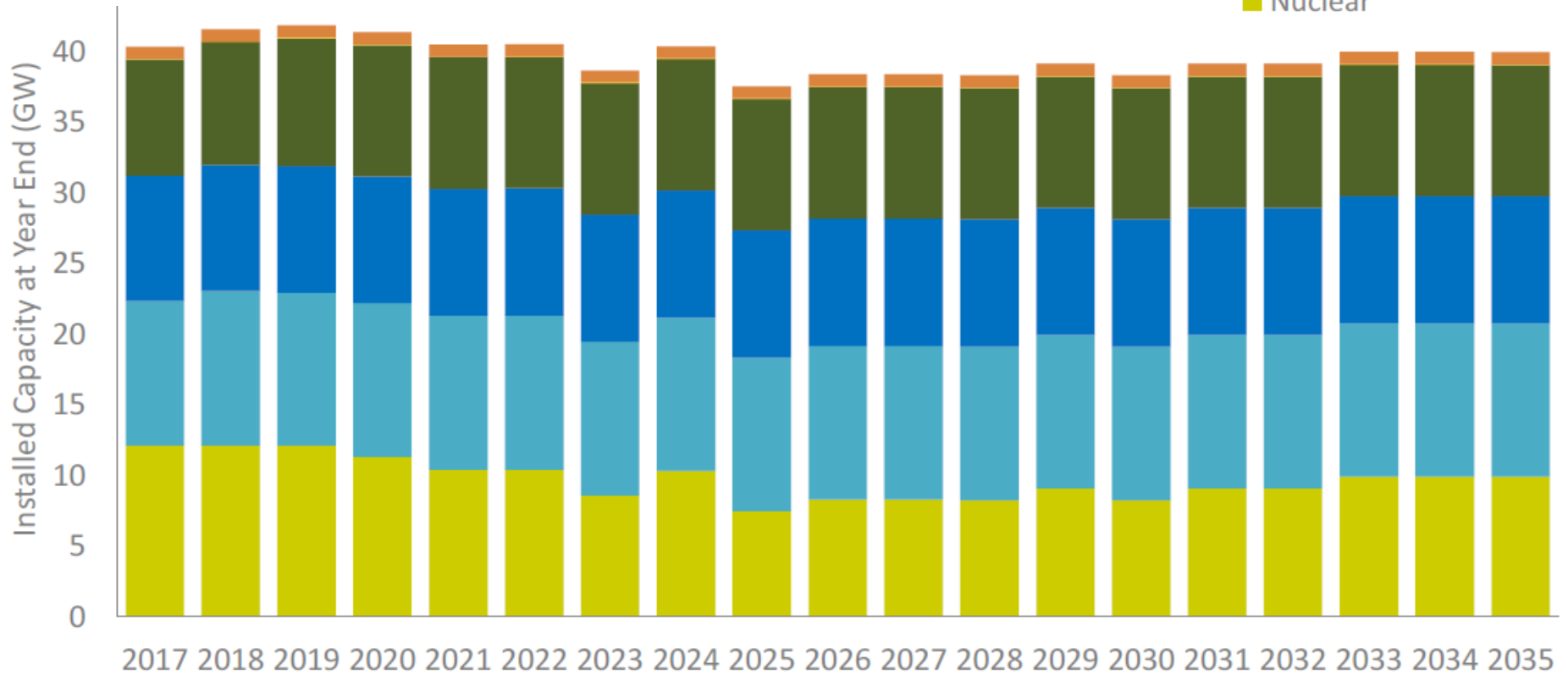


Expiring contracts, installed capacity by fuel type - 2016-2035



Supply Resources – looking ahead

- Demand Response
- Storage
- Non-Hydro Renewables
- Hydro
- Natural Gas
- Nuclear



Supply Availability – looking ahead

	Capacity	Energy	Operating Reserve	Load Following	Frequency Regulation	Capacity Factor	Contribution to Winter Peak	Contribution to Summer Peak	LUEC (\$/MWh)
Conservation	Yes	Yes	No	No	No	Depends on Measure	Depends on Measure	Depends on Measure	\$30-50
Demand Response	Yes	No	Yes	Yes	Limited	N/A	60%	85%	N/A
Solar PV	Limited	Yes	No	Limited	No	15%	5%	30%	\$140-290
Wind	Limited	Yes	No	Limited	No	30%	30%	10%	\$65-210
Bioenergy	Yes	Yes	Yes	Limited	No	40-80%	90%	90%	\$160-260
Storage	Yes	No	Yes	Yes	Yes	Depends on technology/application	Depends on technology/application	Depends on technology/application	Depends on technology/application
Waterpower	Yes	Yes	Yes	Yes	Yes	30-70%	75%	71%	\$120-240
Nuclear	Yes	Yes	No	Limited	No	85-95%	90-95%	95-99%	\$120-290
Natural Gas	Yes	Yes	Yes	Yes	Yes	up to 65%	95%	89%	\$80-310

Source: IESO. LUEC: Levelized Unit Energy Cost.

Supply Availability – looking ahead

- Needs are not projected to occur until the **early-to-mid-2020s**, with significant increases in resource requirements **beyond 2030**
- Ontario's current robust supply provides us with the opportunity to explore and efficiently implement new approaches to procuring electricity resources

Long-term electricity
supply contracts



Enhancing market-based
approach



Market Renewal is expected to result in up to **\$5.2 billion in efficiency improvements** between 2021 – 2030

Supply Availability – looking ahead

- Near-term: demand for electricity is forecast to be relatively steady
- Long-term: projected increase in overall demand as electrification of the economy increases
- As new supply needs are identified, the IESO will be able to use a technology-neutral competitive process to acquire electricity supply

IESO Resources – Keep in Touch

www.ieso.ca

Connecting Today. Powering Tomorrow.

The Independent Electricity System Operator (IESO) works at the heart of Ontario's power system. The IESO delivers key services across the electricity sector including: managing the power system in real-time, planning for the province's future energy needs, enabling conservation and designing a more efficient electricity marketplace to support sector evolution.

Tuesday, January 16, 2018

Demand	
Hourly Ontario Demand at 9:00 a.m. EST	19,013 MW
Projected Demand at 10:00 a.m. EST	19,337 MW
Today's Projected Peak at 7:00 p.m. EST	20,434 MW

Supply			
Hourly Output by Fuel Type (Transmission-Connected) at 9:00 a.m. EST			
Nuclear	10,658 MW	Hydro	4,884 MW
Gas	4,468 MW	Wind	834 MW
Solar	2 MW	Biofuel	107 MW
Hourly Imports	1,443 MW	Hourly Exports	3,487 MW

Generator Availability at Peak at 7:00 p.m. EST: 26,401 MW

@IESO_Tweets

Tweets 2,492 | Following 939 | Followers 5,534 | Likes 34

Tweets | Tweets & replies | Media

Ontario's IESO @IESO_Tweets · Jan 12
Bundle up, again! We're back to negative temps this week. Forecast peak demand 20,100 MW Mon/Tue eve, low 14,200 Saturday am.

Ontario's IESO @IESO_Tweets · Jan 10
Catch last night's @theAgenda panel on the future of energy in Ontario. IESO VP Terry Young talks about the importance of a diverse and flexible supply mix tvo.org/video/programs... @tvo

Energy Disruption
The Agenda looks at the future of energy in Ontario. tvo.org

Ontario's IESO @IESO_Tweets · Jan 5
Stay warm over the weekend, we'll get a short break from the cold temps on Monday (0 degrees C). Next week's forecast peak demand 20,770 MW Sat eve, low 14,400 Thurs am.

WebFeedback@ieso.ca

to subscribe to updates

News and Updates

[Back to IESO News](#)

Subscribe to updates

The IESO is working to launch a more interactive email subscription service. While we transition to this new platform, please email WebFeedback@ieso.ca to subscribe. In your email, be sure to advise which updates you would like to receive. The following is a list of available email distribution subscriptions.