

Planning Ontario's

ENERGY FUTURE

A Discussion Guide to Start the Conversation



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1. MINISTER'S MESSAGE

As we launch formal consultations and engagement for the next Long-Term Energy Plan, the most pressing question is this: are we well-positioned for the future?

If the recent *Ontario Planning Outlook* and *Fuels Technical Report* are any indication, the answer is yes. We have invested in our fuel and electricity infrastructure. We have a robust supply of all forms of energy for at least the next 10 years. We have wisely acted on reducing greenhouse gas emissions, while many other jurisdictions are only beginning to tackle this challenge. We have a clean and diverse electricity supply mix. And through our government's *Climate Change Action Plan*, we have vision and direction on future clean prosperity.

The pace of change in the energy sector is high. Fuel switching, electric vehicles, the emerging potential of the Smart Grid, behind-the-meter generation, conservation and demand management, renewable fuels and international efforts to fight climate change are all factors in this change. To be successful, we will need both a strong energy foundation to support our communities and businesses, and the agility to adapt to future sector evolutions.

Our consultations and discussions will address many important issues.

- How can we better represent the interests of our Indigenous communities?
- How will local energy plans integrate with broader planning?
- And how do we ensure that we better integrate fuels and electricity planning with broader community planning?

I look forward to hearing the many voices and perspectives across our province. I am reassured that as we enter into these discussions, the Ontario energy sector enjoys a position of strength and stability.

Sincerely,

Glenn Thibeault
Minister of Energy

2. LTEP 2017

Welcome

This discussion guide is intended to help Ontarians participate in the development of the province's *Long-Term Energy Plan* (LTEP). The LTEP is a road map setting out the direction for Ontario's energy future for the next 20 years. Your involvement is important, as it will help maintain the principles that residents and businesses say are important to them: cost-effectiveness, reliability, clean energy, community and Indigenous engagement, and putting conservation and energy efficiency first before building new energy infrastructure.

There are many ways people can play a part in the development of this latest LTEP. Ontarians can attend any of the Open Houses that are being held across the province or dial into telephone Town Halls. Visit ontario.ca/EnergyTalks to learn where you can participate in the Long-Term Energy Plan consultations in person and online.

The questions in this discussion guide are just a starting point that should in no way limit the scope of the discussion. The guide also includes a glossary to help clear up the mystery often associated with acronyms and technical terms.

The Ministry of Energy is also undertaking a robust engagement with Indigenous communities across the province. Indigenous communities can bring unique perspectives and energy experiences to the long-term energy planning process, and it is important to reflect this in our updated plan and related policy priorities.

The LTEP Process

The development of the next LTEP follows the steps set out in recent changes to the *Electricity Act 1998*. These legislative changes include a requirement for consultation with local communities, stakeholders and other ministries, along with engagement with First Nation and Métis communities. The legislative changes also require a technical report the government must consider when it develops the plan. With the next LTEP, the Ministry of Energy intends to expand the discussion of Ontario's energy future by including a comprehensive review of the province's fuels sector and the supply of fuels such as oil, gasoline and natural gas.

In response to the requirement for a technical report, the Independent Electricity System Operator (IESO) issued the *Ontario Planning Outlook* (OPO), which examines the province's future electricity needs, and how they might be met. The Ministry of Energy also released the *Fuels Technical Report* (FTR), a report that examines the supply and demand for fuels such as oil, gasoline, propane and natural gas in Ontario.

The facts and analyses in these two reports mark the starting points for the development of the next LTEP and will help guide the consultation process. Both reports take into account other government commitments made in the *Climate Change Action Plan*, the *Climate Change Mitigation and Low-Carbon Economy Act, 2016* and the *Vancouver Declaration*.

There is no one path to ensuring an affordable, reliable and clean supply of energy for our residents and businesses. The province's LTEP needs to be flexible, so it can change to meet the needs of future technology, policies or programs. The Ministry intends to publish the next LTEP in 2017, and, together with its agencies, lead the implementation of its recommendations.

Energy Use and Climate Change

To combat climate change, Ontario released a five-year *Climate Change Action Plan* in June 2016. The *Climate Change Action Plan* outlines the approaches the government will take to reduce carbon emissions in the province. This plan is likely to have a significant effect on how energy is used in our province. It also proposes to use conservation, energy efficiency and fuel switching to reduce the use of fossil fuels such as oil, gasoline and natural gas and increase the use of clean electricity and clean fuels.

The *Climate Change Action Plan* will play a key role in the development of the 2017 LTEP, as it intends to share many of the same goals. The OPO incorporates the commitments and targets for 2020 set out in the *Climate Change Action Plan*. In addition, the proceeds from the cap and trade auctions will be used to fund programs that reduce energy use and greenhouse gas (GHG) emissions.

Ontario has already set high standards for building and sustaining a clean, affordable and modern electricity system. In 2014, the province completed the single-largest climate change initiative in North America by completely eliminating coal-fired electricity generation. GHG emissions from Ontario's electricity sector have fallen by 80% since 2005.

Towards a Broader Energy Focus

Three-quarters of the energy used by Ontarians comes from fossil fuels such as oil, natural gas, and their derivatives. Natural gas, for instance, is commonly used to heat water, homes and buildings in the commercial and industrial sectors. Products derived from crude oil, such as gasoline, diesel and jet fuel, are widely used to fuel cars, trucks, buses and planes.

Simply put, residents of Ontario rely on oil and natural gas to support their basic needs for heat and transportation. So any LTEP needs to take account of how these fossil fuels are used. Ontario produces very little of the oil and natural gas it uses. Almost all of it is delivered from outside the province by interprovincial and international pipelines that are under federal jurisdiction and regulated by the National Energy Board. Previous provincial governments have not focused on oil and natural gas the way they have on the electricity produced in the province.

That began to change in 2013. That was when Ontario, through the 2013 LTEP, established a set of principles the government would use to evaluate oil and natural gas pipeline projects. It also committed, where cost-effective, to put *Conservation First* in the planning processes for both electricity and natural gas before building new energy infrastructure.

This increased attention received new urgency with the government's *Climate Change Action Plan*, and its enabling legislation, the *Climate Change Mitigation and Low-Carbon Economy Act, 2016*. In light of the province's emission reduction goals, the 2017 LTEP should take a broader view of the province's energy needs and consider how the uses of electricity and fossil fuels influence each other. For example, because Ontario's electricity supply is largely emissions free, commitments in the *Climate Change Action Plan* foresee a switch from conventional fossil fuels to the use of electricity for heating and cooling buildings and powering transportation. In addition, electric vehicles are becoming a more prominent focus of this discussion.

Work is also underway to add a certain amount of renewable natural gas (RNG) from landfills, sewage treatment plants and agricultural operations to the province's natural gas supply. This would ensure a cleaner and more efficient use of our existing natural gas pipelines. In the future, it may become more economical to produce hydrogen or synthetic natural gas from clean electricity.

The changes sparked by climate change will affect all aspects of energy demand, and will require the government to take an integrated approach to planning for the transition to a low-carbon economy.

3. ONTARIO'S ENERGY MIX AT THE END OF 2015

Electricity Supply

Ontario produced 160 Terawatt-hours (TWh) of electricity in 2015. That electricity does not come from any one type of generation. The province relies on a diverse number of sources to give it a secure and reliable supply of electricity. Nuclear, natural gas and renewable generation, such as hydroelectric, wind, solar and bioenergy, all produce the electricity Ontarians rely on.

The province's supply mix must also be flexible to respond to the changing priorities of Ontarians. The most significant change over the past decade was the elimination of coal-fired generation. To reduce the GHG emissions that cause climate change and to improve Ontario's air quality, the province eliminated the use of coal by closing three coal plants and converting the remaining two plants to cleaner biomass plants. It also invested in new and refurbished generating facilities to replace the closed coal plants.

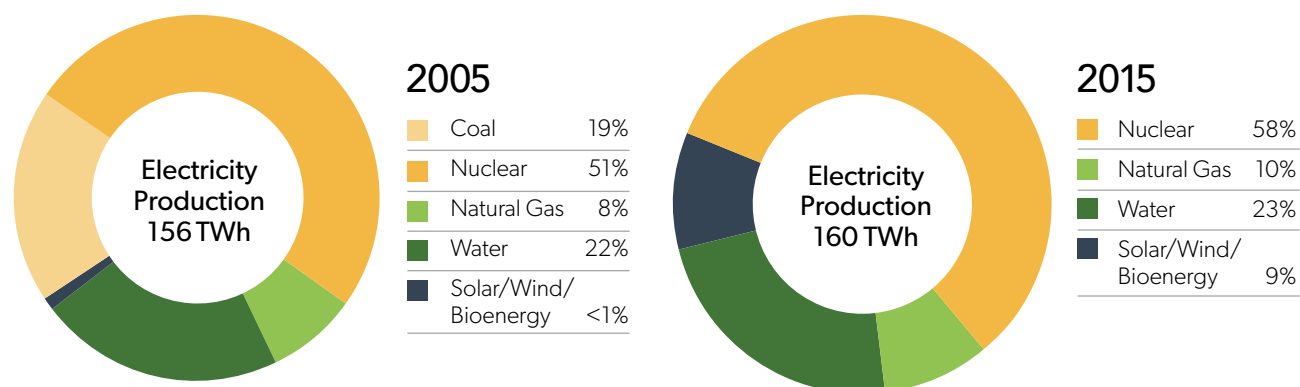


Figure 1: Ontario Electricity Production (Source: Ontario Planning Outlook, 2016)

Nuclear generation provided the biggest share of Ontario's electricity in 2015, producing 92.3 TWh of electricity. That was followed by the 37.3 TWh provided by hydroelectric generation, 15.9 TWh generated from natural gas, and non-hydro renewables such as wind, solar and bioenergy that provided 14.2 TWh.

While Ontario generated 160 TWh of electricity last year, it has the ability to produce more. The installed capacity of the province's generating fleet totals 39,393 MW.

Since the 2013 LTEP, the share of wind, solar and bioenergy capacity in our supply mix has grown from 9% to over 18%. At the end of June 2016, the 4,500 MW of installed wind capacity represents the largest source of our non-hydro renewable generation. Approximately 1,600 MW of additional wind capacity is under contract and under development.

Use of Fuels

Ontario consumed approximately 2,700 petajoules (PJ) of fuels in 2015. These types of fuels include gasoline, diesel, natural gas, propane and natural gas liquids. Alternative fuels include renewable and low-carbon fuels like biomass and biofuels. Ontarians use fuels for cooking, heating, transportation, electricity generation and industrial production. Fossil fuels also provide the energy needed to refine petroleum and manufacture pulp and paper, steel and cement. They are the raw materials in the production of plastics, fertilizers and chemicals.

Ontario’s fuel sector underwent considerable change recently, driven by new sources of supply, new technologies and the use of new, low-carbon biofuels such as ethanol and bio-based diesels. The significance of biofuels in the transportation fuel sector has tripled over the past decade, growing from less than 1% of the fuel used in 2005 to nearly 3% in 2015. There is every expectation that the use of biofuels will continue to expand within Ontario.

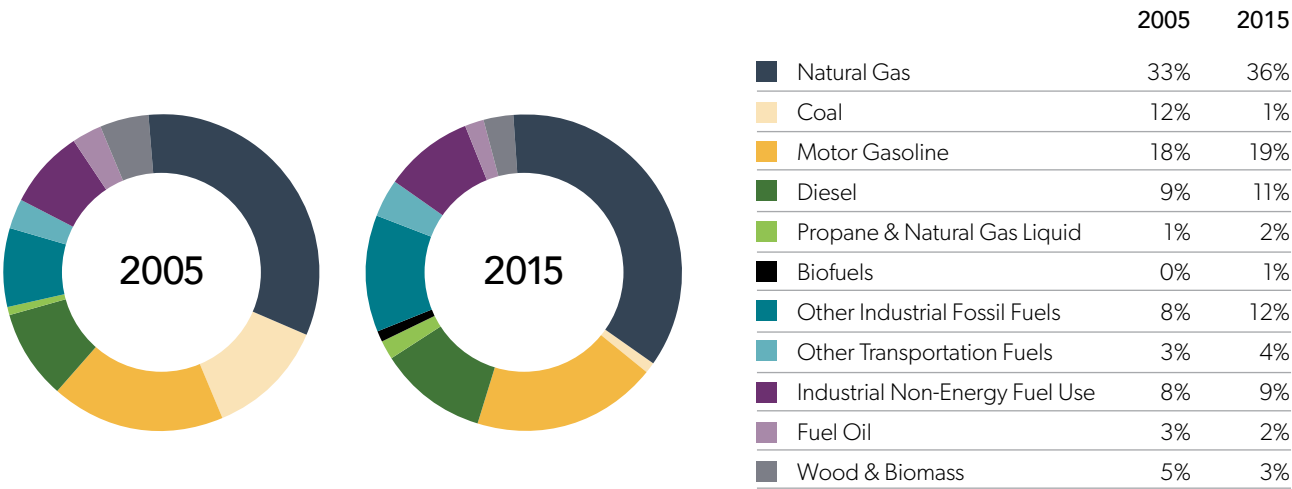


Figure 2: Ontario Fuels Demand by Fuel Type (Source: Fuels Technical Report)

Ontario’s climate change initiatives will impact the supply and demand for these fuels in the future. Because of the strength and diversity of the existing supply chain of pipelines, refineries, terminals and retail stations, Ontario’s fuel sector is well-positioned to adapt to any changes in the supply and demand for fuels, and contribute positively to Ontario’s GHG emission reduction targets.

Emissions

Ontario is a North American leader in the reduction of GHG emissions. Closing three of the province's coal-fired generation plants and converting the remaining two plants to biomass facilities was the continent's largest single reduction effort, and reduced emissions from the electricity sector by 80%. The success in fighting climate change continues. Since the release of the 2013 LTEP, emissions from electricity production declined to 7.1 megatonnes (Mt), a reduction of 35%.

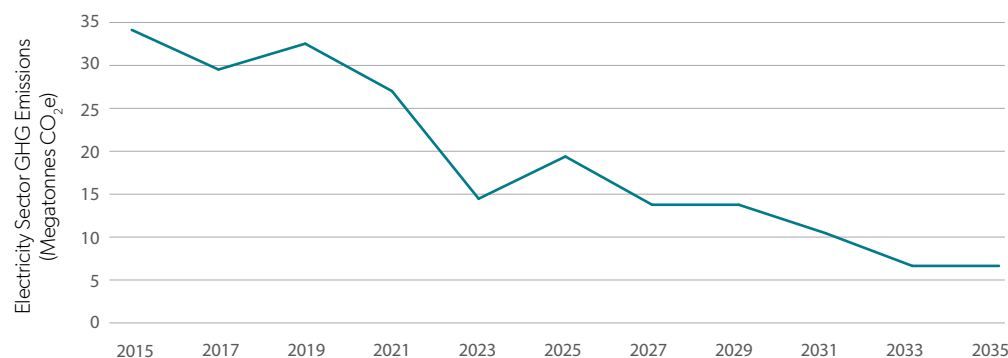


Figure 3: Electricity Sector GHG Emissions
(Source: Ontario Planning Outlook)

Ontario has ambitious targets for reducing its GHG emissions. The *Climate Change Mitigation and Low-Carbon Economy Act, 2016* commits the government to reducing emissions to:

- 15% below 1990 levels by 2020
- 37% below 1990 levels by 2030
- 80% below 1990 levels by 2050

Ontario also established a cap and trade program that sets caps on GHG emissions, and allows businesses to buy or sell allowances (credits) if they are over or under those limits.

The cap and trade program covers:

- Facilities that emit more than 25,000 tonnes of CO₂ a year
- Distributors and importers of liquid petroleum fuels
- Distributors of natural gas

Ontario expects to generate between \$1.8 and \$1.9 billion in revenues annually from the sale of allowances during the first four-year compliance period of the cap and trade program. As part of the Western Climate Initiative, Ontario plans to link up in the future with a cap and trade program jointly run by Quebec and California.

4. DEMAND FORECASTS

Demand Forecasts for Electricity

Ontario's investments over the past decade established a firm foundation for Ontario's energy future. The province is in a strong position to meet the range of demands for electricity that could occur. Ontario has to prepare for a range of demands, and not one single future, because we cannot precisely predict how we will use electricity 10 or 20 years from now.

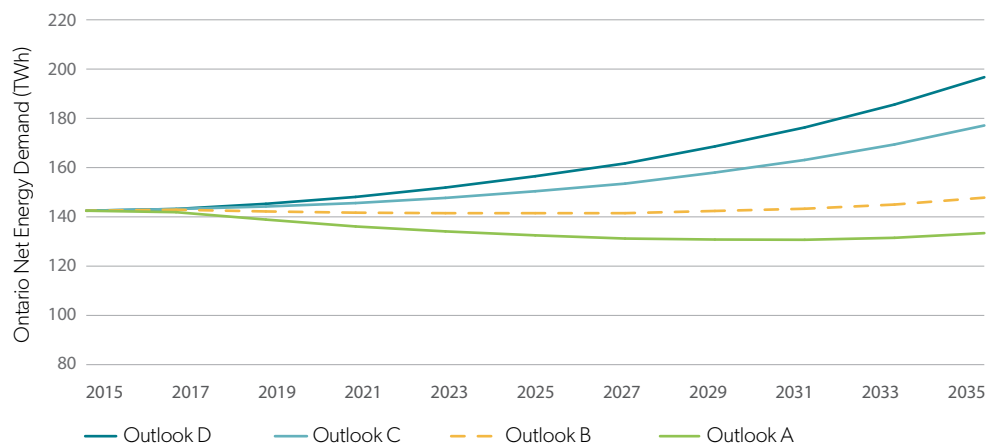


Figure 4: Electricity Demand Forecasts
(Source: Ontario Planning Outlook)

In the OPO, the IESO examined four possible futures, or outlooks:

- Outlook A examines a future of low demand, with the province using less electricity than it does now. In Outlook A, Ontario would use 133 TWh of electricity annually by 2035.
- Outlook B is a continuation of the current pattern of flat growth in energy demand and would see annual electricity use of 148 TWh over the same period. This is close to the current level of 143 TWh used in 2015. With currently planned and existing resources, including conservation efforts, Ontario will have sufficient capacity to meet the needs of a flat demand future.
- Outlooks C and D examine a future with a significantly higher use of electricity due to the increased electrification of transportation and changes in the heating and cooling of homes and businesses. In these outlooks, the annual consumption of electricity could increase to between 177 TWh and 197 TWh by 2035. Ontario would need to generate more electricity than it does today to meet these higher levels of demand. The increase in demand is not expected to occur until the mid-2020s, with significant increases in supply required after 2030.

Demand Forecasts for Fuels

The discussion of future demands for fuels is outlined in the FTR. The report's five scenarios are based on the same primary assumptions contained in the IESO's OPO. As such, the projections for fuel demand in the FTR are the reverse of the projections for electricity demand. For example, an OPO forecast of an increase in the number of electric vehicles would trigger a corresponding decrease in the fuels consumed within the transportation sector.

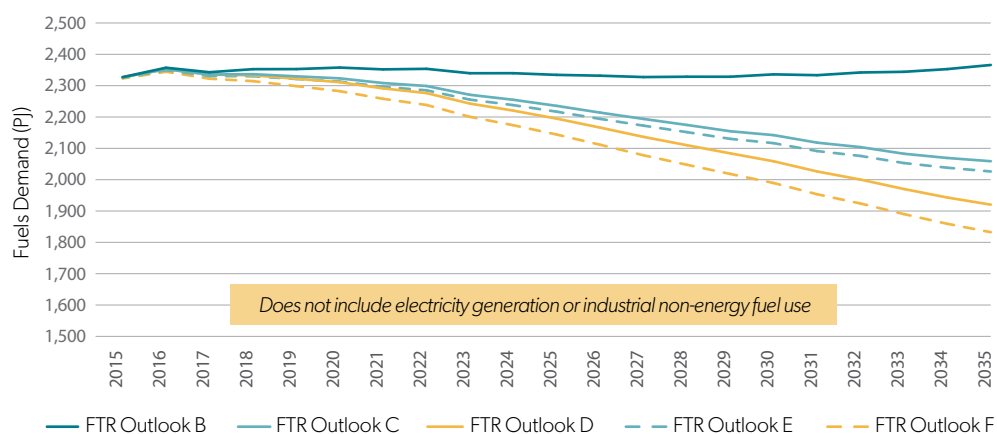


Figure 5: Fuels Demand Forecast
(Source: Fuels Technical Report)

The five Outlooks in the FTR examine a series of demands for fuels, ranging from a continuation of the status quo to a future with reduced demand for fossil fuels due to an increased use of electricity:

- The FTR's Outlook B incorporates the assumption of a flat demand for electricity in the OPO's Outlook B, and assumes that demand side management (DSM) for natural gas would continue at present levels. The proposed transportation fuel standards would also proceed as planned. Outlook B estimates a demand for fuels of 2,377 Petajoules (PJ) by 2035.
- The FTR's Outlooks C and D respond to the assumptions of a significantly higher use of electricity contained in outlooks C and D of the OPO, respectively. There is an assumption that DSM initiatives and proposed transportation fuel standards would continue as currently planned. Fuel demand in Outlooks C and D is estimated to be 2,070 PJ and 1,931 PJ, respectively, in 2035.
- The FTR's Outlooks E and F are based on the same primary assumptions as FTR Outlooks C and D, respectively. They then include greater levels of DSM and the displacement of some conventional fuels with less carbon-intensive alternatives. The demand for fuels in Outlooks E and F is estimated to be 2,037 PJ and 1,842 PJ, respectively, in 2035.

Note – Outlook A in the OPO explores the implications of a lower demand for electricity, but is not modeled in a separate Outlook in the FTR. A lower demand for fuels is explored in Outlooks C, D, E and F of the FTR.

5. ENERGY PRICING

Electricity Pricing – Overview

Ontario continues to make the investments it needs to ensure a clean, reliable, and modern electricity system. The government has worked hard to fix a system that was in need of repair. It also eliminated coal as a source of electricity generation and moved to cleaner forms of energy that will benefit the environment and the health of Ontarians. It also brought stability and transparency back to rates.

The OPO indicates the average unit cost of electricity service in the flat demand outlook will decrease by an average of 0.3% per year in real terms over the next 20 years. The OPO, in turn, indicates the average unit cost of electricity service increased by an average of 3.9% per year in real terms between 2006 and 2015.

Conservation and energy efficiency remain the most effective ways to manage electricity bills for all consumers. Shifting usage to off-peak periods can also reduce the strain on the electricity system and avoid or defer future system upgrades.

Residential Electricity Pricing

Most residential electricity consumers in the province pay time-of-use prices that are adjusted twice a year, in May and November. The prices are set by the Ontario Energy Board (OEB) using its Regulated Price Plan. To calculate Regulated Price Plan prices, the OEB forecasts the cost of supplying electricity to residential and small business consumers for the next 12 months. These forecasts include factors such as:

- A forecast for natural gas prices;
- Supply forecasts from each type of generation (nuclear, hydroelectric, natural gas, etc.);
- A forecast for electricity consumption; and
- The recovery of any variance between what was collected from ratepayers and what the costs were.

Time-of-use prices offer people lower rates for electricity consumed during off-peak periods. The intention is to encourage consumers to shift consumption away from periods of high demand when the cost to meet peak demand is higher. Residential consumers typically use about 65% of their electricity during off-peak hours, 17% in mid-peak hours and 18% in on-peak hours.

The cost of generating the electricity used by consumers can be found on the “Electricity” line of their bills. Residential consumers also pay Delivery and Regulatory Charges. Delivery Charges cover the costs of building and maintaining the transmission and distribution lines, towers and poles. Regulatory Charges pay for the costs of administering the provincially run electricity system and maintaining its reliability. They also cover the financial assistance given to consumers in rural and remote areas and to low-income residents helped by the Ontario Electricity Support Program.

Industrial Electricity Pricing

Industrial electricity consumers are billed differently than residential users. They pay the Hourly Ontario Energy Price, the Global Adjustment, Delivery and Wholesale Market Service Charges and the Debt Retirement Charge.

The Hourly Ontario Energy Price fluctuates in response to hour-to-hour changes in the province’s electricity market. The Global Adjustment ensures generators are able to fully recover costs. Together, they cover the cost of generating electricity.

The Wholesale Market Service Charge is similar to the Regulatory Charge paid by residential consumers. It pays for the costs of administering and maintaining the reliability of the provincially run electricity system. The Debt Retirement Charge contributes to servicing and paying down the stranded debt and liabilities left over from the old Ontario Hydro. The government eliminated the Debt Retirement Charge for residential users as of January 1, 2016, and the charge will be removed for commercial, industrial and all other users’ bills by April 2018.

Electricity Pricing – Rate Mitigation

The government has taken a number of actions to reduce ratepayer costs, including:

- Renegotiating the Green Energy Investment Agreement to reduce contract costs by \$3.7 billion;
- Reducing FIT and microFIT prices for new solar projects since 2009 by 50-75%, and moving procurement of electricity from large renewable projects to a competitive Large Renewable Procurement process;
- Deferring the construction of two new nuclear reactors at Darlington. This was in response to the supply and demand expectations of the 2013 LTEP, avoiding an estimated \$15 billion in new construction costs;
- Deciding on a later start for the refurbishments at the Bruce nuclear generating station. Work will begin in 2020 instead of 2016. This will make the best use of our existing nuclear fleet and save \$1.7 billion compared to what was forecasted in the 2013 LTEP. The government also plans, pending regulatory approvals, to operate the Pickering nuclear station up to 2024, saving ratepayers as much as \$600 million; and
- Suspending the second round of the Large Renewable Procurement and the Energy from Waste Standard Offer Program. This is expected to save up to \$3.8 billion in electricity system costs compared to the forecast in Ontario's 2013 LTEP. This would save the typical residential electricity consumer an average of approximately \$2.45 per month.

Mitigation of Residential Prices

Ontario is committed to helping households and businesses make their everyday life easier by managing their electricity costs. The government has introduced legislation to rebate, effective January 1, 2017, the equivalent of the provincial portion of the HST on residential, farm and small business bills. The average household would save about \$130 annually. When combined with proposed enhancements to the Rural or Remote Rate Protection Program, eligible rural ratepayers would receive additional relief, saving a total of approximately \$540 per year.

Ontario has additional programs to help consumers manage rising electricity prices, including:

- The **Ontario Electricity Support Program** provides on-bill rebates for low-income electricity consumers who have applied and meet the eligibility requirements. These consumers may be able to decrease their monthly electricity costs on an ongoing basis by between \$30 and \$50. Customers with unique electricity needs may be eligible for a higher level of assistance.
- The government also eliminated the **Debt Retirement Charge** for residential customers on January 1, 2016. This will save a typical residential electricity customer (who consumes 750 kWh per month) about \$65 per year.
- The **Ontario Energy and Property Tax Credit** provides relief for low to moderate-income individuals and families to assist with their property taxes and the sales tax they pay on energy. The credit provides up to \$1,008 for non-seniors and \$1,148 for seniors for the 2016 benefit year.
- The **Northern Ontario Energy Credit** helps low to moderate-income individuals and families facing higher energy costs in northern Ontario. Qualifying individuals received up to \$146 for the 2016 benefit year and families, including single parents, received up to \$221.
- The OEB has brought in the **Low-Income Energy Assistance Program** to provide emergency financial assistance for qualifying low-income consumers in critical need of support. The program also includes special customer service rules to help keep the power on for the most vulnerable energy customers.
- The **saveONenergy for Home Program** provides rebates to help with the cost of buying and installing new heating and cooling equipment in the home. Rebates are also available for electricity-saving devices such as LEDs, ENERGYSTAR certified ceiling fans, programmable thermostats for baseboards and advanced power bars.

Mitigation of Industrial Prices

For industry, Ontario developed a number of programs that reduce electricity costs and keep them competitive with other jurisdictions. They include:

- The **Industrial Conservation Initiative** encourages eligible industrial consumers to save money by reducing electricity consumption during peak hours. Current participants reduce their electricity bills by an average of one-third.
- The **Northern Industrial Electricity Rate Program** provides electricity price rebates of 2 cents per kilowatt hour for large northern industrial consumers that are eligible. This represents a reduction of about 25% in their electricity prices.
- The **saveONenergy for Business Program** offers financial incentives to reduce the costs of energy audits and upgrading to energy-efficiency lighting and equipment.
- The **Industrial Accelerator Program** provides financial incentives to make transmission-connected companies more competitive by helping them invest in important energy conservation projects.
- The **Demand Response Auction** offers incentives to businesses that agree to reduce their electricity consumption when called upon. This lowers the costs of the electricity system and enhances its reliability.

Larger businesses would see relief through a proposed expansion of the Industrial Conservation Initiative, which encourages large energy users to reduce their electricity use during peak periods. This improves the system's reliability, while lowering total costs. If proposed regulatory changes are approved, the Industrial Conservation Initiative would be expanded to include the agricultural sector and smaller participants in the commercial and institutional sectors. More than 300 businesses already use the Industrial Conservation Initiative to save electricity, and these proposed changes would make 1,000 businesses eligible for reductions. On average, the Industrial Conservation Initiative reduced participants' bills by one-third. It also cut peak electricity demand by an estimated 1,000 MW in 2015.

Fuels Pricing – Overview

The wholesale prices for fuels in Ontario, such as gasoline, diesel, propane and natural gas, are determined in an integrated and competitive North American market. That means Ontario fuel buyers must pay the market price to attract supply from outside the province.

Ontario imports virtually all of its crude oil from Western Canada. As such, Ontario refineries must compete with other users by paying market prices for crude oil. Since crude oil is refined to produce gasoline, changes in crude oil prices affect the price of gasoline. Gasoline prices are also affected by supply and demand in North America, local market conditions and government taxes.

The Ministry of Energy monitors the pricing and supply of gasoline and diesel oil on an ongoing basis, and publishes the information in the *Ontario Energy Report* on the Ministry's website. Between April and June of this year, the price of gasoline averaged \$1.04 a litre and diesel fuel averaged \$0.93 a litre. This is a significant reduction from the prices seen in the second quarter of 2014, about 25% less for gasoline and 30% for diesel fuel. The drop is largely attributable to the decline in crude oil prices.

In setting the price of natural gas, the OEB uses forecasts of market prices over the next 12 months to set the price charged by its regulated utilities. Natural gas distributors only sell natural gas at cost. They earn their income by charging regulated amounts for building and maintaining the pipes and equipment required to deliver the natural gas to their customers.

According to the *Ontario Energy Report*, Enbridge Gas Distribution charged 11.38 cents per cubic metre for the natural gas it delivered between April and June of 2016. The other major distributor in the province, Union Gas, charged 9.21 cents per cubic metre. Comparable prices in the second quarter of 2014 were a lot higher because of the abnormally cold winter of 2013-2014.

Fuels Pricing – Rate Mitigation

For residential users of natural gas, Enbridge Gas Distribution and Union Gas offer a wide range of programs to help with consumers' energy costs.

- The Enbridge Gas Distribution **Home Energy Conservation Program** and the Union Gas **Home Reno Rebate Program** offer rebates for energy audits and energy efficient improvements such as new furnaces, new water heaters and insulation upgrades. Enbridge Gas Distribution also provides rebates for programmable thermostats.
- The Enbridge Gas Distribution **Home Winterproofing Program** is free to its eligible low-income customers. Enbridge Gas Distribution will pay the cost of energy efficiency improvements such as insulation and draft proofing measures. The program can lower energy bills by cutting energy use by 30%.
- The Union Gas **Home Weatherization Program** is free to its eligible low-income customers. Participants will receive a free energy audit to determine what improvements can be made to their home. Then, if needed, Union Gas will install insulation in the homes' basement, walls and attic. The utility may also install a programmable thermostat, an energy-efficient shower head and other equipment that lowers heating and hot water costs.

The province is investing \$100 million from the **Green Investment Fund** to enhance the existing home energy audits and retrofits programs offered by Enbridge Gas Distribution and Union Gas to be available across the province to homeowners who heat their homes with natural gas and other fuels, including oil, propane or wood. The Green Investment Fund is part of the province's Climate Change Strategy.

- Homeowners who heat their homes with natural gas, oil, propane or wood will be able to qualify for rebates towards energy audits and home energy efficiency retrofits. Examples of retrofit rebates include replacing furnaces and water heaters and upgrading insulation. These measures will conserve energy, save consumers money on their energy bills, and reduce greenhouse gases.
- This investment is expected to enable audits and retrofits for approximately 37,000 homes and save approximately 1.6 Mt of greenhouse gases, contributing to the province's targets for reducing GHG emissions.

6. CHANGES ON THE HORIZON

Distribution and Grid Modernization

Innovation and changes in customer behaviour are encouraging the spread of new energy technologies. Energy storage, smart homes, microgrids, distributed energy resources, electric vehicles, and the increasing electrification of transit and transportation will change the way utilities interact with how their customers manage their systems.

For most electricity customers, local distribution companies (LDCs) are the face of Ontario's electricity system, the enterprises that bring power to their door. LDCs are continuing to invest to update their assets to maintain reliable service to their customers. LDCs must balance the need to provide the expected level of service to customers with the ever-pressing need to limit cost increases. They will also need to incorporate innovative approaches to manage the core demands of their businesses. This includes meeting their customers' needs, managing their costs, maintaining and modernizing their assets, and leveraging the opportunities presented by new technologies and new business models.

LDCs are using new smart grid technologies to combine their old and new assets to build a modern, intelligent distribution system for Ontario. The modernization of the grid gives energy consumers access to new technologies that will improve their understanding and control of their energy consumption and even allow them to generate their own electricity. Greater adoption of electric vehicles and storage technologies will also have a significant impact on how Ontarians use electricity. These changes all require a modern distribution system.

Ontario used the Smart Grid Fund, as well as the IESO's Conservation and LDC Innovation Funds, to help LDCs explore new technologies that can contribute to a modern and efficient grid. But some LDCs may face challenges with the nature and pace of the expected changes. *The Smart Grid Assessment and Roadmap* report identified a number of barriers that prevent LDCs from achieving a fully modernized grid.

Ontario needs to create conditions in the distribution sector that are conducive to grid modernization and provide, at the same time, incentives for efficiencies, productivity gains and optimal levels of reliability. Ontario's policy and regulatory frameworks should promote cost-effective improvements to the quality, reliability and efficiency of distribution service, as well as more opportunities for conservation and reducing peak demand. They also need to allow for enough flexibility in the LDCs' business models, so distributors can respond more effectively to increased efficiencies presented by emerging technologies.

Natural Gas Expansion

Access to natural gas especially helps smaller communities in Ontario. It can stimulate their economies by attracting new industry and providing less-costly energy to consumers. Natural gas can also make commercial transportation more affordable, and allow agricultural producers to use less-costly natural gas to dry their crops and heat their buildings.

In the 2013 LTEP, Ontario committed to working with natural gas distributors and municipalities to pursue options for expanding natural gas pipelines to more communities in rural and northern Ontario. These commitments were reinforced in the most recent Ontario Budget when the government announced it would offer loans and grants to help communities work with their utilities to acquire natural gas service.

With support from the Ministries of Energy; Agriculture, Food and Rural Affairs; and Infrastructure; the Ontario government is establishing two programs:

- A \$200 million Natural Gas Access Loan program to help communities work with utilities to get access to natural gas; and
- A \$30 million Natural Gas Economic Development Grant to accelerate projects that have a clear potential for economic development.

In June 2016, the OEB reviewed how it can facilitate the expansion of natural gas pipelines in the province. The OEB held hearings and received numerous submissions from interested parties. Its decision is expected in the early fall of 2016.

For Consideration

What are the significant challenges facing utilities and what can government do to meet them?

What are the most important benefits of a modern grid?
Increased reliability? Greater information on your energy usage?

What additional policies should the government consider to expand access to natural gas?

Microgrids

There is an interesting opportunity for microgrid technologies, brought on by a convergence between innovation, renewable generation, and new economic opportunities. Ontario is a big province with many rural and remote communities. These have traditionally been connected to single power lines, sometimes over long distances, which can affect the reliability of their supply. Other communities are not connected at all and rely on diesel generation. In both circumstances, an advanced microgrid may be a solution. Ontario is establishing itself as a leading innovator with this technology.

A microgrid, as the name suggests, is a miniature version of the main grid. It is a network that takes electricity generated from sources such as solar panels or a combined heat and power plant and distributes it to local users in houses, schools or offices. It can also be thought of as an “island” within the larger grid, but an “island” that responds to the larger system. In the event of a widespread outage, the microgrid has the potential to isolate itself and continue to produce power. This is critical for users such as a hospital campus, where resiliency and reliability are vital.

It is expected that innovation and the technical expertise gained from commercial scale demonstrations will drive a decline in the cost of microgrids. The Ministry of Energy is learning a great deal from the successful pilot projects its Smart Grid Fund has supported. Microgrids may already make sense in remote communities that rely on expensive and dirty diesel fuel to generate their electricity. In these communities, microgrids could use renewable energy to offset the use of diesel generators. They could also improve the reliability of supply in these isolated areas. While the government’s priority is to connect as many of these communities as possible to the transmission system, there may be complementary opportunities to use microgrids, particularly in the ones that cannot be connected at this time.

For Consideration

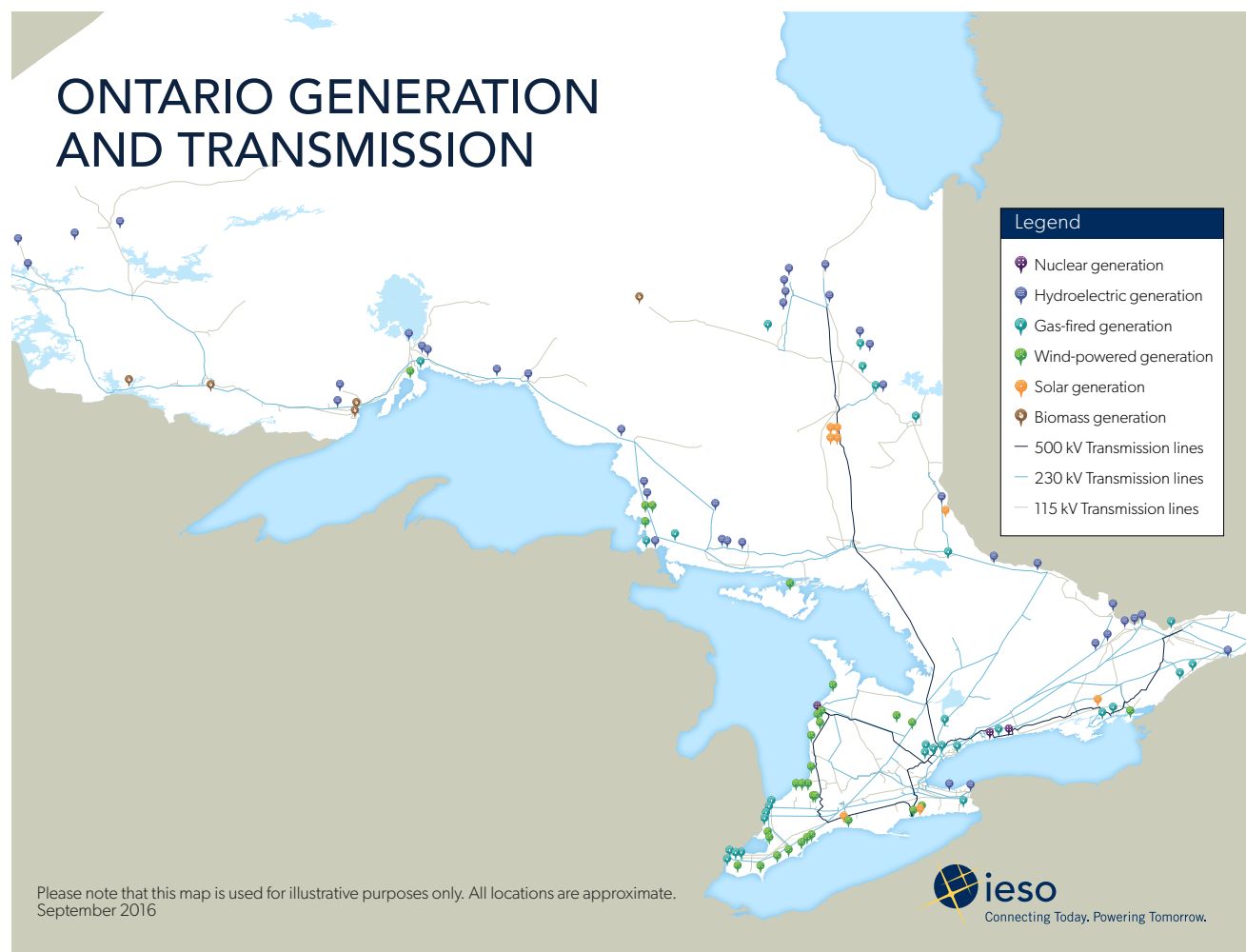
What are the best uses of microgrids in Ontario?

Are there any barriers preventing the use of microgrids?

Transmission

Electricity Transmission

Ontario's electricity transmission system is a network of high-voltage electricity wires that form the backbone of Ontario's electricity grid. Most of it is owned and operated by Hydro One. Approximately \$15 billion has been invested since 2003 to enhance and renew Hydro One's systems. This includes upgrades to over 15,000 kilometres of transmission and lower-voltage distribution lines. As a result, Ontario's residents and businesses have reliable access to clean electricity.



Map 1: Ontario's Transmission Grid (Source: Ontario Energy Report Q2 2016)

The 2010 and 2013 Long-Term Energy Plans identified a number of priority projects for electricity transmission improvements in Northwestern Ontario:

- A Northwest Bulk Transmission Line to increase the supply and reliability of electricity to the area west of Thunder Bay;
- An East-West Tie line to reinforce the network between Wawa and Thunder Bay; and
- The connection of remote northwestern First Nation communities to the electricity grid, including a new line to Pickle Lake to support these connections.

Proponents are moving ahead on planning and implementing these projects, and are seeking the necessary regulatory approvals.

The existing electricity transmission system, including the projects already underway, is expected to be sufficient to meet current levels of electricity demand. Even so, transmitters will need to replace aging transmission equipment. This presents them with an opportunity to continually improve the system's efficiency.

In outlooks with high demand (Outlooks C&D in the IESO's OPO), electrification would require significant growth in Ontario's electricity supply, and new sources of generation would also be needed. Additional investments in transmission would in turn be needed to connect the generation to users. For instance, the development of large scale hydroelectric projects in northern Ontario would require major transmission investments to connect the new generation to the grid, and reinforce the network to accommodate greater volumes of electricity flow. These would be system costs shared by the electricity ratepayers.

In a different scenario from the one above, if a specific customer requires a transmission upgrade to meet its own need, such as providing supply for new industrial plant, the cost of this upgrade must be paid for by that customer. Ontario currently applies a "user pay" principle to ensure the direct beneficiary picks up the costs and not the other ratepayers. By the same principle, transmission lines are not expanded to attract new customers.

Pipelines

The 2013 LTEP set out six principles Ontario would use to evaluate oil and natural gas pipelines, such as TransCanada's Energy East project.

The principles state that:

- Pipelines must meet the highest available technical standards for public safety and environmental protection;
- Pipelines must have world-leading contingency planning and emergency response programs;
- Proponents and governments must fulfill their duty to consult obligations with Indigenous communities;
- Local municipalities must be consulted;
- Projects should provide demonstrable economic benefits and opportunities to the people of Ontario, over both the short and long term; and
- Economic and environmental risks and responsibilities, including remediation, should be borne exclusively by the pipeline companies, who must also provide financial assurance demonstrating their capability to respond to leaks and spills.

Ontario and Quebec jointly adopted these six principles in November 2014, and added the need to take GHGs into account, as well as the interests of natural gas consumers.

In 2015, the OEB undertook province-wide public consultations on how to ensure there is an appropriate balance for Ontarians between the benefits and risks associated with Energy East. The OEB's report, *Giving a Voice to Ontarians on Energy East*, will help shape Ontario's participation in the National Energy Board hearings on whether to approve the project.

The Ontario government is committed to ensuring that Energy East is in the best interest of Ontarians. This includes protecting the environment and the safety of the people of Ontario, maintaining the reliability of the province's natural gas supply, and guaranteeing future economic benefits for the province.

For Consideration

How can Ontario continue to strengthen reliability of the transmission system in all regions of the province?

Is the current "user pay" model an effective way to meet Ontario's needs? Does it appropriately balance the goals of economic development and protecting taxpayers?

Will Ontario's pipeline principles protect the best interests of Ontarians and allow for informed participation in the National Energy Board's review of the Energy East project? What considerations should be taken into account?

Storage

Like smart grid, energy storage is a term that captures a range of technologies, each with their own unique functions and abilities. The potential of energy storage has captured worldwide interest, particularly with the global push to use cleaner sources of energy like solar and wind. However, the simplicity of the concept conceals the true complexity of integrating energy storage into the grid.

This is where Ontario stands out as an innovator. The 2013 LTEP committed the province to procuring 50 MW of energy storage to learn how energy storage works in real-world applications. Over the next two years these projects – covering a full range of technologies and services – will come online and demonstrate the true potential of energy storage as a game-changing energy resource.

Ontario's interest in storage does not end there. Several projects funded by the Smart Grid Fund test the use of energy storage in different scenarios and in combination with other complementary technologies. This will balance our knowledge about how storage at the high-voltage transmission level can serve the Ontario grid by helping local utilities and storage companies to test their devices on distribution grids.



Image 1: Flywheel Storage (source: 2013 Long-Term Energy Plan)

The IESO released a report on energy storage earlier this year that outlines what has been learned to date, and identifies where storage has potential to solve bulk system issues. To compliment the IESO, the Ministry of Energy will publish an independent study this fall on the value of storage at the distribution level.

Storage is already being used to meet the seasonal demand for fuels used to heat homes and businesses. For natural gas, Ontario uses the Dawn Hub underground storage near Sarnia in southwestern Ontario to manage seasonal demand. The Dawn Hub does this by storing gas during the summer and providing it during the winter. The Dawn Hub is one the largest storage facilities in North America and is used to manage the demand for natural gas in Ontario, Quebec and the eastern U.S. The Sarnia-area also has storage facilities for propane and other natural gas liquids.

Since natural gas is also used to generate electricity, the storage facilities in Ontario can also be used to supply generators during periods of high electricity demand.

For Consideration

Would you be willing to participate in a program where your utility could use your home storage device from time to time to operate a more reliable electricity distribution system?

What role do you foresee for natural gas to supplement and complement the province's existing electricity storage options?

How can Ontario further support innovative energy storage technologies that leverage our existing natural gas infrastructure assets and take advantage of our clean electricity system?

Innovation and Economic Growth

Ontario has made innovation in energy technology a priority. By encouraging innovation in our energy sector, Ontario has created opportunities for jobs and growth and kept pace with a changing energy environment. It has done this by supporting organizations such as the Advanced Energy Centre, whose mission is to encourage the adoption of new energy skills and technologies in Ontario and Canada, and export them internationally.



Image 2: Ontario's Smart Grid (source: Ministry of Energy, 2016)

Ontario's resolve to pursue energy innovation has led to the development and implementation of new technologies across the province. The Smart Grid Fund has established Ontario as an energy innovation leader, supporting 26 unique projects that are helping Ontario companies to grow. Another round of funding is nearly complete, which will continue to encourage a culture of innovation within the distribution sector, and further the adoption of many new technologies like energy storage and electric vehicles.

The government is also committed to cultivating a dynamic and innovative business climate in Ontario. Accordingly, it is actively exploring opportunities to push beyond our borders and share Ontario's energy expertise abroad. The growing expertise in smart grid, energy efficiency, renewable, energy storage and energy innovation is expected to be an important export industry for Ontario. The Ministry is working with companies to develop and support trade initiatives that will strengthen international relationships and create new business opportunities. That way, our energy sector can use its growing expertise in energy innovation for the benefit of all Ontarians.

Another key priority for Ontario is to decarbonize the province's economy. The focus on reducing GHG emissions will affect the selection and consumption of fuels within the province. It is anticipated there will be a transition from conventional fossil fuels to lower-carbon alternatives. Initiatives under the current and future *Climate Change Action Plans* could accelerate this transition by spurring innovation and rewarding efficiency.

RNG is one example of a low carbon alternative with potential. RNG (also known as bio-methane) is methane derived from organic sources, such as landfill gas, agricultural residues and wastes from food and beverage manufacturing. Since RNG is produced from renewable resources, it is a carbon-neutral fuel. Once RNG is processed to remove impurities, it can be mixed in with conventional natural gas and use the same pipelines and equipment. *Ontario's Climate Change Action Plan* proposes to require that natural gas contain renewable content. This will likely expand the supply and use of RNG.

Existing regulations in Ontario already require the use of ethanol and bio-based diesel in the transportation sector. Most ethanol currently used in Ontario is produced from corn. The use of alternative feedstock such as crop and wood residues, dedicated energy crops, and industrial wastes would reduce the GHG emissions that come from corn-based ethanol. Despite decades of research and development, these alternative sources of ethanol currently have little commercial viability.

The challenge will be how this transition in fuels is managed. The fuels sector in Ontario is owned and operated by commercial interests who meet the differing energy needs of the province's residential, commercial, industrial and transportation sectors. Ontario will need to balance the goal of reducing GHG emissions and its effect on overall economic activity.

There are low-carbon technologies that are feasible today, or are expected to become more feasible over time. These alternative technologies will require policy changes and the removal of regulatory barriers before their widespread adoption. Additional barriers could include economies of scale and lack of infrastructure. The associated costs and benefits will also have to be carefully considered.

For Consideration

Which innovations offer the greatest benefit to your community and the energy system as a whole?

How should the public and private sectors cooperate to encourage innovation in the energy section?

What actions could the government take to support the adoption of alternative fuels?

Conservation and Energy Efficiency

In the 2013 LTEP, the government adopted a policy of putting *Conservation First* before building new energy infrastructure, wherever cost effective. Conservation is the cleanest and most cost-effective energy resource. It also offers households and businesses a way to manage their energy bills and reduces the need to build new energy infrastructure.

Significant progress was made by setting new and enhanced efficiency standards for products and appliances, establishing conservation frameworks for electricity and natural gas distributors, and consulting on additional government-led initiatives. Between 2005 and 2014, Ontarians conserved:

- 9.9 TWh of electricity supply – enough to power the cities of Ottawa and Windsor in 2014;
- 3,628 MW of peak demand – equal to more than the combined peak demands of Mississauga, Brampton and Ottawa in 2014; and
- 1,880 million cubic meters of natural gas from conservation programs alone – equivalent to the natural gas used annually by 817,000 homes.

Conservation and energy efficiency require a sustained commitment to achieve persistent savings over the long-term. Ontario has been setting energy efficiency standards for products and appliances for over 25 years, the first jurisdiction in Canada to do so. Since 2012, the province has set new or improved efficiency standards for over three-quarters of the more than 80 products and appliances it regulates. New and enhanced efficiency standards help reduce consumers' energy bills, increase the choice of energy efficient products available for sale, and play a significant role in reducing energy consumption and GHG emissions.



*Image 3: Small Business Conservation Programs
(Source: "Helping Small Businesses Save Energy"
Ministry of Energy 2016)*

Ontario launched the 2015-2020 *Demand Side Management Framework* for natural gas in 2014, followed by the 2015-2020 *Conservation First Framework* for electricity in 2015. The new frameworks provide the rules, guidelines and funding that govern the delivery of conservation programs for electricity and natural gas energy efficiency programs in the province. Both frameworks give distributors the flexibility to meet local needs and require programs to be cost-effective to ensure value for money.

Here are two examples of the rebates and support that electricity and natural gas distributors offer households and businesses to improve their energy efficiency:

- Home audit and retrofit programs from Enbridge Gas Distribution and Union Gas provide rebates to homeowners for energy audits and energy efficient retrofits such as insulation, furnaces and water heaters, windows and doors; and
- The Small Business Lighting program provided by LDCs gives small businesses free assessments of their lighting and incentives towards upgrading to energy efficient lighting.



*Image 4: Home Energy Audit and Retrofit
(Source: Enbridge Gas)*

In response to direction from the Minister of Energy issued in March 2014, the IESO has successfully changed its demand response programs to a new market-based approach. In the first auction, about 400 MW were procured for 2016-2017. The next auction will take place in December 2016. Demand response can reduce the need to build costly generating facilities by reducing electricity usage during the hours of highest demand, typically on a hot summer day. Demand response can also reduce GHG emissions, as the plants that provide peaking power use natural gas to generate electricity.

Customer access to energy and water data can facilitate the tools and information needed to help households and businesses make informed decisions about their consumption. After completing a cost-benefit analysis, the Ministry consulted with a broad range of stakeholders earlier this year on a proposal to require the implementation of Green Button. Green Button enables households and businesses to electronically access and share their electricity, natural gas and water usage data in a standardized and secure way. They can then use software applications to view and better manage their usage, bills and GHGs. The 2013 LTEP promoted Green Button as a way to give consumers access to their electricity consumption data. In addition, the *Climate Change Action Plan* committed to expanding Green Button province-wide to help households and businesses manage and conserve energy and water use. The Ministry is reviewing comments received from stakeholders as it develops a proposal for implementing Green Button.

Government-owned facilities and broader public sector organizations in Ontario are already demonstrating leadership by annually reporting their energy consumption and GHG emissions. Organizations in the broader public sector are also required to publish conservation and demand management plans every five years.

To expand on the success of this initiative, the Ministry is proposing to extend reporting and benchmarking of energy and water use to commercial, multi-residential and some industrial buildings that are 50,000 or more square feet. It will also help building owners manage energy and water use and costs and allow a value to be put on the energy efficiency of buildings.

Using Energy Efficiency and Low-Carbon Technologies to Fight Climate Change

While acknowledging the success of the province's conservation and energy efficiency programs, the *Climate Change Action Plan* committed the government to bolder action to achieve its GHG reduction targets.

The IESO and the OEB recently completed studies on the cost-effective savings in electricity and natural gas that can be achieved in Ontario. They show that:

- Ontario's electricity conservation target of 30 TWh in 2032 is aggressive and that there is limited potential to achieve cost-effective conservation beyond this target; and
- There is significant potential beyond current levels of activity for cost-effective conservation of natural gas.

The province is investing \$100 million as part of its *Climate Change Strategy* to enhance the existing home energy audits and retrofit programs offered by Enbridge Gas Distribution and Union Gas . Homeowners across Ontario who heat their homes with natural gas, oil, propane or wood can apply for rebates towards home energy audits and energy efficiency retrofits. This investment is expected to enable audits and retrofits of approximately 37,000 homes across the province and save approximately 1.6 Mt of GHG emissions.

The *Climate Change Action Plan* also committed the government to develop a program that would provide mandatory free energy audits before the sale of a home. Energy audits would be required before a new or existing single-family home could be listed for sale, and the home's energy rating would be included in the real estate listing. The evaluation of a home's energy performance is useful information for comparing the energy efficiency of properties and encouraging improvements to energy efficiency and reductions in GHG emissions. Sellers can use the audit to focus on where to make cost-effective energy improvements and buyers can use the audit when considering retrofits to increase energy efficiency. The province proposes to introduce the program by 2019.

There are low-carbon technologies that are feasible today, or are expected to become more feasible over time. These alternative technologies will require policy changes and the removal of regulatory barriers before widespread adoption. Additional barriers could include economies of scale and a lack of infrastructure. The associated costs and benefits will also have to be carefully considered.

Ontario's *Climate Change Action Plan* points to a need to increase the use of low-carbon technology in Ontario homes and businesses, such as solar, battery storage, advanced insulation, and heat pumps. A number of programs funded by the proceeds from the cap and trade program will also be introduced to increase the choices that Ontarians have to use energy wisely.

For Consideration

Should Ontario set provincial conservation targets for other fuel types such as natural gas, oil and propane?

To meet the province's climate change objectives, how can existing or new conservation and energy efficiency programs be enhanced in the near and longer term?

How can we continue to inform and engage energy consumers?

Clean Energy Supply

Renewables

Ontario has approximately 18,000 MW of wind, solar, bioenergy and hydroelectricity on-line or under contract and in development. This is helping offset our reliance on fossil fuels and reduce Ontario's GHGs.

The success of the Feed-In Tariff (FIT) and microFIT programs, and the competitive Large Renewable Procurement, have made the province one of the North American leaders in the development and use of renewable energy and the manufacturing of renewable energy technology. The 30 solar and wind manufacturers currently operating in the province have made Ontario home to the fastest-growing clean-tech sector in Canada.

Ontario firms are now poised to challenge foreign competition and export their products and expertise just as other jurisdictions accelerate their efforts to procure clean energy technologies following the 2015 United Nations Climate Change Conference in Paris (COP21).

This is not the only change in the renewable energy landscape. The Ministry of Energy is also implementing an updated and streamlined net metering program. This billing arrangement allows customers to generate renewable energy on-site for their own use, and then receive credits on their bill for any surplus electricity sent to the grid. In anticipation of a future with more distributed energy, the updated net metering regulation would support renewable energy developments that are better integrated into the electricity system.

In August 2016, the Ministry of Energy proposed updates to the existing net metering regulation and posted it on the Environmental and Regulatory Registries for public comment.

As the electricity system accommodates more distributed energy, renewable energy projects will find new opportunities to respond to the system's changing needs. The Net Metering program would also support the construction of near-net zero and net-zero buildings, a key element of Ontario's *Climate Change Action Plan*.

Nuclear

The Darlington, Pickering and Bruce nuclear generating stations currently provide about 60% of Ontario's electricity. Nuclear generation is important because it is reliable, cost-effective and GHG-free. Nuclear power plants are also able to operate safely, reliably and continuously, making them ideally suited for meeting around-the-clock "baseload" energy needs, the basic demand that is always present in the system. There are currently 18 units operating at the three sites in Ontario, with a combined capacity of about 13,000 MW. Two units at Pickering have been shut down and are being decommissioned. Ontario has safely operated nuclear power plants for over 40 years.

The government supports nuclear power and is committed to its continued operation in Ontario. As laid out in the 2013 LTEP, Ontario is moving forward with plans to refurbish four units at Darlington and six units at Bruce between 2016 and 2033. Together with the two already refurbished units at Bruce, these investments will ensure Ontario has over 9,800 MW of affordable, reliable and GHG-free baseload generation. This, in turn, will help the province meet the GHG-reduction targets set by Ontario's *Climate Change Action Plan*.

Ontario Power Generation will begin refurbishing the first of the Darlington units in October 2016. The first Bruce unit will start being refurbished in 2020. Ontario is proceeding cautiously and has built flexibility into the planning of both of these projects:

- Both Ontario Power Generation and Bruce Power will be subject to strict oversight;
- The government has off-ramps to ensure the work is only carried out if it continues to provide value to ratepayers; and
- Ontario also has the option of stopping the work if it expects that disruptive changes in technology or the province's energy system will cause low demand for electricity over a sustained period of time.

Ontario Power Generation is also seeking regulatory approvals to allow it to operate the Pickering station until 2024. After that, it will be shut down and decommissioned. Keeping Pickering running until 2024 will ensure the province has a reliable source of GHG-free baseload electricity to carry it through the refurbishment of the Darlington and the initial Bruce units.

The nuclear industry is made up of over 180 companies and is an important driver of Ontario's economy, employing about 60,000 people and generating billions of dollars in economic activity every year. Nuclear companies and research laboratories in communities across Ontario have expertise in the design and construction of sophisticated systems and components for current and future reactors. In addition to being used in all of Ontario's nuclear plants, the Ontario-developed CANDU nuclear technology was exported to Argentina, Romania, South Korea, China, Pakistan and India. The Darlington and Bruce refurbishments will support Ontario's globally-recognized nuclear industry for decades to come.

Clean Electricity Trade

The 2013 LTEP committed the government to seeking out agreements with other jurisdictions for the import of clean energy, where such imports would benefit the province's electricity system and be cost-effective for Ontario ratepayers. This commitment led to discussions with Quebec, Manitoba and Newfoundland and Labrador.

Discussions with our provincial neighbours on potential electricity trade agreements were guided by the goals of reducing emissions, reducing costs for Ontario ratepayers, and supporting existing initiatives such as the development of a capacity auction.

So far these discussions have led to some positive outcomes, including:

- A 10-year agreement allowing Ontario and Quebec to trade up to 500 MW of capacity on a seasonal basis;
- Continuing discussions with Quebec on further trading opportunities; and
- A working group with Newfoundland to discuss the potential for clean electricity trade.

As Ontario investigates opportunities for electricity trade agreements, the impact on the reliability of supply will need to be considered, as will the impact on emissions and the province's capacity auction process.

For Consideration

What role should distributed renewable energy generation play in the ongoing modernization and transformation of Ontario's electricity system?

What strategies should Ontario pursue to harness the potential of its nuclear sector to meet its future energy needs?

What factors should Ontario focus on as it pursues opportunities for electricity trade agreements with nearby provinces and states?

Regional Planning

Ontario is a big province that is not the same everywhere you go. This is reflected in the use of electricity. Some regions may experience heavy growth in demand, while others may see flat or declining demand. Urban centres often have different needs than rural regions, and areas with heavy industry can have different energy priorities from residential communities.

The province's regional planning process addresses these issues. It links provincial planning processes with local needs, so the planning of province-wide generation and transmission systems can be integrated with the energy plans of municipal or Indigenous communities. This will ensure the electricity needs of all 21 Ontario electricity regions are reliably met in ways that consider local preferences and priorities.



In the 2013 LTEP, Ontario committed to promoting the policy of *Conservation First* in regional electricity planning and incorporating it into the planning processes used by both electricity and natural gas distributors. The Ministry continues to monitor the IESO's and OEB's progress in this area.

Regional planning is a collaborative process led by the IESO. The IESO collaborates with the transmitter and the local distribution companies to evaluate the electricity needs of a region over the near (1-5 years), medium (5-10 years), and long terms (10-20+ years).

Regional plans come in two varieties. A *Regional Infrastructure Plan* is a “wires only” solution that uses upgrades to transmission and distribution systems to meet the electricity needs of a region. This type of plan is led by the transmitter. The other type of plan, an *Integrated Regional Resource Plan*, considers a larger variety of options, including conservation, generation or other innovative solutions. An *Integrated Regional Resource Plan* could be implemented in combination with, or instead of, a “wires” solution, depending on the nature and urgency of the specific needs.

Integrated Regional Resource Plans are led by the IESO, together with a working group involving the region’s LDCs and the local transmitter. Since community engagement is an important part of regional planning, a Local Advisory Committee also provides recommendations on how to develop the regional plans and advises on aspects of broader community engagement. Local Advisory Committees are made up of municipal, Indigenous, environmental, business, sustainability and community representatives.

All 21 regions have begun or completed the first cycle of the regional planning process.

Following the release of the *Climate Change Action Plan*, there is an opportunity to consider changes to the regional planning process to support the possible growing use of electricity.

For Consideration

In areas expected to undergo a transformation from rural to suburban, through intense development, how could the province help to ensure that corridor lands are reserved/set-aside before development occurs to minimize the potential costs and inconvenience of acquiring and clearing developed lands in the future?

Indigenous Energy Policy

As the Ontario government strengthens and transforms its electricity and fuels systems, Indigenous communities have emerged as critical partners in the energy sector. Indigenous communities can bring unique perspectives, knowledge and leadership to energy projects and energy planning.

There are over 150 First Nation and Métis communities across Ontario, many with Aboriginal and treaty rights that are protected under Section 35 of the Canadian Constitution. Energy projects can affect these rights, as well as the social and economic well-being of the communities.

Indigenous communities across Ontario often face unique challenges when it comes to energy. These challenges have complex historical, jurisdictional, geographic and regulatory contexts. Ontario recognizes that participation in the energy sector can play a key role in the development and well-being of Indigenous communities. Ontario encourages First Nations and Métis communities to play an active role in the energy sector through conservation, generation and major transmission projects. To support this, the government needs the leadership, input and guidance of Indigenous communities, and has established forums with community leaders to ensure this important dialogue occurs regularly.

Ontario brought in a range of policies and programs to support Indigenous participation and engagement in the energy sector, and to enhance the government's relationship with Indigenous peoples across the province:

- First Nation and Métis communities and groups are leading or partnering in more than 550 different wind, solar and hydroelectric projects, as a result of incentives in renewable energy programs. In total, these projects have a contracted capacity of over 1,800 MW of clean energy;
- The Aboriginal Loan Guarantee Program delivered more than \$200 million in guarantees for Indigenous partnerships in renewable energy and transmission projects;
- The Aboriginal Renewable Energy Fund helped 45 different communities and groups with over \$8.5 million to assess and develop renewable energy projects. It has now been replaced by the new Energy Partnerships Program that will help Indigenous communities consider how to participate in major transmission and renewable generation projects;
- The Aboriginal Conservation Program provided energy-saving assessments and upgrades for homes in 46 First Nations communities; and
- 89 First Nation communities used provincial funding to develop community energy plans.

Many of these initiatives have resulted in rewarding and innovative partnerships between First Nation and Métis communities and energy developers. Others support Indigenous communities in taking control of their own energy needs and interests.

In August 2015, the Chiefs of Ontario signed an historic Political Accord with the Government of Ontario. This Accord guides the relationship between First Nations and the province. The government is committed to working on a range of issues, including jurisdictional matters and the sharing of resource benefits. The Accord is in line with the spirit and intent of the *Calls to Action* issued by the Truth and Reconciliation Commission and the United Nations *Declaration on the Rights of Indigenous Peoples*.

The government also took steps recently to facilitate the expansion of the transmission system to remote First Nation communities in northwestern Ontario that currently rely on diesel generation. A First Nation led company, Wataynikaneyap Power, is developing a project that will connect First Nations remote communities.

In addition to meeting its constitutional obligation to consult First Nation and Métis communities when energy projects could affect their recognized or credibly asserted Aboriginal and treaty rights, Ontario will work with Indigenous partners to support reconciliation and community economic development. As we update the LTEP, it is important to continue supporting Indigenous communities and individuals so they can engage in energy issues, explore opportunities and manage their energy use. Programs and policies will need to evolve to reflect technological innovation, an ever-changing electricity and fuels systems, and the broader implications of climate change. We look to the First Nation and Métis communities and organizations, developers, and other key partners to provide the ideas and guidance that will strengthen province's long-term energy planning.

For Consideration

What are the best tools to support Indigenous community engagement and leadership in Ontario's energy sector?

Supply Mix

The 2013 LTEP took a pragmatic and flexible approach to planning for Ontario's future energy needs. The plan was designed to balance the principles of cost-effectiveness, reliability, clean energy, community engagement, and an emphasis on *Conservation First*.

The government will continue to apply these principles in developing the next LTEP, while acknowledging the impact the *Climate Change Action Plan* will have on both the electricity and fuels sectors. Given the range of outlooks for the future demand for electricity and fuels, the need for flexibility in long-term planning is of particular importance. In addition, the government's commitment to reducing Ontario's GHG emissions will require an even greater emphasis on conservation and clean energy sources.

In the electricity sector, the OPO projects the province's installed capacity will increase from 39,527 MW to 42,635 MW by 2035. There is potential that increased electrification will produce even higher demand. Outlooks C and D in the OPO present a number of ways to get the electricity needed to meet this demand. No single option can meet all consumer needs at all times. The OPO illustrates these choices with options that include mixes of wind, solar, hydroelectricity, natural gas, bioenergy, demand response, nuclear and long-term contracts for imports. New technologies that are not currently in Ontario's supply mix are also included. Each combination will have a different impact on costs, reliability, emissions or supporting infrastructure, such as transmission systems.

When it comes to fuels, the government's climate change policies are expected to put downward pressure on the demand for traditional fuels, while increasing the opportunity to use electricity and new cleaner fuels such as renewable natural gas or biofuels. How this transformation is accomplished over the next twenty years will have implications for customers' costs and the use of the province's existing delivery infrastructure for fuels.

For Consideration

To meet a higher demand, what mix of new electricity resources would best balance the principles of cost-effectiveness, reliability, clean energy, community engagement, and an emphasis on *Conservation First*?

What policies will Ontario need to adapt to a transformation in the fuels sector?

7. GLOSSARY

Aboriginal Rights – Rights held by some Indigenous peoples of Canada that are acquired through long-standing use and occupancy of the land, and are protected under Section 35 of the *Constitution Act, 1982*.

Baseload Generation – Generation sources designed to operate more or less continuously through the day and night and across the seasons of the year. Nuclear and many hydro generating stations are examples of baseload generation.

Bioenergy and Bio-diesel – Energy produced from living or recently living plants or animal sources. Sources for bioenergy generation can include agricultural residues, food process by-products, animal manure, waste wood and kitchen waste.

Cap and Trade – A program to reduce GHG emissions. The “cap” puts a limit on the amount of greenhouse gases that can be discharged. If a company releases more than that amount, it can purchase credits from a company that reduced its GHG emissions levels to below the cap.

Capacity Auction – A competitive market that commits a supplier to provide capacity.

Clean Energy – Energy that is produced without the emission of greenhouse gases.

Clean Imports – Imports of electricity from non-emitting sources through contractual agreement.

Climate Change Action Plan – A five-year Ontario plan aimed at fighting climate change over the long-term. The current *Climate Change Action Plan* will be replaced by a revised plan, when it expires in 2020.

Climate Change Mitigation and Low Carbon

Economy Act, 2016 – Ontario legislation, that among other things, established legal framework for Ontario’s cap and trade program.

Conservation First – *Conservation First* is Ontario’s policy making conservation the first resource considered, wherever cost-effective, in planning to meet the province’s energy needs.

Conservation First Framework – Launched January 1, 2015, the six-year *Conservation First Framework* (2015-2020), overseen by the IESO, governs the delivery of electricity conservation and energy efficiency programs in Ontario and provides the funding, guidelines and certainty needed for electricity distributors to deliver conservation and energy efficiency programs to their customers.

Decarbonizing – The removal of carbon from sources of energy, done to reduce the discharge of greenhouse gases.

Demand Side Management (DSM) Framework

– Launched December 22, 2014, the six-year DSM Framework (2015-2020), overseen by the OEB, governs the delivery of natural gas conservation and energy efficiency programs in Ontario and provides the funding, guidelines and certainty needed for natural gas distributors to deliver energy efficiency programs to their customers.

Demand Response – Provides price or financial incentives to residential and business users to shift or reduce their electricity usage away from peak periods of consumption.

Distributed Generation – Energy produced by small, decentralized generators, such as wind turbines and solar panels.

Distribution System – A system that takes electricity from a high-voltage transmission system, reduces the voltage and delivers it to residents.

Electricity Act 1998 – Ontario legislation to ensure the adequacy, safety, sustainability and reliability of electricity supply in the province.

Energy East – A proposal from TransCanada Pipelines Limited to convert a natural gas pipeline to crude oil from western Canada for export and use by eastern Canadian refineries.

Energy Audit – A process to determine where, when, why and how energy is being used by energy-consuming systems, such as buildings. The information can then be used to identify opportunities to improve efficiency, decrease energy costs and reduce GHGs.

Energy Retrofit – The process of upgrading a building's energy consuming systems. Retrofitting may involve improving or replacing lighting fixtures, ventilation systems, or windows and doors, or adding insulation where it makes economic sense. Retrofitting also means including energy efficiency measures in all renovation and repair activities.

Energy Storage – Equipment or technology that collects energy so it can be used at a later date. Examples include batteries and hydro-electric dams.

Environmental Registry – An online database where Ontario ministries post environmentally significant proposals or decisions, and invite comments from the public.

Ethanol – A renewable fuel made from plants such as corn, sugar cane and grasses. Its use can reduce greenhouse gases.

Fossil Fuels – Fuels that contain high percentages of carbon and emit greenhouse gases. Fossil fuels include coal, oil and natural gas, and derivatives such as gasoline, kerosene and propane.

Fuels Technical Report (FTR) – A report prepared for the Ontario Ministry of Energy that reviews the current supply and demand for fuels in Ontario, and the possible changes that could occur through to 2036.

Green Button – A data standard that gives customers the ability to access and share their utility data in an electronic, standardized and secure way. Customers can share their data with innovative software applications that allow them to view and manage their energy and water use.

Greenhouse Gases (GHG) – Gas that contributes to the capture of heat in the Earth's atmosphere. Carbon dioxide is the most prominent GHG. It is released into the Earth's atmosphere as a result of the burning of fossil fuels such as coal, oil or natural gas. GHGs are widely acknowledged as contributing to climate change.

Heat Pumps – A device that heats or cools buildings by absorbing heat from one area and transferring it to another. Heat pumps can replace the need for furnaces and air conditioners

Independent Electricity System Operator (IESO) – The provincial agency that ensures there is always enough electricity to meet the province's energy needs. It is also responsible for planning and securing electricity to meet future needs, and overseeing delivery of programs under the *Conservation First* framework.

Indigenous – Another term for Canada's First Nation, Métis and Inuit peoples.

Infrastructure – Equipment that generates the energy used by consumers, including nuclear power plants, hydroelectric dams and solar panels and delivers it through wires, pipelines.

Integrated Regional Resource Plan – A plan that identifies the appropriate mix of investments in conservation and demand management, generation, transmission facilities or distribution facilities, needed to address the electricity needs of a region in the near- (up to 5 years), mid- (5 to 10 years), and long-term (more than 10 and up to 20 years).

Kilowatt (kW) – A standard unit of power that is equal to 1000 Watts (W). Ten 100-watt light bulbs operated together require one kW of power.

Local Advisory Committee – A committee of local community representatives that provides advice on local priorities and makes recommendations on the development of regional electricity plans. It is comprised of up to 18 members, representing municipalities, First Nation and Métis communities, consumers and citizens, the business community, and environmental and conservation groups.

Local Distribution Company (LDC) – A public or private corporation that owns the wires, poles transformers and pipelines that deliver electricity or natural gas to local consumers.

Long-Term Energy Plan (LTEP) – A blueprint setting out the projected supply and demand for energy for the next 20 years in Ontario. It is updated every few years.

Megatonnes (Mt) – One million metric tons.

Megawatt – A unit of power equal to 1,000 kilowatts (kW) or one million watts (W).

Megawatt Hour (MWh) – A measure of the energy produced by a generating station over time: a one MW generator, operating for 24 hours, generates 24 MWh of energy.

Methane – A greenhouse gas that is the primary component of natural gas.

Microgrid – A local electricity network linking smaller sources of electricity with nearby users such as homes, business and institutions. In the event of a failure of the larger network, a microgrid can seal itself off and continue to provide power locally.

National Energy Board – The federal agency that regulates the international and inter-provincial operations of oil and gas pipelines and electricity transmitters.

Net Metering – A billing arrangement allowing customers to generate their own electricity on site for their personal use, and receive bill credits for any surplus electricity sent to the local distribution system.

Net-zero Energy Buildings – A building that annually produces at least as much energy as it consumes.

Off-ramps – Specific decision points that give the government the ability to stop the refurbishment of the Bruce or Darlington nuclear reactors.

Ontario Energy Board (OEB) – A provincial agency that sets the prices for natural gas and electricity in Ontario. It also regulates the activities of generators, transmitters, distributors, and the wholesalers and retailers of electricity and natural gas.

Ontario Planning Outlook (OPO) – A report that reviews the past ten years of activity in the electricity system, and provides a series of future scenarios for the next 20 years.

Peak Demand – Peak demand, peak load or on peak are terms describing a period in which demand for electricity is highest.

Petajoules – One petajoule is roughly equivalent to the energy produced by one billion cubic feet of natural gas.

Political Accord – An agreement between the Government of Ontario and the Chiefs of Ontario that will guide the relationship between First Nations and the province.

Regional Infrastructure Plan – A plan developed by the local transmitter as part of the regional infrastructure planning process. It identifies investments in transmission and distribution facilities that should be developed and implemented on a coordinated basis to meet the electricity infrastructure needs within a region.

Regulated Price Plan – A time-of-use pricing plan, revised every six months by the OEB, that sets the prices for electricity during peak, off-peak, and mid-peak periods of the day.

Regulatory Registry – An online database where Ontario ministries post proposed regulations, and invite comments from the public.

Reliability – The ability to deliver electricity to consumers on demand, in accordance with industry standards. For example, standards that set parameters for power quality, availability, or restoration times in case of an outage.

Resiliency – The ability to withstand impacts from climate change, including changes in demand, disruption in supply, and damage to infrastructure.

Renewable Natural Gas (RNG) – A form of methane that comes from organic sources, such as landfill gas, agricultural residues and wastes from food and beverage manufacturing. RNG is a “carbon-neutral” fuel as it is produced from renewable resources.

Rural and Remote Rate Protection Program – Provides financial assistance to eligible customers of certain local distribution companies located in rural or remote areas. This program helps offset the higher cost of providing service to consumers in these areas.

Smart Grid – A Smart Grid uses digital computerized equipment with two-way communications to deliver electricity and control applications in consumers’ homes and business. Equipment using the Smart Grid can save energy, reduce costs and increase reliability and transparency.

Smart, or Programmable Thermostat – A smart thermostat learns the temperature preferences of a building’s occupants and automatically turns itself down when the building occupants are away. It can typically be controlled remotely from a phone, tablet or laptop.

Social Benchmarking – A program that provides customers with information about their energy usage, and compares it to the usage of their neighbours or peers.

Terawatt Hours (TWh) – One billion kilowatt hours (kWh). A kWh is the same as one kilowatt (1 kW) of power being used for one hour.

Time-Of-Use – Prices for electricity that vary according to the demands put on the system. Under a time-of-use plan, prices are higher during periods of peak consumption when it costs more to generate electricity. Conversely, prices are lower during off-peak periods, when the cost of electricity is less.

Transmission – The movement of electricity or natural gas, usually over long distance, from generation sites to consumers and local distributions systems. Transmission of electricity is done at high voltages.

Vancouver Declaration – An agreement-in-principle by Canada’s First Ministers to work toward a national climate change plan and develop a price on carbon.

Watt (W) – A unit of electricity that measures how much electrical power is being generated or used at any one time.

Whole Home – An holistic approach to conservation and energy efficiency that looks at improvements in the use of electricity, natural gas and water throughout a home to achieve the most efficient results.





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