

## Draft LTEP Discussion Guide

### Table of Contents

1. Minister's Message
2. LTEP 2017
  - Welcome
  - The LTEP Process
  - Energy Use and Climate Change
  - Towards A Broader Energy Focus
3. Ontario's Energy Mix at the End of 2015
  - Electricity Supply
  - Use of Fossil Fuels
  - \* Emissions
4. Demand Forecasts
  - Demand Forecasts for Electricity
  - Demand Forecasts for Fossil Fuels
5. Energy Prices
  - \* Electricity Pricing Overview
  - \* Electricity Price Mitigation
  - \* Fuels Pricing Overview
  - \* Fuels Pricing Mitigation
- 6.6 Changes on the Horizon
  - Distribution
  - Transmission
  - Storage
  - Innovation and Economic Growth
  - Microgrids
  - Conservation and Energy Efficiency
  - Clean Energy Supply
  - Regional Planning
  - Indigenous Energy Policy
  - \* Supply Mix
- 6.7 Glossary

## 1. Minister's Message

As we go into 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 Reports 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 ten 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 that will set 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 the next LTEP. Ontarians can attend any of the Open Houses that are being held across the province or dial into telephone town halls. The government also encourages Ontarians to submit written proposals through the Environmental Registry for comments and consideration. The schedule for the Open Houses and Town Halls is available at <http://www.energy.gov.on.ca/en/ltep/>. The link to the Registry posting is here.

The questions in this guide are a starting point that should in no way limit the scope of the discussion.

The Ministry 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 Ministry of Energy is consulting and engaging with Ontarians, First Nation and Métis communities, energy stakeholders and across government to get views and gather input on the choices that need to be made for Ontario's energy future. The development of the next LTEP follows the steps set out in recent changes to the *Electricity Act, 1998*. These legislative changes include the requirement for public consultation and the publication of a technical report that the government must consider when it develops the plan. With the next LTEP, the Ministry of Energy intends to will also expand the discussion of Ontario's energy future by including a comprehensive review of the province's fossil fuels sector and the supply of oil, gasoline and natural gas.

In response to the legislative requirement for a technical report, the Independent Electricity System Operator (IESO) issued the *Ontario Planning Outlook* (OPO), which examines the province's future electricity supply. The Ministry of Energy also released the *Fuels Technical Report* [link] (FTR), a technical report that examines Ontario's oil, gasoline and natural gas supply.

The facts and analyses in these two technical reports mark the starting points for the development of the next LTEP and will help guide the consultation process. These reports took 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<sup>1</sup>.

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<sup>1</sup> The Vancouver declaration committed the federal and provincial governments to meet or exceed Canada's international targets for reducing GHG emissions.

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, begin leading the implementation of the specific programs and policies to deliver on the LTEP's objectives of the LTEP.

### **Energy Use and Climate Change**

In order to combat climate change, Ontario released a five-year Climate Change Action Plan (CCAP) in June 2016. The Climate Change Action Plan outlines the approaches the government will take to reduce carbon emissions in the province. This plan could have a significant effect on how energy is used in our province. It 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 fight against climate change will play a key role in the development of the new LTEP as the Long-Term Energy Plan is linked to the Climate Change Action Plan. For instance, the proceeds from the cap and trade auctions will be used between 2017-2020 to fund programs, such as those supporting low-carbon technology, that will help reduce energy use and greenhouse gas (GHG) emissions. The IESO's OPO incorporated the commitments and targets to 2020 set out in the Climate Change Action Plan.

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

### **Towards a Broader Energy Focus**

Three-quarters of the energy used by Ontarians comes from hydro-carbon based fuels such as oil and natural gas. For instance, natural gas is commonly used as a fuel for space and water heating in the residential and commercial sectors. Similarly, crude oil-derived products like gasoline, diesel and jet fuel are widely used in the transportation sector to fuel cars, trucks, buses and planes. Simply put, Ontario relies on oil and natural gas to support basic needs such as heating and transportation. These fossil fuels, as they are commonly known, need to be included in any Long-Term Energy Plan. However, there is a significant difference when we compare them to electricity. Ontario produces very little of the oil, gasoline and natural gas it uses. Almost all of our fossil fuels come from outside of the province, delivered by interprovincial and international pipelines that are under federal jurisdiction and regulated by the National Energy Board (NEB). Recently, past provincial governments have not focussed on oil, gasoline and natural gas the way they have on the electricity produced by the province itself.

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 to put energy conservation first in both electricity and natural gas planning processes before building new energy infrastructure.

This increased attention received new urgency with the government's *Climate Change Action Plan* CCAP and its enabling legislation, the *Climate Change Mitigation and Low-Carbon Economy Act, 2016*. In light of the province's emission reduction goals, the new LTEP *should* takes 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* CCAP foresee a switch from conventional fossil fuels to electricity for use in buildings and transportation. As well, electric vehicles are becoming a more prominent focus of discussion.

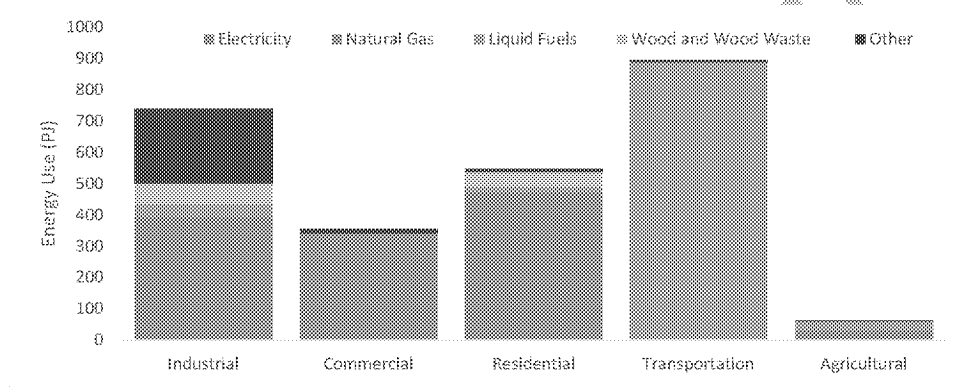


Figure 1: Total energy use in Ontario by sector (source: ??)

Work is also being done ~~underway to on~~ using a certain amount of renewable natural gas from landfills, sewage treatment plants and agricultural operations in 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. These changes require the Ministry of Energy to take an integrated approach and plan for how the transition to a low-carbon economy will affect all aspects of energy demand.

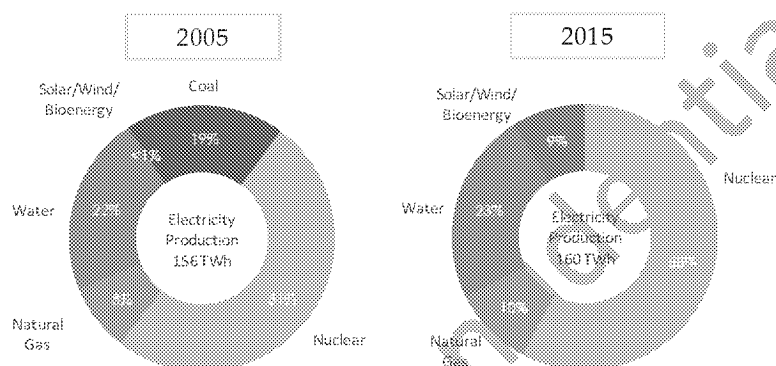
### 3. Ontario's Energy Mix at the end of 2015

#### Electricity Supply

In 2015, Ontario produced 160 Terawatt-hours (TWh) of electricity in order to meet the needs of the province's residents and businesses. That electricity did not come from any one type of generation. The province relies on a diverse number of sources to give it the secure and reliable

supply of electricity it enjoys. This includes, including nuclear, natural gas and renewable generation such as hydroelectric, wind, solar and bioenergy.

The province's supply mix also must also be flexible to respond to Ontarians' the changing priorities of Ontarians. The most significant big change over the past decade was the elimination of coal-fired generation. In order to reduce the GHG emissions that cause climate change and improve Ontario's air quality, Ontario the province closed five coal-powered generating stations, and invested in new and refurbished generating facilities to replace the closed facilities.



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Figure 2: Electricity supply -- installed supply mix (source: Ontario Planning Outlook, 2016)

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

While Ontario generated 160 TWh of electricity in 2015, it also has the ability to produce more. The installed capacity of the province's generating fleet totalled 39,393 MW.

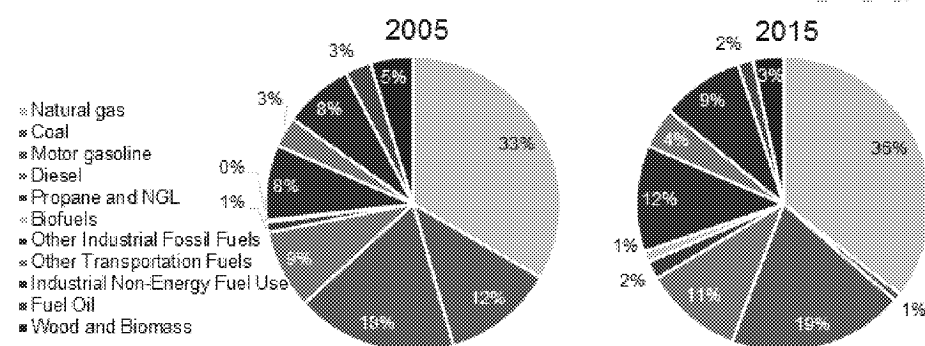
Since the 2013 LTEP, the share of wind, solar and bioenergy in our supply mix has grown from 9% to over 18%. As of June 30/March 31, 2016, wind represents the largest source of our non-hydro renewables generation with an installed capacity of approximately 4,540 MW and approximately 1,600 MW of additional wind energy capacity contracted and under development.

### Use of Fossil Fuels

Ontario consumed approximately 2,400 petajoules (PJ) of fossil fuels in 2015. These types of fuels include gasoline, diesel, natural gas, propane and natural gas liquids. Other fuels consumed include renewable and low-carbon fuels like biomass and biofuels. Ontarians use them for a number of reasons, ranging from cooking and heating to transportation, electricity generation and industrial processes (such as process heat in energy-intensive industries like petroleum refining, pulp and paper, steel and cement). Industry also uses fossil fuels in non-

energy applications; especially as a feedstock in the manufacture of plastics, fertilizers and chemicals.

Ontario's fossil 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. For example, the significance of biofuels in the transportation fuel sector has tripled over the past decade, growing from less than one per cent in 2005 to nearly three per cent in 2015. There is every expectation that the use of biofuels will continue to expand within Ontario.



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Figure 3: Ontario fuels demand by fuel type (source: *Fuels Technical Report*)

Ontario's climate change initiatives will have an effect on the supply and demand for these fuels in the future. Because of the strength and diversity of the existing supply chain, Ontario's fossil fuel sector is well positioned to adapt to any changes in the supply and demand for its fuels, and contribute positively to Ontario's GHG emission reduction targets. Each fossil fuel has its own particular supply chain to deliver fuel to end-users. In general, fossil fuels must be extracted from the ground, processed to meet transportation requirements, refined to meet end-use specifications and delivered to final consumers. Since Ontario produces minimal quantities of crude oil and natural gas within its borders, the extraction phase of the supply chain often occurs outside the province. Ontario therefore relies on pipelines to deliver crude oil and natural gas into the province. To illustrate further, the elements of the gasoline supply chain in Ontario are: crude oil pipelines to supply petroleum refineries, the petroleum refineries to produce gasoline, supply of gasoline to distribution terminals (by pipeline, rail, marine or truck) and final delivery from distribution terminals to retail gasoline stations by truck.

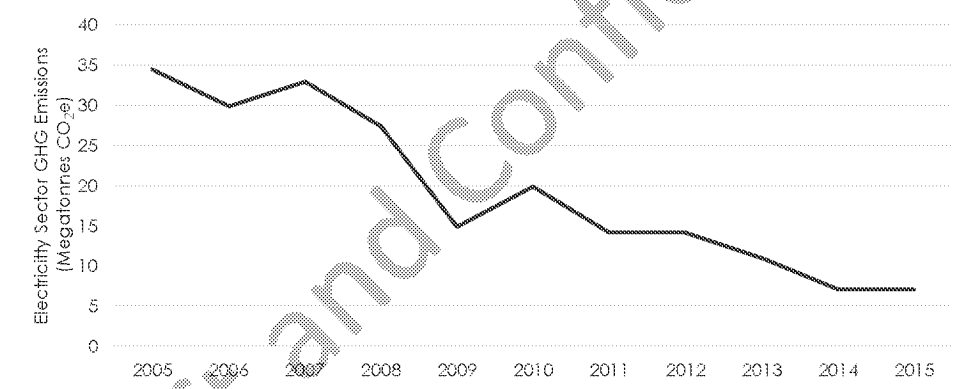
## Emissions

Ontario is a North American leader in the reduction of GHG emissions. Closing The closure of the province's five coal plants was the single largest 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 have declined by another 7.1 Mt, a reduction of 35%.

Ontario adopted ambitious targets for further reductions in the province's GHG emissions. The *Climate Change Mitigation and Low-Carbon Economy Act, 2016* commits the government to reducing emissions:

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

Ontario has also established a cap and trade program that sets caps for the emission of GHGs, and allows businesses to buy or sell allowances (credits) if they are over or under those limits.



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Figure 4: Electricity sector GHG emissions (source: *Ontario Planning Outlook*)

The cap and trade program covers:

- Facilities that emit more than 25,000 tonnes of CO<sub>2</sub> 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 as a result of the sale of allowances during the first four year compliance period of the cap and trade program to 2020. As part of the Western Climate Initiative, Ontario plans to link up in the future with a cap and trade program run jointly 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. We are in a strong position to meet the range of electricity demands that could occur. But we have to prepare for a range of possibilities, and not just one single future, because we cannot precisely predict how we will use electricity 10 or 20 years from now. That future will depend on a number of things, such as:

How will our population grow?

- Where will the new residents live?
- How much conservation and distributed generation will occur?
- Will the current transformation of the provincial economy continue?
- What will be the pace of our efforts to mitigate Climate Change?
- Will Ontarians travel differently to work and around the province?

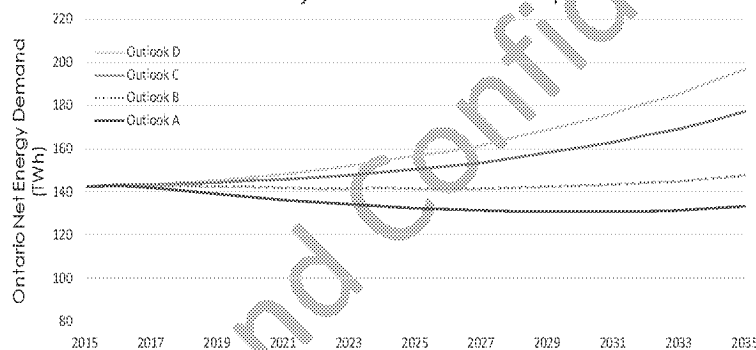


Figure 5: Electricity demand forecasts (source: Ontario Planning Outlook)

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In the *Ontario Power Outlook* (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 of homes and businesses. In these outlooks, the annual consumption of electricity could increase to between 177 and 197 TWh by 2035. Ontario would need to generate more electricity to be generated than it does today to serve meet these higher levels of growth in demand.

The needs are not expected to occur until the mid-2020's, with significant increases in supply required after 2030<sup>2</sup>.

### **Demand Forecasts for Fossil Fuels**

The discussion of the future demand for fossil fuels is outlined in the *Fuels Sector Technical Report* (FTR). The scenarios are based on the same primary assumptions contained in the IESO's OPO report. As such, the projections for fuel demand in the FTR are inversely related to the electricity projections contained within the OPO. For example, an OPO forecast of an increase in the number of electric vehicles would trigger a corresponding decrease in the fossil fuels consumed within the transportation sector.

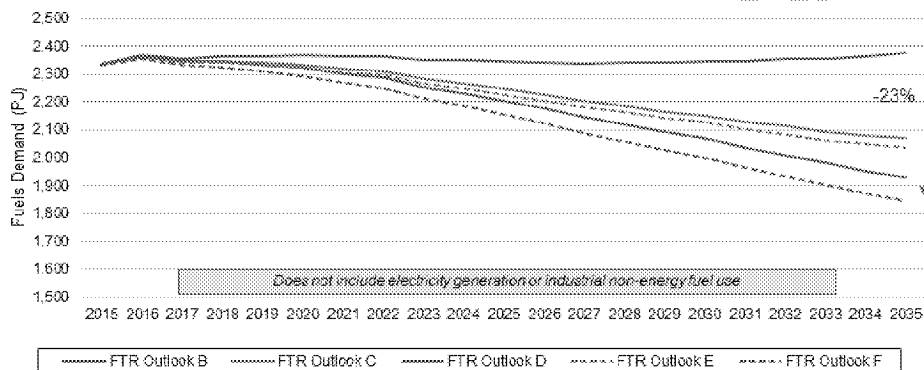


Figure 6: Fuels Demand Forecast (source: *Fuels Technical Report*)

The FTR produced five Outlooks for the demand of fossil fuels, ranging from a continuation of the status quo to alternatives that would see a reduced demand for fossil fuels due to an increased electricity consumption of electricity:

- The FTR's Outlook B reflects the assumptions of flat electricity demand contained in the OPO's Outlook B, and assumes the demand side management (DSM) for natural gas would continue at present levels. Proposed transportation fuel standards would also proceed as planned. Outlook B estimates fuels demand of 2,377 PJ by 2035.
- The FTR's Outlooks C and D respond to the assumptions of the significantly higher use of electricity contained in the OPO's Outlooks C and D respectively. There is again an assumption that DSM initiatives and proposed transportation fuel standards would

<sup>2</sup> All figures from the Aug. 12 draft of the OPO

continue as currently planned. Fuel demand in Outlooks C and D, in 2035, is estimated at 2,070 PJ and 1,931 PJ, respectively.

- 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. Fuel demand in Outlooks E and F, in 2035, is estimated at 2,037 PJ and 1,842 PJ, respectively.
- **Note:** Outlook A was developed by IESO to explore the implications of lower electricity demand. The same assumptions applied to fuels would also result in lower fuels demand. Lower fuels demand is already explored in the FTR by Outlooks C, D, E and F. Outlook A has therefore not been modeled as part of the FTR.

## **5. Energy Pricing**

### **Electricity Pricing Overview**

Ontario continues to make the investments we need 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 eliminated coal as a source of electricity generation and moved to cleaner forms of energy that will benefit our environment and the health of Ontarians. It has also brought stability and transparency back to rates.

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

#### *Residential electricity pricing*

Most residential electricity consumers in the province participate in the Ontario Energy Board's (OEB) Regulated Price Plan (RPP) and pay time-of-use prices that are adjusted twice annually, in May and November. To calculate RPP prices, the OEB forecasts the cost to supply electricity to residential and small business consumers for the next 12 months. These forecasts include factors such as:

- Forecast natural gas prices;
- Supply forecasts from each type of generation (nuclear, hydroelectric, natural gas, etc.);
- Electricity consumption forecast; and
- Any variance recovery (the over/under-collected electricity costs) from the previous period.

TOU prices are intended to provide an incentive to consumers to shift consumption away from high demand periods when the cost to meet province-wide demand is higher. Residential consumers typically consume about 65% of their electricity during off-peak hours, 17% in mid-peak hours and 18% in on-peak hours.

In addition to RPP prices, which are reflected on the "Electricity" line on bills, residential consumers pay Delivery and Regulatory charges. Delivery charges reflect costs to build and

maintain the transmission grid and distribution lines, towers and poles. Regulatory charges reflect the costs of administering the wholesale electricity system, maintaining the reliability of the provincial grid and providing financial assistance to consumers in rural and remote areas of the province, and the Ontario Electricity Support Program (OESP).

#### Industrial electricity pricing

Industrial electricity consumers are billed for the Hourly Ontario Energy Price (HOEP), Global Adjustment (GA), Delivery, Wholesale Market Service charges (WMSC) and the Debt Retirement Charge (DRC).

HOEP is the hour-by-hour market clearing price that reflects the short term cost of producing power. GA (included in the Electricity line of residential bills) is a cost recovery mechanism as well as a charge that ensures generators are able to fully recover costs. Together, HOEP and GA comprise the electricity generation cost.

WMSC is analogous to the Regulatory charges paid by residential consumers and reflects the costs of administering the wholesale electricity system and maintaining the reliability of the provincial grid. DRC pays down the stranded debt and liabilities of the former Ontario Hydro and will be removed from bills in April 2018.

#### Electricity 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 (LRP) process.
- Deferring the construction of two new nuclear reactors at Darlington in response to supply and demand expectations at the time of the 2013 LTEP, avoiding an estimated \$15 billion in new construction costs.
- Maximizing the value of our existing nuclear fleet by starting Bruce refurbishments in 2020, instead of 2016, thus helping to achieve \$1.7 billion in savings relative to the 2013 Long-Term Energy Plan (2013 LTEP) forecast and by continuing to operate Pickering up to 2024, pending regulatory approvals, which could save ratepayers as much as \$600 million.
- Suspending the second Large Renewable Procurement and the Energy from Waste Standard Offer Program. This decision is expected to save up to \$3.8 billion in electricity system costs relative to Ontario's 2013 Long-Term Energy Plan (LTEP) forecast. This

would save the typical residential electricity consumer an average of approximately \$2.45 per month on their electricity bill, relative to previous forecasts.

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

#### *Residential Price Mitigation*

Ontario has several programs to help consumers manage rising energy prices, including:

- The **Ontario Electricity Support Program**, launched on January 1, 2016, directly reduces the bills of 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 to low to moderate-income individuals and families to assist with their property taxes and the sales tax they pay on energy.
- 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 \$143 during the most recent benefit year and families, including single parents, received up to \$221.
- The Ontario Energy Board has brought in the **Low-Income Energy Assistance Program** to provide financial assistance for qualifying low-income consumers in critical financial need. The program also includes special rules and conservation programs.
- The **saveONenergy** program for homes provides rebates to help with the cost of buying and installing new heating and cooling equipment in the home. The partial rebates also cover electricity-saving devices such as LEDs, ENERGYSTAR certified ceiling fans, programmable thermostats for baseboards and advanced power bars. A Home Assistance Program for low income customers is also included.

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. If the legislation is passed, the average household would save about \$130 annually. Eligible When combined with enhancements to the Rural or Remote Rate Protection Program (RRRP), eligible rural ratepayers would receive additional relief, saving a total of approximately rural ratepayers would receive additional relief, saving about \$540 per year.

#### *Industrial Price Mitigation*

For industry, Ontario has 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 shifting electricity consumption to off-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 percent in their electricity prices.
- The **saveONenergy** program for business offers financial incentives to reduce the costs of upgrading energy-efficiency 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 an expansion of the Industrial Conservation Initiative (ICI), which encourages large energy users to reduce their electricity use during peak periods. This improves the system's reliability of the system while lowering total costs. If the bill passes, the ICI would be expanded to include all sectors (i.e., commercial, institutional and agricultural as well as manufacturing) while lowering the threshold for their participation. More than 300 businesses are already using the ICI to save electricity, and these changes would make another 1,000 businesses eligible for the reductions. On average the ICI reduced participants' bills by one third. It also cut peak electricity demand in 2015 by an estimated 1,000 MW in 2015.

### **Fossil Fuels Pricing Overview**

In Ontario, wholesale prices for fuels (e.g., gasoline, diesel, propane natural gas) are determined in an unregulated, integrated North American market. Consequently, to attract supply to the province, Ontario fuel buyers must pay a market price.

For example, since crude oil is refined to produce gasoline, changes in crude oil prices affect the price of gasoline. Ontario imports virtually all its crude oil from Western Canada, so Ontario refineries must compete with other users by paying market prices for crude oil. Ontario refineries, in turn, pass crude oil costs on to their customers. Gasoline prices are also affected by other factors such as North American supply and demand balances, local market conditions, inventory levels and government taxes.

The Ontario Energy Report provides information on retail gasoline and diesel prices on a quarterly basis. In the second quarter (April through June) of 2016, Ontario gasoline prices averaged \$1.04 per litre and Ontario diesel prices averaged \$0.93 per litre. The comparable second quarter prices in 2014 were \$1.37 per litre for gasoline and \$1.35 for diesel - the drop in prices is largely attributable to the decline in crude oil prices over that time period.

For natural gas, the Ontario Energy Board (OEB) sets the commodity price charged by the utilities it regulates based on forecasts of market prices over the next 12 months. The commodity forecast is adjusted quarterly and the OEB also adjusts the rate charged by utilities to account for any differences between the previous commodity price forecast and the actual

price for natural gas. Natural gas distributors do not earn a profit on selling the commodity. Their business is distributing the gas and they are paid - via rates regulated by the OEB - to build and maintain the pipes and equipment required to deliver the natural gas in their service areas.

The Ontario Energy Report provides information on the effective price (i.e., commodity price) for natural gas charged by the major natural gas distributors in Ontario: Enbridge Gas Distribution and Union Gas. In the second quarter (April through June) of 2016, the Enbridge Gas Distribution effective price was 11.38 cents per cubic meter and the Union Gas effective price was 9.21 cents per cubic metre. The comparable second quarter prices in 2014 were 20.9 cents per cubic metre for Enbridge Gas Distribution and 22.39 cents per cubic metre for Union Gas - the drop in prices largely attributable to the fact that the OEB's rate adjustment mechanism accounted for the high prices experienced during the abnormally cold winter of 2013-14.

### **Fossil Fuels Price Mitigation**

For residential users of natural gas, Enbridge Gas Distribution and Union Gas offer a wide range of programs that to help with their 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 Home Winterproofing Program** is free to its eligible low-income customers. Enbridge 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 the utility's eligible low-income customers. They will receive a free energy audit to ~~find and determine~~ what improvements can be done to their home. Then, if needed, Union Gas will install insulation to 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 itself is investing \$100 million from the **Green Investment Fund** to expand home energy audit and retrofit programs. This part of the Climate Change Strategy is being delivered by Enbridge Gas Distribution and Union Gas Limited.

- 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. The rebates can be applied to new furnaces and new water heaters as well as upgrades to insulation. This 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 megatonnes of greenhouse gases, contributing to the province's targets for reducing GHG emissions.

With respect to the costs of transportation fuels, the Ministry of Energy monitors the pricing and supply of gasoline and diesel oil on an ongoing basis, and posts this information in the Ontario Energy Report on the Ministry website.

On September 30, 2016, the Ministry of Energy directed the Ontario Energy Board (OEB) to conduct a review into Ontario's retail transportation fuels market. The OEB is expected to consult with the public and key stakeholders in the coming months and report back to the Ministry with its findings. The OEB will examine and report back on the following:

- \* The extent and causes of retail gasoline/diesel price variations over time and between regions within Ontario.
- \* How Ontario compares with pricing and markets in other jurisdictions.
- \* The information available to consumers about pricing and price variations.

The OEB's review of transportation fuels is distinct from the Ministry's 2017 LTEP engagement process and the government's consultation process for the development and implementation of the *Climate Change Action Plan*.

All available evidence suggests Ontario's gasoline market is competitive, with multiple retailers active in the province. Cities in Ontario often have the lowest before-tax prices in Canada and the wholesale prices in Ontario track North American equivalents.

The supply and price of North American crude oil and fuel prices are influenced by world oil markets. In particular, gasoline prices at the pump are affected by crude oil prices, wholesale gasoline prices, and competition in the local retail gasoline market.

The federal Competition Bureau has responsibility for ensuring competition in Canada's gasoline markets. Ontario has opted not to regulate the industry and instead allows a competitive gasoline market to operate.

## **§.5. Changes on the Horizon**

### **Distribution**

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

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 and update their assets to maintain reliable service to their customers. But many of the distributors' assets are aging and LDCs will have to make significant investments to maintain reliable service to Ontarians. LDCs must balance the need to provide the expected level of

service to customers with the ever present need to limit cost increases. They will also need to incorporate innovative approaches to managing the core demands of their businesses: meeting their customers' needs, managing their costs, maintaining, renewing and modernizing their assets, and seizing the opportunity 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 technologies such as storage 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 by the nature and pace of the expected changes. The Smart Grid Assessment and Roadmap report [\[link\]](#) identified a number of barriers preventing LDCs from achieving a fully modernized grid.

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

### ***Natural Gas Expansion***

Access to natural gas especially helps smaller communities in Ontario. It can help stimulate their economies by attracting new industry, making commercial transportation more affordable, benefiting agricultural producers who would save money by using less-costly natural gas to dry their crops or heat buildings in the winter, and providing consumers with less-costly energy to heat their homes.

Ontario committed in the 2013 LTEP 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 the support from the Ministries of Energy and Agriculture, Food and Rural Affairs, the Ministry of Infrastructure is establishing two programs:

- A \$200 million Natural Gas Access Loan program to help communities work with utilities to get access to natural gas.

- A \$30 million Natural Gas Economic Development Grant to accelerate projects that have a clear potential for economic development.

At the request of the Minister of Energy, in 2016, the OEB held a regulatory hearing process where it reviewed how it can facilitate the expansion of natural gas pipelines in the province. The Board OEB held hearings over the spring and summer of 2016 and numerous submissions were made by interested parties. The Board's OEB's decision is expected in the early fall of 2016.

#### For Consideration

- What are the significant challenges facing utilities/LDCs, and what can government do to help meet them?
- What are the most important benefits of a modern grid to you? Increased reliability? Greater information on your energy usage?
- What additional policies might should the government consider to expand access to natural gas?

#### Microgrids

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

A microgrid is, as the name suggests, a mini version/analogue 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 users such as a house, a school, or an electric vehicle. It does this by using computerized controls that optimize power flow and enable features like demand response and smart EV charging. 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 something that 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 be expected to drive a decline in the cost of microgrids, both in Ontario and around the world. The Ministry of Energy's Smart Grid Fund supported several of these successful pilot projects, and we are learning a great deal from them. There are places where microgrids may already make sense, namely remote communities that rely on expensive and dirty diesel fuel for their power needs. In these communities, microgrids could use renewable

energy to offset diesel consumption. They could also improve the reliability of supply in these isolated areas. While the government's priority is to connect many of these communities to the transmission system, there may be complementary opportunities to use microgrids, particularly in communities the ones that can't be connected at this time.

#### **For Consideration**

- What are the best uses of microgrids in the near future in Ontario?
- Are there any barriers preventing the use of microgrids?

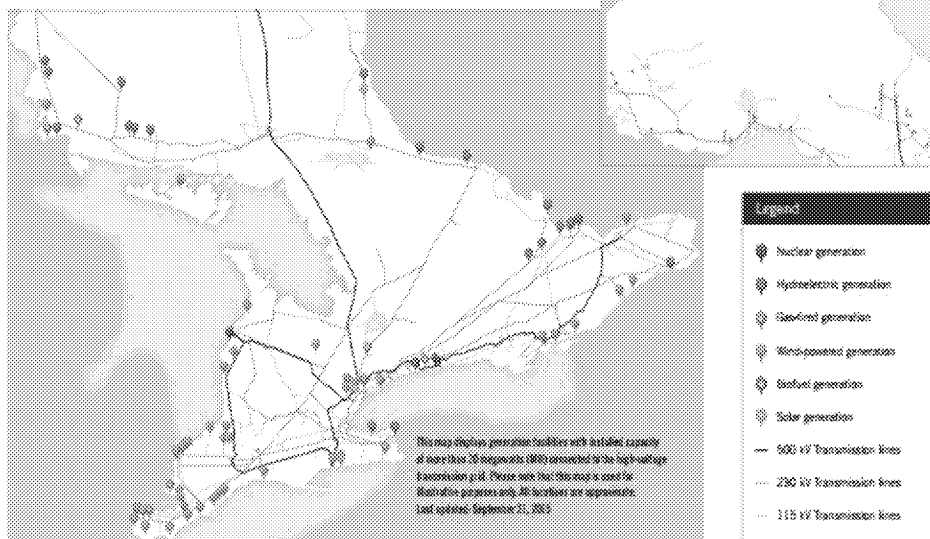
#### **Transmission**

##### ***Electricity Transmission***

Ontario's electricity transmission system is a network of high voltage electricity wires that forms the backbone of Ontario's electricity grid. Most of it is owned and operated by Hydro One. Since 2003, approximately \$15 billion has been invested 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, this has ensured that Ontario's residents and businesses have reliable access to clean electricity.

Source: IESO

## Ontario's Transmission Grid



1. Class A customers are large electricity consumers that pay Global Adjustment based on their proportion of energy use during the five hours of the year with the highest demand. All other customers are Class B.

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Figure 7: 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:

- The Northwest Bulk Transmission Line increases the supply and reliability of electricity to the area west of Thunder Bay
- The East-West Tie line reinforces the network between Wawa and Thunder Bay.
- The connection of remote northwestern First Nation communities to the electricity grid including a new line to Pickle Lake that is required to support these connections.

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

The existing electricity transmission system, including the projects already underway, is expected to be sufficient to meet the 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 of the system.

In outlooks with high demand though, (Outlooks C&D in the IESO's OPO), electrification would cause significant growth in Ontario's electricity requirements and new sources of generation

would be needed. This ~~will may~~ require additional investments in transmission to connect generation to users. For instance, the development of large scale hydroelectric projects in northern Ontario would require a major investment in the transmission system to connect the new hydro projects and to reinforce the existing system so power could flow to southern Ontario where it is needed.

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 ~~the~~ upgrade must be paid for by ~~the~~ customer. Ontario currently applies a 'user pay' principle, to ensure the direct beneficiary is responsible for the costs, and not the other ratepayers. By the same principle, transmitters do not expand the transmission system to attract new customers.

### **Pipelines**

The 2013 Long-Term Energy Plan (2013 LTEP) set out six principles for Ontario's evaluation of oil and natural gas energy pipeline projects such as TransCanada's proposed Energy East Pipeline: 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 into account greenhouse gas emissions and the interests of natural gas consumers.

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

Ontario is committed to ensuring that Energy East is in the best interest of Ontarians. This includes ensuring the safety of the people of Ontario, protecting the environment, maintaining the reliability of ~~the province's~~ Ontario'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?
- Will Ontario's pipeline principles protect the best interests of Ontarians and allow for informed participation in the NEB's review of the Energy East project? If not, what new considerations should be taken into account?

## Storage

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

This is where Ontario stands out as an innovation leader. The last 2013 Long-Term Energy Plan committed to procuring 50 megawatts of energy storage so we could 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.

Our interest in storage doesn't end there. Several of our Smart Grid Fund projects focus on testing energy storage in different scenarios and in combination with other complementary technologies. This will help balance our learnings on storage at the bulk system level with experiences at the distribution level.



Image: flywheel storage (source: TBC)

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Building our knowledge and sharing it with industry and the public was a critical element of the 2013 Long-Term Energy Plan. Earlier this year the IESO released a report on energy storage that outlines what we have learned to date, and also identifies where storage has potential to solve bulk system issues. The Ministry of Energy is following that report with an independent study of the value of storage at the distribution level, expected this fall.

For fuels used to heat homes and businesses, demand is seasonal. To help manage seasonal demand fluctuations for these fuels, storage is used. For natural gas, Ontario uses underground storage infrastructure in southwestern Ontario (near Sarnia) called the Dawn Hub to help manage seasonal demand. It does so 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 natural gas demand by end-users in Ontario, Quebec and the eastern U.S. The Sarnia-area also has storage infrastructure for propane and other natural gas liquids.

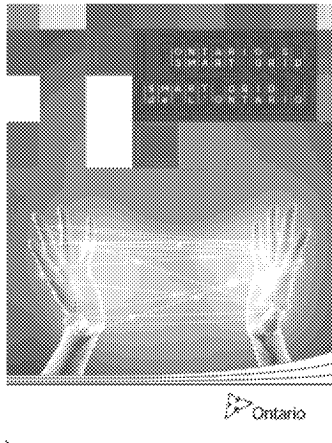
Since natural gas is also used to generate electricity, Ontario's natural gas storage infrastructure in Ontario can also be used to help manage periods of high electricity demand.

#### **For Consideration**

- **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. We have 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.



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Image: 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 invested nearly \$50 million in 26 projects, creating nearly 900 jobs and helping innovative Ontario companies to grow. This has encouraged a culture of innovation within the distribution sector, and furthered the adoption of many new technologies such as 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 energy efficiency, renewable and energy innovation sectors are expected to be important export industries for Ontario. The Ministry is working with sector partners to develop and support trade initiatives that will strengthen international relationships and produce create new business opportunities. That way, our energy sector can leverage its growing energy innovation expertise for the benefit of Ontarians.

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

Renewable natural gas (RNG) is one example of a low carbon alternative that has potential. RNG (also known as bio-methane) is methane derived that comes from organic sources, such as landfill gas, agricultural residues, wastes from food and beverage manufacturing and other sources. Since RNG is produced from renewable resources, it is a "carbon neutral" fuel. Once RNG is processed to remove impurities, it is fully interchangeable with conventional natural gas and can use the same pipelines and equipment. Ontario's *Climate Change Action Plan* proposes to require an addition of renewable content in natural gas. This can be expected to 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 and wastes would reduce the GHG emissions that come from corn-based ethanol. Despite decades of research and development, the commercial availability of these alternative sources of ethanol is currently limited.

The challenge will be in how this fuels transition is managed. The Ontario fuel sector is owned and operated by commercial interests responding to 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 with its effect on overall economic activity.

Currently, ~~there are feasible fuel technologies today that are less GHG intensive. Regulations and policies would need to be changed in order to eliminate barriers to the adoption of these alternative technologies. These barriers may include the economies of scale, the availability of infrastructure, existing regulatory standards and the deployment and availability of new technologies.~~

#### For Consideration

- **Which innovations offer the greatest benefit to your community and the energy system as a whole and how should the public and private sectors cooperate to encourage innovation in the energy sector?**
- **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 has been made by continuing to set 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—enough to power the cities of Ottawa and Windsor in 2014.
- 3,628 MW—equivalent to more than the peak demand of Mississauga, Brampton and Ottawa combined in 2014.

- 1,880 million cubic meters of natural gas from conservation programs alone – equivalent to natural gas used by 817,000 homes in a year.

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.



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Image: Small business conservation programs (source: "Helping Small Businesses Save Energy," Ministry of Energy 2016)

In 2014, the *Demand Side Management Framework* for natural gas was launched, followed by the *Conservation First Framework* for electricity in 2015. The new frameworks provide the rules, guidelines and funding that govern the delivery of electricity and natural gas conservation and the province's 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. Both electricity and natural gas distributors are delivering offering a number of programs that offer rebates, training and support to help households and businesses improve their energy efficiency. for eExamples include:

- Home audit and retrofit programs, offered provided by both Enbridge Gas Distribution and Union Gas, offer homeowners rebates for energy audits and energy efficient retrofits such as insulation, furnaces and water heaters, windows and doors.

- The Small Business Lighting program offered-provided by electricity distributors offers small businesses free onsite facility lighting assessments and incentives towards energy efficient lighting upgrades with turn-key installation.

Ontario has successfully evolved demand response (DR) programs to a new IESO market-based approach. In the first auction, held in December 2015, about 400 MW were procured for 2016-2017. The next DR auction will take place in December 2016. DR can reduce the need to build costly generating facilities that use natural gas by reducing electricity usage during the hours of highest demand on a hot summer day. This is the time-of-day when electricity generation has higher GHG emissions because it comes from natural gas generation.

Earlier this year, the Ministry held consultations on a proposal, informed by a cost-benefit analysis, that would require the province's electricity, natural gas and water distributors to implement the Green Button program. The Ministry is currently considering stakeholder feedback as it develops its policy proposal for implementing Green Button province-wide. Green Button enables households and businesses to electronically access and share their electricity, natural gas and water utility data. This allows customers to in a standardized and secure way so they can transfer their data to software and innovative applications to view and better manage their usage, bills and greenhouse gas emissions. The 2013 LTEP promoted Green Button as a way to give-provide consumers with access to their electricity consumption data. In addition, and the *Climate Change Action Plan* committed to expanding the Green Button program province-wide to help households and businesses manage and conserve energy and water use.

Government-owned facilities and Ontario's broader public sector organizations in Ontario are already showing-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.

The Ministry is proposing to implement a large building energy and water reporting and benchmarking initiative for buildings that are 50,000 square feet or larger. The initiative would apply to commercial, multi-residential and some industrial buildings. Reporting and benchmarking can help building owners identify and better manage energy and water use and its-related costs. On top of this, it -and-allows the market to value energy efficiency in building purchasing, as well as leasing and lending decisions.

### **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 to taking bolder action to assist the province in achieving its GHG reduction targets.

Recent studies completed by the IESO and the OEB on achievable, cost-effective electricity and natural gas savings opportunities in Ontario show that:

- Ontario's electricity conservation target of 30 TWh in 2032 is aggressive and with limited potential to achieve cost-effective conservation beyond this target.

- There is significant potential for cost-effective natural gas conservation and energy efficiency of natural gas that goes beyond current levels of activity.<sup>3</sup>

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

The *Climate Change Action Plan* also committed the government to developing a program that would provide free energy audits before homes can be sold. 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 in 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 their widespread adoption can be widespread. 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 current *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 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?

<sup>3</sup> Page 12, Updated FTR deck, August 2017

## **Clean Energy Supply**

### ***Renewables***

Ontario has approximately 18,000 MW of wind, solar, bioenergy and hydroelectric energy online or contracted, more than 16,000 MW of wind, solar, bioenergy, and hydroelectricity online and approximately 2,000 MW of additional capacity under contract and in development. This is helping to offset our reliance on fossil fuels and reduce Ontario's greenhouse gas emissions.

The success of the Feed-In Tariff (FIT) and microFIT programs, and the competitive Large Renewable Procurement (LRP), 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 operating in the province have made Ontario home to the fastest-growing clean tech sector in Canada.

Ontario firms are now poised to beat out foreign competition, exporting 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 implementing an updated and streamlined net metering program. This Net metering is a billing arrangement that 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. Anticipating a more distributed energy future, the updated net metering regulation would support renewable energy developments that are better integrated into the electricity system, enable innovative technologies and provide customers with new ways to reduce their energy use and save on their bills.

In August 2016, the Ministry of Energy proposed updates to the Net Metering Regulation and posted them 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 changing system needs. The Net Metering program will also support the construction of near-net zero and net-zero buildings, a key element of Ontario's 2016-2020 Climate Change Action Plan.

### ***Nuclear***

The three nuclear stations in Ontario, Darlington, Pickering and Bruce, 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 been safely operating nuclear power plants safely 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 that have already been refurbished, these investments will ensure Ontario has over 9,800 MW of affordable, reliable and GHG-free baseload generation capacity. This in turn will help the province meet the GHG-reduction targets set by Ontario's *Climate Change Action Plan*.

OPG will begin refurbishing the first of the units at Darlington 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 (OPG) 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.
- Ontario also has the option of stopping the work if it expects that disruptive changes in technology or the province's energy system will result in a 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 an important driver of Ontario's economy, supporting tens of thousands of jobs and billions of dollars in economic activity every year. Ontario's nuclear supply chain is made up of over 180 companies across the province and employs about 60,000 people. This supply chain includes nuclear manufacturing, engineering, construction and consulting, fuel fabrication, research and development and medical isotopes used for medical equipment sterilization and cancer treatment. Nuclear companies and research laboratories in communities across Ontario have an expertise in the design and construction of sophisticated systems and components for current and future reactors. In addition to being used in all Ontario nuclear plants, the Ontario-developed CANDU nuclear technology has been 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, creating tens of thousands of jobs and billions of dollars in economic activity along the way.

### ***Clean Electricity Trade***

The 2013 LTEP committed the government to seeking out clean import agreements with other jurisdictions, 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 energy trades 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~~ a number of positive outcomes, including:

- A 10-year agreement which allows 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 potential impact on the reliability of supply will need to be considered, as will the impact on emissions and the IESO's capacity auction initiative, which would use a competitive process to procure capacity to ensure long-term reliability.

#### 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~~ in meeting its the Province's future energy needs?**
- **What factors should Ontario focus on as it pursues opportunities for electricity trade with nearby provinces and states?**

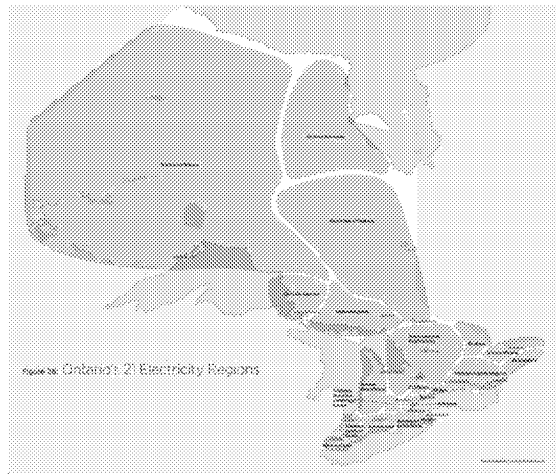
#### Regional Planning

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

The regional planning process addresses these issues. It links provincial planning with local needs to better integrate the so that the planning of the province-wide and local distribution systems can be integrated with the energy plans of municipal or Indigenous community. This will ensure the electricity needs of all 21 Ontario electricity regions [link] 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 is continuing to monitor the IESO's and OEB's progress in integrating conservation into the regional planning process.



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Image: Ontario's 21 Electricity Regions (source: Long-Term Energy Plan 2013)

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

Regional plans come in two varieties. A *Regional Infrastructure Plan* (RIP) that is a 'wires only' solution, using 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, called an *Integrated Regional Resource Plan* (IRRP), considers a larger number of options, including conservation, generation or other innovative solutions. The IRRP could be implemented in combination with, or instead of a "wires" solution.

IRRPs 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 (LAC) also provides recommendations on how to develop the regional plans and advise on aspects of broader community engagement. LACs 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. Twelve sub-regions have released *Integrated Regional Resource Plans* that make recommendations for meeting the reliability and supply needs of the region.

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

use of electricity.

#### For Consideration

- **What can be done to strengthen the link between regional electricity planning and land use planning for infrastructure corridors, in order to ensure that land for transmission corridors is available when needed?**

#### Indigenous Energy Policy

As the Ontario government transforms and strengthens our electricity and fuel systems, Indigenous communities have emerged as critical partners. Because of their special relationship with the land and their long history in this province, Indigenous communities can bring unique and important perspectives, knowledge and leadership to energy projects and energy planning. In addition, over 150 First Nation and Métis communities across Ontario have recognized or credibly asserted Aboriginal and treaty rights which are affirmed and protected under Section 35 of the Canadian Constitution. These rights, as well as the social and economic well-being of the communities, can be affected by energy developments.

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 economic well-being and development of Indigenous communities. Ontario encourages First Nation and Métis communities to play an active role in the energy sector, including through involvement in generation, conservation, generation and major transmission projects. The government needs the input and guidance of Indigenous communities to support their ongoing participation in the energy sector, and has established forums with community leadership to ensure this important dialogue happens regularly.

Consistent with the spirit of reconciliation, 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:

- 89 First Nation communities accessed provincial funding to develop community energy plans.
- First Nation and Métis communities and groups are leading or partnering in more than 5500 different wind, solar and hydroelectric projects across the province thanks to incentives offered through renewable energy procurement initiatives such as the Feed-in Tariff program and the recent Large Renewable Procurement process. These projects have a contracted capacity of over 1,800 MW of clean energy.
- The Aboriginal Renewable Energy Fund committed over \$8.5 million to help 45 different communities and groups assess and develop renewable energy projects. It has now been replaced by the new Energy Partnerships Program that will help Indigenous communities to consider participation opportunities in renewable generation and major transmission projects.

- The Aboriginal Loan Guarantee Program delivered more than \$200 million in guarantees for Indigenous partnerships in renewable energy and transmission projects.
- The Aboriginal Conservation Program provided in-home energy assessments and energy-saving upgrades for homes in 46 Indigenous communities.
- The Education and Capacity Building Program is enhancing the education, capacity, and skills of Indigenous communities, to improve their understanding of and ability to engage in the electricity sector.

Many of these initiatives have resulted in rewarding and innovative partnerships between First Nation and Métis communities and energy developers. Others support are giving Indigenous communities the ability to take control of their own energy needs and interests.

In August 2015, the Chiefs of Ontario signed a historic Political Accord with the Government of Ontario. This Accord will guide the relationship between First Nations and the province. The government has committed to working on a range of issues with First Nations, including jurisdictional matters and the sharing of resource benefits. These goals are 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.

In line with the principles of the Political Accord, the Province and First Nations in Ontario announced an agreement-in-principle in July of 2016 that would see the province sell shares of Hydro One Limited to First Nations for their collective benefit. This would be a 25-year deal to advance the economic development of First Nations, reduce the barriers to accessing capital, and provide meaningful opportunities for collective creation of wealth by Indigenous communities.

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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. Wataynikaneyap Power, a First-Nation led company, is developing a project that will connect remote communities.

In addition to meeting its constitutional obligation to consult First Nation and Métis communities where there is potential for energy developments to impact recognized or credibly asserted Aboriginal and treaty rights, Ontario is committed to working with Indigenous partners on energy planning and policy in a way that supports reconciliation and community economic development. As we update the Long-Term Energy Plan, it is important that we continue supporting Indigenous communities and individuals to manage energy use and to engage in energy issues and take advantage of opportunities that are available to participate in projects and manage energy use. Programs and policies will need to evolve to better reflect technological innovation, ever-changing electricity and fuel systems, and the broader policy implications of climate change. We look to First Nation and Métis communities and organizations, developers and other key partners to provide the ideas and guidance that will strengthen our long-term energy planning for the province how we implement this important priority.

## For Consideration

- **What are the most important tools to support Indigenous community engagement and leadership in Ontario's energy sector going forward?**

## Supply Mix

The 2013 LTEP took a pragmatic and flexible approach to planning to address 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 effect the *Climate Change Action Plan's* impact will have on both the electricity and fossil fuels sector. Given the range of outlooks for the future demand for electricity and fossil fuels, the need for flexibility in long-term planning is of particularly importance. In addition, the government's commitment to reducing Ontario's GHG emissions in Ontario will require an even greater emphasis on conservation and clean energy sources.

In the electricity sector, the *Ontario Planning Outlook* (OPO) projects the province's installed capacity to increase from 39,527 MW to 42,635 MW by 2035. There is a potential though that increased electrification will produce an 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, waterpower/hydroelectricity, bioenergy, natural gas, demand response, nuclear and long-term contracts for imports. The potential groupings also include new technologies that are not currently in Ontario's supply mix. Each combination will have a different effect/impact on costs, reliability, emissions or supporting infrastructure, such as transmission systems.

When it comes to fossil fuels, the government's climate change policies are expected to put downward pressure on the demand for traditional fuels, while at the same time increasing the opportunity to use 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 Ontario's existing fuels delivery infrastructure.

## For Consideration

- **in order 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** – The legal description for the constitutionally protected rights and privileges of Canada's Indigenous peoples. Rights held by some Indigenous peoples of Canada that are

acquired through long-standing use and occupancy of the land and are protected under s.35 of the Constitution Act, 1982.

**Baseload Generation** - Sources of electricity that operate continuously day and night and through all the seasons of the year. Baseload generation is usually provided by nuclear and large hydro-electric generating stations.

**Bioenergy and Bio-diesel** - Energy produced from plants or animals. 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 climate change. 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 meet a possible demand for electricity for a period of time in the future.

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

**Clean Imports** – Imports of hydro-electricity from neighboring provinces such as Quebec, Manitoba or Newfoundland.

**Climate Change Action Plan (CCAP)** - A five-year Ontario plan aimed at fighting climate change over the long-term. The current *Climate Change Action Plan* CCAP 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** and the **Conservation First Framework** – *Conservation First* is the Ontario's policy that making energy conservation the first resource to be considered when in planning to meeting the province's energy/electricity needs, where cost-effective. The

**Conservation First Framework** - Launched January 1, 2015, the six-year Conservation First Framework (CFF) (2015-2020), overseen by the Independent Electricity System Operator, 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 programs to their customers. Framework is a series of programs and policies that govern conservation by electricity LDCs.

**Decarbonizing** – The removal of carbon from sources of energy, done in order 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 Ontario Energy Board, 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. The programs and policies that govern conservation by natural gas distributors in Ontario.

**Demand Response** – Provides price or financial incentives to residential and business users to shift or reduce their electricity usage away from peak periods to help avoid the need to build costly energy infrastructure to meet a few short periods of peak demand a year. Reductions in electricity demand that are triggered by incentives or by higher than usual prices.

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

**Distribution system** - A distribution 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 Corporation to convert a natural gas pipeline to carry crude oil from Western Canada for export and use by eastern Canadian refineries.

**Energy Audit** - A process designed to determine where, when, why and how energy is being used by energy-consuming systems, such as a building. The information can then be used to identify opportunities to improve efficiency, decrease energy costs and reduce greenhouse gas emissions. An analysis of the existing airtightness of a building. The audit identifies air leaks that should be sealed, provides specific options for upgrading insulation, doors and windows, and suggests upgrades to the heating system.

**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 your renovation and repair activities. Cost-effective improvements to a building that reduce energy costs and greenhouse gas emissions. Examples include upgrades to doors, windows and insulation, and furnace replacement.

**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 [link] 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** – A report prepared for the Ontario Ministry of Energy that reviews the current supply and demand for fossil fuels in Ontario, and the possible changes that could occur through to 2036.

**Green Button** – A data standard that can empower customers to access and share their utility data in an electronic, standardized and secure way. When customers share their data with developers they can use innovative software applications that allow them to view and manage their energy and water use. Software that gives Ontarians access to data from their Smart Meter about their electricity usage.

**Greenhouse Gases (GHG)** - Gases that contribute contributing to climate change. The most prominent GHG, carbon dioxide, is released by the burning of fossil fuels such as coal, oil or natural gas.

**Heat Pumps** - Technology that heats or cools buildings by absorbing heat from a cold space and releasing it to a warmer one. 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 the delivery of electricity distributor electricity conservation and energy efficiency 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, dams and solar panels and delivers it through wires, pipelines.

**Integrated Regional Resource Plan (IRRP)** – A document developed by the IESO, in consultation with the local distribution company, transmitter, and the local advisory council. It 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). A plan that assesses the options for meeting local electricity needs through additional conservation and demand management, distributed or large-scale generation, transmission and distribution. The plan ranks the options by feasibility, cost, reliability, environmental performance and local acceptance.

**Local Advisory Committee (LAC)** – 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 delivery 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 electricity equal to 1,000 kilowatts (kW) or one million watts (W). A large residential or commercial building may use several megawatts of electricity.

**Megawatt Hour** - 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 event of a failure of the larger network, a microgrid can seal itself off and continue to provide power locally.

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

**Net Metering** – A billing arrangement that allows customers to generate renewable energy onsite for their own use, and receive bill credits for any surplus electricity sent to the grid. A policy allowing homes and businesses who generate their own electricity to send any surplus to the local distribution system, in exchange for a credit on their bill.

**Net-Zero Energy Buildings** – A building that produces at least as much energy as it consumes on an annual basis. A building that uses renewable technology to generate more electricity than it consumes from its local distribution or transmission utility.

**Net-Zero Energy Emissions** - A building that produces at least as much emissions-free energy as it uses from emissions-producing energy sources.

**Off-ramps** – Contract language that Specific decision points that gives 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** – The period of time in which significantly more natural gas or electricity is needed by consumers.

**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 document 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. A plan, led by the local transmission company, on how to use transmission and distribution systems to meet the electricity needs of a region.

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

**Reliability** - the ability to deliver electricity in accordance with all applicable reliability standards and in the amount desired to meet demand. The ability to meet customers' electricity needs, even when equipment unexpectedly fails or the amount of available power is reduced.

**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.

**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. can typically be controlled remotely from a phone, tablet or laptop. A programmable thermostat can be programmed to automatically adjust the interior temperature of a building or house and can help to save energy. It can usually be controlled with an application on a smart phone.

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

**Transmission system** - The movement of electricity, usually over long distance, from generation sites to consumers and local distributions systems. Transmission of electricity is done at high voltages. Transmission also applies to the long distance transportation of natural gas and oil. The transfer of electricity at high voltages from a large generator to a local

distribution system.

**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.

**Whole Home** – An approach to ~~energy~~ conservation and ~~energy~~ efficiency that looks at how improvements in the use of electricity and natural gas throughout a home can work together to produce the best results.

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