

Delivering Fairness and Choice

2017 Long-Term Energy Plan Minister's Message

[Placeholder]

Commented [LT1]: This needs to be reworked as the exec summary. We will provide Min Message later.

Response: Will wait for MO to provide Minister's Message, and keep as placeholder for now. Will placeholder exec summary as well, as we'll need John's help to rework.

Executive Summary

Commented [AH(2): Being included this week.

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Overview

The 2017 Long-Term Energy Plan, *Delivering Fairness and Choice*, builds on the years of investment that Ontarians made renewing and cleaning up the province's electricity system. Ontario now has a reliable electricity system that is 90% free of the emissions causing climate change. Its robust supply of electricity will be sufficient to meet Ontario's foreseeable electricity demand well into the next decade. This leaves the province well positioned to plan for and meet future challenges.

Ontario's success in building a clean and reliable energy system means we can renew our focus on helping Ontarians and their families. That is the key priority of *Delivering Fairness and Choice*. The government has already brought in a number of measures to reduce electricity costs. The *Ontario Fair Hydro Plan Act, 2017* reduced electricity bills for residential consumers by an average of 25%, and will ensure that electricity rates won't rise by more than the rate of inflation for four years. Ontario's Fair Hydro Plan is also helping as many as half a million small businesses and farms. Lower-income Ontarians and those living in eligible rural and northern communities are receiving even greater reductions, of as much as 40 to 50%. *Delivering Fairness & Choice* will continue our focus on managing electricity system costs over the long term.

Since the release of the last LTEP, Ontario has taken a number of measures to combat climate change. These include the passage of the *Climate Change Mitigation and Low-Carbon Economy Act*, the introduction of Ontario's cap and trade program, and the release of the first Climate Change Action Plan (CCAP). *Delivering Fairness and Choice* builds on the province's leading role in the global fight against climate change.

Key Elements of *Delivering Fairness and Choice*

Chapter 1. Ensuring Affordable and Accessible Energy

- Ontario's Fair Hydro Plan lowers electricity bills by 25 per cent for a typical residential consumer.
- Ontario will share the costs of existing electricity investments more fairly with future generations by refinancing a portion of the Global Adjustment, spreading the cost of the investments over a longer period of time.
- Residential customers served by local distribution companies with some of the highest rates are getting enhanced distribution rate protection.
- The First Nations Delivery Credit reduces the monthly electricity bills of on-reserve First Nation residential customers of licensed distributors.
- Residential electricity prices over the 2017 LTEP outlook period are forecast to remain below the level forecast in the 2013 LTEP. The outlook for electricity prices for large business reflects average increases in line with inflation over the forecast period.

- Ontario will enhance consumer protection by giving the Ontario Energy Board increased regulatory authority over unit sub-meter providers.
- Ontario will continue to support expanded access to natural gas, giving customers greater choice and aiding in the economic development of their communities.

Chapter 2. Ensuring a Flexible Energy System

- Market Renewal will refashion Ontario's wholesale electricity markets and ultimately result in a more competitive and flexible marketplace.
- Incremental capacity auctions will increase the use of competition to secure technology-neutral resources and help reduce the cost of procuring resources to meet system adequacy in a more flexible manner.
- Ontario will maximize the use of its existing energy assets in order to limit any future cost increases for electricity consumers.
- The Province will direct the Independent Electricity System Operator to establish a formal process for planning the future of the integrated province-wide bulk system.
- The Northwest Bulk transmission project will proceed in three phases.
- The Province will review all options to ensure the East-West Tie project is built at a cost that is fair to Ontario ratepayers.
- Ontario will continue to exercise strict oversight of nuclear refurbishments and ensure they provide value for ratepayers.

Chapter 3. Innovating to Meet the Future

- The Province will work with the OEB to provide customers greater choice in their electricity price plans.
- The net metering framework will continue to be enhanced to give customers new sources of clean energy and new ways to reduce their electricity bills.
- Barriers to the deployment of cost-effective energy storage will be reduced.
- Utilities will be able to intelligently and cost-effectively integrate electric vehicles into their grids, including smart charging in homes.
- The Province will articulate a vision for grid modernization in Ontario, and give LDCs more tools to overcome barriers and provide more customer choice and efficient, reliable and cost-effective services to customers.
- Ontario will build on its success and renew and enhance the Smart Grid Fund. This will continue the Province's support of Ontario's innovation sector and help overcome other barriers to grid modernization.
- The IESO will strategically deploy renewable distributed generation projects that demonstrate the value of innovative technologies to the system and to customers;
- Ontario will explore funding pilot projects to help Ontario's innovative energy companies export to foreign markets;

- The Province will collaborate with the federal government, universities and industry to support the province's nuclear sector; and
- Innovative uses for Ontario's natural gas distribution system will be pursued.

Chapter 4. Improving Value and Performance for Consumers

- The Province will direct the OEB to continue and enhance its efforts to improve the performance of LDCs.
- The OEB will make utilities more accountable to their consumers, promote efficiencies and cost reductions, encourage partnerships, and ensure regulatory processes are cost-effective and streamlined to accommodate changing utility business models.
- Ontario will work with the OEB and LDCs to redesign the electricity bill to make it more useful for consumers in understanding and managing their energy costs.
- The Province will direct the OEB to review the standards for reliability and quality of service for transmitters and distributors and recommend options for improving the standards. It will also ask the Independent Electricity System Operator (IESO) to review how its planning and policies can improve customer reliability.
- The Province will direct the IESO to develop a competitive selection or procurement process for transmission, and to identify possible pilot projects.
- Ontario will look to the IESO and the OEB to promote the right-sizing of transmission and distribution assets at their end of life.
- Significant cost savings are possible if land for a transmission corridor in the northwest Greater Toronto Area is reserved before the area develops.
- Ontario will provide greater transparency for consumers on gasoline pricing through the OEB's transportation fuels review.

Chapter 5. Strengthening our Commitment to Energy Conservation and Efficiency

- The transition to an incremental capacity auction will provide a stable platform to effectively use demand response as a system resource, enabling it to compete directly with traditional generation and other emerging technologies.
- Ontario will continue to set advanced efficiency standards for products and appliances and will explore setting or updating energy efficiency standards for key electrical equipment in drinking water and wastewater treatment plants.
- The Province and its agencies will further encourage LDCs to pursue conservation on their distribution systems to achieve customer electricity and cost savings.
- The Green Ontario Fund will provide energy consumers with a co-ordinated, one-window approach to encourage conservation across multiple energy sources and programs.
- Beginning July 1, 2018, combined heat and power projects that use fossil fuels to generate electricity will no longer be eligible for incentives under the Conservation First Framework or the Industrial Accelerator Program. Behind the meter waste energy

recovery projects will continue to be eligible, as will renewable energy projects, including those paired with energy storage systems.

- Ontario is committed to expanding Green Button province-wide and intends to amend legislation that would, if passed, enable Ontario to require electricity and natural gas utilities to implement Green Button Download My Data and Connect My Data.

Chapter 6. Responding to the Challenge of Climate Change

- Ontario remains committed to an electricity system that includes renewable energy generation and supports the goals of the Province's Climate Change Action Plan.
- Ontario will encourage the construction of near net zero and net zero carbon emission homes and buildings to reduce emissions in the building sector.
- The Province will continue to work with its agencies to support the deployment of low-carbon energy technologies and consider further opportunities to integrate the delivery of conservation and low-carbon technology programs.
- Ontario is expanding the options for net metering to give building owners more opportunities to integrate renewable energy generation and energy storage technologies.
- Advanced efficiency standards will be set for products and appliances used in new and existing homes and buildings.
- Ontario will continue to work with industry partners to introduce renewable natural gas into the province's natural gas supply and expand the use of lower-carbon fuels for transportation.
- Ontario will strengthen the ability of the energy industry to anticipate the effects of climate change and integrate its impacts into its operational and infrastructure planning.

Chapter 7. Supporting First Nation Capacity and Leadership

- Ontario will improve the availability of conservation programs for First Nations and Métis, including communities served by Independent Power Authorities.
- Ontario will continue to prioritize the connection of remote First Nation communities to the grid and continue to support the four First Nations where transmission connection is not economically feasible.
- The Aboriginal Community Energy Plan program will be expanded to help communities implement their community energy plans and support Ontario's Climate Change Action Plan.
- Ontario will engage with First Nations and Métis to explore options for supporting education and capacity building, the integration of small-scale renewable energy projects, net metering and other innovative solutions that address local or regional energy needs and interests.
- Innovative financing models and support tools will be investigated to lower the financing costs of projects led or partnered by First Nations or Métis.

- Ontario will report back to communities between Long-Term Energy Plans to provide updates on the province's progress and seek ongoing feedback from First Nations and Métis.
- Ontario's Natural Gas Grant Program will support the expansion of natural gas access to First Nation communities.

Chapter 8. Supporting Regional Solutions and Infrastructure

- The Province will continue to work with its agencies to implement the Conservation First policy in regional and local energy planning processes.
- With the first cycle of regional planning completed, the Province is directing the Independent IESO to review the regional planning process and report back with options and recommendations that address the challenges and opportunities that have emerged.
- Ontario's Climate Change Action Plan has reinforced the importance of community energy plans, and indicated Ontario's continued support for them.
- Ontario is committed to public engagement when it undertakes reviews of major pipeline projects.

Next Steps

The development of *Delivering Fairness and Choice* followed a new legislated long-term energy planning process. The process included the development of electricity and fuels technical reports, a comprehensive engagement process with Ontarians and the issuance of implementation directives to the OEB and IESO. The next step is for the OEB and IESO to submit implementation plans to the Minister of Energy, which will outline the steps these agencies will take to implement the policies and programs in the implementation directives. The development of these implementation plans will also lay out how the agencies will engage with the public, Indigenous communities and councils, and key stakeholders.

Chapter 1. Ensuring Affordable and Accessible Energy

Making Energy Affordable

Ontario's electricity system is well positioned to meet any challenges and pursue any opportunities that may occur over the next 20 years. More than \$50 billion has been invested in

the electricity system since 2003¹. These investments have provided several benefits, including restoring the reliability of our electricity system.

Commented [ENE3]: Note: This fact requires verification by both SNAP and ESP.

This is a significant change compared to 2003, when power from sources emitting greenhouse gases (GHG) made up one-third of the province's generation mix.²

Text Box: What We Heard from You

Commented [AH(4)]: MO had asked that this say "How We've Heard You".

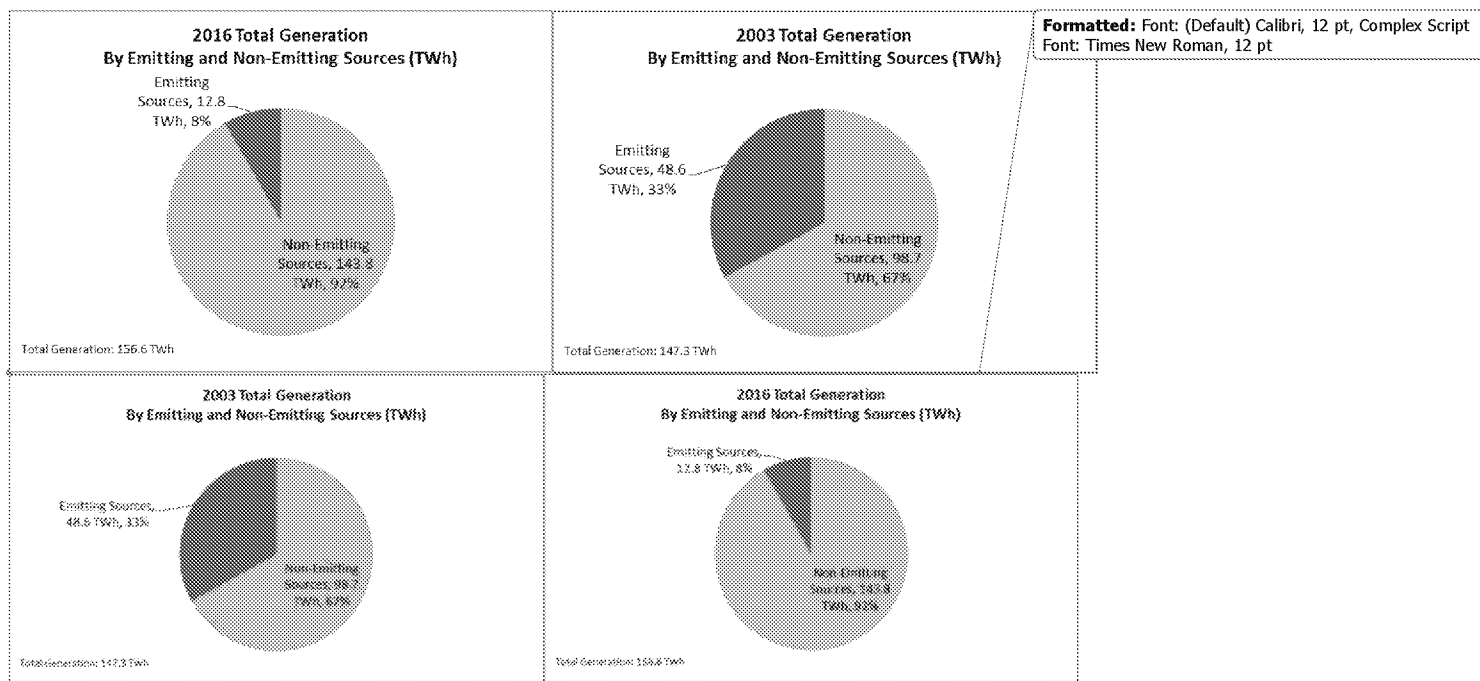
- Electricity costs are too high
- High prices hurt industrial competitiveness
- Reduce rates by funding from tax base
- Consider new technologies and methods to manage energy use
- ~~Offer more pricing plans~~
- Promote the benefits of conservation for both customers and the system
- Delivery charges should be the same province-wide
- Expand access to natural gas³

Response: The above wording makes it sound like we're listing the actions we've taken to respond to what we've heard. We've revised the title of the boxes to reflect that these summarize key things we heard from stakeholders during consultations.

¹ Internal Ministry of Energy/Hydro One

² IESO, Power Data – Supply Overview - <http://www.ieso.ca/power-data/supply-overview>

³ Source needed



Today, Ontario's electricity sector accounts for two per cent of the province's total greenhouse gas emissions⁴. We now have a robust and clean supply of electricity that can be expected to meet Ontario's electricity demand well into the next decade.⁵

Making Energy Affordable

The much-needed investments in our electricity system have led to higher electricity prices⁷. As a result, Ontario's Fair Hydro Plan was developed to relieve the cost pressures caused by these system improvements. It builds on actions already taken over the past several years that reduced electricity costs for families, farms and businesses, including:

⁴ IESO, Power Data – Supply Overview - <http://www.ieso.ca/power-data/supply-overview>

⁵ IESO estimate based on National Inventory Report data

⁶ Source needed

⁷ Source needed

- deferring the construction of two new nuclear reactors at the Darlington Nuclear Generating Station, avoiding an estimated \$15 billion in new construction costs;⁸
- driving down the cost of renewable energy generation through annual reviews of Feed-In Tariff (FIT) pricing, revised procurement totals, and the introduction of competitive procurement for large renewable projects. This drove down the cost of renewable energy generation by at least \$3 billion⁹, compared to the forecast in the 2013 Long-Term Energy Plan (2013 LTEP).

Commented [SPA5]: Move footnote to the end of the statement.

- suspending the second round of the large renewable procurement process (LRP II) and the Energy-from-Waste Standard Offer Program. This is expected to save up to \$3.8 billion compared to the forecast in the 2013 LTEP¹⁰;
- renegotiating the Green Energy Investment Agreement with Samsung, reducing contract costs by \$3.7 billion¹¹;
- starting the refurbishments at the Bruce Nuclear Generating Station in 2020, instead of 2016, helping to save \$1.7 billion compared to the forecast in the 2013 LTEP¹²; and
- pending regulatory approvals, continuing to operate the Pickering Nuclear Generating Station up to 2024, for an estimated saving for ratepayers of as much as \$600 million¹³.

Ontario's Fair Hydro Plan

Commented [SPA6]: Many of the facts in this section could reference the same OFHP news release etc. as a source.

On June 1, 2017, the *Ontario Fair Hydro Plan Act, 2017* became law¹⁴, providing additional help for electricity consumers. Ontario's Fair Hydro Plan:

- lowers electricity bills by 25 per cent for a typical residential consumer. As many as half a million small businesses and farms are also benefiting from the reduction¹⁵;
- expands the Ontario Electricity Support Program (OESP) by increasing the on-bill credits by 50 per cent and making more Ontarians eligible for the program;¹⁶
- provides enhanced distribution rate protection for residential customers served by the local distribution companies (LDCs) that have some of the highest rates. This will let

⁸ LTEP 2013, pg. 16, http://www.energy.gov.on.ca/en/files/2014/10/LTEP_2013_English_WEB.pdf

⁹ Internal Ministry of Energy analysis

¹⁰ Description needed, <https://news.ontario.ca/mei/en/2016/09/actions-to-reduce-energy-costs.html>

¹¹ Internal Ministry of Energy analysis

¹² Ontario Ministry of Energy news release, Link needed

¹³ Source needed

¹⁴ Ontario's Fair Hydro Act, 2017

¹⁵ Source needed

¹⁶ OEB Decision & Order for OESP Credits (April 25, 2017), <https://www.oeb.ca/newsroom/2017/oesp-benefit-more-consumers-increase-credits-50> and amounts prescribed in s. 5(2) and Schedule 1 in O. Reg. 314/15 (OESP) of *Ontario Energy Board Act, 1998* (OEBA). The amendments were approved by Cabinet on April 26, 2017.

eligible customers save as much as 40 or 50 per cent on their electricity bills¹⁷. The enhanced distribution rate protection broadens the support provided under the existing Rural or Remote Rate Protection (RRRP);

- reduces the monthly electricity bills for on-reserve First Nation residential customers of licensed distributors by giving the customers a 100 per cent credit on the delivery line or service charge of their bills. This provides them with an average monthly benefit of \$85;¹⁸
- shifts the funding of the Ontario Energy Support Plan (OESP) and most of the Rural and Remote Rate Protection (RRRP) program from electricity bills to provincial revenues¹⁹. This will reduce the regulatory charges paid by all Ontario ratepayers;
- allows smaller manufacturers and greenhouses with average monthly peak demand greater than 500 kilowatts (kW) to participate in the Industrial Conservation Initiative (ICI)²⁰. This gives them with a strong incentive to lower their consumption during peak hours and can reduce their bills by an average of one-third²¹;
- includes the 8 per cent rebate that took effect on January 1, 2017, a reduction equal to the provincial portion of the Harmonized Sales Tax²²; and
- establishes an Affordability Fund that helps people who don't qualify for low-income conservation programs to make energy efficiency improvements to their homes, improvements that couldn't otherwise be done without financial assistance support.

Additional Details on Ontario's Fair Hydro Plan

Commented [LT7]: Add sample bills.

Response: Being considered for future iterations.

Ontario Electricity Support Program

In order to benefit more low-income Ontarians and provide them with additional support, Ontario has expanded the eligibility criteria for the OESP and increased the monthly credits by 50 per cent²³. This means that:

- a single customer earning under \$28,000 can now receive \$45 per month²⁴, up from \$30;

¹⁷ Source needed

¹⁸ OEB report on First Nation Rate, <https://www.oeb.ca/industry/policy-initiatives-and-consultations/options-appropriate-rate-assistance-program-reserve>

¹⁹ Source needed

²⁰ Source needed

²¹ Source needed

²² Source needed

²³ OEB Decision & Order for OESP Credits (April 25, 2017), <https://www.oeb.ca/newsroom/2017/oesp-benefit-more-consumers-increase-credits-50> and amounts prescribed in s. 5(2) and Schedule 1 in O. Reg. 314/15 (OESP) of *Ontario Energy Board Act, 1998* (OEBA). The amendments were approved by Cabinet on April 26, 2017.

- a family of four with a combined earning under \$48,000 can now receive \$40 per month; and²⁵
- seven or more people living together who earn a total of \$39,000 or less can receive \$75 per month²⁶, up from \$50.

Household Income (After Tax)	Household Size (Number of people living in household)						
	1	2	3	4	5	6	7+
< \$28,000	\$45	\$45	\$51	\$57	\$63	\$75	\$75
\$28,001 - \$39,000	\$40	\$40	\$45	\$51	\$57	\$63	\$75
\$39,001 - \$48,000	\$35	\$35	\$35	\$40	\$45	\$51	\$57
\$48,001 - \$52,000	\$35	\$35	\$35	\$35	\$35	\$40	\$45
Over \$52,001	\$35	\$35	\$35	\$35	\$35	\$35	\$35

Household Income (After Tax)	Household Size (Number of people living in household) Energy Intensive						
	1	2	3	4	5	6	7+
< \$28,000	\$68	\$68	\$75	\$83	\$90	\$113	\$113
\$28,001 - \$39,000	\$60	\$60	\$68	\$75	\$83	\$90	\$113
\$39,001 - \$48,000	\$52	\$52	\$52	\$60	\$68	\$75	\$83
\$48,001 - \$52,000	\$52	\$52	\$52	\$52	\$52	\$60	\$68
Over \$52,001	\$52	\$52	\$52	\$52	\$52	\$52	\$52

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Red cells: new eligibility categories under Ontario's Fair Hydro Plan that came into effect on May 1, 2017.²⁴

Orange cells [graphic needs to be fixed]: new eligibility categories to ensure that OESP is available to those deemed financially eligible for social assistance (Ontario Works, Ontario Disability Support Program) but were previously ineligible for OESP.²⁵

Purple cells: new eligibility categories to ensure that, if financial eligibility categories for social assistance change in the future, clients will remain eligible for OESP.²⁶

Electricity customers are eligible if they meet the household size and income requirements for the program. The amounts of the basic credits are [below / in Table X].

Table X: Amounts of Monthly Credits of Ontario Electricity Support Program (OESP) by Household Income Level³⁰

²⁴ Amount prescribed in section s. 5(2)(c) in O. Reg. 314/15 (OESP) of OEBA

<https://www.ontario.ca/laws/regulation/150314>

²⁵ Amount prescribed in section s. 5(2)(b) in O. Reg. 314/15 (OESP) of OEBA

<https://www.ontario.ca/laws/regulation/150314>

²⁶ Amount prescribed in section s. 5(2)(i) in O. Reg. 314/15 (OESP) of OEBA.

<https://www.ontario.ca/laws/regulation/150314>

²⁷ Category included under Schedule 1, s. 1, 2, 5 and 7 in O. Reg. 314/15 (OESP) of OEBA

<https://www.ontario.ca/laws/regulation/150314>

²⁸ Category included under Schedule 1, ss. 2(iv) in O. Reg. 314/15 (OESP) of OEBA

<https://www.ontario.ca/laws/regulation/150314>

²⁹ Category included under Schedule 1, ss. 1(iii) in O. Reg. 314/15 (OESP) of OEBA

<https://www.ontario.ca/laws/regulation/150314>

Household Income (After Tax)	Household Size (Number of people living in household)						
	1	2	3	4	5	6	7+
\$28,000 or less	\$45	\$45	\$51	\$57	\$63	\$75	\$75
\$28,001 - \$39,000		\$40	\$45	\$51	\$57	\$63	\$75
\$39,001 - \$48,000			\$35	\$40	\$45	\$51	\$57
\$48,001 - \$52,000					\$35	\$40	\$45

If a customer is eligible, uses electric heat as the primary heating source, has certain electrically intensive medical devices, or is Indigenous or lives with Indigenous family members, the OESP provides an enhanced credit (Table Y).

Table Y: Amounts of Monthly Credits of Ontario Electricity Support Program (OESP) by Household Income Level – Energy Intensive ³¹							
Household Income (After Tax)	Household Size (Number of people living in household)						
	1	2	3	4	5	6	7+
\$28,000 or less	\$68	\$68	\$75	\$83	\$90	\$113	\$113
\$28,001 - \$39,000		\$60	\$68	\$75	\$83	\$90	\$113
\$39,001 - \$48,000			\$52	\$60	\$68	\$75	\$83
\$48,001 - \$52,000					\$52	\$60	\$68

Ontario is also working to improve co-ordination across provincial programs that provide support to low-income Ontarians. Synchronizing the OESP with other social assistance programs will help get more vulnerable consumers into the program so they can receive the support they need on electricity bills.

Distribution Rate Protection

The Rural or Remote Rate Protection program subsidizes the distribution rates paid by rural and remote customers who face higher distribution costs compared to less rural areas³².

Ontario has expanded this rate protection to provide distribution rate relief to residential customers served by LDCs with some of the highest rates³³. About 800,000³⁴ customers will

Commented [SPA8]: Move footnote to the end of the statement.

³⁰ Source Needed

³¹ Source Needed

³² Source needed

³³ Source needed

³⁴ Internal Ministry of Energy analysis, estimated from Hydro One R1 and R2 customers benefiting from DRP, plus eligible customers from 7 smaller LDCs.

now benefit from the enhanced distribution rate protection.

LDCs whose customers are benefiting from the enhanced distribution rate protection include: Hydro One (medium- and low-density rate classes), Northern Ontario Wires, Lakeland Power (Parry Sound service territory), Chapleau, Sioux Lookout, InnPower, Atikokan and Algoma³⁵. The level of benefits differs from utility to utility³⁶.

On-reserve Credit

The First Nations Delivery Credit benefits up to 21,500 residential customers³⁷ living on reserves. The costs are being funded by provincial revenues³⁸.

Commented [LT9]: Mention Political Accord

Response: We speak to this in detail in chapter 7.

The credit provides much needed relief ~~to from the high electricity costs faced by First Nation on-reserve communities from the high costs of electricity households~~ and encourages their socio-economic well-being. This is an important step towards reconciliation and the strengthening of Ontario's ~~the relationship with~~ between Ontario and First Nations.

Text Box:

"The elimination of the delivery charge will assist our citizens by reducing energy poverty in our communities. It also represents recognition for the use of the land in the development and expansion of the provincial energy grid," said Ontario Regional Chief Isadore Day. "Poverty, lack of opportunity and choosing to pay for electricity over food is a reality that affects our people. ~~Today's Ontario's commitment by the Ontario government~~ is commendable and allows a path forward for greater quality of life for First Nations in Ontario."

Ontario Regional Chief Isadore Day (Date?)

Industrial Conservation Initiative

The Industrial Conservation Initiative (ICI) provides incentives to large electricity consumers to reduce their consumption during peak hours and lower their electricity costs during peak hours³⁹. This also benefits the electricity system by deferring the longer-term need for new peaking generation⁴⁰.

³⁵ Source needed

³⁶ Source needed

³⁷ OEB report on First Nation Rate, <https://www.oeb.ca/industry/policy-initiatives-and-consultations/options-appropriate-rate-assistance-program-reserve>

³⁸ Source needed

³⁹ Source needed

⁴⁰ Source needed

To give more businesses the opportunity to participate in the ICI, Ontario has lowered the threshold for entry and increased the number of companies that can benefit. As of July 1, 2017, all customers with an average monthly peak demand of greater than one megawatt (MW) are eligible for the program. In addition, small manufacturing companies and greenhouses with average monthly peak demand greater than 500 kW and one MW or less are also eligible.⁴¹

Commented [LT10]: Use example from Min tour(s) / new users.

Response: Ministry is unable confirm any new participants in the program. IESO is expected to provide a list of participants by late August, could be included in a later iteration.

Affordability Fund

The Affordability Fund helps those Ontarians not eligible for low-income conservation programs, but and who have a need for financial assistance to improve the energy efficiency of their homes⁴². The fund is expected to pay for the installation of household improvements such as energy-saving LED light bulbs, power bars, better insulation, and energy efficient window air conditioners and refrigerators⁴³.

The Affordability Fund is administered by an independent trust that distributes funds to the electricity distributors that apply⁴⁴. Distributors, working with community partners are in the best position to provide energy efficiency improvements to consumers in need of assistance. Ontario will continue to plan for the integration of conservation and low-carbon technology in the province's energy system.

Refinancing the Global Adjustment to Ensure Intergenerational Fairness

Ontario's Fair Hydro Plan helps consumers by refinancing a portion of the Global Adjustment (GA)⁴⁵. The GA pays costs associated with contracted generation and as well as conservation and demand management programs in Ontario⁴⁶.

The majority of the province's electricity generators have 20-year contracts, but many facilities are expected to operate beyond the life of those contracts and provide additional benefits for Ontarians in the future⁴⁷. Similarly, the savings resulting from conservation programs paid for by the GA will persist for about 13 years⁴⁸.

Present-day consumers should not be burdened with paying a disproportionate share of investments that will give provide benefits for decades to come. To relieve the burden on

⁴¹ Ontario Regulation 429/04

⁴² Source needed

⁴³ Source needed

⁴⁴ Source needed

⁴⁵ Source needed

⁴⁶ Source needed

⁴⁷ Source needed

⁴⁸ [Source Needed- staff confirming with IESO] As determined by the IESO, based on the 2016 Verified Results for Conservation First Framework

today's ratepayers and share costs more fairly with future generations, a portion of the GA is being refinanced to spread the cost of electricity investments over a longer period of time⁴⁹. This refinancing, which reflects the expected longer life cycle of the existing facilities, will provide significant and immediate rate relief and help ensure greater intergenerational fairness.

New Expanding the Low-Income Conservation Program

To increase its support enhance and improve the availability of conservation programs helping low-income customers and increase their availability, the Province directed the Independent Electricity System Operator (IESO) in August 2017 to centrally design, fund and deliver a Home Assistance Program conservation program for all LDC service territories low-income customers⁵⁰. The program, beginning to start in January 2018, is expected to increase the benefit enhance and increase access seen in existing programs to the Save on Energy Home Assistance Program⁵¹. LDCs may continue to deliver their own program if they demonstrate a commitment to serve the sector low-income customer sector, as determined by the IESO⁵².

Existing Help for Families and Individuals

The measures included in Ontario's Fair Hydro Plan build on existing programs that Ontario families and individuals can use to pay their electricity bills. This assistance includes:

- the Ontario Energy and Property Tax Credit, for low- to moderate-income individuals;
- low-income Energy Assistance Programs, for emergency situations;
- the Save on Energy Home Assistance Program, that which provides free home energy efficiency assessments and upgrades to low-income consumers; and
- the Northern Ontario Energy Credit, for low- to middle-income families and individuals living in Northern Ontario⁵³.

Existing Help for Businesses and Industry

There are a number of measures already in place to lower electricity prices for help industries, business and commercial operations and institutions, lower their electricity costs. These measures include:

⁴⁹ Source needed

⁵⁰ Source needed

⁵¹ Source needed

⁵² Source needed

⁵³ Source needed

- the Industrial Accelerator Program, which assists eligible transmission-connected companies and their distribution-connected sites to fast-track the capital investment needed for major energy conservation projects;
- the Save on Energy for Business programs, which provide financial incentives that help distribution-connected businesses to reduce their electricity use and manage costs through energy audits, retrofits and process and system improvements; and
- the Northern Industrial Electricity Rate Program, which provides rate rebates to northern energy intensive industries facing competitiveness pressures due to higher energy costs and. The program also assists industrial consumers in developing and implementing energy management plans to manage their usage and reduce costs⁵⁴.

Commented [AH(11)]: From JM: Do we mean businesses here? Consumers makes it sound like this program is also available to residential customers.

In addition to these measures, Ontario is looking for new ways to provide electricity rate assistance to consumers that are too large to be eligible for the OEB's Regulated Price Plan (RPP) and too small for the ICI program. For example, the Ontario Energy Board (OEB) is considering changes to the way the GA is charged to these consumers, also known as non-RPP Class B consumers⁵⁵. For these consumers, the GA is a fixed monthly charge that is the same regardless of the time that they consume electricity⁵⁶. A GA charge that varies with time of use would lower prices for some Class B consumers and encourage more efficient consumption⁵⁷.

Commented [ENE12]: The OEB will not have another chance to review. Please assign fact to a Division of Energy.

Ontario will continue to explore innovative ways to provide assistance to these mid-sized consumers, while always striving to increase system efficiency. The Province will continue to engage with businesses to explore options that provide them with support for electricity costs and meet communities' priorities for economic development.

Electricity Price Forecast

[Placeholder for residential and industrial price curves with the impact of OFHP included]. The 2017 LTEP residential price outlook shows progress compared to earlier versions of the LTEP in 2010 and 2013⁵⁸. The 2017 LTEP residential price outlook remains below the 2013 LTEP outlook for the full forecast horizon due to the OFHP, as well as removing costs from the electricity system, anticipated benefits from implementing Market Renewal initiatives, and a more efficient consumption of electricity⁵⁹. The outlook also considers the impacts of cap and trade and assumes that some of our generation assets will continue to be available for the duration of the planning outlook⁶⁰.

⁵⁴ Source needed

⁵⁵ Source needed

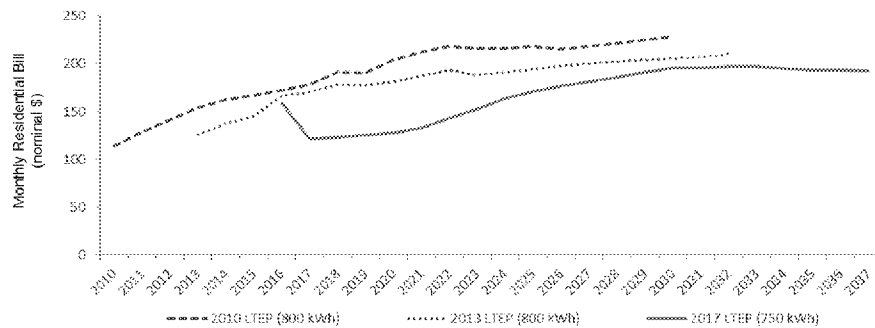
⁵⁶ Source needed

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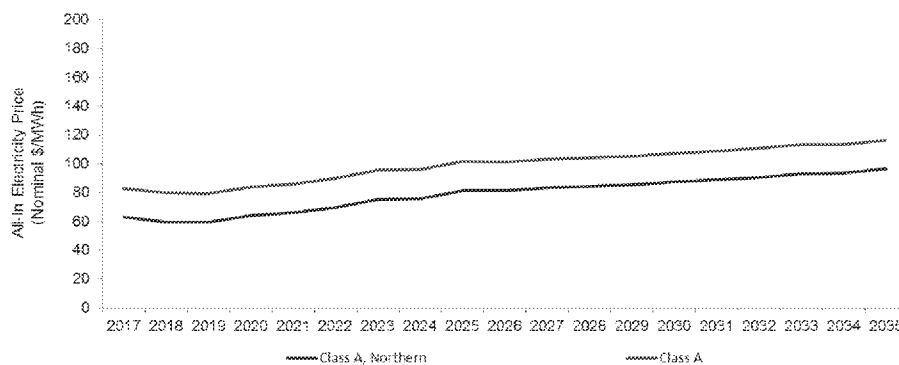
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As seen below in *Figure X*, the 2017 LTEP price outlook for large industrial electricity consumers reflects average increases in line with inflation over the forecast period⁶¹. The actual price paid by a large industrial electricity consumer is dependent on their consumption patterns and can vary between industries and specific consumers⁶².

Currently, the electricity price for industrial electricity consumers in Ontario is within 5 per cent of the United States average as reported by the U.S. Energy Information Administration⁶³. Consumers in Northern Ontario that participate in the NIERP program can achieve even lower rates⁶⁴.



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Increasing Consumer Protection

On January 1, 2017, new provisions of the *Energy Consumer Protection Act, 2010*, came into force that protect Ontario consumers from fraudulent claims and high-pressure sales tactics by restricting the door-to-door sale of energy contracts⁶⁵. Additionally, in February 2017, the *Protecting Vulnerable Energy Consumers, Act, 2017* gave the Ontario Energy Board (OEB) in February 2017 the authority to prohibit disconnections during certain periods of time, such as winter⁶⁶. The Province will now turn its attention to protecting those consumers who live in condominiums and other multi-unit residential buildings and are served by unit submeter providers (USMPs).

USMPs are private companies that meter and send bills directly to the residents of the individual units in multi-unit residential buildings for the electricity they consume. The OEB currently licenses 28 USMPs, who that provide services to 2,500 buildings with 326,000 individual units metered.⁶⁷ The residential customers inherit the pricing arrangements; costs are set by the owner or developer of the building or by the condominium board⁶⁸.

Commented [ENE13]: The OEB will not have another chance to review. Please assign fact to a Division of Energy.

Consumers have told both the Province and the OEB that they would like to know more about how these decisions are made and what they are being asked to pay for⁶⁹. That is why the Province will enable the OEB to increase its oversight of submetering companies and bring in new consumer protection measures.

Improving consumer protection and taking a more stringent approach to regulation would give the OEB more insight into how these submetering companies determine their costs and set their rates and how they set up their contractual agreements with developers.

Consumers living in condominiums and other multi-unit residential buildings will benefit from having the same protections as LDC customers, including:

- clarity about what goes into the prices they are charged;
- protection from winter disconnections; and
- the ability to appeal unfair practices to the OEB⁷⁰.

The OEB has made it a priority to complete a review of these issues.

⁶⁵ Source needed

⁶⁶ Source needed

⁶⁷ Ontario Energy Board Briefing for Minister of Energy on USMPs June 27, 2017

⁶⁸ Source needed

⁶⁹ Source needed

⁷⁰ Source needed

Natural Gas Expansion

Ontario wants to expand access to natural gas to give customers greater choice in their energy supply and to aid the economic development of their communities. To do this, the Province launched a new \$100 million Natural Gas Grant Program in April 2017, administered by the Ministry of Infrastructure.⁷¹ It supports both the expansion of natural gas pipelines and the construction of new infrastructure for liquefied or compressed natural gas⁷². The average consumer could save an estimated \$1,100 a year⁷³ under this program by switching from heating with oil to using natural gas.

Commented [ENE14]: MOI will not have another chance to review. Please assign facts to a division of ENE.

A new regulatory framework issued by the OEB in November 2016⁷⁴ makes natural gas expansion more economically feasible for unserved communities by giving utilities more flexibility in how they structure their rates. The framework also encourages multiple utilities to use rate competition when applying to the OEB to serve these communities. On August 10, 2017, the OEB released its first decision under the new framework, approving an expansion of natural gas service to several communities.⁷⁵ Natural gas is one of several different energy options that provide greater consumer choice and can help to reduce overall energy costs.

Commented [SPA15]: Move footnote to the end of the statement.

Commented [ENE16]: The OEB will not have another chance to review. Please assign fact to a Division of Energy.

Gasoline Price Review

Northern and remote communities have raised concerns about the high cost of gasoline. As a result, the Province directed the OEB to review the operation of Ontario's retail market for gasoline and diesel fuel.

The Gasoline Price Review will focus on three main topics:

- the extent and causes of variations in retail prices over time and between one region and another in Ontario;
- how pricing and markets in Ontario compare with other jurisdictions; and
- the information available to consumers about pricing and price variations.

The OEB expects to report on its findings later this year. The Province will review the OEB's report in detail and consider the information in its future decision-making.

⁷¹ News Release: Expanding Natural Gas to More Communities Across Ontario, Ministry of Infrastructure, January 30, 2017 and <http://www.infrastructureontario.ca/NGGP/>

⁷² Source needed

⁷³ News Release: Expanding Natural Gas to More Communities Across Ontario, Ministry of Infrastructure, January 30, 2017

⁷⁴ OEB Decision EB-2016-004, Generic Proceeding on Community Expansion (Natural Gas), November 17, 2016

⁷⁵ OEB Decision EB-2015-0179, Union Gas Community Expansion Application

Summary

- Ontario's Fair Hydro Plan lowers electricity bills by 25 per cent for a typical residential consumer. As many as half a million small businesses and farms are also benefiting from the reduction. Ontario's Fair Hydro Plan builds on previous actions that reduced electricity costs for families, farms and businesses.
- Ontario will share the costs of existing electricity investments more fairly with future generations by refinancing a portion of the Global Adjustment, spreading the cost of the investments over a longer period of time.
- ~~The Province will keep forecast residential and industrial electricity prices over the outlook period below the level forecast in the 2013 Long-Term Energy Plan.~~
- ~~Ontario will enhance consumer protection by giving the Ontario Energy Board increased regulatory authority over unit submeter providers (USMPs) to gain better insight into USMP costs and rates, and their contractual agreements with developers.~~
- ~~The expansion of the Industrial Conservation Initiative will encourage more businesses to lower their electricity costs by reducing their consumption during peak hours.~~
- ~~Ontario will continue to support expanded access to natural gas, giving customers greater choice and aiding in the economic development of their communities.~~
- Residential customers served by local distribution companies with some of the highest rates are getting enhanced distribution rate protection. This will save eligible customers as much as 40 or 50 per cent on their electricity bills.
- The First Nations Delivery Credit reduces the monthly electricity bills of on-reserve First Nation residential customers of licensed distributors.

Commented [CD(17)]: Pending confirmation in final modelling

- ~~Residential electricity prices over the 2017 LTEP outlook period are forecast to remain below the level forecast in the 2013 LTEP. The outlook for electricity prices for large business reflects average increases in line with inflation over the forecast period.~~
- ~~Ontario will enhance consumer protection by giving the Ontario Energy Board increased regulatory authority over unit sub-meter providers.~~
- ~~Ontario will continue to support expanded access to natural gas, giving customers greater choice and aiding in the economic development of their communities.~~

Chapter 2. Ensuring a Flexible Energy System

Ontario has made significant progress in rebuilding its electricity system. Of the more than \$50 billion invested in Ontario's electricity system since 2003, over \$35 billion has been focussed on ensuring Ontario's households and businesses have a clean and reliable supply of electricity.⁷⁶

Commented [ENE18]: SNAP and ESP

⁷⁶ <https://news.ontario.ca/mei/en/2016/10/ontario-passes-legislation-to-reduce-electricity-costs-for-families-and-businesses.html> Ministry

This is in addition to the much-needed upgrades the Province made to its transmission and distribution systems. Ontario now has an electricity system that is well-positioned to pursue emerging opportunities and meet future challenges, including the fight against climate change.⁷⁷

Text Box: What We Heard from You

- ~~First consider~~ Consider costs first when deciding on supply
- Use a technology-neutral competitive process to acquire electricity supply
- Optimise use of our existing energy facilities and infrastructure, including nuclear generation
- Acquire more power from neighboring jurisdictions
- Both support and concerns expressed about nuclear and ~~renewables~~ renewable generation
- Storage can solve problems⁷⁸

Ontario's electricity system provides the province with a firm base on which to take further steps to fight climate change. Currently, the province's fuels sector supplies most of the energy needed for our transportation, heating and manufacturing⁷⁹. Our clean and reliable electricity system can provide us with enough energy to electrify further sectors of the economy and reduce greenhouse gas emissions⁸⁰. The province's existing network of pipelines and retail outlets can also be used to deliver future alternative fuels, such as renewable natural gas⁸¹.

The Need for Flexibility

Ontario is moving towards a new market-based approach⁸² that will ensure the province can reduce the costs of the electricity supply it needs and have the flexibility the electricity system requires to meet future challenges, such as shifting to a lower-carbon economy. While the structure and mechanisms of the current electricity market have kept the lights on in Ontario, it is time to keep up with the pace of change and adjust them to meet-keep pace with our evolving supply mix. Ontario is now moving away from relying on the long-term contracts that have ensured to ensure it has a sufficient supply of electricity. The more competitive, market-based approach that Ontario is moving towards can provide a cost-effective supply of electricity and the flexibility to react

⁷⁷ Source needed

⁷⁸ Source needed

⁷⁹ Source needed

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quickly to changing needs⁸⁴. System operators in New England, New York and the Pennsylvania-New Jersey-Maryland interconnection have successfully implemented this type of approach⁸⁵.

Our current robust supply provides us with the ideal conditions to take the time that's necessary⁸⁶ needed to explore new approaches to procuring electricity resources and to implement them efficiently. These approaches will need to be designed to be robust and flexible enough to ensure that Ontario is well positioned to accommodate and benefit from rapidly changing⁸⁷ emerging energy technologies.

Due to the substantial decline in the cost of renewable technologies over the last decade⁸⁸, particularly in wind and solar, renewables are becoming increasingly competitive with conventional energy sources and will continue to play a key role in helping Ontario meet its climate change goals, as well as meeting system needs. Changes will need to be made to the market to ensure, while also ensuring that system needs, including the need for increased flexibility, are met at the lowest cost to ratepayers.

Commented [AL19]: Need to be clear whether it is referring to an attribute of supply resources or an attribute of processes.

To meet our long-term needs, the Independent Electricity System Operator (IESO) has begun a Market Renewal initiative to redesign the province's electricity markets. This undertaking is expected to save up to \$5.2 billion between 2021 and 2031⁸⁹ and forms a key component of Ontario's plan to bring down the cost of electricity. The IESO is developing a capacity auction that will use competition to secure the resources we need, regardless of the technology⁹⁰. This process would be used to secure the

The incremental capacity required to meet Ontario's forecasted requirements for supply and resource adequacy requirements, would be in addition to the already contracted resources. Upgrades and expansions to existing generators, demand response providers, importers and emerging new technologies could all participate in the auction, with the lowest-cost resources winning out, most cost-effective resources winning out.

Commented [BE20]: See comment 21 – move this section here.

provide flexibility, reliability and ancillary services. This will help provide transparent revenue streams for the needed services, and ensure that all resources can compete on a level playing field.

⁸⁴ Source needed

⁸⁵ Source needed

⁸⁶ Ontario Planning Outlook (Pg. 13) reports solar PV module prices have declined by 70-80 per cent over the last decade.

⁸⁷ Brattle Group, prepared for the IESO, A Benefits Case Assessment of the Market Renewal Project (2017)

⁸⁸ Source needed

⁸⁹ Source needed

Market Renewal is expected to ultimately result in a more competitive marketplace that more flexibly and efficiently meets system needs under [REDACTED] Market Renewal will be aligned with the objectives of Ontario's Climate Change Action Plan, and related initiatives will be designed to reduce GHG emissions and ratepayer costs and meet system needs⁹¹. It can be flexible enough to meet various demand outlook scenarios for electricity demand, from higher demand scenarios due to increased electrification of our economy to lower demand scenarios as a result of increased behind-the-meter resources. Market Renewal will also help Ontario prepare for the future by creating a competitive framework to effectively incorporate new and emerging technologies that, together with cap and trade, will help to ensure Ontario's climate change commitments are met, use of distributed energy.

Commented [BE21]: I would move this up to the auction part

Market Renewal will help Ontario prepare for the future by creating a competitive framework that cost-effectively incorporates clean energy resources and new and emerging clean technologies.

[REDACTED] property value, environmental attributes and the benefits they provide to the system. At the same time, [REDACTED]

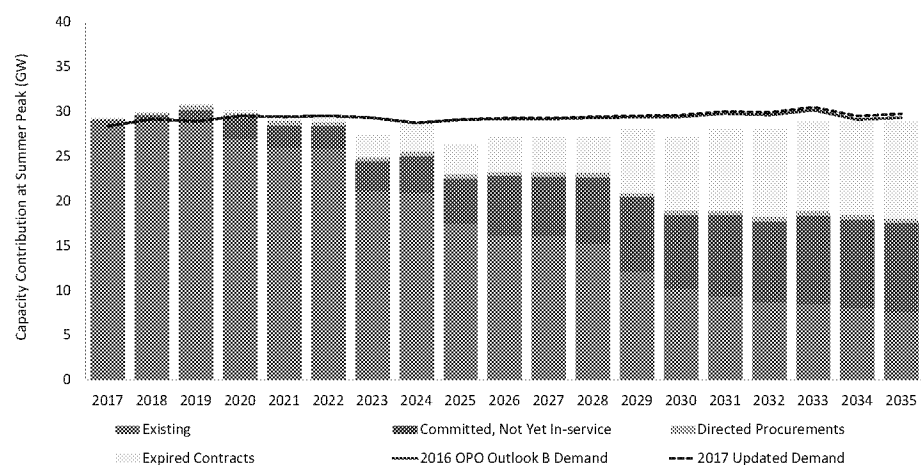
A reformed electricity market would not only help reduce costs, but also increase two-way electricity trade with other jurisdictions. Imports and exports could be scheduled more frequently on the interties, which are the transmission lines going to states and other provinces. This could allow more imports of lower-cost generation, and provide greater revenue and flexible access to export markets for Ontario generators⁹².

The IESO is working closely with partners in the electricity sector to develop high-level designs and a plan for bringing in the significant changes that will become the foundation of Market Renewal. The plan will set out specify the specific changes to be implemented and the timelines for completing the work. This will allow the IESO and its partners to address the known challenges of our existing markets while laying and lay a solid foundation for a more competitive and flexible energy market that can meet future needs.

Electricity: Supply and Demand

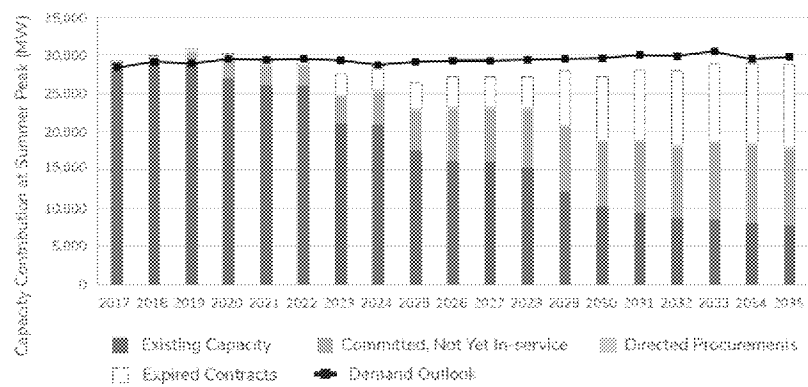
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While there is currently a robust supply of electricity⁹⁷, a shortfall in capacity is expected when existing contracts begin to expire and the Pickering Nuclear Generating Station reaches its end of life in the early 2020s⁹⁸.



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Supply and Demand Outlook (2017-2035)



This need for additional capacity requirement will be met through the IESO's proposed incremental capacity auction. The auction, together with a robust energy market, will allow existing and new clean generation facilities to compete within a robust energy market with

⁹⁷ Source needed

⁹⁸ Source needed

clean imports, and demand-side initiatives. The and new emerging technologies. In addition, the continued growth of embedded distribution-connected wind and solar power is also expected to reduce local demand and the need for grid-supplied electricity from the province's transmission networks⁹⁹.

Demand is forecast to be relatively steady over the 20-year planning period of *Delivering Fairness and Choice*¹⁰⁰. In the long-term, the IESO projects an increase in overall demand as electrification of the economy increases¹⁰¹. The potential for possibility of electrification exists in nearly every part of society¹⁰². In particular, there is a great potential for electrification in the transportation sector, where it would be an economical and clean alternative to fossil-fuel powered engines¹⁰³. The IESO's outlook assumes that there will be approximately 2.4 million electric vehicles on the road by 2035, up from about 9,000 electric vehicles in Ontario at the end of 2016.¹⁰⁴

Transmission Forecast

The IESO's outlook for demand indicates there will be no need for any major expansion of the province's transmission system, beyond the projects already planned or under development¹⁰⁵. [TBD: IESO to input transmission outlook]¹⁰⁶. See figure x on page x for some of the major projects planned or underway on the high-voltage transmission system. Regional electricity needs are discussed in Chapter 8.

Commented [AL22]: Noting that this statement was made in the OPO under the "business as usual" case with no further renewable needs and also excluded any potential needs identified through Regional Planning

The Province will direct the IESO to establish a formal process for planning the future of the integrated province-wide bulk system, which includes the high voltage system that typically carries 230 and 500 kilovolts in Ontario. As part of the process, the IESO will engage with its partners and communities around the province.

Commented [AL23]: This will be broader than transmission, as the bulk process will also consider resources. May not fit under existing heading.

Major Province-Wide Transmission Projects Under Development Across Ontario¹⁰⁷

⁹⁹ Source needed

¹⁰⁰ Source needed

¹⁰¹ Source needed

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¹⁰³ Source needed

¹⁰⁴ IESO, Ontario Planning Outlook; FleetCarma

¹⁰⁵ TBD based on IESO modelling

¹⁰⁶ TBD based on IESO modelling

Hawthorne to Merivale

IESO, Ontario- Quebec Interconnection Capability: A Technical Review, page 19, <http://www.ieso.ca/-/media/files/ieso/document-library/power-data/supply/intertiereport-20170508.pdf?la=en> ; and Hydro One's 2017/18 transmission rate application, Exhibit B1, Tab 3, Schedule 3, pages 7 and 10 of 35, http://www.hydroone.com/RegulatoryAffairs/EB20160160/HONI_Tx_Appl_Ex_B1_20160531.pdf

Clarington Transformer Station

|

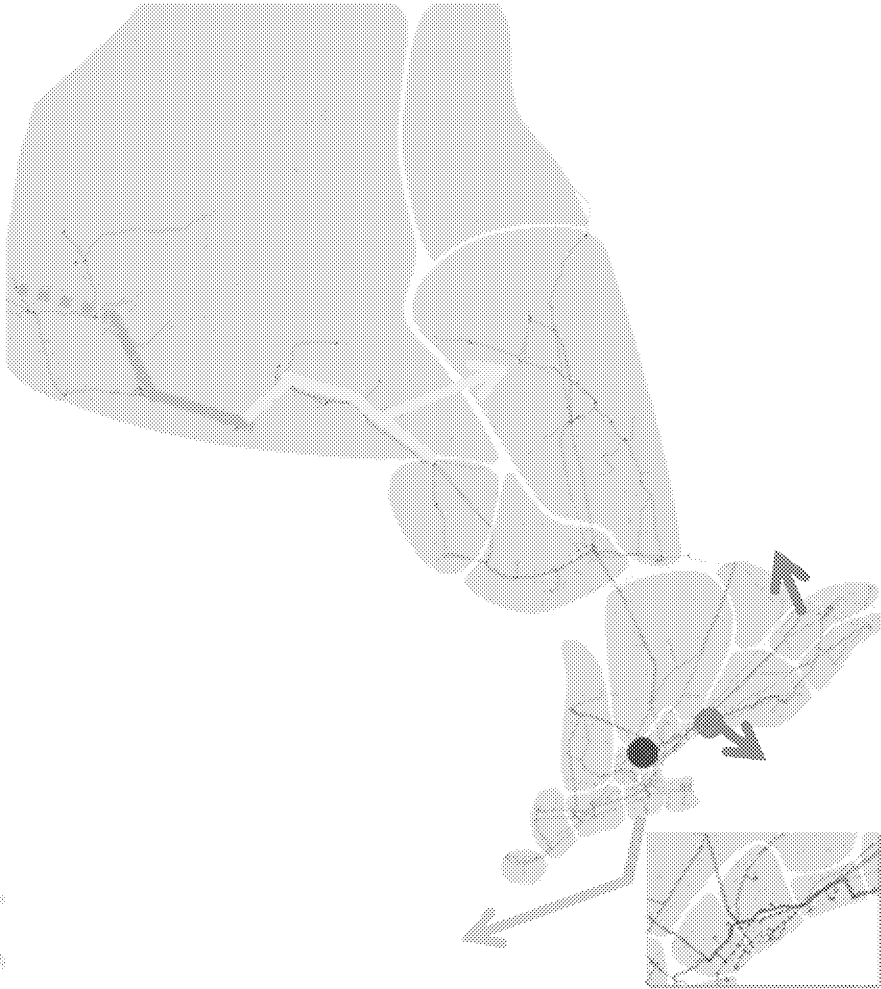
<http://www.hydroone.com/Projects/Clarington/Pages/default.aspx>;
<http://www.hydroone.com/Projects/Clarington/Pages/Timeline.aspx>;

GTA West Bulk Reinforcement

<http://www.ieso.ca/-/media/files/ieso/document-library/regional-planning/northwest-greater-toronto/2015-northwest-gta-irrp-report.pdf?la=en>; <http://www.ieso.ca/get-involved/regional-planning/gta-and-central-ontario/gta-west>

Lake Erie Connector

<http://www.itclakeerieconnector.com/>



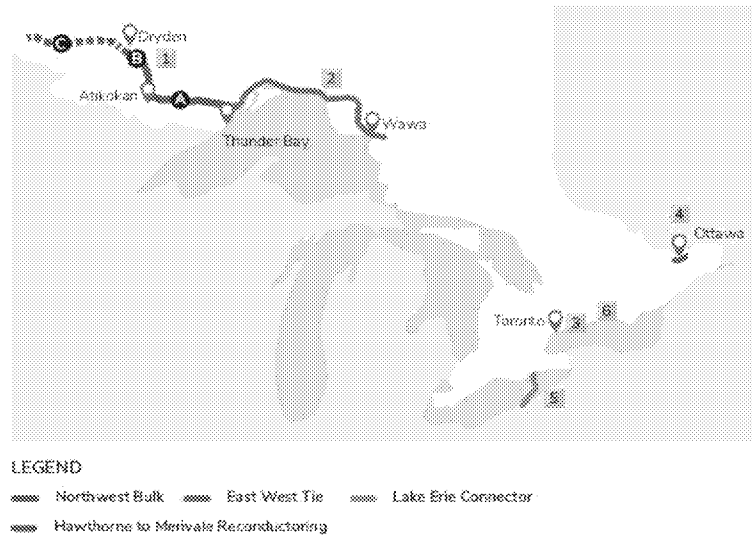
Commented [LT24]: EW tie language must be changed.

Response: Some updates were made, but further edits may be needed in next iteration.

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Major Province-Wide Transmission Projects Under Development



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Text Boxes:

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Northwest Bulk Transmission Line

The Northwest Bulk line is needed to support growth and maintain a reliable electricity supply to areas west of Atikokan and north of Dryden. The project will proceed in phases:

- Phase One ~~is~~ a line from Thunder Bay to Atikokan ~~and~~ should come into service as soon as is practical, and no later than 2024.
- Phase Two ~~will be~~ a line from Atikokan to Dryden ~~and~~ should come into service by 2034 unless IESO's outlook on the demand forecast suggests an earlier date.
- Phase Three ~~will be~~ a line from Dryden to the Manitoba border ~~that is~~ could be needed ~~post-after~~ 2035 (or earlier if recommended by the IESO) to ~~accommodate~~ enable the better integration of provincial electricity grids.
- Development work for ~~the first two phases~~ Phases One and Two will proceed at the same time.

East-West Tie Transmission Line

The East-West Tie Line ~~will~~ would provide a long-term, reliable supply of electricity to meet the growth in demand and changes to the supply mix in Northwest Ontario.

Commented [AL26]: IESO is currently undertaking the needs assessment to confirm whether or not the East West Tie is the recommended alternative. This may imply a decision has been made.

As the project has moved through development, estimates on its total cost have increased. This is a concern, as Ontario is focussed on making the electricity system more cost-effective. The Province will review all options to ensure that the project is built for a cost that is fair to Ontario ratepayers.

Hawthorne to Merivale

The 230 kV circuits between Hawthorne and Merivale transformer stations require upgrades to their capability so that Ontario can optimize the use of its interties with Québec. [REDACTED]

GTA West Bulk Reinforcement

Growth in demand, the eventual retirement of the Pickering Nuclear Generating Station and new renewable generation across Ontario are all adding stress to the bulk transmission system in the western section of the Greater Toronto Area. The IESO is presently studying the need for and timing of reinforcements to the transmission system in the region. Transmission solutions being investigated include building new transmission lines along the existing Parkway belt west transmission corridor (between Milton SS to Hurontario SS) and expanding station facilities at the existing Milton switching station.

Clarington Transformer Stations

To meet the needs of the growing eastern GTA and prepare for the eventual retirement of Pickering Nuclear Generating Station, Hydro One is building the Clarington Transformer Station in the Municipality of Clarington. [REDACTED]

Lake Erie Connector

ITC Lake Erie Connector LLC is proposing to build a 1,000 MW High Voltage Direct Current transmission cable under Lake Erie, running from Nanticoke, Ontario to Erie County, Pennsylvania. The two-way line would provide the first direct link between Ontario electricity markets and markets in 13 states in the Eastern U.S. The ~~Generators~~ generators and electricity traders who would transmit electricity and related products over the line would pay the entire cost of the project. Under this merchant funding model, the costs of the project would not impact the transmission rates paid by Ontario ratepayers. ~~will pay none of the costs of building, operating or maintaining the line.~~

¹⁰⁸ Source needed

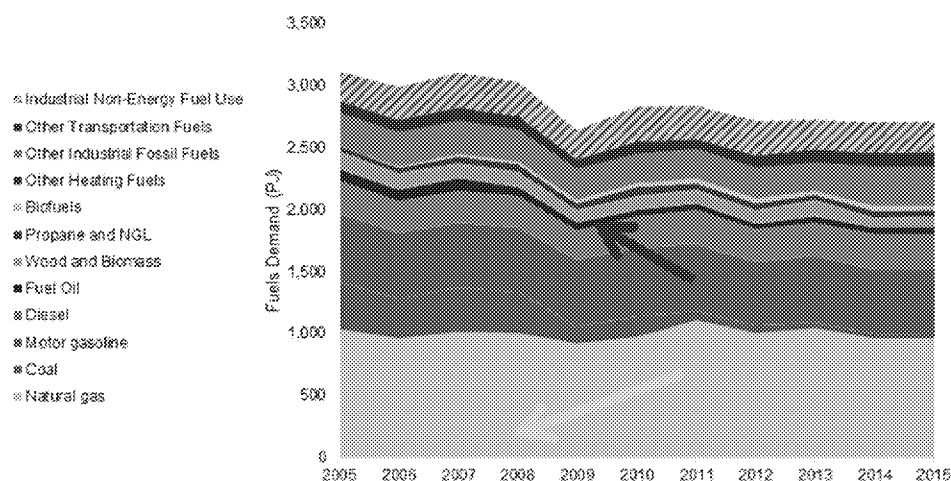
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Fuels: Supply and Demand

Delivering Fairness and Choice is not forecasting any issues with the supply of liquid fuels or natural gas and anticipates the industry will continue to reinvest and maintain its facilities in Ontario. While the existing infrastructure is likely to be sufficient for fossil fuels, new investments in processing and delivery may be required to handle increases in the use of alternative fuels such as ethanol, renewable natural gas, biodiesel and other biofuels.

{Placeholder pending further analysis/modelling}

Fuels are an important component of the province's economy, critical for households, businesses and industry¹¹⁰. Ontario's fuels sector is multi-faceted in its sources and uses. Natural gas and transportation fuels, such as gasoline and diesel, make up the majority of our supply. There are also a variety of "niche" fuels such as propane, wood and aviation fuel. Biofuels play a small but growing role¹¹¹.



Source: Fuels Technical Report, 2016.

Fuels consumption has generally trended downward between 2005-2015, largely due to the retirement of coal-fired generating stations¹¹². In the past few years, fuels consumption is relatively flat with lower use of natural gas being offset by higher use of transportation fuels.

¹¹⁰ Source needed

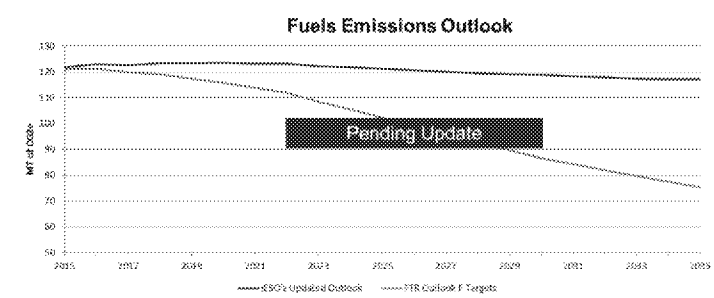
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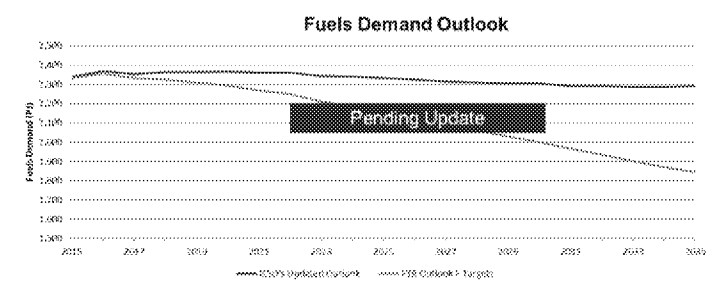
About 10 per cent of Ontario's fuels consumption is for non-energy uses such as feedstock for manufacturing (i.e., fuels are converted to consumer products rather than energy) ¹¹³.

Ontario's fuel supply is produced and delivered through a variety of means and markets, including those outside of the province such as our supply of crude oil and natural gas¹¹⁴. As such, the government does not have the same policy and planning functions as it does for electricity.

Nonetheless, Ontario's cap and trade program provides efficient, market-based incentives to transition from conventional fuels to renewable and lower-carbon sources. In addition, programs and initiatives in the Climate Change Action Plan (CCAP) and delivered by the Green Ontario Fund (COF) will further support efforts to decarbonize the fuels sector¹¹⁵. Over the next 20 years, the electrification of vehicles transportation, enhanced conservation and switching to lower-carbon fuels will be expected to transform the fuels sector¹¹⁶. As a result, both the demand for fuels and the emissions from the sector they release are expected to decline¹¹⁷.



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[placeholder for chart showing expired capacity over next 20 years]

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The outlook for supply and demand of fuels will ultimately depend on future policy and program decisions, as well as technological innovation and adoption, over the next 20 years. Given these uncertainties, the Province will continue to undertake modelling and analysis to identify opportunities to decarbonize the fuels sector consistent with the provincial target of reducing GHG emissions by 37 per cent from 1990 levels in 2030.

The Influence of the Carbon Market

On January 1, 2017, Ontario implemented a cap and trade program.¹¹⁸ Cap and trade will increase the cost of fossil fuels, but also influence how Ontario plans the province's energy supply and achieves cost-effective reductions in greenhouse gas (GHG) emissions¹¹⁹.

Fossil-fuelled generators must now face an additional cost due to account for the GHG emissions they produce when burning fossil fuels to generate electricity¹²⁰. This carbon cost accounts for part of the price of the electricity they offer into the wholesale market. It, which increases the relative competitiveness of non-emitting electricity generation and imports of clean energy imports from neighbouring jurisdictions¹²¹, which are not subject to this cost.

Consumers pay the carbon cost of fossil fuels such as natural gas, gasoline, diesel and propane because of cap and trade¹²². The Ontario Energy Board (OEB) has to approve the costs that regulated natural gas utilities incur when they comply with cap and trade, including the cost of acquiring emission allowances¹²³. These costs are then folded into the rates charged to their customers. Natural gas utilities that are not regulated by the OEB and large facilities that must independently comply with cap and trade can will decide on their own how to pass on manage their compliance costs their customers.

Commented [AL27]: Can or will?

Suppliers of other fuels in Ontario, such as gasoline, diesel and propane, operate in a competitive market. They are responsible for complying with cap and trade regulations¹²⁴ and are expected to pass through their compliance costs to retail consumers.

Maximizing Existing Assets

Delivering Fairness and Choice aims to limit any future cost increases for electricity consumers by maximizing the use of the province's existing energy assets. Ontario can do this because

¹¹⁸ <https://www.ontario.ca/page/cap-and-trade>

¹¹⁹ Source needed

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many of the electricity generation facilities that have been built in the last decade and a half will be able to generate power beyond their planned contract life¹²⁵.

Market Renewal will bring about a more competitive marketplace that, in the long run, will provide opportunities to improve the use of existing energy resources and enable future investments in new resources, both of which will support Ontario's climate change goals.

Commented [BE28]: It is important that MR related language is not tied to one particular technology group. It is better to include this in the introduction

Renewable Energy

Contracts for over 4,800 megawatts (MW) of wind energy, 2,100 MW of solar energy, and 1,200 MW of hydroelectric generation will expire between 2026 and 2035, with most expiring after 2030¹²⁶. While wind and solar contracts are ~~last~~ for 20 years¹²⁷, and hydroelectric contracts for 40 years¹²⁸, wind turbines and photovoltaic panels are often able to still generate electricity after their contracts expire¹²⁹ and we know from experience that hydroelectric facilities can operate for as long as a century¹³⁰. ~~In many cases, new or more efficient technology could be added to upgrade these renewable energy facilities so they could continue operating or even increase their output.~~

Commented [LT29]: Use ieso deck language.

Response: Not sure which deck this is. Extra content has been added.

Due to the substantial decline in the cost of wind and solar technologies over the last decade¹³¹, renewables are increasingly competitive with conventional energy sources and will continue to play a key role in helping Ontario meet its climate change goals.

Wind and Solar

In many cases, new or more efficient technology can be added to upgrade the province's wind and solar energy facilities so they can continue operating, increase their output, and provide additional system benefits¹³².

¹²⁵ Source needed

¹²⁶ Source Needed

¹²⁷ Source needed

¹²⁸ Source needed

¹²⁹ Source needed

¹³⁰ Source needed

¹³¹ Ontario Planning Outlook (Pg. 13) reports solar PV module prices have declined by 70-80 per cent over the last decade.

¹³² Source needed

Waterpower

There is an opportunity to get more from existing waterpower assets, including minimizing water spill and increasing operational flexibility¹³³. The performance of older hydroelectric projects can be improved by using new, more efficient turbines¹³⁴. With the growing need for flexibility in our electricity system¹³⁵, Ontario's pumped storage potential could also play an important role in the provision of services that ensure the electricity system operates reliably¹³⁶.

Natural Gas

The natural gas generating stations that produce electricity in Ontario can respond quickly to match any changes in demand¹³⁷. These generators can be relied upon to meet our needs during the province's periods of highest demand periods, including hot summer days and cold winter nights. Natural gas can also be used to ensure the reliability of the power supply when other generators are unavailable or require maintenance.

Commented [ENE30]: Recommend not requiring a source for this statement.

Most of Ontario's natural gas generating stations are expected to operate beyond the life of their contracts¹³⁸. This will be important over the coming decade, when additional electricity will be needed to replace the electricity that will be unavailable during ongoing nuclear refurbishments and with the retirement of the Pickering Nuclear Generating Station in 2024¹³⁹. In the early 2020s, it is forecasted that there will no longer be enough contracted and rate regulated facilities to meet reliability requirements¹⁴⁰.

Many of the existing generation contracts will expire over the same time frame¹⁴¹, predominantly the natural gas generators that came online in the 2006–14 period. These natural gas facilities could continue to generate electricity past their contract term, but only if they are more cost competitive relative to all other resources be available during times of peak demand by participating in the incremental capacity auctions being considered under Market Renewal, but only if they are more cost competitive relative to other resources.

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¹³⁸ IESO/Navigant (TBC)

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¹⁴⁰ IESO

¹⁴¹ Source needed

Refurbishing Nuclear

The most cost-effective option for producing the required baseload generation while producing/releasing no GHG emissions is to refurbish Ontario's nuclear generating stations¹⁴². Ontario is moving forward with the plans laid out in the 2013 LTEP to refurbish a total of 10 ten nuclear units between 2016 and 2033 – four units at Darlington and six units at Bruce¹⁴³.

The Darlington Nuclear Generating Station, in the Municipality of Clarington, is one of the world's best-performing nuclear power plants. The and the Bruce Nuclear Generating Station, in the Municipality of Kincardine, is are two of the largest world's best-performing nuclear facility operating anywhere in the world power plants¹⁴⁴. Together, Darlington and Bruce provide around 50 per cent of Ontario's electricity needs¹⁴⁵.

Refurbishing these 10 ten units will secure/lock-in over 9,800 MW of affordable, reliable and emission-free generation capacity for the long-term benefit of Ontario.¹⁴⁶ It will also support the 180 companies and 60,000 jobs that make up the province's globally recognized nuclear supply chain.¹⁴⁷

Ontario Power Generation (OPG) is taking a phased approach to refurbishing the Darlington Nuclear Generating Station¹⁴⁸. This approach benefits from the lessons learned during previous refurbishment projects, which highlighted the need for in-depth planning and preparation prior to starting the work¹⁴⁹.

In November 2015, OPG's Board of Directors approved a total estimated cost of \$12.8 billion for refurbishing all four Darlington units.¹⁵⁰ This includes all spending to-date, interest and inflation and is \$1.2 billion lower than OPG's original estimate in 2009.¹⁵¹

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¹⁴⁶ Ontario Ministry of Energy news releases for Darlington and Bruce refurbishments, <https://news.ontario.ca/mei/en/2016/01/ontario-moving-forward-with-nuclear-refurbishment-at-darlington-and-pursuing-continued-operations-at.html>, <https://news.ontario.ca/mei/en/2015/12/ontario-commits-to-future-in-nuclear-energy.html> Source Needed

¹⁴⁷ Power Workers Union website, <http://www.pwu.ca/news/opinion-editorials/post/ontario-delivers-good-news#.WX9vvpLytQI> Source Needed

¹⁴⁸ Source needed

¹⁴⁹ Source needed

¹⁵⁰ OPG 4th Quarter-2015 financial results, pg. 21, <http://www.opg.com/about/finance/Documents/160304CombinedNewsReleaseMDAOPGQ42015FINAL.pdf> Source Needed

In January 2016, Ontario gave OPG approval to proceed with refurbishing Unit 2¹⁵², the first of the Darlington units. On April 13, 2017, OPG announced it had successfully completed the first of four major elements of the refurbishing Unit 2 refurbishment and isolated the unit from the rest of the Darlington plant¹⁵³. OPG has now moved on to the next phase of work and is on track to complete the entire project on budget and on schedule.¹⁵⁴

The refurbishment and continued operation of Darlington will contribute a total of \$90 billion to Ontario's gross domestic product and increase employment by an average of 14,200 jobs annually.¹⁵⁵

On December 3, 2015, the IESO updated its contract with Bruce Power for the refurbishment of six nuclear units at the Bruce Nuclear Generating Station. Bruce Power plans to invest approximately \$13 billion of its own funds in the project.¹⁵⁶ Ontario further optimized the schedule for refurbishment in order to get the most value out of the existing nuclear units. The new schedule will see construction start in 2020, instead of the start date of 2016 that was previously estimated. This updated agreement saved \$1.7 billion for electricity customers, compared to the cost forecast in the 2013 LTEP.¹⁵⁷

Updated Nuclear Refurbishment Schedule

¹⁵¹ Ontario Ministry of Energy news release, <https://news.ontario.ca/mei/en/2016/01/ontario-moving-forward-with-nuclear-refurbishment-at-darlington-and-pursuing-continued-operations-at.html> Source Needed

¹⁵² Source needed

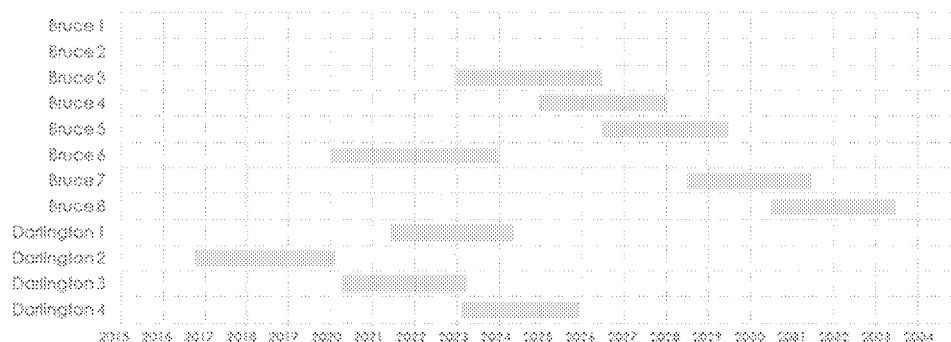
¹⁵³ Source needed

¹⁵⁴ OPG news release, http://www.opg.com/news-and-media/news-releases/Documents/20170413_RefurbMajorMilestone.pdf

¹⁵⁵ October 2016 economic impact study by Conference Board of Canada, pg. 12-13, http://www.opg.com/darlington-refurbishment/Documents/CBOC-DarlingtonContinuedOps_ImpactAnalysis.pdf

¹⁵⁶ Ontario Ministry of Energy news release, <https://news.ontario.ca/mei/en/2015/12/ontario-commits-to-future-in-nuclear-energy.html>

¹⁵⁷ Ontario Ministry of Energy news release, <https://news.ontario.ca/mei/en/2015/12/ontario-commits-to-future-in-nuclear-energy.html>



Text Box

Bruce Power and OPG Collaboration

As operators of Ontario's nuclear fleet, OPG and Bruce Power have a long-standing relationship, regularly sharing best practices and information with one another¹⁵⁸ on a regular basis.

On November 12, 2015, Bruce Power and OPG signed a Memorandum of Understanding (MOU) —that was facilitated by the Ministry of Energy— to formalize the collaboration between the two companies on nuclear refurbishment and power plant operation¹⁵⁹.

The MOU addressed a key objective of the 2013 LTEP¹⁶⁰ that the two companies work together to identify efficiencies and innovation that lower costs for ratepayers, share lessons learned on refurbishments and leverage economies of scale to ensure Ontario's refurbishments remain on time and on budget.

Bruce Power is currently undertaking a number of activities as part of the revised contract, including:

- implementing an asset management program to optimize the life of the Bruce units before and after refurbishment;
- developing a final cost estimate for refurbishing the first unit, Unit 6; and
- executing contracts with suppliers, including BWXT Canada and SNC-Lavalin¹⁶¹.

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The refurbishment of Bruce and its long-term operation of Bruce are expected to annually generate up to \$4 billion in economic benefits annually and increase employment by up to 22,000 jobs.¹⁶²

Bruce Power has begun a Nuclear Economic Development and Innovation Initiative with the County of Bruce to maximize the local economic impact of Bruce Power's \$13 billion investment¹⁶³. This program seeks to ensure there are long-term benefits for the counties of Bruce, Grey and Huron by:

- asking suppliers to open offices in Bruce, Grey and Huron counties, and hire local people; and
- giving preference to suppliers who generate jobs and economic benefit in Ontario and, where possible, operate close to the Bruce nuclear site¹⁶⁴.

This effort will have spin-off economic benefits for the region, such as the construction of new housing and added other facilities needed to accommodate the businesses and workers involved in this long-term project¹⁶⁵.

Text Box

ONTARIO COMPANIES PARTNERS WORKING ON NUCLEAR REFURBISHMENT

CAMECO

Cameco is one of the world's largest uranium companies, with facilities in Blind River, Cobourg and Port Hope.¹⁶⁶

In May 2017, Cameco agreed to continue supplying uranium fuel to Bruce Power for another 10 years, reducing the cost of electricity to Ontarians by an estimated \$200 million over the 10-year period. This stable partnership will also bring long-term economic benefits to the County of Northumberland.¹⁶⁷

¹⁶² 2016 economic impact study on Bruce refurbishment, pg. 5, <http://www.brucepower.com/wp-content/uploads/2016/11/Economic-Impact-Study-2016.pdf>

¹⁶³ Source needed

¹⁶⁴ Source needed

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¹⁶⁶ Cameco website, <https://www.cameco.com/about>

¹⁶⁷ Bruce Power news release, <http://www.brucepower.com/bruce-power-cameco-longterm-arrangement/>

Cameco is also supporting the Darlington refurbishment, and in May 2017 delivered a first shipment of more than 200 calandria tubes ahead of schedule and on budget.¹⁶⁸ Calandria tubes hold nuclear fuel and coolant and play a critical role in the safe and efficient operation of the reactor.

BWXT

~~BWXT Canada Ltd, headquartered~~ Headquartered in Cambridge, Ontario, BWXT Canada Ltd employs 850 people across the province and is a leader in the design, manufacturing, commissioning and servicing of nuclear power generation equipment.¹⁶⁹

BWXT played a key role in defueling Darlington's Unit 2 ahead of schedule.¹⁷⁰ The company will continue to manufacture ~~feeders—the feeder tubes~~ delivering that deliver coolant to the reactor —as part of the Darlington refurbishment program.¹⁷¹

BWXT will also supply eight new steam generators for the Bruce refurbishment. ~~The~~ That contract is worth about \$130.175 million and will secure more than 100 jobs.¹⁷²

Laker

LAKER

Laker Energy Products is a leading supplier of ~~nuclear~~ reactor components for the CANDU nuclear power industry. The Ontario company is building on this success and is exporting its precision-tooled products around the world.¹⁷³

Laker recently purchased a new 65,000 square foot facility to handle more than \$130 million in contracts to help refurbish the Bruce and Darlington nuclear reactors. The facility will also

¹⁶⁸ OPG news release, http://www.opg.com/darlington-refurbishment/Pages/20170524_CamecoDelivery.aspx

¹⁶⁹ BWXT news release, <http://www.bwxt.com/news/2017/04/13/BWXT-Awarded-CA55-Million-Contract-for-Feeder-Supply-in-Support-of-OPG%E2%80%99s-Darlington-Refurbishment->

¹⁷⁰ Organization of Canadian Nuclear Industries (OCNI) news release, <https://ocni.ca/public-resources/publications/darlington-refurbishment/>

¹⁷¹ BWXT news release, <http://www.bwxt.com/news/2017/04/13/BWXT-Awarded-CA55-Million-Contract-for-Feeder-Supply-in-Support-of-OPG%E2%80%99s-Darlington-Refurbishment->

¹⁷² BWXT news release, <http://www.bwxt.com/news/2016/07/12/BWXT-Subsidiary-Awarded-Steam-Generator--Design-and-Supply-Contract-from-Bruce-Power>

¹⁷³ Bruce power news release. <http://www.brucepower.com/bruce-power-signs-35-million-agreement-with-laker-energy-products/>

support Laker's sales to international markets, including existing and new-build projects in Argentina, Romania, China and the U.K.¹⁷⁴

Text Box

ONTARIO'S LABOUR UNIONS

For more than four decades, Ontario's electricity sector labour unions have been key partners in Ontario's nuclear industry. Today, Power Workers Union (PWU) and Society of Energy Professionals (SEP) represent a total of more than 23,000 employees in Ontario's electricity system, including our nuclear plants and supply chain companies. OPG and Bruce Power will continue to rely on their skills and expertise to refurbish our nuclear fleet and ensure safe operation for decades to come¹⁷⁵.

Ontario's building trade unions are also doing their part in refurbishment, including International Brotherhood of Electrical Workers (IBEW) and Labourers' international Union of North America (LIUNA). To ensure smooth and successful execution of refurbishments, all key building trade unions have struck special nuclear project agreements with OPG and Bruce Power that will remain in force through the period of peak refurbishment activities, until December 31, 2032¹⁷⁶.

Managing the Risks

One of the principles of the 2013 LTEP was to include potential off-ramps for nuclear refurbishment¹⁷⁷. Off-ramps ensure that refurbishments only proceed if they continue to deliver value for ratepayers.

OPG must get provincial approval before refurbishing each remaining unit at Darlington¹⁷⁸. Every decision to proceed with refurbishing will depend on:

- OPG's adherence to the approved costs and schedules of previous refurbishments; and
- whether the project provides ongoing value to ratepayers.

Ontario's contract with the privately-owned Bruce Power also includes strong protection from cost overruns with the refurbishments. For example, Bruce Power is paying for approximately

¹⁷⁴ Op. Cit. Bruce power news release. <http://www.brucepower.com/bruce-power-signs-35-million-agreement-with-laker-energy-products/> Op. Cit. Op. Cit.

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\$2 billion in cost overruns that occurred when two of the Bruce units were refurbished and restarted in 2012.¹⁷⁹

Under its recently updated agreement with the IESO¹⁸⁰, Bruce Power will be assuming the execution risk of any cost overruns during the execution of refurbishment of each of the six remaining Bruce units.

Contractual off-ramps allow Ontario to stop work on any Bruce refurbishment if the estimated cost exceeds a pre-defined amount. Refurbishment at Bruce can also be stopped if demand drops or lower-cost resources emerge¹⁸¹.

Commented [AL31]: Bruce Power does not take the full risk of the program. Bruce power takes the risk of execution of each unit. It also does not take full risk (i.e. force majeure is a shared risk). We carry the estimating risk.

Ontario will proceed with caution and protect ratepayers by strictly controlling the cost and timetable of refurbishments. There will be strict oversight of OPG and Bruce Power to ensure they complete the refurbishments on time and on budget.

In addition to OPG's oversight of the Darlington refurbishment, Ontario has its own independent advisor to ensure, with support from, supported by Infrastructure Ontario, to ensure that it has continued and effective oversight¹⁸². All of OPG's expenditures on nuclear refurbishment will also be reviewed by the OEB as part of its rate-setting process.

The Province subjected the updated agreement with Bruce to extensive due diligence, as did the financial and technical advisors who were engaged by the IESO when it negotiated the contract.

The IESO will continue to manage the Bruce contract and conduct an open book review of closely scrutinize the basis for costs underlying the refurbishment and ongoing operation of the Bruce reactors. It has full-time representatives on-site and will regularly report back to the Province.

Pickering Nuclear Generating Station

OPG is working on plans to continue to operate the Pickering Nuclear Generating Station until 2024.¹⁸³ Two of the units would be shut down in 2022, with the remaining four units shut down in 2024. The continued operation of Pickering will ensure Ontario has a reliable source of

¹⁷⁹ Ontario Power Authority (now a part of IESO, following reorganization) presentation, slide 2, <http://14083-presscdn-0-0.pagely.netdna-cdn.com/wp-content/uploads/2015/09/MPP-Briefing-on-Force-Majeure.pdf>

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¹⁸³ OPG webpage on Pickering licence renewal, <http://www.opg.com/generating-power/nuclear/stations/pickering-nuclear/Pages/pickering-nuclear-licence-renewal.aspx>

emission-free baseload electricity to replace the power that will not be available during the Darlington and initial Bruce refurbishments. ~~It~~ The continued operation of Pickering would also reduce reliance on the use of natural gas to generate electricity generated from natural gas, saving \$600 million for electricity consumers and reducing GHG emissions by at least eight million tonnes.¹⁸⁴

The Province announced on January 11, 2016, that it had approved OPG's plan to ask the OEB and the Canadian Nuclear Safety Commission (CNSC) to approve the continued operation of Pickering until 2024¹⁸⁵. The OEB will ensure the costs of OPG's plan for continued Pickering operation are prudently incurred prudent, while CNSC will ensure the safe operation of Pickering during this period. OPG will still need to get final approval from the government approval, OPG's sole shareholder, to proceed with the continued operation of Pickering after these regulatory reviews are complete completed. OPG will also update the government on the safety and operational performance of Pickering as part of its regular reporting and business planning.

Summary

- Market Renewal will refashion Ontario's wholesale electricity markets and ultimately result in a more competitive and flexible marketplace that efficiently meets system needs at the lowest cost, while preparing Ontario for the future by creating new mechanisms to effectively incorporate non-emitting resources and new and emerging technologies. Together, with cap and trade, it will also help to ensure Ontario's climate change commitments are met.
- An incremental incremental capacity auction auctions will increase the use of competition to secure technology-neutral resources and help reduce the cost of procuring resources to meet system adequacy in a more flexible manner.
- ~~Market Renewal will prepare Ontario for the future by creating new mechanisms to effectively incorporate existing and, new and emerging technologies.~~
- *Delivering Fairness and Choice* aims to maximize the use of the province's existing energy assets in order to limit any future cost increases for electricity consumers.
- Cap and trade will make increase the price of conventional fuels more expensive and will affect how often fossil-fueled generators will get called on to meet the province's electricity demand. This will help reduce the province's greenhouse gas emissions and shift Ontario towards a low-carbon economy.
- ~~Market Renewal will give new all and existing energy resources, including renewables as well as emerging technologies, opportunities to provide different services to help meet system needs, benefiting consumers and supporting Ontario's climate change goals.~~

¹⁸⁴ IESO Assessment of Pickering Life Extension Options referenced in OPG rate application to OEB, Exhibit F2-2-3 pg. 132, <http://www.rds.ontarioenergyboard.ca/webdrawer/webdrawer.dll/webdrawer/rec/529935/view/>

¹⁸⁵ Source needed

- The Province will direct the Independent Electricity System Operator to establish a formal process for planning the future of the integrated province-wide bulk system.
- The Northwest Bulk transmission project will proceed in phases. Phase One, a line from Thunder Bay to Atikokan, is to come into service as soon as is practical, with development work on the second phase, a line from Atikokan to Dryden, proceeding at the same time. Phase Three, a line from Dryden to the Manitoba border, may be needed ~~post-after 2035 to accommodate~~ enable the better integration of provincial electricity grids.
- The Province will review all options to ensure the East-West Tie project is built at a cost that is fair to Ontario ratepayers.
- Ontario will continue to exercise strict oversight of nuclear refurbishments and ensure they ~~are only undertaken if they~~ provide value for ratepayers.

Chapter 3. Innovating to Meet the Future

Modernizing the System

The way we deliver and use electricity is changing.

New technologies allow us to capture, store and use energy locally and deliver it in new and innovative ways. Clean, distributed energy resources are powering our economy and moving closer to home¹⁸⁶. New tools and devices are appearing on smartphones and in homes, harnessing the power of data that can give customers greater choice and control over the energy they use¹⁸⁷. Customers' expectations of their utilities are increasing¹⁸⁸.

Modernizing the System

These new technologies present a significant opportunity to make electricity systems run better, reduce costs and give customers more choice.

Text Box: What We Heard from You

- Support increased use of electric vehicles (EVs)
- Support and enable options for home energy storage, including EV batteries
- New business models can drive innovation
- Offer more pricing plans

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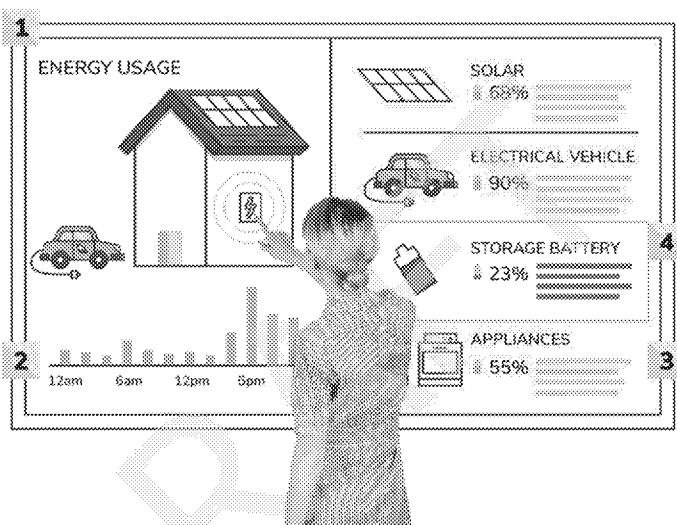
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- Modernize regulations and rate designs
- Customers will decide which technologies best meet their needs
- Government support is needed for research and development
- Distributed generation will transform conventional electricity distribution networks¹⁸⁹

Customer of Tomorrow



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1. Energy Management System – An energy management system can tell users how electricity is being used in real time, and can balance their preferences with the needs of the system to make the best use of energy.
2. Dynamic pricing – Consumers can choose the electricity pricing model that works best for their needs and complements their lifestyle.
3. Internet of Things – Technologies already on the market can connect appliances, lighting, and other plugged-in electronics to smart controllers. Smartphones can turn on lights and a dishwasher, or consumers can let an energy management system run the show
4. Distributed Energy Resources – Prices continue to drop for solar panels, home energy storage and electric vehicles, giving consumers more choice and making them less dependent on electricity from their local distribution company (LDC). The connected smart home will make the best use of these emerging technologies.

¹⁸⁹ Source needed

Innovative Pricing Plans

The Province is working with the Ontario Energy Board (OEB) to give consumers more choice in their electricity price plans¹⁹⁰. As part of its review of the Regulated Price Plan (RPP), the OEB is using pilot projects to test innovative time-of-use price structures¹⁹¹. Consumers can better manage their costs with time-of-use pricing by reducing or shifting their consumption to off-peak times when electricity is less expensive to produce¹⁹². Time-of-use pricing also ensures that consumers pay a price for electricity that reflects the cost of producing it at peak and off-peak times.

The pilots will test a variety of innovative price structures, including:

- different ratios between on- and off-peak prices;
- different times for on- and off-peak periods;
- prices that increase during critical peaks – the short time periods with extremely high demand; and
- seasonal pricing plans that have a flat rate for spring and fall, and on- and off-peak price periods for summer and winter¹⁹³.

Some of the pricing pilots will be combined with smart technologies¹⁹⁴, such as smart thermostats, energy use apps, and electric vehicles, to give customers additional ability to manage their electricity use.

The pilots have begun rolling out and will run for at least one calendar year¹⁹⁵. The results will help guide OEB decisions on potential new price plans that match customer lifestyles and increase customer control.

In addition to these pilot programs, the OEB is also examining changes to the way the Global Adjustment (GA) is charged to mid-sized commercial and industrial consumers¹⁹⁶, otherwise known as non-RPP Class B consumers. For these consumers, the GA is a fixed charge that is the same regardless of the time that they consume electricity¹⁹⁷.

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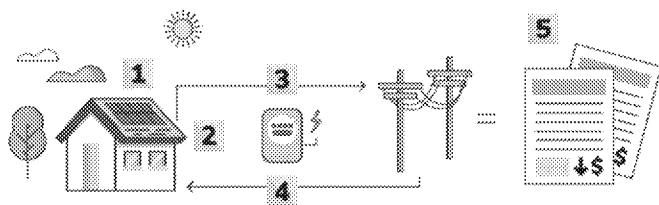
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Net Metering

Changes to Ontario's net metering framework will give businesses and consumers more opportunities to generate and store renewable electricity.

Net metering is a billing arrangement with an LDC that allows a customer to offset the electricity they buy from their LDC with electricity generated by their own renewable energy systems. Net-metered customers also receive credits on their electricity bill for the electricity they send to the grid, reducing their total bill charges. These credits can be carried over for up to 12 months for application on future bills. A net-metered customer is still able to draw power from the local distribution grid when needed.

How Net Metering Works



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The graphic describes a typical residential rooftop solar net metering arrangement. Other renewable energy technologies are also eligible to net meter in Ontario.

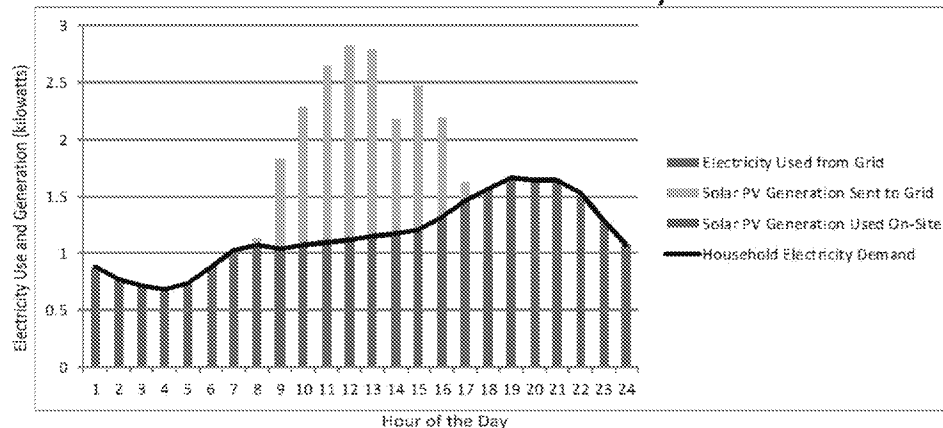
1. Solar photovoltaic (PV) panels mounted on the roof of a house generate electricity.
2. The electricity generated is first used on-site to power the house.
3. Net-metered customers receive credits on their electricity bill for any electricity that is not used on-site and is sent to the LDC.
4. Net-metered customers receive a charge on their electricity bill for the electricity they draw from the local grid when their electricity needs cannot be met by the on-site generation.

5. A net-metered customer's monthly electricity bill is calculated based on the difference between the dollar value of any electricity bought from their LDC, and the dollar value of electricity sent to the LDC from their renewable energy system.

The graph below shows the electricity generated by a typical net-metered solar installation on a residential rooftop in the summer:

- the purple columns show the electricity bought from their LDC;
- the red columns show the electricity generated and used on-site; and
- the green column shows the electricity that is generated and sent back to their LDC.

A Typical Summer Day With a Residential Net Metered Solar PV System



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Ontario has recently taken significant steps to boost net metering by removing the limit on the size of eligible generation systems and allowing them to be paired with energy storage technologies.¹⁹⁸

Ontario will expand and enhance net metering by proposing legislative and regulatory amendments that would allow third-party providers to own and operate net-metered renewable generation systems, while ensuring appropriate consumer protection measures are in place. This would give Ontario electricity consumers added opportunities to reduce their electricity bills by offsetting their electricity purchases with clean power generated on-site. Net-

¹⁹⁸ Source needed

metered renewable energy systems can also help reduce peak demand¹⁹⁹ and delay or even eliminate the need for LDCs to invest in costly upgrades to their networks.

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The Province will also propose changes that would enable the deployment of demonstration projects for virtual net metering, and work with the Independent Electricity System Operator (IESO) to support these demonstration projects. Virtual net metering could allow Ontarians who may not be able to install their own renewable energy system to participate in renewable energy projects located away from their homes or businesses, and still receive a credit offsetting their electricity bill. It could also support the siting of renewable generation where the electricity is most needed and valuable on the distribution grid. The goal of these demonstration projects would be to better understand the impacts of virtual net metering and guide future policy decisions on net metering.

Taken together, these proposed enhancements would provide a platform for future innovation in clean, distributed energy and put the province at the forefront of renewable energy integration in Canada.

Energy Storage

Energy storage is a game-changing technology. Sometimes, it acts like a home or business, consuming electricity from a local network. At other times, it acts like a power plant, sending out electricity when needed.

The Province has made it a priority since 2013 to understand the value of energy storage for Ontarians²⁰⁰. This includes:

- procuring 50 megawatts of different types of energy storage to test how they can support Ontario's electricity network²⁰¹,
- using the Smart Grid Fund to support several energy storage projects and test the full range of their capabilities on distribution systems²⁰², and
- undertaking studies that look at realizing the different benefits of storage²⁰³.

A March 2016 study by the IESO found that energy storage facilities can provide many of the services that are needed to ensure the electricity system in Ontario operates reliably²⁰⁴. The

¹⁹⁹ Source needed

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²⁰⁴ IESO Report: Energy Storage, Pages 1-5, http://www.ieso.ca/-/media/files/ieso/document-library/energy-storage/ieso-energy-storage-report_march-2016.pdf?la=en

Province also commissioned Essex Energy to study the benefits of storage for distribution networks. The study found that energy storage can provide many benefits, including cost reduction, for larger consumers²⁰⁵.

The unique aspects of energy storage come into conflict with some of the rules governing the electricity system²⁰⁶. The Province will propose updates to its regulations, and is directing the IESO and OEB to examine codes and rules that may inhibit the cost-effective development of energy storage that provides value to customers and the electricity system.

Electrification of Transportation

Ontario's Climate Change Action Plan focused significant attention on using low-emission transportation to drive down greenhouse gas emissions in the province²⁰⁷. This is critical to establishing a green economy and a carbon-free Ontario. The continued adoption of EVs will have an impact on our distribution networks. If enough EVs in a neighborhood charge at the same time, important parts of the distribution system could be strained²⁰⁸. As EVs become more popular, pressures on our distribution networks will grow, and utilities will need the tools to manage this change in a cost-effective way.

Utilities have begun to test ways to work with EV owners to minimize these impacts. FleetCarma successfully tested a project that guarantees EV owners the amount of charge they need in the morning, but allows an LDC to control charging to minimize the impact on its network²⁰⁹. Burlington and Oakville Hydro²¹⁰ are testing how to do the same thing by offering smart chargers at a reduced cost in exchange for some control of the charging activity.

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Ontario wants to provide LDCs with more options for integrating EVs into their networks at the lowest cost. The OEB will support this goal by looking at how LDCs can invest in technologies such as residential smart chargers that would avoid more costly system upgrades affecting all customers²¹¹. These new technologies could also use new pricing and charging plans to give more choices to EV owners. For example, an EV owner could be rewarded for allowing the car

²⁰⁵ Essex Energy: The Study of Energy Storage in Ontario Distribution Systems, Pages 35-39. Not yet public.

²⁰⁶ Source needed

²⁰⁷ Source needed

²⁰⁸ Ardakanian, S., Catherine Rosenberg, and S. Keshav. "Distributed Control of Electric Vehicle Charging." University of Waterloo, Pages 1-4, http://blizzard.cs.uwaterloo.ca/iss4e/wp-content/uploads/2013/04/dist_control.pdf

²⁰⁹ FleetCarma SGF Sell Sheet, P.1.

²¹⁰ Oakville Hydro, "Electric Vehicles," <https://www.oakvillehydro.com/my-home/general/electric-vehicles.html> and Burlington Hydro, "EVfutureGRID," <http://www.burlingtonhydro.com/your-bhi/evfuturegrid.html>

²¹¹ Source needed

to be charged at times when the distribution network is not constrained. The customer would work with the LDC to find the right combination of preferences so both parties can benefit from smart charging.

Ontario will also promote the sharing of information and data on EV usage, and work to harmonize the province's energy, climate change, transportation, and infrastructure policies. While the focus is often on personal EVs²¹², the Province is broadening its attention to include other types of mobility, including electrified transit and school buses.

Callout box: Goldcorp and Electric Mining

Goldcorp produces roughly half of Ontario's yearly gold production²¹³. The company employs over 3,000 Ontarians, 99% of them in Northern Ontario²¹⁴. Goldcorp is developing an all-electric mine in Borden²¹⁵. Teaming up with Sandvik Mining and MacLean Engineering, nearly all the underground vehicles at Borden will be powered by batteries²¹⁶. By using electricity to power its equipment, Goldcorp can avoid 7,000 tonnes of carbon dioxide emissions, and eliminate the need for 2 million litres of diesel and 1 million litres of propane²¹⁷.

Callout Box: RDH Mining Equipment

RDH Mining Equipment from Alban, Ontario is a world leader in battery-powered vehicles for underground mines²¹⁸. The company has developed the Muckmaster 600EB, the world's first underground six-yard capacity loader for hard rock powered by batteries²¹⁹. Compared to traditional, fossil-fueled machines, RDH's battery-powered vehicles have no diesel emissions²²⁰. They can increase the quality of the air underground, reduce underground ventilation needs, and lower overall GHG emissions from mining operations²²¹. RDH is now working with partners to bring its battery-powered mining technology to Latin and South America²²².

Vehicle-Grid Integration

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Vehicle-grid integration is a perfect example of what can be gained by modernizing the the grid. Vehicle-grid integration provides more choice for customers while giving utilities the information and tools to optimize their systems²²³.

A car is parked 95 per cent of the time.²²⁴ For EVs, some of that time is dedicated to charging; the rest of the time, it sits idle, waiting for its next trip. In the future, the battery of an electric vehicle could be used to deliver electricity to the home in the event of an outage²²⁵. The battery could also deliver electricity back to the community, or even to the entire grid²²⁶. Essentially, the EV becomes a distributed energy resource, one that can help avoid system upgrades and reduce costs for everyone²²⁷.

The Province will engage with its partners in the energy sector to develop a roadmap for vehicle-grid integration that will look closely at this technology and what it could mean for Ontario.

Grid Modernization

Electricity distribution is a critical piece of Ontario's grid. Ontario's LDCs are the final step in a system that delivers electricity from generators to our homes and businesses. Ontario was a world leader in deploying smart meters, which are the foundation for a smart grid.²²⁸ The meters continue to provide data to LDCs, allowing them to locate and respond more quickly to power outages, monitor their systems, and better plan for the future – all to the benefit of Ontario's customers.²²⁹

A modern grid is a digital grid²³⁰. It harnesses the power of data so that customers and utilities can make the right decisions. For LDCs, it means having the information critical to making their networks run as smoothly as possible. For customers, it means the local network will be ready when you want to buy an electric vehicle, install a battery, put up solar panels, or choose a new pricing plan. It means more tools for you to track your energy usage. It means a more efficient, reliable, and resilient grid. Above all, it means potential savings on your bill.

²²³ Source needed

²²⁴ Fortune. « Today's Cars Are Parked 95% of the Time », <http://fortune.com/2016/03/13/cars-parked-95-per-cent-of-time/>

²²⁵ Source needed

²²⁶ Source needed

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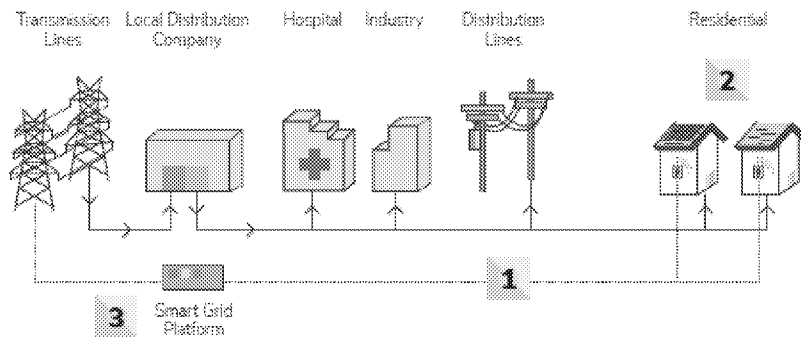
²²⁸ Impact Evaluation of Ontario's Time-of-Use Rates: First Year Analysis, Pages iv, 1, <http://www.ieso.ca/-/media/files/ieso/document-library/conservation/emv/2012/preliminary-report-first-year-impact-evaluation-of-ontario-tou-rates.pdf?la=en>.

²²⁹ Information provided to the Ministry by PowerStream, including inserts (Website offline), Pages 1-10.

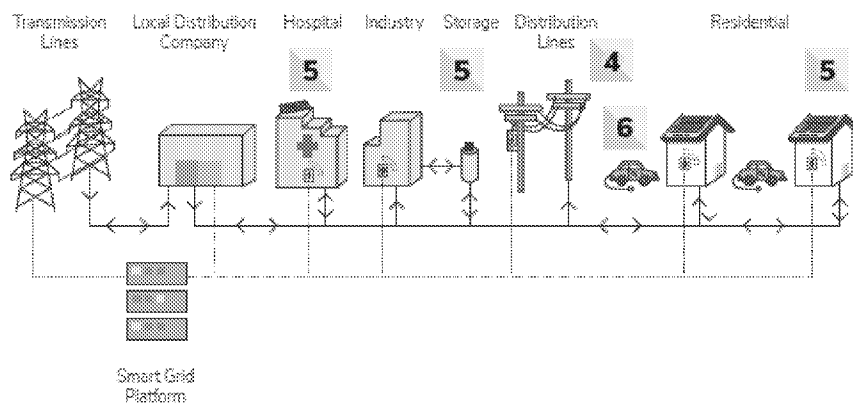
²³⁰ Source needed

The Transition in the Electricity Sector

TODAY



FUTURE



1. Communication Lines

Data from smart meters is sent to the LDC using communications infrastructure. In the future, this will also include data from sensors and other devices monitoring the entire grid.

2. Smart Meters

In addition to their use for billing, smart meters also provide critical data on system health for LDCs, and Smart meters also be used for DER and large consumers to provide even more information on how the grid is operating.

3. Smart Grid Platform

LDCs use powerful software platforms to analyze data and use that information to make their networks as efficient and reliable as possible, potentially avoiding costly upgrades.

4. Sensors

Sensors instantaneously feed data back to the LDC about the health of its network's wires, transformers, and other assets.

5. Distributed Energy Resources (DER)

Today, DERs are mostly renewable generation. In the future, they will include energy storage, microgrids, and even electric vehicles. DERs have a range of benefits that are optimized by a Smart Grid Platform.

6. Vehicle Grid Integration (VGI)

In the future, electric vehicles (EVs) can be used to power homes and even support the local network. VGI can turn EVs into highly responsive DERs and give owners more services and choice.

A modern grid can also give customers more choice, ranging from flexible pricing to enabling home energy management systems and realizing the full value of EVs. A modern grid can ensure that distributed energy resources like solar power, storage and microgrids can be integrated in the most efficient way possible. Above all, a modern grid can drive down costs for customers²³¹.

Now is the time to build on our investments in smart meters and the smart grid and establish a modern electricity system for Ontarians. An independent study in 2015 found that Ontario's consumers and businesses stand to gain \$6.3 billion in economic, environmental and reliability benefits if the grid is modernized over the coming decades²³². A modern grid would be more resilient to the effects of climate change and utilize the real-time visibility needed to respond to problems or address them before they happen.

However, that same study found there were several barriers to modernizing the grid further in Ontario. For example, LDCs are challenged by the diffuse benefits issue²³³. This is when they bear the costs of technologies such as energy storage, but do not get the benefits, which can accrue to our generation sector, transmission sector, and customers. Without clear rules for addressing diffused benefits, LDCs are prevented from exploring solutions that may be more cost-effective and provide greater benefits to the grid. Ontario is committed to removing these barriers so that utilities can make the right investments.

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Grid modernization can also support new business models. One exciting opportunity is peer-to-peer frameworks for "transactive energy". One way to implement transactive energy is through Blockchain. A computer protocol that tracks transactions within a marketplace,

²³¹ Source needed

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Blockchain uses secure, distributed databases to enable, for example, the management of electric vehicles, the trade of renewable electricity, and peer-to-peer demand response opportunities. We know that transactive energy and blockchain pilots are being undertaken in many jurisdictions. These models are also being studied and developed in Ontario, and the Ministry plans to explore how blockchain and other transactive energy models could benefit Ontarians²³⁴.

Driving Innovation: Enhancing the Smart Grid Fund

The Smart Grid Fund was launched in 2011 to support innovation in Ontario's electricity sector²³⁵. Innovation has produced a wide range of technologies – home energy management, grid automation, energy storage, microgrids, cyber security and EV integration. Through the Fund, Ontario companies have solved problems on distribution grids, and utilities have increased their understanding of how the smart grid can benefit the system and their customers²³⁶.

The Smart Grid Fund is also supporting jobs and growth in the province.²³⁷ The Fund has given Ontario businesses the support they need to turn demonstrations into commercial successes. A number of recipients and products are gaining traction in foreign markets, including:

- N-Dimension Solutions, a cybersecurity firm with over 100 utility customers in North America²³⁸,
- Utilismart's distribution monitoring software, which has been installed by over 140 utility customers²³⁹; and
- a transformer sensor manufactured in Ontario by GRID20/20, which has been tested in 11 countries²⁴⁰.

As part of Ontario's grid modernization strategy, Ontario believes now is the right time to build on this success by renewing and enhancing the Smart Grid Fund. A \$60 million enhanced Smart Grid Fund²⁴¹ will focus on encouraging a culture of innovation within the electricity sector that explores new solutions for integrating many technologies, tests new business models,

²³⁴ Source needed

²³⁵ Government of Ontario News Release, <https://news.ontario.ca/mei/en/2014/11/ontario-supports-leading-edge-smart-grid-projects.html>.

²³⁶ Source needed

²³⁷ Internal data to be included for the fact-check binder.

²³⁸ N-Dimension SGF Sell Sheet, P.1.

²³⁹ E-mail confirmation – to be included in the fact-check binder.

²⁴⁰ E-mail confirmation – to be included in the fact-check binder

²⁴¹ Source needed

integrates electricity and other energy resources, and generates new ideas for advancing grid modernization.

Text Box: Modernizing the Grid – Success Stories

POWER.HOUSE

Alectra Utilities launched the POWER.HOUSE pilot in 2015 with the support of the IESO's Conservation Fund. This innovative program for residential solar storage installed solar panels on 20 homes, and equipped them with an energy storage device and an energy management system that allows the homes to communicate with the LDC.

The pilot allows Alectra to treat the 20 homes as a single, virtual power plant and provide demand response or electricity when outages occur. The 20 homeowners saved money, and Alectra saw how POWER.HOUSE could delay the need for upgrades to its distribution network, which benefits all customers. Alectra believes POWER.HOUSE could be expanded to include 30,000 homes in Markham, Richmond Hill, and Vaughan alone.²⁴²

FleetCarma

With support from the Smart Grid Fund, FleetCarma developed a system that lets LDCs control when an EV is charged, helping them protect their local network infrastructure. FleetCarma's solution takes the needs of EV owners into account as well. They can opt-out on a day-to-day basis and set a minimum, guaranteed charge for the morning commute.

FleetCarma is a great example of Ontario exporting its expertise. Building on its success from its Smart Grid Fund project in the Toronto area, the company announced in April 2017 that the New York City utility, Con Edison, will be using its system to dampen the impact of EV charging on the grid while collecting critical data on how EVs are used.²⁴³

Distributed Energy Resources

A distributed energy resource (DER) is a decentralized source of energy that provides electricity services to individual customers or to the wider system located nearby.

Specific examples of DER include:

- Distributed generation (DG): electricity generated for self-consumption and/or export to the distribution grid;
- Energy storage: energy stored for use close to where it is needed;

²⁴² Source needed

²⁴³ ConEd. "SmartCharge New York" <https://www.coned.com/en/save-money/rebates-incentives-tax-credits/rebates-incentives-tax-credits-for-residential-customers/electric-vehicle-rewards>.

- Microgrid: a mini network that can operate independently when it is disconnected from the main electricity grid; and
- Energy efficiency: measures to reduce overall electricity use, either behind the customer's meter, or on the distribution system (see Chapter 5);
- Demand response: a temporary reduction or shift in demand in response to higher prices or requests from a system operator.

Each DER offers its own distinct benefits. However, the biggest gains occur²⁴⁴ when LDCs use smart communications systems to integrate a number of the technologies across their distribution networks.

Renewable Distributed Energy Resources

Renewable generation systems, such as solar PV panels, are becoming more widely adopted across the province²⁴⁵. When strategically located and combined with smart communications and control systems, renewable distributed generation can benefit LDCs and their customers: utilities can defer or avoid costly investments in their local distribution networks²⁴⁶, and customers can generate and store their own power, lowering bills and ensuring reliable access to electricity when power from their network is not available²⁴⁷.

The Province and the IESO will develop a program to support the deployment of strategically located renewable DG systems, paired with other DERs and smart grid technologies, to demonstrate their value to customers and the grid. The data gathered from these innovative projects will help guide the treatment of renewable DG by regulators and energy markets, and steer further integration of these resources into Ontario's energy system.

Barriers to Innovation

Ontario's approach to grid modernization is to create the right environment for LDCs to make the best decisions for their systems and their customers. To get there, the Province and its partners need to address the barriers to innovation. Many of these barriers are a legacy of the old way of doing things, when power only flowed one way and the technologies were simple and straightforward. However, the times have changed.

The Province has taken a number of steps to encourage innovation in a changing energy sector. In 2010, it directed the OEB to give guidance to utilities on building smart grid technologies into their systems and putting innovation into their business practices²⁴⁸. The OEB incorporated

²⁴⁴ Source needed

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these ideas through a new regulatory framework²⁴⁹. The OEB also established a Smart Grid Advisory Committee in 2013²⁵⁰ to provide it with ongoing assistance in facilitating grid modernization

Despite these efforts, there has been an unclear and uneven level of investment in grid modernization by Ontario's LDCs. Some of them, such as Hydro Ottawa and Greater Sudbury Utilities, are implementing plans to build a modern grid and a culture of innovation within their organizations²⁵¹. Nevertheless, the EDA found that half of Ontario LDCs still approach innovation in a gradual or incremental way.²⁵² It is clear that barriers to innovation remain. With the rapid development of new technology and the increase in customer expectations, the time to address these barriers is now.

To encourage change in the energy sector, the Province will work with utilities and other partners to build a culture of innovation, and will look to the OEB to explore, where cost-appropriate:

- building a stronger culture of innovation in the sector;
- ensuring that there are no unfair barriers that disadvantage the deployment of energy storage;
- utility participation in residential smart charging;
- the deployment of renewable distributed generation and other distributed energy resources;
- the use of innovative, non-wires solutions that will, among other things, allow utilities to manage their systems better and encourage customer choice²⁵³;
- a cost-benefit framework that provides clarity on the treatment of investments, such as those with localized costs that provide benefits to other electricity system participants (also known as the diffuse benefits issue);
- providing clarity on how the OEB will consider applications from utilities for new business models and innovative ideas allowed under the *Strengthening Consumer Protection and Electricity System Oversight Act, 2015*;
- the ability of utilities to participate in market opportunities that would ultimately reduce ratepayers' costs associated with capital or other investments²⁵⁴; and
- opportunities for utilities to partner with their customers to use in-front and behind-the-meter applications to address system needs.

²⁴⁹ Source needed

²⁵⁰ Source needed

²⁵¹ Source needed

²⁵² Electricity Distributors Association. 2017. *The Power to Connect – Advancing Customer-Driven Electricity Solutions for Ontario*. p. 49. [https://secure2.eda-on.ca/IMIS15/EDA/EDA_Priorities/EDA_Policy_Papers/PowerToConnect_Feb2017.aspx](https://secure2.eda.on.ca/IMIS15/EDA/EDA_Priorities/EDA_Policy_Papers/PowerToConnect_Feb2017.aspx).

²⁵³ Source needed

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As part of this effort, the Province will encourage LDCs to develop plans that demonstrate how they intend to modernize their grids and their businesses. These modernization plans could be incorporated into a LDC's asset management practices and their filings to the OEB.

IESO Market Renewal and Innovation.

The IESO is preparing for ~~this~~the future by laying the foundation through Market Renewal to create better price signals and establish more competitive market-based mechanisms to meet system needs²⁵⁵. The long-term goal of Market Renewal is to create a more dynamic market where all resources including new technologies will have the opportunity to compete alongside traditional forms of supply for a variety of system products such as energy, capacity and flexibility²⁵⁶. As costs come down and new business models are developed, emerging technologies, often at the ~~distributed~~local level, will be increasingly competitive compared to traditional resources. At the same time the existing and new markets will present opportunities and choice to a wide variety of consumers looking to become more active in Ontario's energy markets.

Text Box: What We Heard from You

- Support increased use of electric vehicles (EVs)
- Support and enable options for home energy storage, including EV batteries
- New business models can drive innovation
- Modernize regulations and rate designs
- Customers will decide which technologies best meet their needs
- Government support is needed for research and development
- Distributed generation will transform conventional electricity distribution networks

Innovative Pricing Plans

The Province is working with the Ontario Energy Board (OEB) to give consumers more choice in their electricity price plans. The OEB is using pilot projects to test innovative time-of-use price structures as part of its review of the Regulated Price Plan (RPP). Time-of-use pricing allows most of the province's residential and small business electricity customers to better manage their costs by reducing or shifting their consumption to off-peak times when electricity is less expensive to produce. It also ensures that consumers pay a price for electricity that reflects the cost of producing it at peak and off-peak times.

Commented [LT36]: Can we move this to the Value for ... section?

Response: Preference is to keep this section here given the link with the graphic that is being developed for the following page.

²⁵⁵ Source needed

²⁵⁶ Source needed

The pilots will test a variety of innovative price structures, including:

- different ratios between on- and off-peak prices;
- different times for on- and off-peak periods;
- prices that increase during critical peaks—the short time periods with extremely high demand; and
- seasonal pricing plans that have a flat rate for spring and fall, and on- and off-peak price periods for summer and winter.

Some of the pricing pilots will be combined with smart technologies, such as smart thermostats, energy use apps, and electric vehicles, to give customers additional ability to manage their electricity use.

The pilots will help guide the OEB when it decides on potential new price plans that match a customer's lifestyle and give them more control over their electricity costs.

In addition to these pilot programs, the OEB is also examining changes to the way the Global Adjustment (GA) is charged to mid-sized commercial and industrial consumers, otherwise known as non-RPP Class B consumers. For these consumers, the GA is a fixed charge that is the same regardless of the time that they consume electricity. A GA charge that varies with the time of use could lower prices for all Class B consumers, as well as residential and small business consumers who are on the RPP.

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Response: The OEB has not committed to any particular date by which new price plans will be rolled out. Hence we suggest not including a specific year.

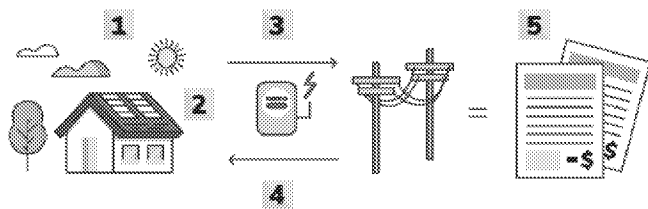
Commented [AL38]: Only if some costs are shifted to Class A customers

Customer of Tomorrow		
Graphic of a person looking at a Home Energy Management System that shows linkages to their home solar, battery, EV, etc. - [Placeholder]	Responding to Visibility Customers have access to real-time data and applications to manage their electricity use. -	Participating Consumers Customers actively manage their electricity use and self-generators trade electricity with the grid.
	Customer-Focused Interaction Distributors have the tools to meet demands for broader customer-centric services. -	Technology Integration Home energy management systems connect customer generation, electric vehicles, energy storage and more.

Net Metering

Net metering is a billing arrangement with an electricity distributor (also known as a local distribution company or LDC) that allows a customer to offset the electricity they buy from the LDC with electricity generated by their own renewable energy systems. Net-metered customers also receive credits on their electricity bill for the electricity they don't consume that they send to the grid, reducing their total bill charges. These credits can also be carried over for up to 12 months for application on future bills. A net-metered customer is still able to draw power from the local distribution grid when needed.

How Net Metering Works



The graphic shows how a typical residential rooftop solar project works under net metering. Other types of renewable energy installations are also allowed to net meter in Ontario.

- 1** Solar photovoltaic (PV) panels mounted on the roof of a house generate electricity.
- 2** The electricity generated is first used on-site to power the house.
- 3** Net-metered customers receive credits on their electricity bill when they send any excess electricity to the local grid.
- 4** Net-metered customers receive a charge on their electricity bill for the electricity they draw from the local grid when their electricity needs cannot be met by the on-site generation.
- 5** A net-metered customer's monthly electricity bill is calculated based on the difference between the dollar value of any electricity used from the local grid, and the dollar value of electricity sent to the grid from their renewable energy system.

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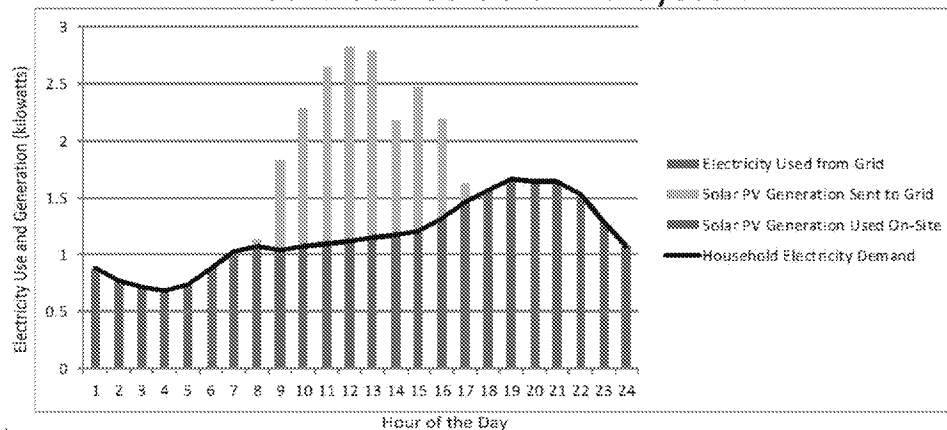
Response: We will work with designer to revise graphic to be clearer for future iterations.

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The graph below shows the electricity generated by a typical net-metered solar installation on a residential rooftop in the summer.

- the purple columns show the electricity used from the local grid;
- the red columns show the electricity generated and used on-site; and
- the green column shows the electricity that is generated and sent back to the local grid.

A Typical Summer Day With a Residential Net Metered Solar PV System



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Ontario has recently taken significant steps to boost net metering by removing the limit on the size of eligible generation systems and allowing them to be paired with energy storage technologies.

Ontario will further expand and enhance net metering by proposing legislative and regulatory amendments allowing third-party providers to own and operate net-metered renewable generation systems, while ensuring appropriate consumer protection measures are in place. This would give Ontario electricity consumers additional opportunities to reduce their electricity bills by offsetting their electricity purchases with clean power generated on-site. Net metered renewable energy systems can also help reduce peak demand and delay or even eliminate the need for local utilities to invest in costly grid upgrades.

The Province will also propose changes that would enable the deployment of demonstration projects for virtual net metering, and work with the Independent Electricity System Operator (IESO) to support these demonstration projects. Virtual net metering could allow Ontarians who may not be able to host their own renewable energy system to participate in renewable energy projects located away from their homes or businesses, and still receive a credit to offset their electricity bill. It could also support the siting of renewable generation where the electricity is

most needed and valuable on the distribution grid. The goal of these demonstration projects would be to better understand the impacts of virtual net metering and ultimately guide future policy decisions on net metering.

Taken together, these proposed enhancements would provide a platform for future innovation in clean, distributed energy and put the province at the forefront of renewable energy integration in Canada.

Energy Storage

Energy storage is a game-changing technology. Sometimes, it acts like a home or business, consuming electricity from the grid. At other times, it acts like a power plant, sending electricity out when needed.

Since 2013, the Province has made it a priority to understand the value of energy storage for Ontarians. This includes:

- procuring 50 megawatts of different types of energy storage to test how they can support Ontario's electricity network;
- using the Smart Grid Fund to support several energy storage projects, testing the full range of their capabilities on distribution systems; and
- undertaking studies that look at capturing the different values of storage.

A March 2016 study by the IESO found that energy storage facilities can provide many of the services that are needed to ensure the electricity system in Ontario operates reliably²⁵⁷. The Province also commissioned Essex Energy to study the benefits of storage for distribution grids. The study found that energy storage can provide many benefits, including cost reduction, for larger consumers²⁵⁸.

The unique aspects of energy storage come into conflict with some of the rules governing the electricity system. The Province intends to change its regulations, and will look to the IESO and OEB to examine codes and rules that may inhibit the cost-effective development of energy storage that provides value to customers and the electricity system.

Market Renewal will also aim to enhance and improve existing market mechanisms and create new mechanisms that will allow new technologies, like energy storage, to showcase the different values they provide in meeting system needs.

²⁵⁷ IESO Report: Energy Storage, Pages 1-5, http://www.ieso.ca/-/media/files/ieso/document-library/energy-storage/ieso-energy-storage-report_march-2016.pdf?la=en

²⁵⁸ Essex Energy: The Study of Energy Storage in Ontario Distribution Systems, Pages 35-39. Not yet public.

Electric Vehicles

Ontario's Climate Change Action Plan focused significant attention using low-emission transportation to drive down greenhouse gas emissions in the province. This is critical to establishing a green economy and a carbon-free Ontario. The continued adoption of EVs will have an impact on our distribution networks. If enough EVs in a neighborhood charge at the same time, important parts of the distribution system can be strained²⁵⁹. As the uptake of EVs continues, pressures on our distribution networks will grow, and utilities will need the tools to manage this change in a cost-effective way.

Utilities have begun to test ways to work with EV owners to minimize these impacts. FleetCarma and Toronto Hydro successfully tested a project that guarantees EV owners a charged vehicle, but allows the utility to control charging to minimize grid impacts. Burlington and Oakville Hydro²⁶⁰ are testing how to do the same thing with smart chargers by offering the chargers at a reduced cost in exchange for some control of the charging activity.

Ontario wants to provide utilities with more options for integrating EVs into their grids at the lowest cost. The OEB will support this goal by looking at how utilities can invest in technologies such as residential smart chargers that would avoid more costly system upgrades affecting all customers. These types of technologies could also give EV owners more choice by presenting new customer service models. For example, an EV owner could be rewarded for allowing the car to be charged at times when the grid is not constrained. The customer would work with the utility to find the right combination of preferences so both parties can benefit from smart charging.

Ontario will also promote the sharing of information and data on EV usage, and work to harmonize the province's energy, climate change, transportation, and infrastructure policies. While the focus is often on personal EVs, the Province is broadening its attention to include other types of mobility, including electrified transit and school buses.

*Page 81, Climate Change Action Plan.

**Page 82, Climate Change Action Plan.

***See Go Transit website at <http://www.getransit.com/electrification/en/default.aspx>.

Vehicle-Grid Integration

²⁵⁹ Ardakanian, S., Catherine Rosenberg, and S. Keshav. "Distributed Control of Electric Vehicle Charging." University of Waterloo, Pages 1-4, http://blizzard.cs.uwaterloo.ca/iss4e/wp-content/uploads/2013/04/dist_control.pdf

²⁶⁰ Oakville Hydro, "Electric Vehicles," <https://www.oakvillehydro.com/my-home/general/electric-vehicles.html> and Burlington Hydro, "EVfutureGRID," <http://www.burlingtonhydro.com/your-bhi/evfuturegrid.html>

Vehicle-grid integration is a perfect example of what can be gained by modernizing the grid. It provides more choice for customers while giving utilities the information and tools to optimize their systems.

A car is parked 95 per cent of the time.²⁶¹ For EVs, some of that time is dedicated to charging; the rest of the time, it sits idle, waiting for its next trip. In the future, the battery of an electric vehicle could be used to deliver electricity to the home in the event of an outage. It could also deliver electricity back to the community, or even to the entire grid. Essentially, the EV becomes a distributed energy resource, one that can help avoid system upgrades and reduce costs for everyone.

The Province will engage with its partners in the energy sector to develop a roadmap for vehicle-grid integration that will look closely at this technology and what it could mean for Ontario.

Grid Modernization

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Electricity distribution is a critical piece of Ontario's grid. Ontario's utilities are the final step in a system that delivers electricity from generators to our homes and businesses. Ontario was a world leader in deploying smart meters, which are the foundation for a smart grid.²⁶² The meters continue to provide a significant amount of data to utilities, allowing them to locate and respond more quickly to power outages, monitor their systems, and better plan for the future—all to the benefit of Ontario's customers.²⁶³

Now is the time to build on our investments in smart meters and the smart grid to establish a modern grid for Ontarians. An independent study in 2015 found that Ontario's consumers and businesses stand to gain \$6.3 billion in economic, environmental and reliability benefits if the grid is modernized over the coming decades.²⁶⁴ A modern grid would be more resilient to the

²⁶¹ Fortune. « Today's Cars Are Parked 95% of the Time », <http://fortune.com/2016/03/13/cars-parked-95-per-cent-of-time/>

²⁶² Impact Evaluation of Ontario's Time-of-Use Rates: First Year Analysis, Pages iv, 1, <http://www.ieso.ca/-/media/files/ieso/document-library/conservation/emv/2012/preliminary-report-first-year-impact-evaluation-of-ontario-tou-rates.pdf?la=en>.

²⁶³ Information provided to the Ministry by PowerStream, including inserts (Website offline), Pages 1-10.

²⁶⁴ Navigant Ontario Smart Grid Assessment and Roadmap, Page 2, <https://www.ontarioenergyreport.ca/pdfs/Navigant-Smart-Grid-Assessment-and-Roadmap-Final-Report-.pdf>.

effects of climate change and utilize the real-time visibility needed to respond to problems or address them before they happen²⁶⁵.

A modern grid can also give customers more choice, ranging from flexible pricing models to enabling home energy management systems to realizing the full value of EVs. A modern grid can ensure that distributed energy resources like solar power, storage and microgrids can be integrated in the most efficient way possible. Above all, a modern grid can drive down costs for customers.

However, that same study found there were several barriers to modernizing the grid further in Ontario. For example, utilities are challenged by the diffuse benefits issue. This is when the costs of technologies such as energy storage are borne only by utilities, but the benefits flow to a range of other electricity sector participants. Without a clear framework on how to address diffuse benefits, utilities are deterred from exploring solutions that may be more cost-effective and provide greater benefits to the grid. Ontario is committed to overcoming and removing these barriers so that utilities can make the right investments.

Driving Innovation: Enhancing the Smart Grid Fund

The Smart Grid Fund was launched in 2011 to support innovation in Ontario's electricity sector.²⁶⁶ Innovation can be seen in a broad range of technologies — home energy management, grid automation, energy storage, microgrids, cyber security and EV integration. Through the Fund, Ontario has learned a great deal about how these technologies can solve problems on distribution grids, and utilities are using this opportunity to increase their understanding of how the smart grid can benefit the system and their customers.

The Smart Grid Fund is also supporting jobs and growth in the province.²⁶⁷ The Fund has given Ontario businesses the support they need to turn demonstrations into commercial successes. A number of recipients and products are gaining traction in foreign markets, including:

- N-Dimension Solutions, a cybersecurity firm with over 100 utility customers in North America²⁶⁸;
- Utilismart's distribution monitoring software, which has been installed by over 140 utility customers²⁶⁹; and

Commented [LT40]: REWORD – Matt

Response: To be addressed in subsequent drafts when receive further direction from MO.

²⁶⁵ Environmental Commissioner of Ontario. Smart from Sunrise to Sunset: A Primer on Ontario's Evolving Electricity Grid, Pages 33-37, <http://docs.assets.eco.on.ca/reports/other-publications/2014/2014-Smart-Grid.pdf>

²⁶⁶ Government of Ontario News Release, <https://news.ontario.ca/mei/en/2014/11/ontario-supports-leading-edge-smart-grid-projects.html>.

²⁶⁷ Internal data to be included for the fact-check binder.

²⁶⁸ N-Dimension SGF Sell Sheet, P.1.

²⁶⁹ E-mail confirmation – to be included in the fact-check binder.

- a transformer sensor manufactured in Ontario by Grid 20/20, which has been tested in 11 countries²⁷⁰.

As part of Ontario's grid modernization strategy, Ontario believes now is the right time to build on this success by renewing and enhancing the Smart Grid Fund. An enhanced Smart Grid Fund will focus on ways to encourage a culture of innovation within the electricity sector, explore solutions that integrate many technologies, test new business models, explore the integration of electricity and other energy resources, and generate new ideas for advancing grid modernization.

Text Box: Modernizing the Grid—Success Stories

Power House

Alectra Utilities, with support from the IESO's Conservation Fund, launched the POWER.HOUSE pilot in 2015. The innovative residential solar storage program outfitted 20 homes with solar panels, an energy storage device and digital devices that allowed the homes to communicate with the utility.

The pilot allows Alectra to treat the 20 homes as a single, virtual power plant and provide demand response or support when outages occur. This not only resulted in savings for the 20 homeowners, but POWER.HOUSE could even delay the need for distribution network upgrades, which benefits all customers. Alectra believes POWER.HOUSE could be expanded to include 30,000 homes in York Region alone.

Control for You—FleetCarma

With the support from the Smart Grid Fund, FleetCarma developed a system that lets utilities control when an EV is charged, helping them protect their local grid infrastructure. FleetCarma's solution also takes the needs of EV owners into account. They can opt out on a day-to-day basis and set a minimum, guaranteed charge for the morning commute.

FleetCarma is a great example of Ontario exporting its expertise. Building on its success from its Smart Grid Fund project in the Toronto area, the company announced in April 2017 that the New York City utility, Con Edison, will be using its system to dampen the impact of EV charging on the grid while collecting critical data on how EVs are used.²⁷¹

Distributed Energy Resources

²⁷⁰ Grid 20/20 SGF Commercialization Report – included in the fact-check binder.

²⁷¹ ConEd. "SmartCharge New York" <https://www.coned.com/en/save-money/rebates-incentives-tax-credits/rebates-incentives-tax-credits-for-residential-customers/electric-vehicle-rewards>.

A distributed energy resource (DER) is a decentralized source of energy that provides electricity services to individual customers or to the wider system located nearby.

Commented [AL41]: Suggest being clearer on what “decentralize” means. Common definitions for DERs use “distribution connected, either directly or behind the meter”

Specific examples of DER include:

- Distributed generation (DG): electricity generated for self-consumption and/or export to the distribution grid;
- Energy storage: energy stored for use close to where it is needed;
- Microgrid: a mini-network that can operate independently when it is disconnected from the main electricity grid; and
- Demand response: a temporary reduction or shift in demand in response to higher prices or requests from a system operator.

Each DER offers its own distinct benefits. However, their best value occurs when utilities use smart communications systems to integrate a number of the technologies across their distribution network.

Renewable Distributed Energy Resources

Renewable generation systems, such as solar photovoltaic panels, are becoming more widely adopted across the province. When strategically located and combined with smart communications and control systems, renewable distributed generation can benefit local distribution companies and their customers: utilities can defer or avoid costly investments in their local distribution networks, and customers can generate and store their own power, lowering bills and ensuring reliable access to electricity when power from the grid is not available.

Commented [AL42]: Consistent with the suggestion of consistently using DER as a term for such resources which includes storage – distributed generation does not.

The Province and the IESO will develop a program to support the deployment of strategically located renewable DG systems, paired with other DERs and smart grid technologies, to demonstrate their value to customers and the grid. The data gathered from these innovative projects will help guide the treatment of renewable DG by regulators and energy markets, and ultimately steer further integration of these resources into Ontario’s energy system.

Barriers to Innovation

Ontario’s approach to grid modernization is to create the right environment for utilities to make the best decisions for their systems and their customers. To get there, the Province and its partners need to address the barriers to innovation. Many of these barriers are a legacy of the old way of doing things, when power only flowed one way and the technologies were simple and straightforward. However, times have changed.

The Province has taken a number of steps to encourage innovation in a changing energy sector. In 2010, it directed the OEB to give guidance to utilities on building smart grid technologies into

their systems and putting innovation into their business practices. The OEB incorporated these ideas through a new regulatory framework. In 2013, the OEB also established a Smart Grid Advisory Committee to provide it with ongoing assistance in facilitating grid modernization.

Despite these efforts, there has been an unclear and uneven level of investment in grid modernization by Ontario's utilities. Some LDCs — such as Hydro Ottawa and Greater Sudbury Utilities — are implementing plans to build a modern grid and a culture of innovation within their organizations. Nevertheless, the EDA found that half of Ontario LDCs still approach innovation in a gradual or incremental way.²⁷² It is clear that barriers remain to innovation. With the rapid development of new technology and increasing customer expectations, the time to address these barriers is now.

To encourage change in the energy sector, the Province will work with utilities and other partners to build a culture of innovation, and look to the IESO and the OEB to explore, where cost appropriate:

- building a stronger culture of innovation in the sector;
- the equitable treatment of energy storage;
- utility participation in residential smart charging;
- the deployment of renewable distributed generation and other distributed energy resources;
- the use of innovative, non-wires solutions that will, among other things, allow utilities to manage their systems better and encourage customer choice;
- a cost-benefit framework that provides clarity on the treatment of investments, such as those with localized costs that provide benefits to other electricity system participants (also known as the diffuse benefits issue);
- providing clarity on how the OEB will consider applications from utilities for new business models and innovative ideas allowed under the *Strengthening Consumer Protection and Electricity System Oversight Act, 2015*;
- implementing Market Renewal to further foster innovation and provide new opportunities;
- the ability of utilities and other service providers to participate in market opportunities that would ultimately reduce ratepayers' costs associated with capital or other investments; and
- opportunities for utilities to partner with their customers to use in-front and behind-the-meter applications to address system needs.

Commented [AL43]: Suggest using wording that is similar to directive: no unfair barriers to deployment and participation of energy storage

Commented [AL44]: "opportunities for utilities and other service providers to partner with end use consumers to use in-front and behind-the-meter applications to address system needs"

²⁷² Electricity Distributors Association. 2017. *The Power to Connect – Advancing Customer-Driven Electricity Solutions for Ontario*. p. 49. [https://secure2.eda-on.ca/iMIS15/EDA/EDA_Priorities/EDA_Policy_Papers/PowerToConnect_Feb2017.aspx](https://secure2.eda.on.ca/iMIS15/EDA/EDA_Priorities/EDA_Policy_Papers/PowerToConnect_Feb2017.aspx).

As part of this effort, the Province will encourage utilities to develop plans that demonstrate how they intend to modernize their grids and their businesses. These modernization plans could be incorporated into a utility's asset management practices and filings to the OEB.

Building on the Success of Renewables

The tremendous growth of Ontario's clean tech and renewable energy sectors has attracted billions of dollars in investment to Ontario²⁷³ and led to the creation of thousands of new jobs, and led to the creation of thousands of new jobs across many trades and professions. Estimates show that new renewable energy generation alone has created over 200,000 direct and indirect jobs in Ontario since 2008²⁷⁴. That explains why a broad coalition of employers, labour and industry groups, including the Renewable Energy Alliance of Ontario supports Ontario's investment in renewable energy.²⁷⁵

Ontarians have every reason to expect these economic benefits will continue. The renewables sector is forecast to contribute nearly \$5.4 billion dollars to Ontario's gross domestic product and create 56,500 jobs between 2017 and 2021. Over \$2.5 billion of these expenditures will occur directly in Ontario communities, contributing appreciably to local economic activity.²⁷⁶

Commented [LT45]: Meaghan to find number.

Response: To be addressed in subsequent version when MO has provided text.

Many of the companies that participated in Ontario's expansion of renewable energy are now poised to export their expertise and products to foreign markets. This could contribute as much as \$1 billion to Ontario's GDP and could add as many as 10,700 jobs between 2017 and 2021.²⁷⁷ For example, Ontario-based manufacturers of hydroelectric components have been successfully exporting to the United States for years²⁷⁸. Many of Ontario's solar manufacturers are also reporting increased export activity to the U.S., despite strong global competition²⁷⁹. And wind component manufacturers have developed expertise that will help them succeed in nearby American markets that have strong renewable energy targets, are replacing coal-fired generation with renewables and other clean sources of electricity.

Exporting Ontario's Energy Expertise

²⁷³ Source needed

²⁷⁴ Source needed

²⁷⁵ Calculations by Power Advisory. APPRO. (2015). The Value of Electricity to Ontario. Power Advisory LLP. Retrieved from http://www.appro.org/index.php?option=com_content&task=view&id=130&Itemid=166.)

²⁷⁶ Source needed

²⁷⁷ Market Analysis of Ontario's Renewable Energy Sector, Compass Renewable Energy Consulting Inc., June 2017 (URL and Page number forthcoming from REFO)

²⁷⁸ Source needed

²⁷⁹ Source needed

Ontario's energy innovators are experts in smart grid, renewables, nuclear and other technologies, and are using the solid base they have established in Ontario to export to other markets in North America and around the world.

Text Box: A Northern Ontario Success in Manufacturing

Heliene Canada has been manufacturing solar photovoltaic panels in Sault Ste. Marie since 2010. The ~~company~~ company's manufacturing facility uses state of the art technology and currently exports over half of its modules to the U.S. and other markets²⁸⁰

Heliene's manufacturing facility uses state of the art technologies from around the world, including Japanese robotics, a Spanish lamination process, materials from the U.S. and solar cells from Asia.

Heliene collaborates with other industry players and universities, such as ePower, the micro-electronics laboratory of Queens University and the Rotman School of Business at the University of Toronto, to create a link between academic research and industrial applications²⁸¹

Ontario continues to ~~be committed to supporting support~~ the dynamic and innovative business climate that made this possible. The Province will expand its ~~support of assistance for~~ Ontario energy companies wanting to export their goods, services and expertise, by:

- working with ~~the federal and~~ other provincial and federal governments, industry and postsecondary institutions to develop and support trade initiatives that support market entry and new business opportunities;
- developing market intelligence that determines which foreign markets hold promise for Ontario's energy goods and services;
- participating in energy-related trade missions abroad; and
- promoting Ontario's technical expertise at appropriate international forums.

In consultation with industry and the federal government, Ontario will develop a pilot program that provides financial support for the demonstration of locally-developed technologies abroad. The pilot will help Ontario energy companies get a foothold with utilities and buyers in global markets, and support the Province's commitments to help Ontario companies go global.

²⁸⁰ Source needed

²⁸¹ Source needed

Text Box:

"Global economies are demanding clean and low-cost energy solutions and Ontario entrepreneurs are poised to seize that opportunity." – MaRS Cleantech

Nuclear Innovation

Canada's expertise in nuclear energy has enabled it to be a world leader in nuclear research and nuclear medicine, saving lives and bringing peace of mind to countless numbers of cancer and heart surgery patients around the world²⁸².

Ontario is keenly interested in collaborating with the federal government, universities and industry partners to continue its support of the nuclear industry for both energy and non-energy applications. Ontario can help create new export opportunities for nuclear innovations, such as:

- Small Modular Reactor (SMR) Technology: This is a new generation of nuclear power reactors that have smaller footprints than conventional reactors and the promise economies of scale through lower costs from mass production²⁸³. In 2016, the Province released a consultant's study on the feasibility of SMRs for remote mining applications in Ontario. It continues, which found that SMRs could be an economic and emission-free alternative to diesel power²⁸⁴. The Province continues to monitor SMR technologies and engage with key stakeholders involved in advancing these innovative technologies designs.
- Nuclear Fuel Research: Technological innovations could lead to the reprocessing or recycling of used nuclear fuel or the use of thorium to power nuclear reactors²⁸⁵.
- Hydrogen: Ontario's nuclear technology could be used for the large-scale production of hydrogen²⁸⁶. Hydrogen is a source of low-carbon energy source that could, in the future, replace gasoline in the future for transportation or natural gas for heating²⁸⁷.

Text Box: Medical Isotopes

²⁸² Source needed

²⁸³ Source needed

²⁸⁴ Source needed

²⁸⁵ Source needed

²⁸⁶ Source needed

²⁸⁷ Source needed

Ontario's ~~power~~nuclear reactors transform chemical elements, such as Cobalt, into ~~new forms or isotopes for medical applications such as the that can diagnosis and treatment of treat~~ life-threatening diseases²⁸⁸. These isotopes can also sterilize medical equipment such as hospital gowns, gloves, masks, implantable devices and syringes, as well as some food products²⁸⁹.

Cobalt-60 is a key isotope for medical applications. Currently, 70 per cent of the world's supply of the medical-grade Cobalt-60 isotope is produced in nuclear reactors at Chalk River, Pickering and Bruce B²⁹⁰. The isotope is used for 10 million cancer therapy treatments around the world every year ~~and, as well as for medical imaging, equipment sterilization and non-invasive brain surgery.~~^{291,292}

Recently, Cobalt-60 harvested from the Bruce reactor was used in the Sterile Insect Technique or SIT, to combat the spread of Zika, West Nile and Dengue viruses.²⁹³

The Ottawa-based ~~medical health-sciences company, Nordion,~~ is exploring ~~future~~the use of the Bruce A and ~~opportunities~~Darlington reactors to expand the production of Cobalt-60 ~~using the Bruce A and Darlington reactors.~~²⁹⁴

Innovative Uses for Ontario's Natural Gas System

Renewable Natural Gas

Renewable natural gas (RNG) is a low-carbon fuel produced by the decomposition of organic materials found in landfills, forestry and agricultural residue, green bin and food and beverage waste, as well as the waste from sewage and wastewater treatment plants²⁹⁵. Because it comes

²⁸⁸ Source needed

²⁸⁹ Source needed

²⁹⁰ Canadian companies collaborate to secure isotope supplies, 8 November 2016, World Nuclear News, <http://www.world-nuclear-news.org/RS-Canadian-companies-collaborate-to-secure-isotope-supplies-0811168.html>

²⁹¹ American Brain Tumor Association webpage on brain cancer therapy with Cobalt-60, <http://www.abta.org/brain-tumor-treatment/treatments/stereotactic-radiosurgery/gamma-knife.html>

²⁹² Medical Isotopes, Canadian Nuclear Laboratories Website, <http://www.cnl.ca/en/home/facilities-and-expertise/nru/isotopes.aspx>

²⁹³ The nuclear connection to combat the Zika virus, May 2016, Canadian Nuclear Association, <https://cna.ca/news/nuclear-connection-combating-zika-virus-2/>

²⁹⁴ Nordion and Bruce Power ensure global Cobalt-60 supply up to 2064, 8 November 2016, Bruce Power website, <http://www.brucepower.com/bruce-power-ontario-power-generation-collaborate-to-ensure-steady-supply-of-cobalt-60/>

²⁹⁵ Source needed

from organic sources, the use of RNG does not ~~send~~ release any additional carbon into the atmosphere. As an added benefit, it can use the existing natural gas distribution system to replace the use of conventional natural gas in today's stoves and furnaces²⁹⁶.

RNG can be an innovative Ontario-made source of energy. Some types of RNG, such as biogas from landfills or agricultural waste, are technically feasible today²⁹⁷. In the longer term, RNG may be produced by biomass from forestry residue²⁹⁸.

Text Box: A Pilot Program for Renewable Natural Gas in Transportation.

Ontario's Climate Change Action Plan committed the Province to ~~increase~~ increasing the availability and use of lower-carbon fuel²⁹⁹.

The Province is now developing a pilot program that ~~takes~~ would take methane from agricultural materials or food wastes and ~~uses~~ use it for transportation. The ~~program~~ pilot is expected to demonstrate the business models and technology that will allow agricultural and food sectors to produce RNG, and support businesses as they change their vehicles and fueling infrastructure to use RNG³⁰⁰.

In May 2017, Ontario issued a discussion paper to gather feedback from businesses, partners and the public to help guide the design of the program³⁰¹.

Power-to-Gas

Electrolysis, also known as power-to-gas, uses electricity to break down water molecules into hydrogen and oxygen. This transforms electricity into hydrogen gas, a ~~different~~ another type of fuel. The hydrogen can be stored or transported in existing natural gas pipelines³⁰² and used to heat homes and fuel vehicles. The ~~vast storage system that currently exists for natural gas in Ontario~~ can be used for the long-term storage of hydrogen. The gas can even, in a sense, go back to where it came from and be used to generate electricity when and where it is needed.

Power-to-gas could potentially become a new ~~and important~~ link between the province's electricity system and its natural gas system. The IESO recognizes this, and has already awarded a contract to Hydrogenics³⁰³, an Ontario-based manufacturer of electrolysis and fuel cell

²⁹⁶ Source needed

²⁹⁷ Source needed

²⁹⁸ Source needed

²⁹⁹ Source needed

³⁰⁰ Source needed

³⁰¹ Source needed

³⁰² Source needed

³⁰³ Source needed

technology, to provide electricity grid services while it makes during the production of hydrogen.

Using electricity to create hydrogen is one way to help decarbonize the natural gas supply as well as the natural gas vehicles that are expected to reach market soon³⁰⁴. The Province has acknowledged the potential versatility of this fuel and is undertaking a feasibility study of using hydrogen to fuel for GO Transit passenger trains³⁰⁵.

To support this technology going forward, the province will work with the IESO to develop a pilot project that explores the energy system benefits, and GHG emission reductions of on electrolysis.

Summary

- The Province will work with the Ontario Energy Board to provide customers greater choice in their electricity price plans;
- The net metering framework will continue to be enhanced to give customers new sources of clean energy and new ways to reduce their electricity bills;
- Barriers to the deployment of cost-effective energy storage will be reduced;
- Utilities will be able to intelligently and cost-effectively integrate electric vehicles into their grids, including smart charging in homes;
- The Province will articulate a vision for grid modernization in Ontario, and give LDCs more tools to overcome barriers to give utilities more tools to and provide more customer choice and efficient, reliable and cost-effective services to customers;
- Ontario will build on the its success of and renew and enhance the Smart Grid Fund by renewing and enhancing the program. This will continue the Province's support of Ontario's innovation sector and help overcome other barriers to grid modernization;
- The Independent Electricity System Operator will strategically deploy renewable distributed generation projects that demonstrate the value of innovative technologies to the system and to customers;
- Ontario will fund pilot projects to help Ontario's innovative energy companies export to foreign markets;
- The Province will collaborate with the federal government, universities and industry to support the province's nuclear sector; and
- Innovative uses for Ontario's natural gas distribution system will be pursued.

Commented [LT46]: Possible ch move.

Response: Per advice earlier in chapter, recommend keeping in this chapter.

³⁰⁴ Source needed

³⁰⁵ Source needed

Chapter 4 – Improving Value and Performance for Consumers

Ontario and its partners are focusing their efforts on improving service to the province's electricity consumers. This requires a continuous search for efficiencies, and maintaining a culture of innovation in the sector. These new technologies and systems can benefit energy consumers by enabling more intelligent planning and investments. Ontario expects local transmission and distribution companies (LDCs) utilities to rise to the challenge and continue to deliver high-quality service while finding efficiencies and opportunities to lower costs.

Text Box: What We Heard from You

- *Eliminate Regulatory Barriers*
- *Encourage consolidation and partnerships*
- *Expedite approvals for new technologies*
- *Allow utilities to provide additional services*
- *Improve reliability³⁰⁶*

³⁰⁶ Source needed

Continued innovation in the electricity sector enables customers to use data and information in their decision making and create the additional choice they have in many other parts of their lives. But more choice requires more information, so consumers will expect more openness from energy companies and agencies³⁰⁷. Ontario is making this change possible by ensuring the standards and performance of the sector's entities are readily accessible.

The independence of the Ontario Energy Board (OEB) is a vital feature of Ontario's electricity sector. It gives consumers and sector partners the confidence that decisions are being made in the public interest. Ontario upholds this independence, and expects that the OEB, when delivering on the vision outlined in *Delivering Fairness and Choice*, will set policies in a manner that benefits ratepayers and the sector as a whole.

Modernizing the Utility Business

Ontario's LDCs are the main point of contact when customers deal with the electricity system. They provide the services that consumers count on, such as restoring power after outages, maintaining the safety of the system and fielding calls and questions.

In the coming years, utilities will face a number of challenges to how they conduct their business³⁰⁸. Disruptive technologies and innovative companies are all on the horizon, entering poised to enter the energy space and changing consumer expectations. LDCs need to determine how they will continue to provide value to consumers and participate effectively to meet system needs in the future. Ontario is confident that LDCs can respond to the changing landscape and find opportunities to achieve further efficiencies and savings.

The Ontario Distribution Sector Review Panel found³⁰⁹ determined in 2012 that utility the consolidation of LDCs could reduce costs from the distribution sector by \$1.2 billion over 10 years³⁰⁹. The OEB, as the independent regulatory tribunal regulating electricity distribution, must lead, innovate and provide LDCs with incentives to become more cost effective and efficient. The OEB has made improving LDC performance a priority since it refreshed its framework for utility regulation in 2011³¹⁰.

The OEB's Performance Scorecard uses several key measures, such as resolving customer complaints during the first phone call or the first visit from a customer, to measure track whether LDCs have improved their performance³¹¹. The Scorecard also allows customers to see if the service they receive from their utility LDC meets OEB standards. The OEB is planning to

³⁰⁷ Source needed

³⁰⁸ Source needed

³⁰⁹ Source needed

³¹⁰ Source needed

³¹¹ Source needed

enhance this framework to encourage greater efficiencies and make LDCs more accountable to consumers.

Ontario will look to the OEB to further strengthen the accountability that both distributors and transmitters need to show to their customers. By focusing on the principles of transparency, responsiveness to customers, efficiency and cost-effectiveness, the OEB will support a future in which:

- utilities (LDCs and transmitters) have incentives to cut unnecessary costs and make annual improvements to productivity and cost-efficiency;
- utilities are constantly striving to improve;
- utilities are held to account when expectations are not met;
- customers get the highest possible value from their electricity services; and
- businesses and other large customers have a timely and predictable process to connect to the grid or modify their existing connections.

The OEB is helping LDCs prepare for the future by encouraging them to undertake pilots of new pricing plans. Utilities such as London Hydro and Alectra are giving participants new pricing structures paired with smart technologies, such as smart thermostats and energy use apps. These pilots will give the OEB the information it needs to design new pricing plans that allow customers to manage their electricity usage and enable LDCs to pursue increased system efficiency (see Chapter 5 for more details). The OEB will look to have these enhanced requirements in place for the next major rate application cycle³¹².

Enhancing Reliability

Generators, transmitters and distributors in Ontario must abide by internationally-recognized standards and requirements that ensure the reliability of the bulk electricity grid.³¹³ The Independent Electricity System Operator (IESO) enforces these standards in Ontario, working closely with industry participants to ensure they understand and follow the rules.³¹⁴

The OEB also sets reliability and quality of service standards for transmitters, transmission and distributors, distribution utilities.³¹⁵ Distributors report the frequency and duration of outages in

³¹² Source needed

³¹³ See Chapter 5 of the IESO's Market Rules, Power System Reliability, for scope of the IESO controlled grid: <http://www.ieso.ca/sector-participants/market-operations/-/media/83782a2a5a5d42cea4efbf9f25002939.ashx>

³¹⁴ For IESO's role: <http://www.ieso.ca/sector-participants/system-reliability/reliability-standards-framework>;

³¹⁵ See the Handbook to Utility Rate Applications, October 13, 2016, https://www.oeb.ca/oeb/_Documents/Regulatory/OEB_Rate_Handbook.pdf and the Report of the

their annual performance scorecard to the OEB.³¹⁶ Transmitters also have customer standards, including a process to address areas of poor performance.³¹⁷

Reliability and quality of service are of vital importance to electricity consumers. This is especially true for communities on long, radial lines that can fail more frequently and for businesses that are particularly sensitive to electricity outages or fluctuations.³¹⁸ The OEB has considered a number of ways to improve reliability over the years³¹⁹ and the Province will look to the OEB to examine further cost-effective steps that ensure customers are aware of given useful knowledge about the reliability of their service and their ability/opportunities to resolve their concerns.

Commented [LT47]: Will these be removed later? ... all foot notes.

Response: All of the footnotes are included for ministry fact check purposes, but will be removed in the final version. They can be removed for PO as well.

An enhanced framework for the reliability and quality of service of ~~transmitter~~transmission and ~~distributors~~distribution utilities could provide customers with increased fairness by:

- ~~introducing incentives and consequences to ensure transmitters and distributors~~utilities are held to account for under-performance. For example, ~~customers as in done in some other jurisdictions get~~, Ontario customers could receive an on-bill credit when service standards are not met;
- establishing new standards and measurements of reliability that, ~~in addition to the current system-wide averages~~, give customers more detailed insights into ~~local~~the reliability, ~~in addition to the current system-wide averages of their local networks~~;
- ensuring that utilities report whether they are meeting the standards, in a way that customers find meaningful and easy to understand; and
- setting out clear timelines and steps that utilities must follow when they do not meet reliability standards or when customers report problems with reliability, power quality or other quality of service issues.

Commented [LT48]: REWORD – less gov speak

Additional from MO: Be more specific on this “guarantee” type language. MO wants to give more of a signal that we’re interested in this. If we don’t do this, then the call-out boxes on the next page don’t seem rooted in anything.

Response: Directive to OEB does not prescribe service guarantees so we cannot predetermine the outcome of the OEB process.

~~The Province will direct the OEB to review the standards that transmission and distribution utilities currently have for reliability and quality of service and recommend options for improving the standards. The Province will direct the OEB to review the standards for reliability and quality of service for transmitters and distributors and recommend options for improving~~

Board: Performance Measurement for Electricity Distributors: A Scorecard Approach, March 5, 2014, https://www.oeb.ca/oeb/_Documents/EB-2010-0379/Report_of_the_Board_Scorecard_20140305.pdf

³¹⁶ For more information on the scorecard metrics: <https://www.oeb.ca/utility-performance-and-monitoring/what-are-electricity-utility-scorecards/scorecard-filing> and the Report of the Board cited above.

³¹⁷ See section 4.5 Performance Standards of the Transmission System Code, https://www.oeb.ca/oeb/_Documents/Regulatory/Transmission_System_Code.pdf ; Transmitter-specific CDPP are posted online by the transmitters.

³¹⁸ www.ieso.ca/-/media/files/ieso/document.../18.../methodology_rtaa_2017mar.pdf

³¹⁹ See OEB consultations RP-2003-0190, EB-2008-0001, EB-2010-0249, EB-2014-0189, EB-2015-0182.

the standards. It will also ask the IESO to review how its planning and policies can improve customer reliability.

Test Box: Examples from Outside Ontario: Compensating Customers for Poor Service***

In Michigan, residential customers ~~are eligible for~~ can get a credit of \$25 USD if their utility fails to restore power after 16 hours of outage under normal conditions, after 120 hours under catastrophic conditions and after seven outages within a 12-month period³²⁰.

Commented [LT49]: To be revisited

Response: See response to comment above. We can revisit whether to keep these in or not.

~~**Text Box: Examples from Outside Ontario: Compensating Customers for Poor Service*****~~

~~*In the United Kingdom, residential customers receive £70-75 after 12 hours of outage in normal weather. Utilities in the U.K. also have a percentage of their revenue at risk based on their performance against reliability targets.*~~

Text Box: Raising Awareness of Local Issues ***

The publication of standardized and more detailed criteria for reliability would ensure greater transparency for customers and the regulator. This is particularly relevant for transmitters and large distributors.

The current LDC scorecard requires Ontario distributors to report their system-wide reliability. This means a small distributor, like Whitby Hydro with fewer than 40,000 customers, reports the same level of detail as a large distributor like Toronto Hydro with nearly 700,000 customers.³²¹

Because the OEB scorecard has not been implemented for transmitters, the reporting in transmission rate applications varies. Hydro One, a large transmitter with hundreds of customer delivery points, only reports its system-wide performance,³²² while a small

³²⁰ Electric Outage Service Credits, Michigan Agency for Energy and Michigan Public Service Commission, http://www.michigan.gov/documents/mpsc/mpsc-ca_electricoutageservicecredits_276711_7.pdf

³²¹ Performance Measurement for Electricity Distributors: A Scorecard Approach, March 5, 2014, https://www.oeb.ca/oeb/_Documents/EB-2010-0379/Report_of_the_Board_Scorecard_20140305.pdf; For more information on the scorecard metrics: <https://www.oeb.ca/utility-performance-and-monitoring/what-are-electricity-utility-scorecards/scorecard-filing> and the Report of the Board cited above.

³²² See Hydro One's Transmission Rate Application, 2017/18, Transmission System Plan, Section 5. Reliability Performance, PDF pages 66-77, http://www.hydroone.com/RegulatoryAffairs/EB20160160/HONI_Tx_Appl_Ex_B1_20160531.pdf ; See

transmitter like Five Nations Energy Inc., with only four delivery points, reports the data for each.³²³

Changing Business Models

To meet the challenges of the future, LDCs may need to be able to adopt more flexible and innovative approaches to service delivery than have been allowed in the past.

Text Box: More Flexible Regulation

Many LDCs have entered into joint service agreements to improve customer service and reduce their operating, maintenance and administration costs. Organizations such as GridSmart City, the Coalition of Large Distributors, and Cornerstone Hydro Electricity Concepts are examples of LDCs leading the way in these partnerships³²⁴.

Text Box: GridSmart City Profile



GridSmartCity Cooperative is a partnership of 13 LDCs, created to ~~provide greater value~~ improve service to electricity customers by ~~achieving increased the~~ efficiencies of scale and scope within each of their operations. The Partnership has reduced costs by having joint purchasing for services such as information technology, human resources and infrastructure procurement³²⁵.

The Province will look to the OEB to explore ways of facilitating these partnerships where they make economic sense. It will also consult with LDCs on additional ways to realize these savings and provide better customer service. The OEB will ~~also~~ review its own regulatory requirements and processes to ensure they minimize inefficiency and do not impose unnecessary burdens on LDCs.

also Hydro One's proposed scorecard, in Exhibit B2, T1, Schedule 1, PDF page 5-6,

http://www.hydroone.com/RegulatoryAffairs/EB20160160/HONI_Tx_Appl_Ex_B2_20160531.pdf

³²³ FNEI 2016 Transmission Rate Application, Exhibit 4, Tab 1, Schedule 2, See PDF pages 268-276, http://www.fivenations.ca/index.php/regulatory/regulatory-2/item/download/183_c66a51fef9e93139c3f8312ed16a9dc6

³²⁴ Source needed

³²⁵ Source needed

Making Electricity Bills More Understandable

Electricity bills need to be clearer and more understandable³²⁶. They are the customer's main tool that customers use to interact with window into the electricity system. The bill affects how they view both the value they receive from the electricity system and their opportunities to use electricity more efficiently. Consumers have told both the Province and LDCs they find current bills to be confusing and inaccessible³²⁷. Action is underway to address this. Hydro One Inc., for example, is planning to introduce a redesigned electricity bill for its low-volume consumers in late 2017³²⁸. Hydro One's redesigned bill, the product of testing and research and testing of into consumer behaviour, is expected to increase customers' understanding and comprehension of their electricity charges³²⁹.

In order to expand this effort across Ontario, the Province will work with the OEB and LDCs to redesign electricity bills to give Ontarians the information they have said they want on the bill. This will make bills easier for customers to understand and ensure they get the most useful information out of their bills. Customers expect LDCs to adopt more consumer-friendly billing systems, such as bills that can be viewed and paid on mobile devices³³⁰.

Improving Customer Choice through Data Accessibility

Ontario is promoting improved access to data accessibility to help consumers view and understand the information they need to make decisions on their energy use. Recent initiatives include:

- the Ontario Energy Report³³¹, an online portal that provides electricity sector consumers and stakeholders with an up-to-date snapshot of Ontario's energy sector;
- Green Button³³², a data standard that gives residential and commercial can give consumers the ability to access to data on their energy and water consumption. Green Button can also allows households and businesses allow consumers to securely and automatically transfer that data to various applications they that can choose to help them manage and conserve energy and water; and
- improvements to enhancing the Meter Data Management and Repository, the (MDMR), Ontario's central repository for Ontario's smart meter data. The improvements IESO Smart Metering Entity is leading a project that will allow support much more rigorous

³²⁶ Source needed

³²⁷ Source needed

³²⁸ Source needed

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³³¹ Source needed

³³² Source needed

analysis of consumption data and enable across the province, with the end goal of making better planning decisions and improvements improving services to customer service customers³³³.

Ontario will continue to improve the ability of people to use data to make their decisions. But the effort must also have a broader focus. But it can't stop there. Ontario's energy sector as a whole must continue to improve its ability to analyze data, using and use advanced mapping tools and other cutting-edge technologies to further modernize our grid. This is discussed further in Chapter 5.

These efforts also always need to keep the individual in mind. While the digital economy is integral to an efficient government and an affordable energy sector, it has to be built on a firm foundation of personal privacy.

Cyber Security

Cyber security is increasingly important in protecting critical infrastructure (including, such as the province's electricity system³³⁴). It includes a body of technologies, processes and practices designed to protect networks, computers, programs and data from against attack, damage or unauthorized access.

Cyber security standards for the bulk electric system are set through a North American-wide process led by the North American Electric Reliability Corporation (NERC). These Critical Infrastructure Protection (CIP) standards are have been adopted in Ontario and are enforced through by the OEB and the IESO. Transmitters such as Hydro One Generators, transmitters and other industry participants are required to implement and comply with the standards³³⁵.

Cyber security at the distribution level is an emerging issue, and is an operational necessity for the distribution sector. It includes both the protection of customer-specific information held by LDCs and the protection of distribution-level system operations.

The Province is actively working with both the IESO and the OEB to ensure that cyber security is being implemented everywhere in the electricity system and that there is appropriate regulatory oversight to mitigate cyber risks and threats.

³³³ See OEB Order EB-2015-0297

(<http://www.rds.ontarioenergyboard.ca/webdrawer/webdrawer.dll/webdrawer/rec/514364/view/>);

OEB Order EB-2016-0284

(<http://www.rds.ontarioenergyboard.ca/webdrawer/webdrawer.dll/webdrawer/rec/552233/view/>);

and the SME's application for case EB-2016-0284

(http://www.rds.ontarioenergyboard.ca/webdrawer/webdrawer.dll/webdrawer/rec/545198/view/SME_LtrApplLicence_20160930.PDF)

³³⁴ Source needed

³³⁵ Source needed

In the spring of 2017, the OEB issued a draft framework that will define cyber security guidance and reporting requirements for LDCs³³⁶. This first phase of this framework will be implemented for year-end 2017 and roll into 2018. The second phase of this initiative will start in the fall of 2017. LDCs will begin implementing this framework by the end of this year³³⁷.

Competitive Transmitter Selection

To help ensure least-cost solutions for transmission, the *Energy Statute Law Amendment Act, 2016*³³⁸ enabled the IESO to use competition to select companies or consortia for the construction of new transmission lines in Ontario.

As a first step in implementing the new legislation, Ontario will direct the IESO to develop a process for the competitive selection or procurement of transmission and identify possible pilot projects. The results of these pilots will be used to develop a procurement process that is clear, cost-effective, efficient and able to respond to changing policy, market and system needs.

Text Box: Hydro One Cyber Security

- *As the owner and operator of much of Ontario's bulk transmission system assets, Hydro One is required to comply with NERC Critical Infrastructure Protection standards. Meeting the NERC standards requires actions such as investments in upgrading equipment, proper management of IT systems such as installation of security patches, and ensuring procedures for identifying and acting on cyber security threats are in place.*

Right-Sizing

When transmitters and distributors replace aging equipment, they can increase efficiency by right-sizing the replacements, ensuring the new investments match forecast demand and requirements. This could mean upgrading equipment in communities with growing demand, or downgrading or removing the equipment if demand has dropped.

Partners in the electricity system need to have a realistic view of the aging of transmission and distribution infrastructure across the Province presents significant challenges for the electricity industry. These challenges include managing costs and the outage requirements necessary to deal with replacing or refurbishing end-of-life equipment, while maintaining safe and reliable service to customers. Equipment reaching end of life also presents opportunities to ensure that the new or refurbished facilities are "right-sized". That is downgrading or removing equipment if demand is expected to decrease and upgrading equipment in communities with growing

³³⁶ Source needed

³³⁷ Source needed

³³⁸ <https://www.ontario.ca/laws/statute/S16010>

demand or increasing reliability needs. New facilities will also consider technological advances and other solutions that may be more cost effective in the long run.

The IESO and OEB have key information associated with forecasts for growth, changing customer needs and technological advancements based on government policies and programs, while transmitters and distributors have information related to asset end-of-life and the related reliability and other risks. Together, this information provides important perspectives on the likelihood of growth, including and consequence of asset failure, the forecast of growth, changing customer requirements and the impact of new technologies and government policies, to ensure new and refurbished infrastructure is built to the right size and is capable of meeting the future service quality needs of customers.

As they exercise their respective responsibilities for planning, the Province will direct the IESO and the OEB to ensure that their processes promote a co-ordinated, streamlined and longer-term approach to the replacement of transmission and distribution assets that are at end of their lives. The approach needs to be consistent with the beneficiary pays principle, where the consumers that benefit from the asset are responsible for the costs.

Preserving Transmission Corridors

The Provincial Policy Statement, 2014 states that efficient patterns of land use and development are essential for healthy, livable and financially-viable communities.³³⁹ The statement ~~links~~ connects the planning for land use and energy infrastructure by ~~promoting~~ endorsing the planning and protection of transmission corridors and ~~preventing~~ discouraging development that could preclude or limit the use of a planned corridor.³⁴⁰

The Provincial Policy Statement is the foundation ~~for~~ of the Growth Plan for the Greater Golden Horseshoe (2017),³⁴¹ which requires the Province, municipalities and other public agencies to encourage the co-location of linear infrastructure, such as roads and transmission lines, when they are planning for development. The Growth Plan says governments and public agencies

³³⁹ See Provincial Policy Statement, Part V: Policies, 1.0 Building Strong Healthy Communities, page 6, <http://www.mah.gov.on.ca/AssetFactory.aspx?did=10463>

³⁴⁰ See Provincial Policy Statement, Part V: Policies, 1.1.1 g), 1.2.1 d), 1.6.1, 1.6.8.1, 1.6.11.1, and 1.7.1 b), <http://www.mah.gov.on.ca/AssetFactory.aspx?did=10463>

³⁴¹ Growth Plan for the Greater Golden Horseshoe (2017), 3. Infrastructure to Support Growth, 3.2.5 a) Infrastructure Corridors, see page 35 and definition of infrastructure on page 74, <http://placestogrow.ca/images/pdfs/ggh2017/en/growth%20plan%20%282017%29.pdf>

should also ensure that protect existing and planned corridors are protected to meet current and projected needs.³⁴²

The IESO's regional plan states the northwest Greater Toronto Area has identified the long-term need for a transmission corridor in the northwest Greater Toronto Area³⁴³ (Figure xx). A further studies will identify a more specific route may be identified through future studies. The IESO relied on demand forecasts for the area that were based on the population and employment forecasts included in the Growth Plan to forecast demand for the area.³⁴⁴ The transmission corridor would supply portions of the Regions of Halton, Peel and York.³⁴⁵

Given the size of the forecasted growth and the distance from existing transmission lines, alternatives to a new transmission corridor are either not economical or not technically feasible.³⁴⁶ In addition, the IESO estimates that there could be additional costs of hundreds of millions of dollars to build underground transmission lines later on, if an overhead transmission corridor is not reserved before the area develops.³⁴⁷

~~[Map of GTA West Corridor will be inserted here TBD]~~

Transparency for Consumers on Gasoline Pricing

Gasoline prices are a major area of interest for Many Ontario consumers pay attention to their gasoline prices³⁴⁸. A number of components are part of the retail price of gas, including crude oil costs, taxes, the gross refining/wholesale margin and the gross retail margin. Families and

³⁴² Growth Plan for the Greater Golden Horseshoe (2017), 3. Infrastructure to Support Growth, 3.2.5 b) Infrastructure Corridors, see page 35 and definition of infrastructure on page 74, <http://placestogrow.ca/images/pdfs/ggh2017/en/growth%20plan%20%282017%29.pdf>

³⁴³ IESO, Northwest GTA IRRP, pages 8 and 66-74, <http://www.ieso.ca/-/media/files/ieso/document-library/regional-planning/northwest-greater-toronto/2015-northwest-gta-irrp-report.pdf?la=en>

³⁴⁴ IESO, Northwest GTA IRRP, page 1 and 70, <http://www.ieso.ca/-/media/files/ieso/document-library/regional-planning/northwest-greater-toronto/2015-northwest-gta-irrp-report.pdf?la=en>

³⁴⁵ IESO, Northwest GTA IRRP, page 8, <http://www.ieso.ca/-/media/files/ieso/document-library/regional-planning/northwest-greater-toronto/2015-northwest-gta-irrp-report.pdf?la=en>

³⁴⁶ IESO, Northwest GTA IRRP, pages 72-73, <http://www.ieso.ca/-/media/files/ieso/document-library/regional-planning/northwest-greater-toronto/2015-northwest-gta-irrp-report.pdf?la=en>
IESO, Northwest GTA IRRP – Appendices – OPA, Assessment of the Long-Term Electricity Transmission System Requirements within Northwest GTA, November 10, 2014, page 8/11, <http://www.ieso.ca/-/media/files/ieso/document-library/regional-planning/northwest-greater-toronto/2015-northwest-gta-irrp-appendices.pdf?la=en>

³⁴⁷ IESO, Northwest GTA IRRP – Appendices – OPA, Assessment of the Long-Term Electricity Transmission System Requirements within Northwest GTA, November 10, 2014, page 8/11, <http://www.ieso.ca/-/media/files/ieso/document-library/regional-planning/northwest-greater-toronto/2015-northwest-gta-irrp-appendices.pdf?la=en>

³⁴⁸ Source needed

businesses have requested more information about how gasoline and diesel retail prices are set³⁴⁹.

As a result, the Province asked the OEB in November 2016 to conduct a review the operation of the Ontario's retail market for gasoline and diesel market including the information available to consumers about fuel³⁵⁰. The review will focus on three main topics:

- the extent and causes of variations in retail prices over time and between one region in Ontario and another;
- how pricing and competition in Ontario compare with other jurisdictions; and
- the information available to consumers about pricing and price variations.

price variations. The OEB expects to report on its findings later this year³⁵¹. The Province will review the OEB's report in detail and consider the information in its future decision-making.

Ontario routinely monitors the supply and price of gasoline in the province and other jurisdictions on an on-going basis, and makes this information publicly available through the quarterly Ontario Energy Report³⁵².

Summary

- The Province will direct the Ontario Energy Board (OEB) to continue and enhance its efforts to improve the performance of local distribution companies (LDCs).
- The OEB will increase utility accountability, make utilities more accountable to their consumers, promote efficiencies and cost reductions, encourage partnerships, and ensure regulatory processes are cost-effective and streamlined to accommodate changing utility business models.
- Ontario will work with the OEB and LDCs to redesign the electricity bill to make it more useful for consumers in understanding and managing their energy costs.
- The Province will direct the OEB to review the standards for reliability and quality of service for transmitters and distributors and recommend options for improving the standards. It will also ask the Independent Electricity System Operator (IESO) to review how its planning and policies can improve customer reliability.
- The Province will direct the IESO to develop a competitive selection or procurement process for transmission, and to identify possible pilot projects.
- Ontario will look to the IESO and the OEB to promote the right-sizing of transmission and distribution assets at their end of life.
- Significant cost savings are possible if land for a transmission corridor in the northwest Greater Toronto Area is reserved before the area develops.

³⁴⁹ Source needed

³⁵⁰ Source needed

³⁵¹ Source needed

³⁵² Source needed

- Ontario will provide greater transparency for consumers on gasoline pricing through the OEB's transportation fuels review.

Chapter 5. Strengthening our Commitment to Energy Conservation and Efficiency

Ontario has been building a culture of conservation since 2005³⁵³ and we can be proud of what has been accomplished. According to the Independent Electricity System Operator's (IESO) 2015 study on Ontario's conservation efforts, businesses are becoming more productive by investing in energy-efficiency upgrades and residents are choosing to install energy-efficient equipment in their homes, sometimes with the help of

Commented [LT50]: Add section on low income HAPP

Response: Added in Chapter 1 - Affordability

³⁵³ Source needed

Ontario's suite of residential and business conservation and demand management programs.³⁵⁴

Between 2005 and 2015, the average monthly household consumption for electricity decreased from over 800 to about 750 kilowatt-hours (kWh).³⁵⁵

Text Box: What We Heard from You

- Reaffirm and enhance commitment to Conservation First
- Improve building codes and standards
- Increase awareness of conservation and demand management programs and the value of conservation
- Ensure conservation and demand management programs are in sync with programs in Climate Change Action Plan
- Expand conservation to other fuels
- Encourage energy efficiency on the distribution system³⁵⁶

Energy efficiency is becoming more of a part of our everyday lives.³⁵⁷ Between 2005 and 2015, Ontario conserved 13.5 terawatt-hours (TWh) of electricity.³⁵⁸ That's equivalent to the electricity used annually by 1.5 million households in a year, or the amount of electricity that powered the cities of London, Kingston, Ottawa and Peterborough in 2015.³⁵⁹ During the same time, the conservation programs delivered by Ontario's natural gas utilities saved XX m3 in about 1,900 million cubic meters of natural gas, equivalent to YY the natural gas used by over 860,000 homes in a year.³⁶⁰

Since the 2013 Long-Term Energy Plan (2013 LTEP), the Province, its agencies, and electricity and natural gas distributors have been putting Ontario's Conservation First policy into effect.

Conservation and energy efficiency require a sustained commitment if they are to achieve persistent savings over the long term.³⁶¹ Ontario is enhancing its commitment to Conservation First Framework commitment to improve affordability and choice for people, businesses and

³⁵⁴ Source needed

³⁵⁵ Internal Ministry estimate based on data presented in the 2005, 2006 and 2015 OEB Yearbooks of Electricity Distributors, <https://www.oeb.ca/utility-performance-and-monitoring/natural-gas-and-electricity-utility-yearbooks>

³⁵⁶ Source needed

³⁵⁷ Source needed

³⁵⁸ IESO 2015 Conservation Results Report, page 15

³⁵⁹ Electricity for Cities of Kingston and Stratford - 2015 OEB Yearbook of Electricity Distributors: http://cf.oeb.ca/oeb/_Documents/RRR/2015_Yearbook_of_Electricity_Distributors.pdf

³⁶⁰ Internal Ministry estimate developed based on data reported by Enbridge and Union for 2005-2015 DSM programs. Assumes, average Ontario home consumes 2,200m3 of natural gas per year (based on OEB data), <https://www.oeb.ca/industry/policy-initiatives-and-consultations/natural-gas-demand-side-management-dsm>

³⁶¹ Source needed

communities, and to co-ordinate its conservation programs with Ontario's climate change objectives.

Text Box: The Savings from Conservation and Energy Efficiency}

Electricity			
gigawatt Of energy		Province has \$2 in added costs to it	
Natural Gas			
Over 1,200 80 million cubic metres Of The amount of natural gas savings achieved in 2015 through natural gas conservation programs for businesses ³⁶²	8,000+ Projects The energy efficiency projects completed through home energy audit and retrofit programs in 2015 ³⁶³	the \$7 to \$11 per month A typical household that participates in residential natural gas conservation programs can save about \$7 to \$11 per month. ³⁶⁴	\$0.04 per cubic metre Cost The cost of natural gas conservation programs in 2015, which is significantly cheaper than the cost of purchasing natural gas. ³⁶⁵

Getting More from Conservation

³⁶² IESO 2015 Conservation Results Report, page 5

³⁶³ IESO 2015 Conservation Results Report, page 5

³⁶⁴ IESO 2015 Conservation Results Report, page 1

³⁶⁵ IESO 2015 Conservation Results Report, page 7

³⁶⁶ 2015 Natural Gas DSM Annual Verification Report, calculated based on data presented on page ii and page iv

³⁶⁷ 2015 DSM Draft Annual Reports, calculated based on data presented on page 36 (Enbridge report) and page 16 (Union report)

³⁶⁸ Source needed

³⁶⁹ Calculated based on data presented in the 2015 Natural Gas DSM Annual Verification Report and the 2015 DSM Draft Annual Reports.

Ontario has a healthy supply of energy, with any added demand for electricity not expected to materialize until the early 2020s³⁷⁰. In this context, Ontario will continue to use conservation programs and improved efficiency standards to drive toward its long-term target of saving a total of 10 TWh of electricity by 2032.

³⁷¹ The Province and its agencies will continue to assess the achievable potential for energy conservation, consider initiatives under Ontario's Climate Change Action Plan, and explore options to enhance the value of our existing investments in conservation.

Right now, the IESO is conducting a mid-term review of the Conservation First Framework and the Industrial Accelerator Program for electricity conservation.³⁷² The Ontario Energy Board (OEB) is conducting a parallel similar review of the Demand Side Management Framework for natural gas programs.³⁷³ These reviews are looking at how the programs are meeting customer needs, their distributor budgets and the distributors' 2020 targets for conservation savings, and coordination with Ontario's climate change objectives.³⁷⁴

The IESO is also using the mid-term review to look at how these programs can be better coordinated with local and regional electricity planning and Ontario's climate change objectives.³⁷⁵

Demand Response

Demand response programs reward electricity customers for reducing their electricity use when needed. Demand response can enhance the reliability of the provides benefits to Ontario's electricity system by enhancing reliability's, as well as reduced reducing system costs and GHG emissions. An example of demand response is a factory temporarily halting a process, or a group of residential consumers reducing their air conditioning when electricity demand is high.

The IESO has successfully transitioned away from securing demand response through using multi-year contracts, instead using to secure demand response, holding an annual competitive auction for demand response, instead. The demand response auctions held in 2015 and 2016 reduced the cost of obtaining demand response by up to 17 per cent when compared to previous contracts³⁷⁶. The IESO is now working with industry partners to use demand

³⁷⁰ Source needed

³⁷¹ Source needed

³⁷² Source needed

³⁷³ Source needed

³⁷⁴ Source needed

³⁷⁵ Source needed

³⁷⁶ February 6, 2017 DR Update Note from IESO – Verified by email on June 23, 2017

response to better respond to times of the day when electricity demand increases or decreases.

The 2013 LTEP set a long-term target to use Through collaborative efforts by the IESO and Demand Response Working Group, Ontario's demand response to reduce 10 per cent of the province's peak electricity demand by 2025. As Ontario transitions to a technology-neutral capacity auction, resources have grown significantly above the Province will no longer pursue a long-term target for 2013 LTEP projections, and demand response, and instead has become a mature and competitive resource.³⁷⁸ Instead of pursuing a capacity target, to further increase and develop demand response the Province will work with the IESO to evolve from the demand response auction auctions to a the technology-neutral capacity auction, where demand response resources can grow by competing directly with traditional generation, and other new and emerging technologies.

Commented [AL51]: Could expand here and say that as a result of the DR sector maturing and its integration into the market there is no need for a long-term target

Commented [CD(52): As of July 19, 2017, decision to maintain/remove DR target pending further discussion.

Ensuring a Customer-Centred Approach

The current conservation frameworks encourage electricity and natural gas distributors to collaborate to provide in providing more efficient programs and a streamlined experience for customers. Such partnerships can offer energy consumers a co-ordinated, one-window approach to energy consumers to help meet their energy management needs. Currently, 46 electricity distributors are involved in joint conservation plans, and electricity distributors are partnering with natural gas distributors to design and develop programs that cover multiple fuels.³⁷⁹

Distributors are being encouraged to develop new and innovative programs for their customers. New pilots and programs include Hydro One's Heat Pump Advantage pilot, a province-wide Business Refrigeration Incentive Program (originally developed by Alectra Utilities), Toronto Hydro's incentive program for Energy Star pool pumps, and Enbridge Gas Distribution's School Energy Competition.³⁸⁰

For its part, the IESO has launched the first full-scale pay-for-performance program in North America.³⁸¹ The Save on Energy Multi-Distributor Pay-for-Performance Program rewards businesses for improving their overall energy performance over a number of years.³⁸²

³⁷⁷ Source needed

³⁷⁸ Source needed

³⁷⁹ OEB Conservation and Demand Management Report- 2015 Results, Page 3, https://www.oeb.ca/oeb/_Documents/CDM/OEB_2015_CDM_Results_Report.pdf

³⁸⁰ Source needed

³⁸¹ Source needed

³⁸² Source needed

Businesses are paid for each kilowatt-hour they conserve, and are given flexibility on how they achieve those savings. Ratepayers benefit as well: participants only have to file a single project application, reducing the administration costs of the program.³⁸³

Text Box: Business Refrigeration Incentive

[REDACTED] PowerStream (now [REDACTED])³⁸⁴

[REDACTED]³⁸⁵

PLACEHOLDER: Pictures

Text Box: Union Gas and Social Housing Haldimand Norfolk Housing Corp

Haldimand Norfolk Housing Corporation is saving \$14,000 a year and has improved tenant comfort by installing variable frequency drives on the heating systems of six rental buildings. The \$14,500 incentive through Union Gas's Affordable Housing Conservation Program covered 50 per cent 50 percent of the project's total cost and is reducing annual natural gas consumption by 45,000 cubic meters.³⁸⁶

"This methodology has proven to save significant amounts of energy required to heat incoming fresh air. The resulting savings have been instant and the...incentive was able to cut the payback time in half."

Marc Puype, Technical Services Manager, Haldimand Norfolk Housing Corporation³⁸⁷

³⁸³ Source needed

³⁸⁴ Source needed

³⁸⁵ Source needed

³⁸⁶ Source needed

³⁸⁷ Source needed

Expanding Home Retrofits

As part of its Climate Change Strategy, Ontario has invested \$100 million from its Green Investment Fund to help eligible homeowners who primarily heat with natural gas, oil, propane or wood³⁸⁸. They can improve the energy efficiency of their homes, reduce their energy bills and cut greenhouse gas (GHG) emissions by participating in enhanced audit and retrofit programs offered by Enbridge Gas Distribution and Union Gas.

Launched province-wide in October 2016, the program is expected to allow about 37,000 additional homes to be audited and retrofitted ~~of~~ by 2019, and cumulatively reduce their lifetime GHG emissions by approximately 1.6 million tonnes.³⁸⁹

Ontario made additional improvements to the home energy audit and retrofit programs in May 2017. Partnering with Enbridge Gas Distribution and Union Gas, the IESO expanded the program to include electrically-heated homes, and added electricity savings measures for all participants³⁹⁰. This 'Whole Home' approach is now providing residential consumers with a co-ordinated one-window approach to energy efficiency improvements.

Text Box: Energy Efficiency for Your Whole Home

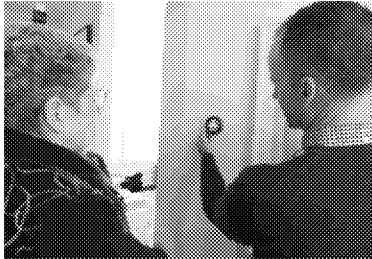
*Incentives from the Home Energy Conservation Program allow families like the O'Haras to reduce their energy bills, increase their home comfort, and cut GHG emissions. The O'Haras upgraded their furnace, hot water heater and windows, improving improved the efficiency of their more than century-old home by upgrading their furnace, hot water heater and windows. They also added basement insulation and air sealed their home. The upgrades will reduce the O'Hara's consumption of natural gas by 36 per cent, and cut their annual GHG emissions by 1.67 tonnes annually. In addition to retrofitting their home, the O'Haras installed a smart thermostat, which increases their savings by allowing them to reduce home temperatures when they are away.*³⁹¹

³⁸⁸ "Helping Homeowners Cut Energy Bills with Retrofits and Renovations." October 31, 2016, <https://news.ontario.ca/opo/en/2016/10/helping-homeowners-cut-energy-bills-with-retrofits-and-renovations.html>

³⁸⁹ "Helping Homeowners Cut Energy Bills with Retrofits and Renovations." October 31, 2016, <https://news.ontario.ca/opo/en/2016/10/helping-homeowners-cut-energy-bills-with-retrofits-and-renovations.html>

³⁹⁰ Whole Home Pilot Program launch, <http://ieso.com/en/sector-participants/ieso-news/2017/06/whole-home-pilot-program-launch>

³⁹¹ Source needed



Providing Choice Through Information, Tools and Access to Energy Data

Ontario is leading the way in helping consumers choose devices and technologies that can give them greater control over their energy use, and help them find opportunities to lower their energy bills.³⁹²

Smart Thermostats

Smart thermostats can be an important piece of technology for homeowners looking for businesses who want to reduce the costs of their heating and cooling their homes as well as their costs and carbon footprint. Smart thermostats:

- give consumers more information about their energy use;
- enable customers to use a smart phone app to remotely control the temperature of their home or small business; and
- automatically adjust the temperature to respond to changes in pricing, a customer's schedule, or to changes in the season.

To standardize incentives for the purchase of smart thermostats and expand their availability across Ontario, the Province directed the IESO in August 2017 to support the design and delivery of deliver, with the support of the Green Ontario Fund, a province-wide rebate program for smart thermostats supported by the Green Ontario Fund.³⁹³

Green Button

Ontario's Climate Change Action Plan committed to expanding the Province's Green Button initiative.³⁹⁴ Green Button Download My Data can give households and businesses easy electronic access to data on their energy and water consumption. Green Button Connect My

³⁹² Source needed

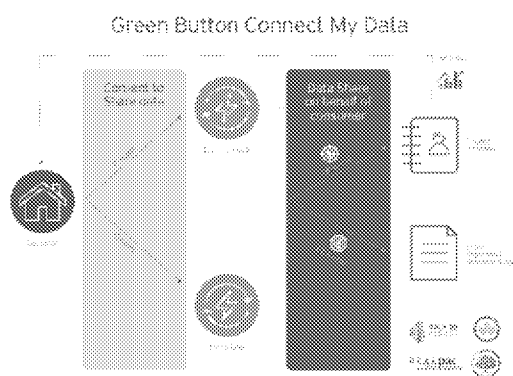
³⁹³ Source needed

³⁹⁴ Ontario's Five-Year Climate Change Action Plan 2016-2020, pages 29 and 69

Data lets households and businesses securely and automatically transfer their own data to applications of their choice.³⁹⁵ Greater access to information through Green Button will allow consumers to better understand their energy and water usage and use the information to make decisions, such as reducing or shifting their energy use or retrofitting their home or business to improve its energy efficiency. Green Button can also support energy reporting and benchmarking, and create new opportunities for economic development.

Ontario is committed to expanding Green Button province-wide and intends to amend legislation that would, if passed, allow Ontario to require electricity and natural gas utilities to implement Green Button Download My Data and Connect My Data. In addition, Ontario will collaborate with the province's electricity, natural gas and water utilities to adapt the Green Button standard and create new guidance documents for natural gas and water utilities, and to update existing guidance documents for electricity utilities.³⁹⁶

[Placeholder: Green Button Graphic]



Accessible Description:

A graphic illustrates how Green Button Connect My Data works. Consumers can give consent for their utility to securely transfer their energy data to a third party of their choice, such as an app or solution provider. The utility transfers the energy data in Green Button format to the third party authorized by the consumer. The third party can analyze the energy usage data, identify patterns and suggest opportunities for consumers to reduce or shift energy use and energy efficiency retrofit improvements. Green Button Connect My Data can also support energy reporting and benchmarking by allowing data to be collected and shared in a consistent manner.

³⁹⁵ Source needed

³⁹⁶ Source needed

Text Box: Green Button

"Budweiser Gardens uses Event Assist, with information gathered through the Green Button initiative, to help us better understand the hydro usage associated with the size, type and configuration of each event. This has the capability to change how we book events in the future, not only for our building, but within the industry. Working with the team at London Hydro has shown me what a truly professional organization they are from top to bottom."

- Gary Turrell, Director of Operations, Budweiser Gardens³⁹⁷

Energy Benchmarking

Ontario's energy benchmarking and rating initiatives give people and organizations the tools and information they need to understand the energy performance of their homes and businesses, and compare it with similar buildings. They can use this information to manage their usage and costs, and justify investments in energy efficiency. ¹⁵ electricity distributors ¹⁵ local distribution companies (LDCs) have social benchmarking programs in their Conservation and Demand Management Plans; five of them are currently being offered to electricity customers. To promote participation in their residential audits and retrofits, Enbridge Gas Distribution and Union Gas are each including social benchmarking in their outreach and education programs to promote participation in their residential audits and retrofits. ³⁹⁸

Ontario's Climate Change Action Plan has committed to expanding another tool, the Province's Green Button initiative. ³⁹⁹ Green Button Download My Data can give households and businesses easy electronic access to data on their energy and water consumption. Green Button Connect My Data lets households and businesses securely and automatically transfer their own data to applications of their choice. Greater access to information through Green Button will allow consumers to have a better understanding of their energy and water use and use the information to make decisions about their energy use, such as reducing or shifting their energy use or retrofitting their home or business to improve its energy efficiency. It can also support energy reporting and benchmarking, and create new opportunities for economic development.

Ontario is committed to expanding Green Button province-wide and intends to introduce amending legislation that would, if passed, require electricity and natural gas distributors to implement Green Button Download My Data and Connect My Data. In addition, Ontario will collaborate with the province's natural gas and water utilities to adapt the Green Button

³⁹⁷ Source needed

³⁹⁸ Source needed

³⁹⁹ Ontario's Five-Year Climate Change Action Plan 2016-2020, pages 29 and 69

standard for use by their customers, and to update guidance documents for Green Button's use with electricity data.

Commented [LT53]: Add line about long term benefits.

Response: Overall benefits of Green Button are included earlier. Could MO advise if there is something missing that MO would like to see featured?

Text Box: Green Button

"Budweiser Gardens uses Event Assist, with information gathered through the Green Button initiative, to help it better understand the hydro usage of each size, type and configuration of event. This gives us the ability to change how we book events in the future not only for our building but within the industry. Working with the team at London Hydro has shown me what a truly professional organisation they are from top to bottom."

Gary Turrell, Director of Operations, Budweiser Gardens

Commented [LT54]: Refer to 2013 LTEP for Green Button pic and language.

Response: MO comment is not clear. Is there a desire to reuse the Green Button graphic from page 82 of the 2013 L TEP? Or include the graphic in addition to the currently proposed call out box?

Organizations in Ontario's broader public sector are required to annually report their energy consumption and GHG emissions to the Province and to make that information available to the public.⁴⁰⁰ Building on this success, as well as on lessons learned from similar programs in the United States, Ontario has introduced a requirement for Energy and Water Reporting and Benchmarking for large private sector buildings as well.⁴⁰¹

Starting in July 1, 2018, and phased in over three years, owners of large commercial, multi-unit residential and some industrial buildings will be required to annually report their building's buildings' use of energy and water and its their GHG emissions to the Province.⁴⁰² Some of that data will be posted on Ontario's Open Data website every year, so that owners can compare the energy and water usage of their buildings with that of similar facilities, and identify where improvements can be made. The first deadline for reporting is July 1, 2018.

Access to Energy Efficiency Financing

Ontario is also exploring how to increase access to corporate financing for energy efficiency projects. The Investor Confidence Project gives financiers the information and tools they need to determine the viability of energy efficiency projects. The Project was established by the Environmental Defense Fund in the United States in 2013. The MaRS Advanced Energy Centre is partnering with the Province to pilot Investor Confidence Project protocols in Ontario and explore how they can be adapted for the Canadian market.⁴⁰³

Raising the Bar for Energy and Water Efficiency

⁴⁰⁰ Source needed

⁴⁰¹ O.reg. 20.17

⁴⁰² O.reg. 20.17

⁴⁰³ Source needed

Ontario continues to play a leading role in improving the energy efficiency of the equipment in our homes, offices and factories. Since 2013, the Province has improved or set new energy efficiency standards for over 60 products.⁴⁰⁴ The gains in energy efficiency not only endure, but have endured, and helped consumers save on their energy bills. In addition, economies of scale have lowered the cost of the technologies, making them more popular, affordable and more available than ever before.

Commented [MK55]: Expand – how does this help customers save.

Response: This number is based on staff's internal analysis. Improved or new energy efficiency standards for over 60 products have been included in Ontario's energy efficiency regulation (O.Reg. 404/12) through a series of amendments. Since 2013 LTEP, the EE regulation has been updated 6 times. There is no single publicly available document that can be used as a source for this information. Decision notices for each of the amendments would support this statement. An internal tracking document will be developed to support the number.

A 2016 amendment to the *Green Energy Act, 2009* now allows Ontario to regulate the water efficiency of products that consume both energy and water.⁴⁰⁵ As a result, the province is now on a path to achieve more efficient use of water, even greater energy savings and reductions in greenhouse gas emissions.

Text Box: "Did You Know?"

By 2032, the most recent efficiency standards for clothes washers in Ontario are expected to save:

- the amount of water that flows over Niagara Falls in 2.75 hours
- the annual electricity currently consumed by the City of Stratford in 2015⁴⁰⁶

Ontario will continue to set advanced efficiency standards for products and appliances and work with other provinces and the federal government to harmonize and raise the bar for energy and water efficiency standards.

Efficiency Standards for Drinking Water and Wastewater Treatment Plants

Ontario is exploring opportunities to set or update energy efficiency standards for key electrical equipment in drinking water and wastewater treatment plants. As Ontario's Climate Change Action Plan pointed out, this would help municipalities to save on their electricity bills by reducing one of their largest uses of electricity.⁴⁰⁷

Commented [AL56]: First Nation communities also have their own water treatment plants.

Commented [LT57]: Add content about CES and EMMC here

Text Box: Waste Water

*"Municipal water and wastewater services are typically one-third to one-half of a municipality's total electrical use, so there is potential for reductions in both costs and emissions."*⁴⁰⁸

Response: CES and EMMC content is not relevant/applicable to this section, since efficiency standards for WWTP and DWTPs were not considered nor discussed by CES and EMMC.

⁴⁰⁴ Source needed

⁴⁰⁵ Source needed

⁴⁰⁶ Source needed

⁴⁰⁷ Source needed

⁴⁰⁸ CCAP 2016, pg. 83

Expanding the Scope of Conservation

Ontario is expanding the scope of conservation to ensure that all participants in the energy sector embed entrench the Conservation First policy in their day-to-day operations and help Ontario reach its GHG targets.

Text Box

: In-Front of the Meter Conservation

In front-of-the-meter conservation (IFMC) technologies reduce line losses and optimize voltage levels. Local distribution companies deploy them on their distribution networks to save electricity and reduce their peak demand.

Ontario and its agencies have taken important steps to implement the Conservation First policy when planning to meet regional and local needs for electricity and natural gas⁴⁰⁹, and are going exploring how to further integrate this policy into their planning processes (see Chapter 8). During the LTEP consultations and engagements, local distribution companies (LDCs) and technology vendors expressed interest in Ontario-urged that using in-front-of-the-meter conservation (IFMC) technologies be deployed to help meet conserve electricity conservation targets and reduce peak demand⁴⁰⁹.

Several pilots across North America have demonstrated the potential benefits of deploying IFMC technologies, and the Smart Grid Fund and the Conservation Fund are supporting have supported pilots in Ontario.⁴¹⁰ A recent provincial study commissioned by the Province estimated they can be cost-effectively deployed on 30 per cent of Ontario's electricity distribution networks⁴¹¹.

The Province and its agencies will encourage distributors to make their networks more energy efficient, by allowing them to use the electricity savings from IFMC measures to meet their targets for electricity savings under the 2015 to -2020 Conservation First Framework. IFMC project costs will continue to be funded through distribution rates, and subject to the OEB's review by the normal OEB processes process. The OEB will also identify steps for pursuing further conservation on the distribution system.

⁴⁰⁹ Source needed

⁴¹⁰ Source needed

⁴¹¹ 2017 Navigant Report – Considerations for Deploying IFMC Technologies in Ontario, Page 6

Integrating Conservation and Climate Change Programs

Ontario's Climate Change Action Plan emphasized the need to increase the use of low-carbon technology, such as solar panels and heat pumps, in homes and businesses.⁴¹² Several programs to increase energy choices for Ontarians are being introduced this year, funded by the proceeds from auctions in the cap-and-trade program carbon market.⁴¹³

A new agency, the Green Ontario Fund, will help is helping Ontarians move to a low-carbon future by offering them incentives, financing and services to increase the use of technologies that reduce GHG emissions. The Green Ontario Fund website provides a co-ordinated one-window approach where Ontarians can get help, information and access to its programs, as well as to other conservation and renewable energy programs in Ontario.⁴¹⁴ [Web launch late Aug or early Sept – TBC]

Green Ontario Fund programs are building on the success of the province's existing conservation and energy efficiency programs, providing Ontarians with a customer-focused approach that gives them more opportunities to reduce their energy costs and carbon footprint. The IESO will be a partner in the delivery partner for of certain Green Ontario Fund programs to help promote an efficient and customer-focused approach.

Ontario will work with its agencies to explore how to further integrate the delivery of all conservation and low-carbon technology programs for both electricity and fuels.

Text Box:

~~Behind-the-meter generation refers to on-site generation projects where the electricity generated is used within a facility. Under the IESO's current program rules, behind-the-meter generation projects include combined heat and power and waste energy recovery.~~

Under current conservation programs, combined heat and power projects that use fossil fuels to generate electricity on-site have been eligible for incentives because they can significantly reduce demand on the electricity grid.⁴¹⁵

To help meet Ontario's climate change goals, these projects will no longer be eligible for incentives under the Conservation First Framework and the Industrial Accelerator Program (IAP), starting July 1, 2018. The deadline coincides with the end of the mid-term review of both the Framework and IAP.

⁴¹² Source needed

⁴¹³ Source needed

⁴¹⁴ Source needed

⁴¹⁵ Source needed

Because of their energy efficiency and environmental benefit, ~~benefits~~, behind the meter waste ~~energy recovery projects and~~ projects that use renewable energy, such as solar thermal water heating or biomass fuel for boilers, will continue to be eligible for funding under the Conservation First Framework and the Industrial Accelerator Program. Electricity distributors may also ~~offer incentives~~ develop incentive programs for energy storage systems that are integrated with a customer's own renewable energy project. When added to on-site renewable generation, energy storage systems can provide reliability and help customers reduce their demand when prices are highest. This can help reduce peaks in demand on the local and provincial systems.

Summary

- The transition to an incremental capacity auction will provide a stable platform to effectively use demand response as a system resource, ~~by enabling it to compete directly with traditional generation and other emerging technologies.~~
- ~~Ontario will continue to set advanced efficiency standards for products and appliances and will explore setting or updating energy efficiency standards for key electrical equipment in drinking water and wastewater treatment plants.~~
- ~~Ontario will continue to set advanced efficiency standards for products and appliances and will explore setting or updating energy efficiency standards for key electrical equipment in drinking water and wastewater treatment plants.~~
- The Province and its agencies will further encourage distributors to pursue conservation on their distribution systems to ~~maximize~~ achieve customer benefit ~~electricity and cost savings.~~
- The Green Ontario Fund will provide energy consumers with a co-ordinated, one-window approach to encourage conservation across multiple energy sources and programs.
- Beginning July 1, 2018, ~~behind-the-meter generation~~ combined heat and power projects that ~~primarily~~ use fossil fuels to generate electricity will no longer be eligible for incentives under the Conservation First Framework or the Industrial Accelerator Programs. ~~Waste Program.~~ Behind the meter waste energy recovery projects will continue to be eligible, as will renewable energy projects, including those paired with energy storage systems.
- ~~Ontario will expand~~ is committed to expanding Green Button province-wide and ~~will introduce~~ intends to amend legislation ~~requiring that would, if passed, enable Ontario to require~~ electricity and natural gas utilities to implement Green Button Download My Data and Connect My Data.

Chapter 6. Responding to the Challenge of Climate Change

Ontario is taking a leading role in Canada and abroad in the global fight against climate change. The energy sector ~~has~~ will play two key roles in meeting the challenge. The robust supply of electricity will ~~play~~ give it a central role ~~task~~ in assisting the transition to a clean economy. At the same time, ~~energy partners~~ we must strengthen ~~their~~ our energy infrastructure and make it more resilient to lessen the damage caused by ~~that~~ climate change can cause.

What We Heard from You

- Support increased use electrification of electric vehicles (EV) transportation
- Support options for home storage, including EV batteries
- Microgrids can help resiliency and northern communities
- Customers will decide which technologies work best
- Modernize regulations and rate designs
- Integrate conservation programs with initiatives announced in the Climate Change Action Plan
- Government support needed for research and development
- Distributed generation will transform conventional networks
- Introduce renewable natural gas into Ontario's natural gas supply⁴¹⁶

Commented [LT58]: Use (an updated) jurisdictional supply mix map from 2012 LTEP.

Response: Reviewing to address in future iterations.

Commented [LT59]: Add stats about health savings.

Response: Recommend against citing the 2005 study as it is now over 10 years old.

Commented [LT60]: REWRITE MC

Response: Need further clarification from MO, to be addressed in future iteration.

⁴¹⁶ Source needed

Ontario's cap and trade program came into effect on January 1, 2017⁴¹⁷. The cap and trade program is a flexible, market-based program that sets an annual cap for greenhouse gas (GHG) emissions, with the targets becoming more stringent over time. The cap will be lowered each year to enable Ontario to meet its GHG reduction targets.

Cap and trade creates a market to provide incentives to reduce emissions. Large emitters must have enough allowances to cover their emissions/GHG releases. Companies that emit more than their allocation can buy additional allowances through government auctions or from other companies that have more allowances than emissions. Some companies are currently allocated free allowances in recognition of their exposure to international trade and/or the amount of energy they need to use.⁴¹⁸

Under the Climate Change Mitigation and Low-Carbon Economy Act, 2016, proceeds from Ontario's cap and trade auctions will be used to reduce the province's GHG emissions by helping Ontarians shift away from higher carbon fuels and reduce their energy consumption.⁴¹⁹ Ontario's Climate Change Action Plan is investing up to \$8.3 billion over five years to fight climate change, reduce greenhouse gas pollution and transition to a low-carbon economy⁴²⁰.

Putting a price on carbon through cap and trade will have a significant impact on the operation of the electricity market in Ontario. It will encourage a transition away from generation that uses fossil fuels to generation and clean imports and generation that are free of GHG emissions. It will also encourage more efficient natural gas generation. As Ontario moves forward with Market Renewal, the cost of carbon will become increasingly important in the economics of electricity generation projects, and become a factor in their success in a capacity auction, their ability to compete in incremental capacity auctions. Market Renewal has the potential to create a framework that effectively incorporates emerging clean technologies into our supply mix.

Together, cap and trade and Market Renewal initiatives can help to ensure electricity sector emissions remain well below historical levels, while also helping to meet our climate change and GHG reduction commitments.

Building on a Clean Electricity System

About 90 per cent of the electricity used in Ontario in 2016 was free of GHG emissions, generated from sources such as water, nuclear, wind, solar and bioenergy.⁴²¹ Our investments in these types of clean generation sources, along with the elimination of coal-fired electricity

⁴¹⁷ Source needed

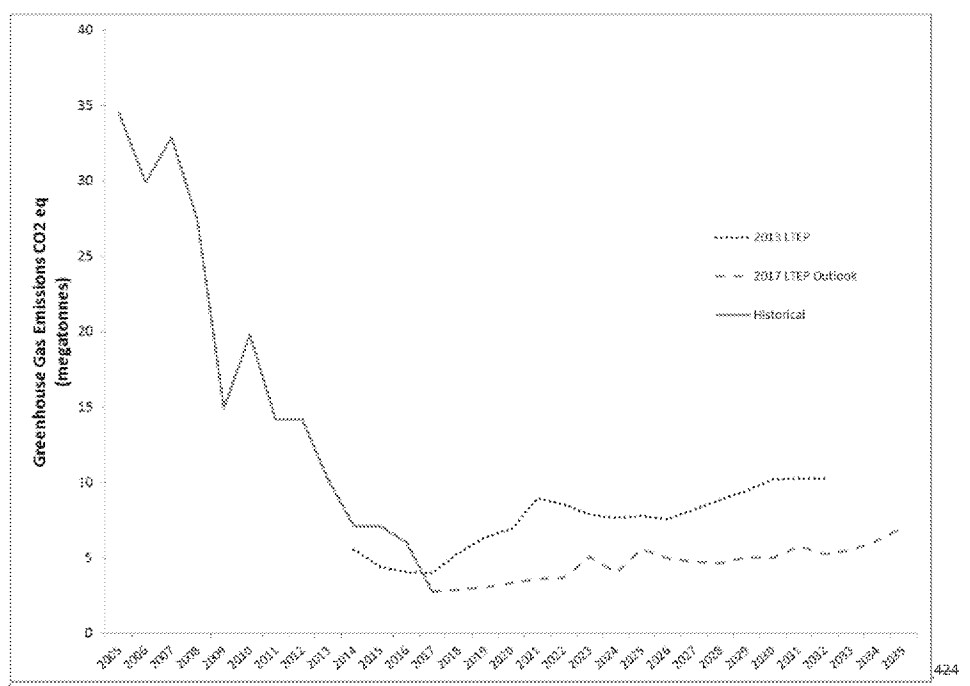
⁴¹⁸ Source needed

⁴¹⁹ Source needed

⁴²⁰ Source needed

⁴²¹ IESO, Power Data – Supply Overview - <http://www.ieso.ca/power-data/supply-overview>

generation, have significantly reduced GHG emissions in the province. Thanks to these investments, our the province's electricity sector currently accounts for only about two per cent of the province's Ontario's total GHG emissions⁴²² and emissions in 2017 are forecast to be more than 80 per cent below 1990 levels in 2017⁴²³. As seen in figure X below, emissions are expected forecast to remain well below historical levels and to be relatively flat over the planning period.

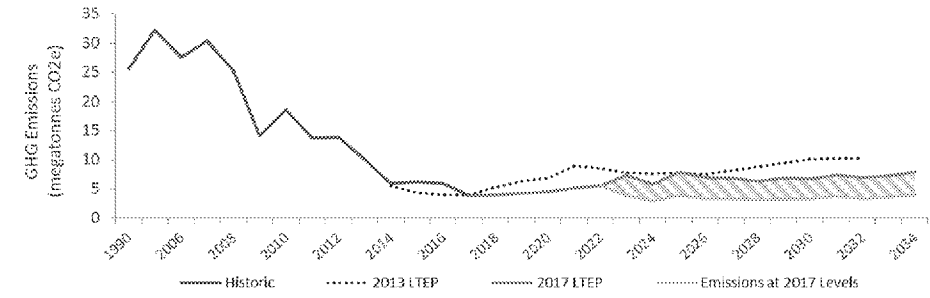


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⁴²² Source needed

⁴²³ IESO, Ontario Planning Outlook forecast and Environment Canada and Climate Change National Inventory Report (NIR). Will need to be confirmed with IESO once updated modelling for 2017 LTP is finalized.

⁴²⁴ IESO, Modelling Update to baseline data for the 2017 LTP (Updated Outlook)



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These actions have given Ontario an significantly decarbonized the provinces' electricity system that is sector, leaving it well positioned to help the province move towards a low-carbon economy, and meet its CCAP targets. Our clean and reliable electricity system gives us the province a strong base needed foundation on which to pursue the increased electrification of other sectors of our economy such as, including the use of more electric vehicles, or the expanded use.

The province's robust supply of renewable natural gas (RNG).

Commented [LT61]: Replace with line about space heating.

It energy will also allow us it to combine different energy sources into integrated energy systems that provide new services for homeowners and businesses. Natural gas will continue to play a critical role in space and water heating, but we must use it as efficiently as possible and supplement it with the next generation of clean energy technologies, such as ground-source and air-source heat pumps. Proceeds of from Ontario's cap and trade auctions will help fund the further application of these technologies.⁴²⁵ By making the best use of our existing energy sources and infrastructure, a more integrated energy system will allow Ontario to chart the most effective course for achieving our its goals for reducing GHG emissions reduction goals.

Response: Adding language on space heating would be inconsistent with the assumptions made in the 2017 LTEP. Recommend staying with RNG as it is expected to make up significant amounts of the emissions reductions in current modelling.

Renewable Energy Success

Ontario is Canada's leader in installed wind and solar power. There is more wind and solar capacity operating in the province Ontario than in any other province or territory. When you add hydroelectric generation and bioenergy into the mix, renewables accounted for 40 per cent of Ontario's electricity supply mix in 2015, up from 26 per cent in 2005⁴²⁶. Currently, Ontario has over 18,300 megawatts (MW) of wind, solar, hydroelectric and bioenergy generation capacity in operation or under development⁴²⁷.

⁴²⁵ Source needed

⁴²⁶ From IESO Ontario Planning Outlook, Sept. 2016

⁴²⁷ IESO Supply Data of December 31, 2016

Ontario's introduction of the Large Renewable Procurement (LRP) process in 2014 resulted in strong competition between developers of large renewable projects and drove down price and secured clean, reliable generation. The results of the first phase (LRP I) significantly reduced the costs of wind and solar energy, saving money for electricity ratepayers.⁴¹⁸

The results of the final feed-in-Tariff (FIT) procurement were announced on [Date TBD] and will add XXXMW of clean renewable generation to the province's supply mix.⁴²⁹ To reflect the decreasing costs of equipment and ensure value to ratepayers, since 2009, prices paid for new electricity from FIT and microFIT projects have been reduced between 50 and 75 per cent since 2009, reflecting the decreasing costs of equipment and ensure value to ratepayers.⁴³⁰

As a result of annual price reviews, revised procurement totals and the introduction of competitive procurement for large renewable energy projects, the FIT, microFIT and LRP initiatives are expected to cost at least \$3 billion less than forecast in the 2013 LTEP.⁴³¹

A highlight of Ontario's renewable energy programs has been the success that individuals, schools, places of worship, municipalities, co-operatives and Indigenous communities have had in participating in clean energy projects. In the last FIT procurement, FIT 4, 74 percent of successful applications had Indigenous, municipal, public sector or community participation.⁴³² From smaller home or farm-sized projects to larger community-scale projects, Ontarians are using renewable energy to meet their community's electricity needs and reduce their demand on the provincial electricity grid.⁴³³

Text Box: Communities Benefitting from Renewable Energy

The Municipality of Chatham-Kent has received significant benefits for hosting a number of wind energy projects. Recent projects include, including:

South Kent Wind

\$2.5 million to upgrade the Chatham-Kent Municipal Airport plus community benefits totalling \$11.5

~~\$14 million over the life of the project. 120 years.~~

North Kent Wind 1- \$9 million over 20 years.

- ~~Community benefit contribution of Romney Wind - \$4 million, and an estimated \$5 million in property taxes over the 20-year life of the contract.~~

Commented [LT62]: Replace box 1 with specific references

Response:

Specific project examples for First Nation and Metis participation are already included in Chapter 7. A wind energy/community example is provided below (Chatham-Kent).

Box 1 to be updated following IESO announcement of FIT 5 contract offers, anticipated by end of August, willtance.

[illegible]

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Romney Wind

Total of \$3 million contribution to the municipality over the 20-year life of the contract, and an estimated \$1.1 million in additional property tax revenue for Chatham-Kent over 20 years⁴³⁴

These companies have invested heavily in the social fabric of the community through partnerships with local organizations for sponsorship of community projects such as splash pads. Chatham-Kent is also widely recognized as one of Ontario's leading green energy communities.⁴³⁴

First item in text box above⁴³⁵

Second item in text box above⁴³⁶

Third item in text box above⁴³⁷

All items in LRP 1 box above⁴³⁸

Ontario's renewable energy policies have made our electricity supply mix cleaner, and are providing real benefits for communities and municipalities. Recognizing this success, *Delivering Fairness and Choice* is focused more on outcomes rather than mandating specifying targets and technologies. With a solid foundation of electricity provided by renewable energy, Ontario can now focus on new opportunities for innovation, modernization and exporting our expertise. The Province remains committed though, to having an electricity system where renewable energy generation plays an essential role for and one that supports supporting the goals of the Province's Climate Change Action Plan.

Wind

Wind power has become an important source of clean electricity for Ontario. In 2003 there was only 15 MW of installed capacity in Ontario in 2003, compared with 4,800 MW today.⁴³⁹ That is enough wind energy to power approximately 1.4 million homes each year.⁴⁴⁰ Today, turbines

It is also being produced more efficiently. Turbines now use state of the art controls to adjust their blades and orientation to get the maximum output of energy in changing wind

⁴³⁴ Source needed

⁴³⁵ IESO FIT website - <http://www.ieso.ca/-/media/files/ieso/document-library/fit/archive/fit-newsroom-archive-2016.pdf?la=en>

⁴³⁶ H02 ABORIGINAL PARTICIPATION IN ONTARIO'S ENERGY SECTOR

⁴³⁷ IESO bi-weekly report on microFIT program – 25,739 microFIT projects connected to the grid as of June 23, 2017 <http://www.ieso.ca/en/get-involved/microfit/news-bi-weekly-reports>

⁴³⁸ <http://www.chatham-kent.ca/Council/CouncilMeetings/2015/Documents/March/Mar-23-10a.pdf>

⁴³⁹ Source needed

⁴⁴⁰ Source needed

conditions^{441, 442}. The IESO has been able to send instructions to renewable energy generators since 2013 to stop producing electricity when it is not required to meet provincial needs.⁴⁴³ Actively controlling wind energy generation results in the more efficient operation of the electricity system, and helps minimize costly nuclear shutdowns and the replacement use of natural gas-fired generation.⁴⁴⁴

Solar

Ontario has become a North American leader in the development of solar photovoltaic (PV) systems with over 2,300 MW of capacity online, enough to power about 300,000 homes each year⁴⁴⁵. Solar power can help the electricity system to meet Ontario's needs on hot and sunny days, when air conditioning use is highest. Advances in solar PV technology have seen improved performance⁴⁴⁶ and a significant decline in costs⁴⁴⁷, resulting in more cost-effective solar generation. –Solar PV systems also support ongoing modernization of the grid. They can be large or small, and can be located close to where electricity is needed. Solar PV systems can also be paired with other innovative technologies like energy storage. These advantages mean that solar PV will continue to be a valuable asset for Ontario's distribution systems, and can help improve the operation of the electricity grid in the future.

Hydroelectric

Most of Ontario's supply of renewable energy supply continues to come from the province's hydroelectric facilities, which provided 24 per cent of Ontario's total generation in 2016⁴⁴⁸. Ontario has approximately 8,800 MW of installed hydroelectric capacity.⁴⁴⁹ Older hydroelectric projects can be redesigned to improve performance by using new, more efficient turbines.⁴⁵⁰

Bioenergy

⁴⁴¹ Source needed

⁴⁴³ Source needed

⁴⁴⁴ IESO Website, 2016 Year-End Data - <http://www.ieso.ca/corporate-ieso/media/year-end-data>

⁴⁴⁵ Source needed

⁴⁴⁶ Source needed

⁴⁴⁷ Source needed

⁴⁴⁸ IESO transmission connected wind generation, 2016. <http://www.ieso.ca/power-data/supply-overview/transmission-connected-generation>

⁴⁴⁹ Source needed

⁴⁵⁰ Source needed

Bioenergy is another word for electricity generated by burning biomass, such as plant or animal by-products and wastes.⁴⁵¹ It also describes biogas and landfill gas, which is methane gas produced by the decomposition of organic matter that is then burned in a generator to produce electricity. Ontario currently has about 500 MW of bioenergy generation capacity in operation. Going forward, the shift toward Renewable Natural Gas (RNG), a low-carbon fuel produced by the decomposition of organic materials, gives biogas producers an additional market opportunity.⁴⁵² Bioenergy systems also support the implementation of Ontario's Strategy for a Waste-Free Ontario.

Shifting to Lower Carbon Gasoline and Diesel

Delivering Fairness and Choice recognizes the commitment in the Climate Change Action Plan to introduce a Renewable Fuel Standard (RFS) for gasoline. This is an important step towards reducing GHG emissions from the transportation sector. Since it uses the existing fuels infrastructure, this RFS standard is one of the more flexible and cost-effective ways to increase the use of renewable and low-carbon fuels.

The use of renewable and low-carbon transportation fuels can be expanded by:

- increasing the use of renewable liquid fuels by in existing vehicles. Drop-in fuels such as ethanol can be mixed with gasoline to produce blended fuels and can be used the same way as regular gasoline;
- having existing fuel stations offer higher blends of ethanol and biodiesel;
- making renewable liquid fuels available to more regions of the province;
- adding bio-fuels/biofuels to the crude oil that Ontario refineries process; and
- lowering the carbon intensity of renewable fuels produced by Ontario manufacturers.⁴⁵²

Delivering Fairness and Choice acknowledges there are other ways to achieve deep reductions in emissions and transform the transportation sector. While current outlooks predict an increased electrification for light-duty vehicles and the use of advanced bioenergy for long-haul road freight and aviation⁴⁵³, technological innovation remains inherently unpredictable.⁴⁵⁴ The technology-neutral approach of the RFS lets the alternatives compete on their merits.

Shifting to Renewable Natural Gas

Natural gas remains a reliable and cleaner option for many Ontarians, and will continue to play an important role in the province's energy supply mix. Homeowners, businesses and industries

⁴⁵¹ Source needed

⁴⁵² Source needed

⁴⁵³ Source needed

⁴⁵⁴ Source needed

use natural gas for space heating, domestic hot water, steam and process heat.⁴⁵⁵ There were about 3.55 million natural gas customers in Ontario in 2016.⁴⁵⁶ Natural gas was also used to generate about 10 per cent of Ontario's electricity in 2015.⁴⁵⁷

Ontario is looking at using renewable natural gas to lower the carbon intensity of the natural gas that people burn. RNG is a low-carbon fuel produced by the decomposition of organic materials found in landfills, forestry and agricultural residue, green bin and food and beverage waste, as well as in waste from sewage and wastewater treatment plants.⁴⁵⁸ Because it comes from organic sources, the use of RNG does not add release any additional carbon to the atmosphere.⁴⁵⁹ As an added benefit, it can use the existing natural gas distribution system when and replace the use of conventional natural gas in today's stoves and furnaces.⁴⁶⁰

Ontario is investing proceeds from the cap-and-trade auctions in the carbon market to help introduce RNG in the province.⁴⁶¹ The investment will help consumers with the cost of shifting to renewable natural gas, as RNG costs more than conventional natural gas.⁴⁶² The Province will continue to work with industry partners and the Ontario Energy Board (OEB) to introduce a requirement that natural gas contain some renewable content, fulfilling a commitment of the Climate Change Action Plan.

RNG can be an Ontario-made source of energy. Some types of RNG like, such as biogas from landfills or agricultural waste are technically feasible today. In the longer term, RNG may be produced by biomass from forestry residue.⁴⁶³

Text Box: Renewable Natural Gas in Transportation – Pilot Program

Ontario's Climate Change Action Plan committed the Province to increasing the availability and use of lower-carbon fuel.

The Province is now developing a pilot program that takes methane from agricultural materials or food wastes and uses it for transportation. The program is expected to demonstrate the

⁴⁵⁵ Source needed

⁴⁵⁶ 2016 Annual Report of the Office of the Auditor General of Ontario, pp. 89-90. Accessed June 29, 2017: http://www.auditor.on.ca/en/content/annualreports/arreports/en16/v2_107en16.pdf

⁴⁵⁷ Fuels Technical Report, pp. 7.

Ontario Planning Outlook, pp. 2. Accessed June 29, 2017: www.ieso.ca/-/media/files/.../ontario.../ontario-planning-outlook-september2016.pdf

⁴⁵⁸ Source needed

⁴⁵⁹ Source needed

⁴⁶⁰ Source needed

⁴⁶¹ Source needed

⁴⁶² Source needed

⁴⁶³ Source needed

~~business models and technology that will allow agricultural and food sectors to produce RNG, and support businesses as they change their vehicles and fueling infrastructure to use RNG.~~

~~In May 2017, Ontario issued a discussion paper to gather feedback from businesses, partners and the public to help guide the design of the program.~~

Integrated Energy Solutions

Renewable energy technologies can be the foundation for innovative integrated clean energy systems that provide the space heating, cooling ~~or the,~~ and energy storage solutions that help to address the climate change challenges facing our electricity system Ontario.

Commented [LT63]: Pare down and add visuals.

Response: Text revised, and visuals to be addressed in future iterations.

Power-to-Gas

Electrolysis, also known as power-to-gas, uses surplus electricity to break down water molecules into hydrogen and oxygen.⁴⁶⁴ The hydrogen can then be stored in the vast storage system that currently exists for natural gas in Ontario and transported in existing natural gas pipelines and used to heat homes and fuel vehicles.⁴⁶⁵

Power-to-gas could potentially become a new and important link between the province's electricity system and its natural gas system systems. The Independent Electricity System Operator (IESO) recognizes this, and has already awarded a contract to Hydrogenics, an Ontario-based manufacturer of electrolysis and fuel cell technology, which will deliver two MW of storage capacity in the Greater Toronto Area.⁴⁶⁶

Heating and Cooling with Renewable Energy Technologies

Ontario aims to reduce greenhouse gas (GHG) emissions by increasing the use of low-carbon technology technologies, such as solar thermal, air- and ground-source heat pumps, to heat and cool Ontario homes and businesses.⁴⁶⁷

This has the potential to deliver a big payoff in the fight against climate change. Space heating accounts for approximately 75 per cent of the demand for fuels energy in Ontario homes⁴⁶⁸, making it an important area to target for reducing GHG emissions.

⁴⁶⁴ Source needed

⁴⁶⁵ Source needed

⁴⁶⁶ Source: Hydrogenics Selected for 2 Megawatt Energy Storage Facility in Ontario.

<http://www.hydrogenics.com/about-the-company/news-updates/2014/07/25/hydrogenics-selected-for-2-megawatt-energy-storage-facility-in-ontario>

⁴⁶⁷ Source needed

Solar Air and Hot Water Heating

Ground Source and Air Source Heating and Cooling

⁴⁶⁸ Source: Hydrogenics Selected for 2 Megawatt Energy Storage Facility in Ontario.
<http://www.hydrogenics.com/about-the-company/news-updates/2014/07/25/hydrogenics-selected-for-2-megawatt-energy-storage-facility-in-ontario>
 Source: Fuels Technical Report: The State of the System: 10-Year Review
<http://www.energy.gov.on.ca/en/archive/fuels-technical-report/10year/#fn8a>

[illegible]

474 Source needed

Starting in July 2017, the Save on Energy Heating and Cooling Incentive program began offering incentives of up to \$4,000 to help those who work or live in electrically-heated homes and businesses to purchase and install air-source heat pumps⁴⁷⁵.

District Heating and Cooling

District energy systems generate and supply heating and cooling, domestic hot water and electricity for blocks or neighborhoods in a community.

Commented [LT64]: Add Geothermal

Response: To be added in future iteration.

District heating and cooling can use local energy resources to reduce GHG emissions, such as biomass, geothermal energy (heating and cooling from the earth) and mechanical waste heat from industrial operations, to reduce GHG emissions.⁴⁷⁶ The best opportunities for district energy are in new residential or commercial developments not served by existing gas pipelines or distribution networks.⁴⁷⁷ District When used in more densely populated areas, district energy systems can even be more cost-effective than providing heating and cooling systems for each individual buildings, when used in more densely populated areas building.⁴⁷⁸

Text Box: Enwave Energy Corporation

Enwave Energy Corporation is a Toronto-based company that provides sustainable energy services in Toronto, Windsor, and numerous American cities, including Chicago, Houston, Los Angeles and Portland. In each community, the company operates highly efficient thermal energy plants that distribute steam, hot water and/or chilled water to customer buildings. Customers benefit from reduced operating costs, lower emissions, and increased reliability.

Enwave's Toronto System

Enwave sells more than 2.5 billion pounds of steam every year to 140 commercial, government, hospital, university, and residential buildings in downtown Toronto, heating over 40 million square feet of real estate.

Enwave's London System

The London system serves provides 60 large commercial and institutional customers in downtown London with 200,000 pounds of steam an hour and up to 4,200 tons of chilled water. It also cogenerates up to 18 MW of electricity and sells it to the grid.⁴⁷⁹

⁴⁷⁵ Source Needed Save on Energy Heating & Cooling Incentives, <https://saveonenergy.ca/Consumer/Programs/HVAC-Rebates.aspx>

⁴⁷⁶ Source needed

⁴⁷⁷ Source needed

⁴⁷⁸ Why District Energy? UNEP. <http://www.districtenergyincities.org/why-district-energy>

⁴⁷⁹ Source needed

Near and Net Zero Carbon Emission Buildings

Ontario's Climate Change Action Plan aims to reduce emissions in the building sector by encouraging the building construction of near net zero and net zero carbon emission homes and buildings. To help create a pathway to these new building standards, the electricity and natural gas conservation frameworks will continue to support the development and enhancement of high efficiency, low-carbon homes and buildings, and new.⁴⁸⁰ New programs will also be offered through the Green Ontario Fund.⁴⁸¹ (GOF).

Advanced efficiency standards will be set for products and appliances used in new and existing homes and buildings.⁴⁸² New high-performance standards for space and water heating equipment could significantly reduce the energy use, environmental footprint and greenhouse gas (GHG) emissions of new and existing homes and buildings and lower consumers' energy costs and environmental footprint.⁴⁸³

Together with other provinces and the federal government and other provincial governments, Ontario is exploring opportunities to develop markets for new high efficiency products and appliances in order to implement these new standards. For example, markets have to be developed for space heating technologies that are more than 100 per cent efficient, such as air source heat pumps. These deliver as much as three to four units of heat for every unit of electricity used to power, supporting the system.⁴⁸⁴ This would enable Ontario to move towards achieving one of the Province's aspirational goals of its Climate Change Action Plan: net zero on achievable energy performance levels and the transition to a low-carbon emissions homes by 2030 economy.⁴⁸⁵

An important part of transitioning to near and net zero energy or carbon emission buildings is to minimize their energy use. Generally, the most cost-effective way is to first improve their energy efficiency, with increased insulation, advanced air sealing, and high efficiency heating and cooling systems.⁴⁸⁶ Once that has been done, some type of on-site renewable energy

⁴⁸⁰ Source needed

⁴⁸¹ Source needed

⁴⁸² Source needed

⁴⁸³ Source needed

⁴⁸⁴ An Examination of the Opportunity for Residential Heat Pumps in Ontario (IESO, February 28, 2017), <http://www.ieso.ca/sector-participants/conservation-delivery-and-tools/conservation-first-framework>.

⁴⁸⁵ Market transformation strategies for energy-using equipment in the building sector, Supporting the transition to a low-carbon economy, Energy and Mines Ministers' Conference St. Andrews by-the-Sea, New Brunswick, August 2017 http://www.nrcan.gc.ca/sites/www.nrcan.gc.ca/files/emmc/pdf/Market-Transformation-Strategies_en.pdf

⁴⁸⁶ Source needed

generation is generally required to achieve net zero energy or carbon emission status.⁴⁸⁷

Ontario is taking steps to expand and enhance the province's net metering framework, which would give building owners increased opportunities to integrate renewable energy generation and energy storage technologies.

Text Box⁴⁸⁸ Reid's Heritage Homes – Guelph

Reid's Heritage Homes built five net zero homes in Guelph in 2016. These homes were the first in Canada to meet new net zero home standards set up by the Canadian Home Builders Association.

Key features include:

- * air source heat pumps;
- * high efficiency water heaters;
- * increased insulation values in exterior walls, attic and basement;
- * advanced air sealing to avoid air leakage;
- * right sized mechanicals and energy recovery ventilators; and
- * solar panels

Text Box

⁴⁸⁷ Source needed

⁴⁸⁸ <http://www.reidsheritagehomes.com/net-zero> and <http://www.cbc.ca/news/canada/kitchener-waterloo/reids-heritage-net-zero-homes-incentives-1.3707640> Reid' sReid' sReid' sReid' sReids

Source: <http://www.coragroup.com/project/evolv1/> (to be approved by The Cora Group)

Source: <http://west5.ca/> and <http://london.ctvnews.ca/provincial-officials-visit-ontario-s-first-net-zero-community-in-london-1.3272767#> (to be approved by Sifton)

West 5 – Sifton Properties Limited - London

The West 5 development in London is Ontario's first sustainable, net zero community. It will have a total of 2,000 apartments, condominiums and townhomes along with 400,000 sq. ft. of commercial and retail space, and a 1.6-acre central park. Construction of West 5 will create about 2,500 jobs over 10 years.

Key features include:

- Solar panels and solar streetlights*
- Solar parkades*
- Green roofs*
- EV charging stations*
- Community gardens*
- Rainwater harvesting⁴⁸⁹*

⁴⁸⁹ Source needed

Climate Change Adaptation

Ensuring a Resilient Energy Supply

Ontarians need to have a reliable supply of energy, not just for ~~for~~ their economic prosperity but for their basic health and safety. In order to provide vital energy services to Ontarians, the province's energy system must remain resilient and able to withstand a changing climate.

The facilities and equipment that currently generate, transmit and distribute energy across the province can be threatened by the extended heat waves, high winds, severe rainfall and ice storms that come with climate change. Climate change may also ~~change~~ lower the flows of rivers and the water levels and temperatures of lakes, possibly ~~effecting~~ reducing the ability to generate electricity.⁴⁹⁰

To address these concerns, Ontario's energy organizations are taking a number of actions that will ensure the province's energy system is better prepared to meet extreme weather events:

- Together with several partner organizations, the IESO ~~conducted a study~~⁴⁹¹ ~~of~~ studied⁴⁹² Ontario's transmission system, and found it resilient enough to substantially withstand most extreme weather scenarios. ~~But~~ However, the study recommended continued monitoring and refinement of climate scenarios.
- More local distribution companies are making adaptation and system resilience a priority. Both Toronto Hydro and ~~the former Horizon Utilities (now Alectra Utilities)~~ conducted vulnerability assessments of their systems. A leader in this regard in Canada, Toronto Hydro is addressing climate change vulnerabilities by ~~enhancing~~ improving its engineering practices and tools, such as its load forecasting model, and installing more resilient equipment on its system. In its last rate application, Toronto Hydro ~~submitted a report on the future impacts of climate change on its grid, and identified extreme weather as a driver for its capital and maintenance expenditures.~~⁴⁹³
- Local distribution companies such as Oshawa PUC Networks, Veridian and Whitby Hydro are developing adaptation plans to match the adaptation planning done by their local transit, water and communications authorities ~~at the local level.~~⁴⁹⁴

⁴⁹⁰ Source needed

⁴⁹¹ Ontario Climate Consortium et al. (2015). Climate Change Vulnerability Assessment of Ontario's Electrical Transmission Sector: Public Technical Report

⁴⁹² Ontario Climate Consortium et al. (2015). Climate Change Vulnerability Assessment of Ontario's Electrical Transmission Sector: Public Technical Report

⁴⁹³ Canadian Electricity Association (2016). Adapting to Climate Change: State of Play and Recommendations for the Electricity Sector in Canada https://electricity.ca/wp-content/uploads/2016/02/Adapting_to_Climate_Change-State_of_Play_and_Recommendations_for_the_Electricity_Sector_in_Canada.pdf

⁴⁹⁴ Durham Region (2016). Towards Resilience: Durham Community Climate Adaptation Plan 2016.

Building on its current activities, Ontario will strengthen the ability of the energy industry to prepare for the effects of climate change and integrate its impacts into their operational and infrastructure planning.

The Province and its agencies will facilitate the exchange of information and knowledge ~~exchange~~ among utilities and other partners to allow them to share best practices and increase their ability to adapt to climate change. Since these activities are best coordinated with other public services, Ontario will encourage utilities to work with municipalities and other public and private infrastructure operators. This knowledge-sharing platform will be a key first step to help with the following initiatives:

- The Province will help develop a vulnerability assessment of the energy distribution sector so utilities can develop state-of-the-art strategies to manage risk. This will complement the vulnerability assessment done of the transmission system in 2015.
- As part of its regulatory review, the OEB will give utilities guidance on cost-effectively integrating climate change adaptation into their planning and operations. The IESO will ensure that climate change adaptation is considered and integrated into the bulk system and regional planning processes.

Text Boxes: Adaptation Initiatives by Local Distribution Companies

*Building on its distribution system vulnerability assessment, ~~Horizon Utilities, now part of~~ Alectra Utilities, developed a long-term plan for adapting to climate change. The plan considers the risk of flooding when planning infrastructure, and improvements to the utility's ~~improved~~ LDC's geographic information and outage management system reduces response times.*⁴⁹⁵

*Hydro Ottawa focused its storm hardening initiative, completed in 2015, on revising the schedule for removing and trimming overhanging tree branches. As a result, public safety has been increased, the distribution system is less vulnerable to damage from high winds and ice storms, and the ~~company's~~ LDC's budget for vegetation management was reduced by \$750,000.*⁴⁹⁶

Summary

⁴⁹⁵ Chartered Professional Accountants of Canada (2015). Adaptation Case Study #5: Horizon Utilities Corporation <https://www.horizonutilities.com/ourCompany/publications/Articles/2015/Climate-Change-Adaptation-Case-Study-5-Horizon-Utilities-Corporation-October-2015.pdf>

⁴⁹⁶ Hydro Ottawa (2015). 2015 Annual Report. At <https://static.hydroottawa.com/documents/publications/annual-report/2015-Annual-Report-EN.pdf>

- Ontario remains committed to an electricity system that includes renewable energy generation and supports the goals of the Province's Climate Change Action Plan.
- The proceeds of cap and trade auctions will help Ontarians reduce their energy consumption and shift away from higher carbon fuels in order to reduce the province's greenhouse gas (GHG) emissions.
- Ontario will encourage the building construction of near net zero and net zero carbon emission homes and buildings to reduce emissions in the building sector.
- The Province will continue to work with its agencies to support the deployment of low-carbon energy technologies and consider further opportunities to integrate the delivery of conservation and low-carbon technology programs.
- Ontario is expanding the options for net metering to give building owners better opportunity more opportunities to integrate renewable energy generation and energy storage technologies.
- Advanced efficiency standards will be set for products and appliances used in new and existing homes and buildings. This will reduce their energy use and GHG emissions and enable lead to an increase in near and net zero carbon emission homes and buildings.
- Ontario will continue to work with industry partners to introduce renewable natural gas into the province's natural gas supply and expand the use of lower-carbon fuels for transportation.
- Building on its current activities, Ontario will strengthen the ability of the energy industry to anticipate the effects of climate change and integrate its impacts into its operational and infrastructure planning.

Chapter 7. Supporting First Nation and Métis Capacity and Leadership

First Nations and Métis are leaders in Ontario's energy sector, bringing their unique perspectives, knowledge and leadership to energy planning, projects and policies. They have created an unprecedented level of First Nation and Métis involvement in the energy sector:

- First Nations and Métis are now leading or partnering on over 600 wind, solar and hydroelectric generation projects across Ontario, accounting for over 2,100 megawatts (MW) of clean energy capacity.⁴⁹⁷
- First Nations and Métis lead or are partners with transmission companies on several major priority transmission lines being proposed.⁴⁹⁸

⁴⁹⁷ IESO data. FIT 526 (1,084 MW), LRP 13 (319.9 MW), Other (785.5 MW) = Total

⁴⁹⁸ Source needed

[REDACTED]

Ontario takes its duty to consult First Nation and Métis seriously and is committed to ensuring they are consulted on any energy activity that could potentially affect their Aboriginal and Treaty rights.

Text Box: What We Heard from You

- Need to connect remote communities
- Unreliable electricity service hurts quality of life and hinders community development
- Eliminate the on-reserve electricity delivery charge to improve electricity affordability
- Need for funding to assist with implementing Community Energy Plans
- Conservation programming should better meet community needs
- General preference for renewable energy over nuclear power
- Desire for First Nation and Métis ownership of and partnerships on projects
- Need for federal funding for connection of remote communities⁵⁰¹

First Nations and Métis are leaders in Ontario's energy sector, bringing their unique perspectives, knowledge and leadership to energy planning, projects and policies. This level of involvement of First Nations and Métis in the energy sector is unprecedented:

- First Nations and Métis are now leading or partnering on over 550 wind, solar, and hydroelectric generation projects across Ontario, accounting for over 2,000 megawatts (MW) of clean energy capacity.⁵⁰²
- First Nations and Métis lead or are partners with transmission companies on several proposed major priority transmission lines.

[REDACTED]

Commented [CD(65):
MO Edit: Update for FIT5 data

Response: FIT5 data is not yet available; retain placeholder for if it is published by time of LTEP printing.

Ontario takes its duty to consult First Nation and Métis seriously and is committed to ensuring that First Nations and Métis are consulted on any energy activity that could potentially affect their Aboriginal and Treaty rights.

⁴⁹⁹ IESO data

⁵⁰⁰ Text Box: OPG and media news release

⁵⁰¹ Source needed

⁵⁰² IESO data. FIT 526 (1,084 MW), LRP 13 (319.9 MW), Other (785.5 MW) = Total

⁵⁰³ IESO data

⁵⁰⁴ Text Box: OPG and media news release

Many First Nations and Métis across Ontario face energy-related challenges: the need for reliable and affordable power, energy-inefficient housing and inadequate infrastructure, to name just a few. The causes and solutions to these challenges are rooted in complex historical, jurisdictional, geographic and regulatory contexts, but progress is being made through nation-to-nation interactions. Ontario is committed to working together with First Nations and Métis to identify issues and propose actions that advance reconciliation and healing.

~~On August 25, 2015, The Chiefs of Ontario and the Province signed the First Nations-Ontario Political Accord was signed by the Chiefs of Ontario and the Province, on August 25, 2015, creating a formal bilateral relationship framed by the recognition of the treaty relationship.⁵⁰⁵ The Political Accord and the Ontario-Métis Nation Framework Agreement signed in 2008 and renewed in 2014, guide Ontario's relationships with First Nations and Métis.⁵⁰⁶ Ontario is committed to working together with First Nations and Métis to identify issues and propose actions to take towards reconciliation and healing.~~

Text Box: The First Nations-Ontario Political Accord

- *Affirms First Nations' inherent right to self-government*
- *Commits the parties to work together on issues of mutual interest, such as resource benefits sharing and jurisdictional matters*
- *Sets a path for reconciliation*

~~The Ontario-Métis Nation Framework Agreement signed in 2008 and renewed in 2014, guides Ontario's relationship with the Métis Nation.⁵⁰⁷~~

Text Box: Ontario-Métis Nation of Ontario Framework Agreement

- *Facilitates the recognition and advancement of Métis people in Ontario*
- *Fosters collaboration between the province and the MNO on issues of mutual interest to support the goals and objectives of the new agreement*
- *Increases awareness of Métis history, identity and culture*

The Province will continue the direction established in the 2013 LTEP and support First Nation and Métis leadership and capacity in Ontario's evolving energy sector. ~~The focus of *Delivering Fairness and Choice* reflects~~Reflecting the province's strong energy supply position, ~~*Delivering*~~

⁵⁰⁵ Political Accord between First Nations and Government of Ontario –Ontario Newsroom 2015

⁵⁰⁶ Ontario and Metis Nation Renew Framework Agreement- Ontario Newsroom 2014

⁵⁰⁷ Ontario and Metis Nation Renew Framework Agreement- Ontario Newsroom 2014

Fairness and Choice responds to the concerns heard through the LTEP engagement process and the ongoing dialogue between the Province, its agencies and First Nation and Métis partners.⁵⁰⁸

Building on the conversations during the LTEP engagement process, Ontario commits to a more regular and ongoing dialogue with First Nations and Métis. This will include energy awareness and education initiatives, the involvement of youth in the energy conversation, and a more regular communication to ensure First Nations and Métis are informed and can provide insight and feedback on the progress of about the Province's energy commitments and have opportunities to provide insight and feedback.

Addressing Electricity Affordability

~~Improving electricity affordability is a~~ major priority for Indigenous and non-Indigenous electricity consumers is to improve the affordability of their electricity. Ontario is working to address the issue with programs such as:

- the Ontario Electricity Support Program (includes enhanced credits for First Nations, Métis and Inuit electricity consumers) (more details in Chapter 1);
- Ontario's Fair Hydro Plan (more details in Chapter 1);
- the Low-Income Energy Assistance Program (more details in Chapter 1); and
- the Conservation First Framework (more details in Chapter 4).

Ontario recognizes that First Nation electricity consumers living on-reserve face unique challenges with respect to electricity affordability. Customers living on-reserve often pay higher distribution costs than customers in more populated areas because distribution rates are partially based on population density.⁵⁰⁹ The problem of higher distribution rates was often compounded by energy inefficient homes on reserves and other challenges that lead to higher levels of energy consumption.⁵¹⁰

Text Box:

A number of remote First Nations rely on diesel generators for power. The fuel is trucked in on winter roads that are becoming increasingly ~~unavailable~~impassable due to climate change. This drives up the cost of diesel oil, which has to be flown in instead.

Ontario selected Wataynikaneyap Power to connect 16 remote First Nations to the province's electricity grid. Wataynikaneyap Power is a transmission company owned by 22 First Nations in partnership with FortisOntario.

*Grid connection will reduce greenhouse gas emissions and support jobs and economic growth. Once completed, more than 10,000 people will have a reliable, clean supply of electricity.*⁵¹¹

⁵⁰⁸ Text Box: First Nations, Ontario sign Political Accord- Ontario Newsroom 2015

⁵⁰⁹ Source needed

⁵¹⁰ Source needed

⁵¹¹ Source needed

First Nation Delivery Credit

To address these unique energy affordability challenges, First Nation leaders recommended eliminating the elimination of delivery charges for electricity transmission and distribution when they met at the First Nations-Ontario Energy Table with the Minister of Energy and other energy sector leaders at the First Nations-Ontario Energy Table in April 2016.⁵¹²

The government recognizes that many First Nation reserves are located far from high density areas of the province. As a result, they often pay higher distribution costs than customers in more populated areas.⁵¹³ This is often compounded by poorly constructed and maintained housing on reserves that, because of electric baseboard heating and poor insulation or sealing, is energy inefficient.⁵¹⁴

The Minister committed to taking action and directed the Ontario Energy Board (OEB) to work with First Nations to research options that would address energy affordability on reserves, and to report back on its findings.⁵¹⁵ Based Acting on the OEB's findings and feedback from First Nations, the Province announced collaborated with the Chiefs of Ontario to develop the First Nations Delivery Credit. The First Nations Delivery Credit was implemented on March 2 July 1, 2017, that Ontario's Fair Hydro Plan would provide and provides a credit equal to 100 per cent of the electricity delivery charge on the bills of on-reserve First Nation residential customers.⁵¹⁶ The of licenced distributors⁵¹⁷. This collaborative effort between the Province and First Nations Delivery Credit, was implemented on July 1, 2017 as a demonstration is another example of the Political Accord signed between Premier Wynne and Ontario Regional Chief Isadore Day on August 24, 2015 being brought to life.

Connecting Off-Grid First Nation Communities

Twenty-five remote First Nation communities in the province's northwest rely on diesel fuel to power their communities. Ontario recognizes the distinct challenges they face and, because of the high cost of diesel fuel, there is a good economic case to connect as many as 21 of those communities to Ontario's electricity grid.⁵¹⁸

⁵¹² Source needed

⁵¹³ Source needed

⁵¹⁴ Source needed

⁵¹⁵ Source needed

⁵¹⁶ Ontario Cutting Electricity Bills by 25 Per Cent- Newsroom 2017

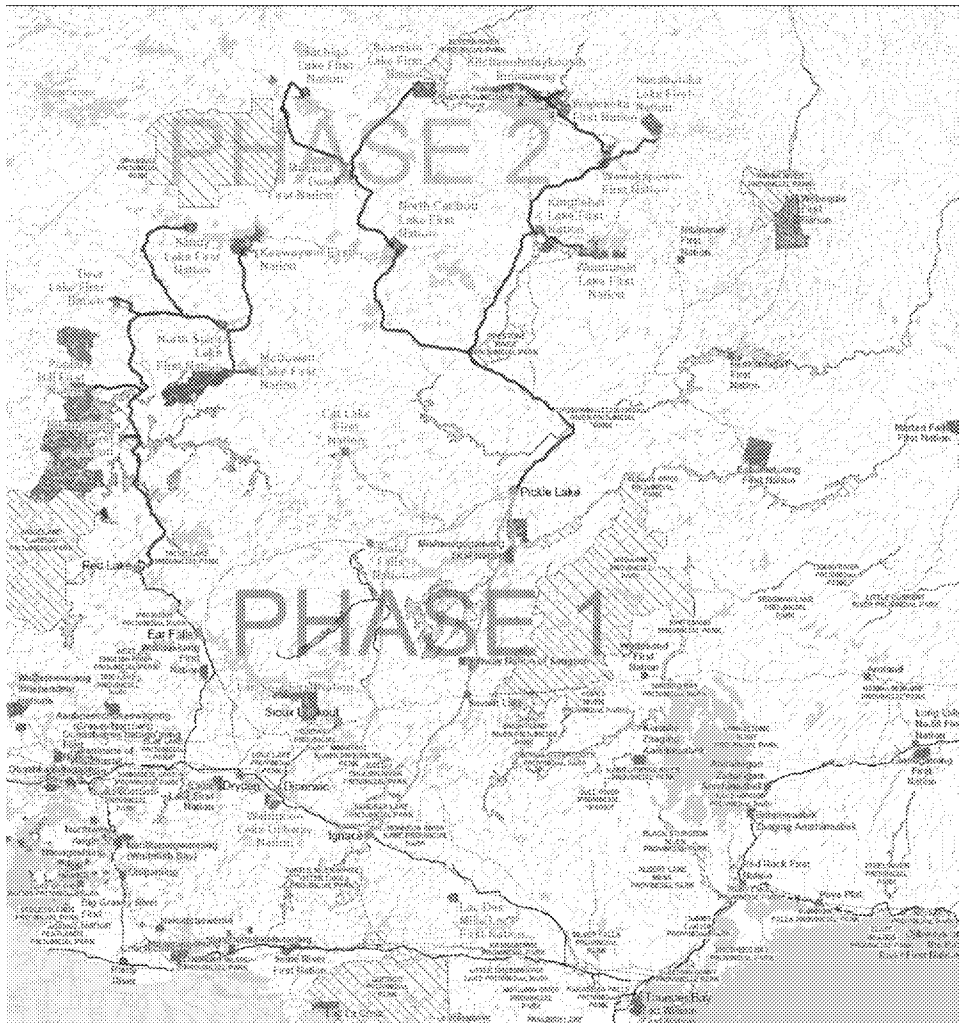
⁵¹⁷ Ontario Cutting Electricity Bills by 25 Per Cent- Newsroom 2017

⁵¹⁸ Preparing Remote First Nation Communities for Grid Connection- Ontario Newsroom 2014

Connecting Ontario has made it a priority to connect these remote First Nations is a priority for Ontario. Communities cannot improve their housing, their water treatment systems or other community infrastructure if they do not have a reliable and adequate supply of electricity.⁵¹⁹

Connection to Ontario's low-carbon electricity grid will not only improve the quality of life of these communities and enable their economic development opportunities for these communities, but it will also reduce local pollution, greenhouse gas emissions, and the environmental risks associated with transporting and storing diesel fuel.

⁵¹⁹ Source needed



For these reasons, Ontario has taken several steps to begin the connection of remote First Nation communities. These include:

- selecting Wataynikaneyap Power as the transmitter for connecting most of the remote First Nations;⁵²⁰

⁵²⁰ Wataynikaneyap Power data

- creating a mechanism for funding a portion of project costs; and
- working to reach a fair cost-sharing agreement with the federal government that ensures the project is fully funded and can proceed to construction.

Text Box: Ontario Power Generation and Gull Bay First Nation [Do not edit]

Ontario Power Generation (OPG) and Gull Bay First Nation (GBFN) are in the early stages of building an advanced renewable microgrid on the GBFN reserve on the western shore of Lake Nipigon. GBFN has an on-reserve population of 300 people and is one of the four remote First Nation communities that the IESO has determined to be economically unfeasible to connect to the provincial grid at this time.

Ontario is supporting the Gull Bay Diesel Offset Microgrid project with \$2 million in funding from the Smart Grid Fund [TBC], as well as \$X2.5 million from the Northern Ontario Heritage Fund Corporation [yet to be announced].

*The Gull Bay Diesel Offset Microgrid project will create a community microgrid by integrating new solar photovoltaic generation, battery energy storage, and a microgrid control system with the existing on-site diesel generators that currently supply the community's entire energy needs. The project development, construction and operation of the project will create additional opportunities for capacity building and employment during the development, construction, and operations phases of the project.*⁵²¹

Ontario also supports the connection of the five remote Matawa communities that are not currently part of the Wataynikaneyap Power project. Further steps will be taken to advance these connections their connection when proposals are brought forward.

At this time, grid connection is not currently feasible for four of the 25 remote First Nations in Ontario. So, each of these communities has begun planning and development work to add sustainable technologies to reduce their reliance on diesel⁵²². Projects that reduce diesel reliance could include renewable microgrids, battery storage, and other innovative technologies that meet identified community needs.⁵²³

Ontario will continue to partner with these communities and other collaborators, and is looking to the federal government to support these projects. The Government of Canada has agreed to financially support the early connection of Pikangikum First Nation and Wataynikaneyap Power plans to begin construction of this connection project in 2017- to connect this First Nation.

⁵²¹ Source needed

⁵²² Source Needed

⁵²³ Cannot insert endnotes into text boxes: OPG-GBFN facts substantiated by OPG & GBFN.

⁵²⁴ Ontario and Canada are continuing to negotiate cost-sharing to support the remainder of the Wataynikaneyap project.

Conservation

Over 40 First Nations participated in the Aboriginal Conservation Program between 2013 and 2015.⁵²⁵ The program funded energy efficiency upgrades such as new insulation, appliances and lighting for more than 3,000 First Nations households.⁵²⁶

Through the 2015–2020 Conservation First Framework, First Nation and Métis customers also have access to other energy efficiency and conservation programs through the 2015–20 Conservation First Framework, such as the Save on Energy programs offered by local distribution companies.⁵²⁷

Text Box: Conservation on the Coast

Local Distribution Companies (LDCs) owned by Attawapiskat, Kashechewan and Fort Albany First Nations are collaborating to provide conservation programs to their customers under using the name, Conservation on the Coast (COTC).

COTC began in 2013 by conducting annual energy audits in the three First Nation communities in 2013.

By October 2017, 30 homes per community will have had LED bulbs, power bars, low flow aerators and showerheads, hot water pipe wrap, and improved insulation installed. This has reduced electricity usage by 20-25 per cent per home. In addition to the energy savings, residents say their homes are more comfortable to live in, they are burning less wood and moisture and mold problems have diminished.⁵²⁸

Text Box: Wikwemikong First Nation

In June of 2017, the Wikwemikong First Nation launched its Ignite Energy and Infrastructure Project. This is a long-term community driven strategy to address the high energy costs faced by the community and upgrade its aging infrastructure. Phase One is a major retrofit and upgrade to LED lighting for three schools, a nursery school, the community's health centres, arenas, and the band administration office.

⁵²⁴ Source needed

⁵²⁵ Source needed

⁵²⁶ Source needed

⁵²⁷ Source needed

⁵²⁸ Source needed

It is estimated this will save the community more than \$157,000 per year in energy costs, a 58% savings in the energy used for lighting. The \$1.1 million project will be financed with a contribution of \$127,900 from the IESO's the Save on Energy Program and private debt financing.

Wikwemikong is also looking to expand its portfolio of renewable energy projects with the Wikwemikong Solar Micro-grid construction project. The 300kW micro-grid is expected to begin construction in 2018/19 and will see the installation of several rooftop solar panels. This project will receive funding through the Small Community Fund, co-funded by Ontario and the federal government.⁵²⁹

While conservation programs are working well in some First Nation and Métis households, participants in meetings of the Long-Term Energy Plan engagement meetings said the programs need to be more flexible, and more widely available.

In conjunction with the mid-term review of the Conservation First Framework and engagement with the Indigenous communities, the IESO will give the Province options to how to improve for improving conservation programs and their availability for First Nations and Métis, including the 10 communities served by unlicensed LDCs in north-western Ontario known as the Independent Power Authorities: Eabametoong, Keewaywin, Muskrat Dam, Nibinamik, North Spirit Lake, Pikangikum, Poplar Hill, Wawakapewin, Wunnumin and Weenusk.⁵³⁰

In addition, the Green Ontario Fund will be offering new incentives, financing and services to help First Nations and Métis adopt low-carbon technologies and reduce their energy use.⁵³¹

Implementing Community Energy Plans

Community energy plans are an important way to understand local energy needs better. They help communities identify opportunities for energy efficiency and clean energy and develop a plan to meet their community's energy goals. Close to 100 First Nations are now developing community energy plans, using funding from the Aboriginal Community Energy Plan (ACEP) program.⁵³² Ontario is committed to continuing this funding.

But energy plans are just a first step and Ontario recognizes that further support is needed to turn these plans into tangible actions and results. That is why the ACEP program will be expanded to help communities implement their community energy plans and support Ontario's Climate Change Action Plan.

Commented [LT66]: Add info on the Save on Energy projects on Manitoulin Island.

Response: Not addressed in this version as there are no case studies to reference.

⁵²⁹ Source needed

⁵³⁰ Source needed

⁵³¹ Source needed

⁵³² IESO ACEP data

The IESO will engage with First Nation and Métis communities and organizations to identify the strengths and weaknesses of the current ACEP program, explore implementation opportunities, the use of conservation projects or other community-directed energy initiatives, and then recommend changes that best support the implementation of allow community energy plans to flourish. Funding will come from the \$10 million the IESO has dedicated for this and other support programs. Ontario's Climate Change Action Plan also identifies opportunities for Indigenous program support.⁵³³

Commented [MS(67)]: TBD based on MOECC decision.

Supporting Local Opportunities

Building Sector Knowledge and Capacity

The IESO's Education and Capacity Building (ECB) program supports the education, training and skills building of First Nations and Métis. It will continue to support initiatives that help build local business skills, energy literacy, and youth engagement.⁵³⁴

Exploring Energy Projects and Partnerships

The IESO's Energy Partnerships Program (EPP) supports First Nation and Métis communities and organizations that want to lead or be partners on renewable energy and transmission projects. Three streams of funding from the EPP help support⁵³⁵

- financial, legal and technical due diligence to so First Nation and Métis can partner on major priority transmission lines and renewable energy projects;
- the development of renewable energy projects, including costs for regulatory approvals; and
- the initiatives that reduce the reliance on diesel fuel for the four First Nations that can't be feasibly connected to the transmission grid.

Ontario will engage further and explore how to change these programs so they better reflect the needs of First Nations and Métis needs within the current energy system. This may include a look at an examination of how programs can support the integration of help integrate small-scale renewable energy projects into the local energy system, or the use of net metering and other innovative solutions that address local or regional energy needs and interests.

Access to Financing

⁵³³ Ontario's Action on Climate Change developed by the Ministry of the Environment and Climate Change-February 2017

⁵³⁴ IESO Education and Capacity Building Program Overview

⁵³⁵ IESO Energy Partnerships Program Overview

The development of energy projects requires significant financial and human capital, and barriers can prevent First Nation and Métis communities and organizations from accessing this capital and so they can actively participatingparticipate in the energy sector. Barriers to more widespread First Nation and Métis participation include:

- lack of capital at reasonable terms;
- high financing costs; and
- a shortage of capacity around financing and building partnerships.⁵³⁶

The Aboriginal Loan Guarantee Program has helped First Nations and Métis obtain lower-cost financing to participate in large-scale energy projects.⁵³⁷ However, Ontario recognizes that barriers to financing remain, particularly for smaller-scale projects. As a result, Ontario will engage with First Nations and Métis to identify gaps in financing, possible changes that could be made to existing programs, as well asand alternative financing models.

Text Box: What is the Aboriginal Loan Guarantee Program?

Launched in 2009, the \$650 million Aboriginal Loan Guarantee program (ALGP) guarantees up to 75 per cent of a First Nation or Métis corporation's equity in a project. To date, the ALGP has approvedsupported nine projects, including the 438MW Lower Mattagami hydroelectric project, the Bruce to Milton transmission reinforcement project, the 28MW Peter Sutherland hydro-electric project, and the 4MW Mother Earth Renewable Energy wind project⁵³⁸.

Commented [ENE68]: There will not be another chance for MOF, OFA to review. Assign to division of ENE.

Ontario can build on its strong record and apply innovative financing models to promote First Nation and Métis participation in energy projects. These financing models and social finance tools have been successfully used in the United States, Australia, and elsewhere in Canada to facilitate greater Indigenous economic participation^{539 540}.

Ontario also appreciates the unique social benefits that can result fromaccrue to First Nation and Métis with their participation in energy projects. Measuring and assessing these non-financial benefits could help Ontario take a broader and more inclusive view of outcomes when deciding on energy policies and projects.

Text Box: The Mother Earth Renewable Energy (MERE) Project

MERE is the first wholly First Nation-owned wind project in Canada wholly owned by a First Nation. The 4MW project consists of two wind turbines owned by M'Chigeeng First Nation

⁵³⁶ Source needed

⁵³⁷ Text box: Ontario Financing Authority: Aboriginal Loan Guarantee Program Overview

⁵³⁸ Overview of the Aboriginal Loan Guarantee Program (ALGP). (2017). Retrieved from <https://www.ofina.on.ca/algp/program/overview.htm>

⁵³⁹ [Verification needed]

⁵⁴⁰ MERE Text box: [Verification needed]

(MFN) that generate enough ~~energy~~ electricity to power the community's 418 homes. The project received ~~an ALGP loan guarantee from the Aboriginal Loan Guarantee Program (ALGP)~~ in 2012.

MERE was established under MFN's mandate to build a green economy. The proceeds, averaging \$300,000 ~~per~~ year for the first 14 years, pay for community development programs. The MERE project is an innovative example of how clean energy and the ALGP can be used to create additional financial and socioeconomic benefits for communities.⁵⁴¹

Text Box: Rainy River First Nations Solar Project

Rainy River First Nations signed a memorandum of understanding with Ontario Solar PV Fields to purchase three solar projects located in ~~the Rainy River~~ their community. The cost of the projects was around \$154 million, of which \$19 million ~~has been~~ was guaranteed ~~through the Aboriginal Loan Guarantee Program by the ALGP.~~

Rainy River First Nations partnered with Clark, Conner and Lunn for the project. The ~~projects' projects will produce a net profits are~~ profit of \$1.3 - \$2.3 million a year for 20 years, ~~generating and generate~~ around 37 million kilowatt-hours of electricity in their first year of operation in 2014. The project generates enough energy to meet the average electricity needs of approximately 3,080 households.⁵⁴²

Building on these and other successes across the province, Ontario will take the following actions to increase First Nation and Métis access to financing:⁵⁴³

⁵⁴¹ [Reference forthcoming. Facts were provided by Mother Earth Renewable Energy project staff; ENERGY staff cross-referencing at the moment]

⁵⁴² Sources:

<http://rainyriverfirstnations.com/wp-content/uploads/2013/06/Solar-Project-Jan.14.pdf>

<http://rainyriverfirstnations.com/wp-content/uploads/2013/06/RRFN-Solar-Generation-Project-2013.pdf>

⁵⁴³ MERE Text box: Canadian Environmental Assessment Agency: M'Chigeeng First Nation Mother Earth Renewable Energy Project Archive 10-01-55899
Prioritization of Call Out boxes/Case Studies

1. Conservation on the Coast
2. The Mother Earth Renewable Energy (MERE) Project
3. Ontario Power Generation and Gull Bay First Nation
4. Wataynikaneyap Power
5. ACEP Case Study: North Caribou
6. Rainy River First Nations Solar Project
7. The First Nations-Ontario Political Accord
8. What is the Aboriginal Loan Guarantee Program
9. The recently completed 28-MW Peter Sutherland Generating Station

- engage with leaders, organisations, and financing experts to identify financing gaps and barriers to the development participation of First Nation and Métis participation in energy projects;
- ~~investigate the applicability of~~ innovative financing models to better support First Nation and Métis participation in energy projects; and
- develop methods to better capture the social, environmental, and local benefits of First Nation and Métis participation in energy projects.

Expanding Access to Natural Gas

Natural gas remains a clean, reliable energy option, and it will continue to play a critical role in Ontario's energy mix. We know access to natural gas is an important issue, especially for Ontario's First Nations communities.

To assist with natural gas expansion, the Province launched a new \$100 Natural Gas Grant Program in April 2017.⁵⁴⁴ Through the program, municipalities and First Nations Nation communities are able to work with natural gas utilities to bring forward proposals to expand access to natural gas. The guidelines for the Natural Gas Grant Program ~~specify~~state that ~~additional special~~ consideration will be given to projects located in northern Ontario or located within First Nation reserves.

⁵⁴⁵Successful applicants under this program can then apply to the OEB for leave-to-construct approval for their expansion projects.

Over the coming years, Ontario looks forward to seeing natural gas expansion projects ~~proceeding and delivering~~deliver greater consumer choice and economic growth to Ontario's municipalities and First Nations communities in Ontario.

Summary

- Ontario will improve the availability of conservation programs for First Nations and Métis, including communities served by Independent Power Authorities.
- Ontario will continue to prioritize the connection of remote First Nation communities to the grid and continue to support the four First Nations where transmission connection is not economically feasible.

10. Comments made during First Nation and Métis LTEP Engagements Sessions

⁵⁴⁴ Source needed

⁵⁴⁵ Source needed

- The Aboriginal Community Energy Plan program will be expanded to help communities implement their community energy plans and support Ontario's Climate Change Action Plan.
- Ontario will engage with First Nations and Métis to explore options for supporting education and capacity building, the integration of small-scale renewable energy projects, net metering and other innovative solutions that address local or regional energy needs and interests.
- Innovative financing models and support tools will be investigated to lower the financing costs of First Nation and Métis projects led or partnered projects by First Nations or Métis.
- Ontario will report back to communities between Long-Term Energy Plans to provide updates on the province's progress and seek ongoing feedback from First Nations and Métis.
- Ontario's Natural Gas Grant Program will support the expansion of natural gas access to First Nation communities.

Chapter 8. Supporting Regional ~~Solutions~~Solutions and Infrastructure

~~Community and Different~~Regional Planning

The regional planning process takes into account that different regions and communities may require different solutions to meet their differingspecific energy needs and the local impacts of large energy infrastructure projects on their communities. For example, urban regions may experience an increase in demand due to population growth, while more rural or remote regions may be more concerned about the reliability of their energy supply.

Industrial activities such as mining and manufacturing have different patterns of energy use than health and social services.⁵⁴⁶ Agri-businesses have different needs than commercial centers⁵⁴⁷. Regions also have different priorities for large infrastructure projects. It is crucial that the process for reviewing interregional projects such as pipelines reflects these priorities. Ontarians need to be able to influence these energy solutions through community planning and engagement.

Regional Planning

Since 2013, communities have participated in a formalized regional planning process now includes participation from communities to identify their electricity needs and develop cost-

⁵⁴⁶ Source needed

⁵⁴⁷ Source needed

effective solutions for meeting them.⁵⁴⁸ For some it could mean additional supply from transmission lines, for others it could come from local resources like district energy or conservation, or a combination of both. Over the past three years, the electricity needs of all 21 of Ontario's planning regions have been evaluated, completing the first full cycle of regional planning assessments across the province.⁵⁴⁹

Text Box: What We Heard from You

- Integrate electricity planning with municipal planning
- Consider impact on economic development
- Improve local reliability
- Innovative technologies and fuels face special barriers in the North.
special barriers in the North
- Programs should meet customer and regional needs⁵⁵⁰

Text Box

Agri-business is growing in rural Essex County, near Kingsville and Leamington. The region has the largest concentration of greenhouse vegetable production in North America.⁵⁵¹ Greenhouses, food processing operations and increasing wineries-related tourism are adding to electricity demand, particularly in the summer months.⁵⁵²

At the same time, other needs in the area are triggering infrastructure upgrades that would benefit not just the local agri-business sector, but local those looking to connect distributed generation ~~developers~~, other customers in the Windsor-Essex region and Ontario ratepayers as a whole.⁵⁵³

If the infrastructure upgrades were carried out separately, they would have cost about \$100 million. Instead, by looking at the totality of the needs, the recommended solution, which includes a new 13-kilometre line and a new transformer station in Leamington, addressed the same needs for ~~\$22.5~~ over \$20 million less. Collaborative solutions like these are critical to realizing the benefits of the enhanced regional planning.⁵⁵⁴

⁵⁴⁸ Source needed

⁵⁴⁹ Source needed

⁵⁵⁰ Source needed

⁵⁵¹ Greenhouses Grow Ontario, An Economic Impact Study of the Greenhouse Industry in Ontario, 2006, page iv, <http://www.planscape.ca/planscapePDFs/50-plan1.pdf>

⁵⁵² IESO, Windsor-Essex Region Integrated Regional Resource Plan, April 2015, p 16-17, <http://www.ieso.ca/-/media/files/ieso/document-library/regional-planning/windsor-essex/2015-windsor-essex-irrp-report.pdf?la=en>

⁵⁵³ Source Needed

⁵⁵⁴ Source Needed

Regional planning gives communities the opportunity to consider all the cost-effective resources for meeting their regional needs.⁵⁵⁵ It promotes the principle of Conservation First by first incorporating conservation targets into the forecasts of net regional electricity demand.⁵⁵⁶ Only then are other economical solutions considered, such as new supply, distributed generation, additional conservation and demand management and/or investments in transmission and distribution.

In order to further increase diversity in the range of cost-effective solutions, barriers to non-wires solutions, such as conservation, demand response and other distributed energy resources must be reduced.

Text Box: Toronto Hydro

"Our Local Demand Response initiative at Cecil TS allows us to cost-effectively defer capacity investments and provide other valuable benefits. This project exemplifies Toronto Hydro's commitment to delivering customer value and building a more flexible, integrated grid."⁵⁵⁷

- Anthony Haines, CEO Toronto Hydro Corporation

The Ontario Energy Board (OEB) is also working to integrate conservation into the regional and local planning of natural gas infrastructure planning⁵⁵⁸ at regional and local levels. The OEB's 2015 to 2020 Demand Side Management (DSM) Framework says natural gas utilities need to consider conservation as a key principle in their infrastructure planning.⁵⁵⁹ As part of the mid-term review of the DSM Framework that is currently underway, natural gas utilities are expected to propose a plan⁵⁶⁰ on how to integrate natural gas conservation into their planning for future infrastructure⁵⁶¹.

Text Box

Targeted conservation initiatives can be the most cost-effective solutions for meeting local and regional electricity needs. The Independent Electricity System Operator (IESO) is working with local utilities⁵⁶² in Ottawa, Toronto, Barrie-Innisfil and Parry Sound-Muskoka regions to determine whether targeted conservation initiatives can defer costly upgrades to specific local distribution and transmission infrastructure⁵⁶¹. In the mid-term reviews of the 2015–2020 Conservation First Framework and Industrial Accelerator Program, the IESO is also exploring how to further integrate conservation initiatives into the regional planning process.⁵⁶²

⁵⁵⁵ Source needed

⁵⁵⁶ Source needed

⁵⁵⁷ Source needed

⁵⁵⁸ Source needed

⁵⁵⁹ Source needed

⁵⁶⁰ Source needed

⁵⁶¹ Source needed

⁵⁶² Source needed

Local advisory committees have helped build an understanding in the community about their communities to understand regional electricity issues. These committees give allow residents an opportunity to provide input and their advice improves the implementation and the regional plan.⁵⁶³ Community engagement is also crucial to linking regional energy plans with community energy planning.

Community Energy Planning

Ontario's Municipal Energy Plan (MEP) program and the IESO's Aboriginal Community Energy Plan (ACEP) program both support the efforts of municipalities and Indigenous communities to assess their energy use and needs, consider the impact of future growth, and foster local economic development.⁵⁶⁴ Communities have been encouraged to develop their own energy plans identifying opportunities for conservation and priorities for infrastructure.⁵⁶⁵ The resulting community energy plans have helped communities recognize opportunities to conserve energy, improve energy efficiency and reduce greenhouse gas (GHG) emissions.⁵⁶⁶ More information on the ACEP program can be found in Chapter 7: Supporting Indigenous Capacity and Leadership.

Ontario's Climate Change Action Plan has reinforced the importance of community energy plans, and indicated Ontario will continue to support them.⁵⁶⁷ Ontario's Climate Change Action Plan also includes a Challenge Fund to provide funding for projects to reduce GHG emissions reduction projects proposed by a municipality that has completed a community energy plan and meets the program eligibility criteria.⁵⁶⁸ The Province launched the Municipal GHG Challenge Fund on August 14, 2017.⁵⁶⁹ Municipalities may request up to \$10 million per project to reduce GHGs in the building, energy supply, water, transportation, waste and organics sectors. Any Ontario municipality with a community-wide GHG emissions inventory, emissions reduction targets and a strategy to reduce emissions is eligible to apply. MEP program participation is one path to eligibility for the Municipal GHG Challenge Fund.⁵⁷⁰

Commented [ENE69]: MOECC will not have another chance to review. Assign to division of ENE.

⁵⁶³ Source needed

⁵⁶⁴ Source needed

⁵⁶⁵ Source needed

⁵⁶⁶ Source needed

⁵⁶⁷ Ontario's Five Year Climate Change Action Plan, 2016-2020, p. 33

<https://www.ontario.ca/page/climate-change-action-plan>

⁵⁶⁸ Ontario's Five Year Climate Change Action Plan, 2016-2020, p. 32

<https://www.ontario.ca/page/climate-change-action-plan>

⁵⁶⁹ Source needed

⁵⁷⁰ Municipal GHG Challenge Fund:

<http://www.grants.gov.on.ca/GrantsPortal/en/OntarioGrants/GrantOpportunities/PRDR017538>

Now that the first cycle of regional planning has been completed, the Province is directing the IESO to review the regional planning process and report back with options and recommendations to address the challenges and opportunities that have emerged.

Text Box: Regional and Community Energy Planning by the Numbers:

21 Electricity Regions

variety

8 Regional Infrastructure Plans (RIP) underway or complete. An RIP, led by the transmitter, identifies investments in transmission and/or distribution facilities to meet a region's electricity needs.

36 Municipalities have Municipal Energy Plans underway or complete

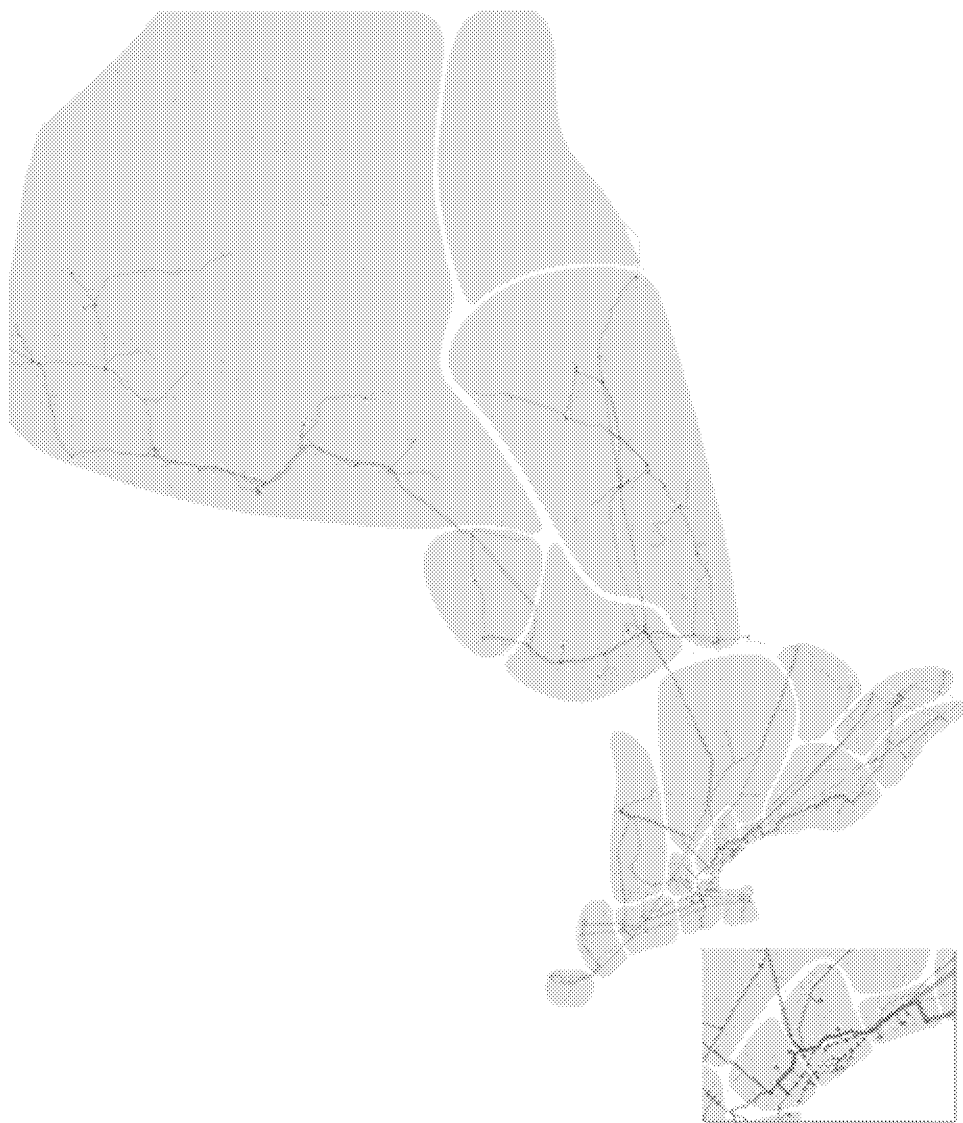
Text Box:

More information on your region can be found by entering your postal code online at <http://www.ieso.ca/en/get-involved/regional-planning>

Map: Differing Regional Needs⁵⁷²

⁵⁷¹ Source needed

⁵⁷² Ottawa : <http://www.ieso.ca/-/media/files/ieso/document-library/regional-planning/greater-ottawa/letter-to-h1-ottawa.pdf?la=en>
<http://www.ieso.ca/-/media/files/ieso/document-library/regional-planning/greater-ottawa/faqs-south-nepean-hand-off-letter.pdf?la=en>
<http://www.ieso.ca/-/media/files/ieso/document-library/regional-planning/greater-ottawa/ieso-handoff-letter-re-south-nepean.pdf?la=en>
<http://www.ieso.ca/-/media/files/ieso/document-library/regional-planning/greater-ottawa/engagement/ottawa-lac-april-19-2017-final.pdf?la=en>
Toronto : <http://www.ieso.ca/en/get-involved/regional-planning/gta-and-central-ontario/-/media/files/ieso/document-library/regional-planning/toronto/engagement/Toronto-LAC-Presentation-20160128.pdf>
North of Dryden: <http://www.ieso.ca/en/get-involved/regional-planning/northwest-ontario/north-of-dryden>
York Region: <http://www.ieso.ca/en/get-involved/regional-planning/gta-and-central-ontario/york>
Windsor Essex: <http://www.ieso.ca/en/get-involved/regional-planning/southwest-ontario/windsor-essex>



Text Boxes – From Graphic above

North of Dryden and Remote Connection

The construction of a new line to Pickle Lake and the connection of remote First Nation communities currently served by diesel generators are priorities for Ontario. The regional plan for North of Dryden recommended two projects to meet the near-term electricity needs of the region:

- building a new 230 kV transmission line from the Dryden/Ignace area to Pickle Lake
- upgrading the existing transmission lines from Dryden to Ear Falls and from Ear Falls to Red Lake

Together, these projects will substantially increase the ability of the ~~subsystem~~ systems in Pickle Lake and Red Lake to meet demand.

Wataynikaneyap Power is the proponent of the 230-kV transmission line from the Dryden/Ignace area to Pickle Lake and is currently acquiring the necessary approvals. The line is expected to be in service in early 2020. ⁵⁷³

Ring of Fire

The Ring of Fire is in one of the most significant mineral regions of the province, and includes the largest deposit of chromite ever discovered in North America. Electricity supply for the development of mines and the connection of remote First Nations in the area was assessed in the North of Dryden regional plan and the most economic option was found to be transmission connection to the Ontario grid.

The final approach to electricity supply in the Ring of Fire will depend on decisions related to transportation infrastructure, Indigenous community preferences and the electricity needs of mining companies. ⁵⁷⁴

Greenstone Marathon

To build on the regional planning process in Greenstone Marathon, a working group was established to work collaboratively with local partners on the issues of electricity reliability and transmission.

The group collected valuable information on the challenges faced in developing transmission projects and ensuring reliability in northern and rural areas of the province. Hydro One participated in the working group and has recently made investments in transmission

⁵⁷³ Source needed

⁵⁷⁴ Source needed

equipment that will help response crews locate the cause of outages and restore power more rapidly.

Ottawa

Work is underway or complete on five transmission projects to address the near-term reliability needs and growth in demand in the Ottawa region.

The projects include the upgrading of a 115-kV circuit to provide increased supply capability for downtown Ottawa and a new transmission station and transmission line to meet the growing electricity needs of new developments in South Nepean.⁵⁷⁵

A Local Advisory Committee has been established to provide advice on the development of the region's longer-term electricity plan.

Central Toronto

Increased density, new large transit projects, ~~aging and aging~~ infrastructure ~~and reliability issues~~ are all driving new investments in Toronto's electricity infrastructure.

Conservation will be a key component of meeting the city's future electricity needs, with conservation resources expected to offset nearly 40 per cent of the growth in demand until 2036.

Investments in the Runnymede, Horner and Copeland transformer will ensure new customers can be connected without harming reliability in the area.

As early as the mid to late 2020s, two major autotransformer stations and key transmission facilities are expected to reach the limit of their ability to supply growth in Central Toronto.

A Local Advisory Committee has been established to provide advice on the development of the region's longer-term electricity plan.⁵⁷⁶

Windsor-Essex

Agri-business is growing in the rural portion of Essex County ~~is growing~~, increasing the demand for electricity. Hydro One is building a new transmission line, a new transformer station near

⁵⁷⁵ Source needed

⁵⁷⁶ Source needed

Leamington, and refurbishing the Kingsville and Keith transformer stations to address this growth and improve restoration timelines. The projects are expected to be in service by 2018.⁵⁷⁷

York Region

Three transmission projects are underway to address the near-term needs for capacity and reliability in York Region, including a new transformer station in the City of Markham.

Based on current projections, York's York sub-region's electricity system is expected to reach its capacity to supply growth in the medium to long term. A Local Advisory Committee has been established to provide advice on the region's longer-term electricity plan.⁵⁷⁸

Text Box

The City of Temiskaming Shores began developing its Municipal Energy Plan (MEP) in 2015. Thanks to its MEP, the city has found ways to be more energy efficient. For example, it installed LED lighting in 955 street lights, converted to smaller pumps and motors in environmental water and wastewater treatment facilities, and installed more efficient heating systems. The energy efficiency changes the city made have resulted in 20 per cent reductions in the utility bills for some projects. The MEP ensures that city council will approve one energy-related project each year. Temiskaming Shores has also increased its public transit service to reduce the number of private vehicles on the road.⁵⁷⁹

Setting Standards for Pipelines

Almost all of Ontario's oil and natural gas is delivered from outside the province by interprovincial and international pipelines⁵⁸⁰. These pipelines are under federal jurisdiction and regulated by the National Energy Board (NEB).⁵⁸¹ The 2013 Long-Term Energy Plan set out six principles that Ontario will use to evaluate oil and natural gas pipelines, such as TransCanada's proposed Energy East project:Pipeline:

- 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;

⁵⁷⁷ Source needed

⁵⁷⁸ Source needed

⁵⁷⁹ Source needed

⁵⁸⁰ Source needed

⁵⁸¹ Source needed

- 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 spills⁵⁸².

In November 2014, Ontario and Québec jointly adopted these six principles for their review of Energy East and added a seventh principle, the need to take into account GHG emissions and the interests of natural gas consumers⁵⁸³.

Ontario is committed to public engagement on major pipeline developments. On November 12, 2013, the Province asked the OEB to conduct province-wide consultations regarding TransCanada's Energy East proposal. The consultation process focused on four areas of potential impact:

- The impacts on Ontario natural gas consumers in terms of rates, reliability and access to supply, especially those consumers in eastern and northern Ontario;
- The impacts on pipeline safety and the natural environment in Ontario;
- The impacts on First Nations, Metis and local communities; and
- The short and long term economic impacts of the project in Ontario.⁵⁸⁴

The OEB undertook an extensive consultation and review process. The OEB ~~It~~ hired experts in the ~~field~~ subjects of pipelines, environmental reviews and economics to assist in understanding of the project and made their reports public. The OEB visited seven cities and towns along the route in spring 2014 and again in winter 2015, meeting with local residents, First Nations and Métis in the spring of 2014 and again in the winter of 2015, to get their views on TransCanada's application. In addition, the OEB received more than 10,000 written submissions during its review.⁵⁸⁵

On August 13, 2015, the OEB published its report *Giving a Voice to Ontarians on Energy East*.⁵⁸⁶ The report ~~said~~ concluded there was not an appropriate balance between the economic and

⁵⁸² Source needed

⁵⁸³ <https://news.ontario.ca/opo/en/2014/11/agreements-reached-at-quebec-ontario-joint-meeting-of-cabinet-ministers.html>

⁵⁸⁴ Source needed

⁵⁸⁵ Source needed

⁵⁸⁶ Source needed

environmental risks of the project and the its expected benefits for Ontarians.⁵⁸⁷ The report will help guide Ontario's participation in the NEB's regulatory proceeding on Energy East.

To ensure its strategic interests in pipeline projects are represented, Ontario will continue to participate in regulatory proceedings at the NEB and at intergovernmental forums that discuss the delivery of energy in a safe and environmentally sustainable manner. Ontario is also working with the federal government on regulatory initiatives such as modernizing the NEB modernization to ensure major energy projects are reviewed in a predictable manner that increases public confidence.

~~Competitive Transmitter Selection~~

~~To help ensure least-cost solutions for transmission, the Energy Statute Law Amendment Act, 2016⁵⁸⁸ enabled the IESO to use competitive processes to select companies or consortia for the construction of new transmission lines in Ontario.~~

~~As a first step in implementing the new legislation, Ontario will direct the IESO to develop a competitive selection or procurement process for transmission and identify possible pilot projects. The results of these pilots will be used to develop a procurement process that is clear, cost-effective, efficient and able to respond to changing policy, market and system needs.~~

Summary

- The Province will continue to work with its agencies to implement the Conservation First policy in regional and local energy planning processes.
- With the first cycle of regional planning completed, the Province is directing the Independent Electricity System Operator (IESO) to review the regional planning process and report back with options and recommendations that will address the challenges and opportunities that have emerged.
- Ontario's Climate Change Action Plan has reinforced the importance of community energy plans, and indicated Ontario's continued support for them.
- ~~The Province will direct the IESO to develop a competitive selection or procurement process for transmission, and to identify possible pilot projects.~~

⁵⁸⁷ Source needed

⁵⁸⁸ <https://www.ontario.ca/laws/statute/S16010>

- Ontario is committed to public engagement when it undertakes reviews of major pipeline projects.

Glossary

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

Baseload Generation – Generation such as nuclear and hydroelectric that provide a more or less constant supply of electricity, every day and every season of the year.

Behind-the-Meter Generation – On-site generation where the electricity generated is used within a facility. Under the Independent Electricity System Operator's (IESO) current program rules, behind-the-meter generation projects include combined heat and power and waste energy recovery.

Beneficiary Pays – an approach to cost allocation where consumers paying the full cost of the asset they benefit from. This protects ratepayers from paying for infrastructure that benefits only a few customers.

Bioenergy and Biodiesel – Energy produced from agricultural residues, food byproducts, animal manure, waste wood and kitchen waste.

Cap and Trade – A program that puts a cap on the amount of greenhouse gases a company can discharge. If it releases more than that, the company can purchase allowances in an auction or from another company whose emissions are below the cap.

Capacity Auction – A competitive market that commits a supplier to provide a specified amount of electricity in the future.

Cap and Trade Program – A market-based system that sets a hard cap on greenhouse gas emissions while giving flexibility to businesses and industry in terms of how they meet their obligations under the program. Companies must have enough allowances (also known as permits or credits) to cover their emissions. As the cap declines, companies can invest in clean technologies to become more efficient, switch to lower carbon fuels, or purchase additional credits from other participants that have more allowances and credits than they need.

Climate Change Action Plan – A five-year plan, part of Ontario's long-term fight against climate change. The current Climate Change Action Plan will be followed by a revised plan in 2020.

Climate Change Mitigation and Low Carbon Economy Act, 2016 – Ontario legislation that established, among other things, the legal framework for Ontario's cap and trade program. The Act establishes the province's greenhouse gas reduction targets in legislation, sets out the framework for the cap and trade program, requires the creation of a climate change action plan, and ensures accountability and transparency in how cap and trade proceeds are spent.

Conservation First and Conservation First Framework – Conservation First is Ontario's policy of making cost-effective conservation the first resource considered when planning the province's energy needs. The Conservation First Framework sets out the rules for conservation and energy efficiency programs offered by Ontario's electricity distributors.

Demand Side Management Framework – The Demand Side Management Framework sets the rules for conservation and energy efficiency programs offered by Ontario's main natural gas distributors.

Demand Response – The reduction of financial incentives offered to residential and business users to shift or shifting reduce their electricity at times of energy use by a variety of consumers in response to pricing or system signals need.

Distributed Generation (also known as Embedded Generation) – Electricity generation that is located on the distribution system close to where it is used.

Energy Audit – Determining the changes that can be made in a building to improve its energy efficiency and reduce costs and greenhouse gas emissions

Energy Retrofit – Renovating a building in order to decrease its use of energy.

Energy Storage – Equipment or technology that collects energy so it can be used at a later date.

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

Gigawatt - A unit of power equal to one million kilowatts (kW) or one billion watts (W).

Green Button – A data standard that gives customers the ability to access and share their utility data in an electronic, standardized and secure way.

Heat Pumps – A device that heats or cools buildings by absorbing heat from one area and transferring it to another.

In-Front-of-the-Meter Technologies - Technologies that are deployed on distribution networks and provide electricity savings and peak reductions to customers behind the meter. Examples include technologies that reduce line losses and optimize voltage levels.

Incremental Capacity Auction – A competitive market that commits a supplier to provide a specified amount of electricity in the future.

Independent Electricity System Operator (IESO) – The provincial agency that manages the province's power system so that Ontarians receive power when and where they need it. It plans and prepares for future electricity needs, and works with its partners to guide conservation efforts.

Independent Power Authority – an unlicensed LDCs that serves one of 10 First Nation communities in northwestern Ontario.

Indigenous – Another description of Canada's First Nation, Métis and Inuit peoples.

Kilowatt (kW) – A standard unit of power equal to 1,000 watts. Ten 100-watt light bulbs operated together require one kW of power.

Megatonnes (Mt) – One million metric tons.

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

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

Microgrid – A local electricity network that in the event of a failure of the larger network, can seal itself off and provide power to local homes and businesses.

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 – Allows customers to generate their own electricity and receive bill credits for any surplus electricity sent to the local distribution system.

Net-Zero Energy Buildings – Buildings that annually produce at least as much energy as they consume.

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

Pumped Storage – A way to store lower-cost energy, by using it to pump water into a reservoir, and release it to generate electricity when prices are higher.

Regulated Price Plan (RPP) – The plan, revised every six months by the OEB, that sets the time-of-use prices for electricity.

Terawatt-Hours (TWh) – One billion kilowatts of electricity used for one hour.

Time-Of-Use Prices – Prices that vary according to the cost of producing the electricity.

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

Fact Checking Tracker

Staff and managers please print and initial next to each fact you are responsible for.

Fact #	Reference Description	LTEP Pg.	Staff 1	Staff 2	Mgr
1	Internal Ministry of Energy/Hydro One	8			
2	IESO, Power Data -- Supply Overview - http://www.ieso.ca/power-data/supply-overview	8			
3	Source needed	8			
4	IESO, Power Data -- Supply Overview - http://www.ieso.ca/power-data/supply-overview	8			
5	IESO estimate based on National Inventory Report data	8			
6	Source needed	8			
7	Source needed	9			
8	LTEP 2013, pg. 16, http://www.energy.gov.on.ca/en/files/2014/10/LTEP_2013_English_WEB.pdf	9			
9	Internal Ministry of Energy analysis	9			
10	Description needed, https://news.ontario.ca/mei/en/2016/09/actions-to-reduce-	9			

	energy-costs.html				
<u>11</u>	Internal Ministry of Energy analysis	<u>9</u>			
<u>12</u>	Ontario Ministry of Energy news release, Link needed	<u>9</u>			
<u>13</u>	Source needed	<u>9</u>			
<u>14</u>	Ontario's Fair Hydro Act, 2017	<u>9</u>			
<u>15</u>	Source needed	<u>9</u>			
<u>16</u>	OEB Decision & Order for OESP Credits (April 25, 2017), https://www.oeb.ca/newsroom/2017/oesp-benefit-more-consumers-increase-credits-50 and amounts prescribed in s. 5(2) and Schedule 1 in O. Reg. 314/15 (OESP) of <i>Ontario Energy Board Act, 1998</i> (OEBA). The amendments were approved by Cabinet on April 26, 2017.	<u>10</u>			
<u>17</u>	Source needed	<u>10</u>			
<u>18</u>	OEB report on First Nation Rate, https://www.oeb.ca/industry/policy-initiatives-and-consultations/options-appropriate-rate-assistance-program-reserve	<u>10</u>			
<u>19</u>	Source needed	<u>10</u>			
<u>20</u>	Source needed	<u>10</u>			
<u>21</u>	Source needed	<u>10</u>			
<u>22</u>	Source needed	<u>10</u>			
<u>23</u>	OEB Decision & Order for OESP Credits (April 25, 2017), https://www.oeb.ca/newsroom/2017/oesp-benefit-more-consumers-increase-credits-50 and amounts prescribed in s. 5(2) and Schedule 1 in O. Reg. 314/15 (OESP) of <i>Ontario Energy Board Act, 1998</i> (OEBA). The amendments were approved by Cabinet on April 26, 2017.	<u>11</u>			
<u>24</u>	Amount prescribed in section s. 5(2)(c) in O. Reg. 314/15 (OESP) of OEBA https://www.ontario.ca/laws/regulation/150314	<u>11</u>			
<u>25</u>	Amount prescribed in sectionsssectionsectionsection s. 5(2)(b) in O. Reg. 314/15 (OESP) of OEBA https://www.ontario.ca/laws/regulation/150314	<u>11</u>			
<u>26</u>	Amount prescribed in sectionsssectionsectionsection s. 5(2)(i) in O. Reg. 314/15 (OESP) of OEBA. https://www.ontario.ca/laws/regulation/150314	<u>11</u>			

<u>27</u>	<u>Source Needed</u>	<u>11</u>			
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<u>30</u>	<u>Source needed</u>	<u>12</u>			
<u>31</u>	<u>Internal Ministry of Energy analysis, estimated from Hydro One R1 and R2 customers benefiting from DRP, plus eligible customers from 7 smaller LDCs.</u>	<u>12</u>			
<u>32</u>	<u>Source needed</u>	<u>12</u>			
<u>33</u>	<u>Source needed</u>	<u>12</u>			
<u>34</u>	<u>OEB report on First Nation Rate , https://www.oeb.ca/industry/policy-initiatives-and-consultations/options-appropriate-rate-assistance-program-reserve</u>	<u>12</u>			
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<u>38</u>	<u>Ontario Regulation 429/04</u>	<u>13</u>			
<u>39</u>	<u>Source needed</u>	<u>13</u>			
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<u>62</u>	<u>Source needed</u>	<u>17</u>			
<u>63</u>	<u>Ontario Energy Board Briefing for Minister of Energy on USMPs June 27, 2017</u>	<u>17</u>			
<u>64</u>	<u>Source needed</u>	<u>17</u>			
<u>65</u>	<u>Source needed</u>	<u>17</u>			
<u>66</u>	<u>Source needed</u>	<u>18</u>			
<u>67</u>	<u>News Release: Expanding Natural Gas to More Communities Across Ontario, Ministry of Infrastructure, January 30, 2017 and http://www.infrastructureontario.ca/NGGP/</u>	<u>18</u>			
<u>68</u>	<u>Source needed</u>	<u>18</u>			
<u>69</u>	<u>News Release: Expanding Natural Gas to More Communities Across Ontario, Ministry of Infrastructure, January 30, 2017</u>	<u>18</u>			
<u>70</u>	<u>OEB Decision EB-2016-004, Generic Proceeding on Community Expansion (Natural Gas), November 17, 2016</u>	<u>18</u>			
<u>71</u>	<u>OEB Decision EB-2015-0179, Union Gas Community Expansion Application</u>	<u>18</u>			
<u>72</u>	<u>https://news.ontario.ca/mei/en/2016/10/ontario-passes-legislation-to-reduce-electricity-costs-for-families-and-businesses.htmlMinistry</u>	<u>19</u>			
<u>73</u>	<u>Source needed</u>	<u>19</u>			
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81	<u>Source needed</u>	<u>20</u>			
82	<u>Brattle Group, prepared for the IESO, A Benefits Case Assessment of the Market Renewal Project (2017)</u>	<u>21</u>			
83	<u>Source needed</u>	<u>21</u>			
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98	<u>Source needed</u>	<u>23</u>			
99	<u>IESO, Ontario Planning Outlook; FleetCarma</u>	<u>23</u>			
100	<u>TBD based on IESO modelling</u>	<u>23</u>			
101	<u>¹ TBD based on IESO modelling</u> <u>Hawthorne to Merivale</u> <u>IESO, Ontario- Quebec Interconnection Capability: A Technical Review, page 19, http://www.ieso.ca/-/media/files/ieso/document-library/power-data/supply/intertiereport-20170508.pdf?la=en ; and Hydro One's 2017/18 transmission rate application, Exhibit B1, Tab</u>	<u>23</u>			

	3, Schedule 3, pages 7 and 10 of 35, http://www.hydroone.com/RegulatoryAffairs/EB20160160/HONI_Tx_Appl_Ex_B1_20160531.pdf Clarington Transformer Station http://www.hydroone.com/Projects/Clarington/Pages/default.aspx ; http://www.hydroone.com/Projects/Clarington/Pages/Timeline.aspx ; GTA West Bulk Reinforcement http://www.ieso.ca/-/media/files/ieso/document-library/regional-planning/northwest-greater-toronto/2015-northwest-gta-irrp-report.pdf?la=en ; http://www.ieso.ca/get-involved/regional-planning/gta-and-central-ontario/gta-west Lake Erie Connector http://www.itclakeerieconnector.com/				
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<u>111</u>	<u>Source needed</u>	<u>27</u>			
<u>112</u>	https://www.ontario.ca/page/cap-and-trade	<u>27</u>			
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<u>124</u>	<u>Source needed</u>	<u>28</u>			
<u>125</u>	<u>Ontario Planning Outlook (Pg. 13) reports solar PV module prices have declined by 70-80 per cent over the last decade.</u>	<u>28</u>			
<u>126</u>	<u>Source needed</u>	<u>28</u>			
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<u>132</u>	<u>IESO/Navigant (TBC)</u>	<u>29</u>			
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<u>134</u>	<u>IESO</u>	<u>29</u>			
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<u>139</u>	<u>Source needed</u>	<u>30</u>			
<u>140</u>	<u>Ontario Ministry of Energy news releases for Darlington and Bruce refurbishments,</u> <u>https://news.ontario.ca/mei/en/2016/01/ontario-moving-forward-with-nuclear-refurbishment-at-darlington-and-pursuing-continued-operations-at.html,</u> <u>https://news.ontario.ca/mei/en/2015/12/ontario-commits-to-future-in-nuclear-energy.html Source Needed</u>	<u>30</u>			
<u>141</u>	<u>Power Workers Union website,</u> <u>http://www.pwu.ca/news/opinion-editorials/post/ontario-</u>	<u>30</u>			

	delivers-good-news#.WX9vklYtQI Source Needed				
142	Source needed	30			
143	Source needed	30			
144	OPG 4 th Quarter-2015 financial results, pg. 21, http://www.opg.com/about/finance/Documents/160304CombinedNewsReleaseMDAOPGQ42015FINAL.pdf Source Needed	30			
145	Ontario Ministry of Energy news release, https://news.ontario.ca/mei/en/2016/01/ontario-moving-forward-with-nuclear-refurbishment-at-darlington-and-pursuing-continued-operations-at.html Source Needed	30			
146	Source needed	31			
147	Source needed	31			
148	OPG news release, http://www.opg.com/news-and-media/news-releases/Documents/20170413_RefurbMajorMilestone.pdf	31			
149	October 2016 economic impact study by Conference Board of Canada, pg. 12-13, http://www.opg.com/darlington-refurbishment/Documents/CBOC-DarlingtonContinuedOps_ImpactAnalysis.pdf	31			
150	Ontario Ministry of Energy news release, https://news.ontario.ca/mei/en/2015/12/ontario-commits-to-future-in-nuclear-energy.html	31			
151	Ontario Ministry of Energy news release, https://news.ontario.ca/mei/en/2015/12/ontario-commits-to-future-in-nuclear-energy.html	31			
152	Source needed	32			
153	Source needed	32			
154	Source needed	32			
155	Source needed	32			
156	2016 economic impact study on Bruce refurbishment, pg. 5, http://www.brucepower.com/wp-content/uploads/2016/11/Economic-Impact-Study-2016.pdf	32			

<u>157</u>	<u>Source needed</u>	<u>32</u>			
<u>158</u>	<u>Source needed</u>	<u>33</u>			
<u>159</u>	<u>Source needed</u>	<u>33</u>			
<u>160</u>	Cameco website, https://www.cameco.com/about	<u>33</u>			
<u>161</u>	Bruce Power news release, http://www.brucepower.com/bruce-power-cameco-longterm-arrangement/	<u>33</u>			
<u>162</u>	OPG news release, http://www.opg.com/darlington-refurbishment/Pages/20170524_CamecoDelivery.aspx	<u>33</u>			
<u>163</u>	BWXT news release, http://www.bwxt.com/news/2017/04/13/BWXT-Awarded-CA55-Million-Contract-for-Feeder-Supply-in-Support-of-OPG%E2%80%99s-Darlington-Refurbishment-	<u>33</u>			
<u>164</u>	Organization of Canadian Nuclear Industries (OCNI) news release, https://ocni.ca/public-resources/publications/darlington-refurbishment/	<u>34</u>			
<u>165</u>	BWXT news release, http://www.bwxt.com/news/2017/04/13/BWXT-Awarded-CA55-Million-Contract-for-Feeder-Supply-in-Support-of-OPG%E2%80%99s-Darlington-Refurbishment-	<u>34</u>			
<u>166</u>	BWXT news release, http://www.bwxt.com/news/2016/07/12/BWXT-Subsidiary-Awarded-Steam-Generator--Design-and-Supply-Contract-from-Bruce-Power	<u>34</u>			
<u>167</u>	Bruce power news release, http://www.brucepower.com/bruce-power-signs-35-million-agreement-with-laker-energy-products/	<u>34</u>			
<u>168</u>	Op. Cit. Bruce power news release, http://www.brucepower.com/bruce-power-signs-35-million-agreement-with-laker-energy-products/ Op. Cit. Op. Cit.	<u>34</u>			
<u>169</u>	<u>Source needed</u>	<u>34</u>			
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<u>172</u>	<u>Source needed</u>	<u>35</u>			
<u>173</u>	Ontario Power Authority (now a part of IESO, following reorganization) presentation, slide 2, http://14083-presscdn-0-0.pagely.netdna-cdn.com/wp-content/uploads/2015/09/MPP-Briefing-on-Force-Majeure.pdf	<u>35</u>			
<u>174</u>	<u>Source needed</u>	<u>35</u>			
<u>175</u>	<u>Source needed</u>	<u>35</u>			
<u>176</u>	<u>Source needed</u>	<u>36</u>			
<u>177</u>	OPG webpage on Pickering licence renewal, http://www.opg.com/generating-power/nuclear/stations/pickering-nuclear/Pages/pickering-nuclear-licence-renewal.aspx	<u>36</u>			
<u>178</u>	IESO Assessment of Pickering Life Extension Options referenced in OPG rate application to OEB, Exhibit F2-2-3 pg. 132, http://www.rds.ontarioenergyboard.ca/webdrawer/webdrawer.dll/webdrawer/rec/529935/view/	<u>36</u>			
<u>179</u>	<u>Source needed</u>	<u>36</u>			
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<u>198</u>	<u>IESO Report: Energy Storage, Pages 1-5,</u> <u>http://www.ieso.ca/-/media/files/ieso/document-library/energy-storage/ieso-energy-storage-report_march-2016.pdf?la=en</u>	<u>43</u>			
<u>199</u>	<u>Essex Energy: The Study of Energy Storage in Ontario Distribution Systems, Pages 35-39. Not yet public.</u>	<u>43</u>			
<u>200</u>	<u>Source needed</u>	<u>43</u>			
<u>201</u>	<u>Source needed</u>	<u>43</u>			
<u>202</u>	<u>Ardakanian, S., Catherine Rosenberg, and S. Keshav,</u> <u>"Distributed Control of Electric Vehicle Charging," University</u> <u>of Waterloo, Pages 1-4,</u> <u>http://blizzard.cs.uwaterloo.ca/iss4e/wp-content/uploads/2013/04/dist_control.pdf</u>	<u>43</u>			
<u>203</u>	<u>FleetCarma SGF Sell Sheet, P.1.</u>	<u>44</u>			
<u>204</u>	<u>Oakville Hydro, "Electric Vehicles,"</u> <u>https://www.oakvillehydro.com/my-home/general/electric-vehicles.html</u> <u>and Burlington Hydro, "EVfutureGRID,"</u> <u>http://www.burlingtonhydro.com/your-</u>	<u>44</u>			

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212	Source needed	44			
213	Source needed	45			
214	Source needed	45			
215	Source needed	45			
216	Source needed	45			
217	Source needed	45			
218	Fortune. « Today's Cars Are Parked 95% of the Time », http://fortune.com/2016/03/13/cars-parked-95-per-cent-of-time/	45			
219	Source needed	45			
220	Source needed	45			
221	Source needed	45			

<u>222</u>	<u>Impact Evaluation of Ontario's Time-of-Use Rates: First Year Analysis, Pages iv, 1, http://www.ieso.ca/-/media/files/ieso/document-library/conservation/emv/2012/preliminary-report-first-year-impact-evaluation-of-ontario-tou-rates.pdf?la=en.</u>	<u>45</u>			
<u>223</u>	<u>Information provided to the Ministry by PowerStream, including inserts (Website offline), Pages 1-10.</u>	<u>46</u>			
<u>224</u>	<u>Source needed</u>	<u>46</u>			
<u>225</u>	<u>Source needed</u>	<u>48</u>			
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<u>228</u>	<u>Source needed</u>	<u>49</u>			
<u>229</u>	<u>Government of Ontario News Release, https://news.ontario.ca/mei/en/2014/11/ontario-supports-leading-edge-smart-grid-projects.html.</u>	<u>49</u>			
<u>230</u>	<u>Source needed</u>	<u>49</u>			
<u>231</u>	<u>Source needed</u>	<u>49</u>			
<u>232</u>	<u>N-Dimension SGF Sell Sheet, P.1.</u>	<u>49</u>			
<u>233</u>	<u>E-mail confirmation – to be included in the fact-check binder.</u>	<u>49</u>			
<u>234</u>	<u>E-mail confirmation – to be included in the fact-check binder</u>	<u>49</u>			
<u>235</u>	<u>Source needed</u>	<u>49</u>			
<u>236</u>	<u>Source needed</u>	<u>50</u>			
<u>237</u>	<u>ConEd. "SmartCharge New York" https://www.coned.com/en/save-money/rebates-incentives-tax-credits/rebates-incentives-tax-credits-for-residential-customers/electric-vehicle-rewards.</u>	<u>50</u>			

<u>238</u>	<u>Source needed</u>	<u>51</u>			
<u>239</u>	<u>Source needed</u>	<u>51</u>			
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<u>244</u>	<u>Source needed</u>	<u>52</u>			
<u>245</u>	<u>Source needed</u>	<u>52</u>			
<u>246</u>	Electricity Distributors Association. 2017. <i>The Power to Connect – Advancing Customer-Driven Electricity Solutions for Ontario</i> . p. 49. https://secure2.eda-on.ca/IMIS15/EDA/EDA_Priorities/EDA_Policy_Papers/PowerToConnect_Feb2017.aspx .	<u>52</u>			
<u>247</u>	<u>Source needed</u>	<u>52</u>			
<u>248</u>	<u>Source needed</u>	<u>52</u>			
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<u>251</u>	<u>Source needed</u>	<u>53</u>			
<u>252</u>	<u>Source needed</u>	<u>53</u>			
<u>253</u>	Calculations by Power Advisory. APPrO. (2015). <i>The Value of Electricity to Ontario</i> . Power Advisory LLP. Retrieved from http://www.appro.org/index.php?option=com_content&tas	<u>53</u>			

	k=view&id=130&Itemid=166.)				
254	Source needed	53			
255	Market Analysis of Ontario's Renewable Energy Sector, Compass Renewable Energy Consulting Inc., June 2017 (URL and Page number forthcoming from REFO)	54			
256	Source needed	54			
257	Source needed	54			
258	Source needed	54			
259	Source needed	54			
260	Source needed	55			
261	Source needed	55			
262	Source needed	55			
263	Source needed	55			
264	Source needed	55			
265	Source needed	55			
266	Source needed	56			
267	Source needed	56			
268	Canadian companies collaborate to secure isotope supplies, 8 November 2016, World Nuclear News, http://www.world-nuclear-news.org/RS-Canadian-companies-collaborate-to-secure-isotope-supplies-0811168.html	56			
269	American Brain Tumor Association webpage on brain cancer therapy with Cobalt-60,	56			

	http://www.abta.org/brain-tumor-treatment/treatments/stereotactic-radiosurgery/gamma-knife.html				
<u>270</u>	Medical Isotopes, Canadian Nuclear Laboratories Website, http://www.cnl.ca/en/home/facilities-and-expertise/nru/isotopes.aspx	<u>56</u>			
<u>271</u>	The nuclear connection to combat the Zika virus, May 2016, Canadian Nuclear Association, https://cna.ca/news/nuclear-connection-combating-zika-virus-2/	<u>56</u>			
<u>272</u>	Nordion and Bruce Power ensure global Cobalt-60 supply up to 2064, 8 November 2016, Bruce Power website, http://www.brucepower.com/bruce-power-ontario-power-generation-collaborate-to-ensure-steady-supply-of-cobalt-60/	<u>56</u>			
<u>273</u>	<u>Source needed</u>	<u>56</u>			
<u>274</u>	<u>Source needed</u>	<u>57</u>			
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<u>289</u>	<u>Source needed</u>	<u>60</u>			
<u>290</u>	<u>Source needed</u>	<u>60</u>			
<u>291</u>	See Chapter 5 of the IESO's Market Rules, Power System Reliability, for scope of the IESO controlled grid: http://www.ieso.ca/sector-participants/market-operations/-/media/83782a2a5a5d42cea4efbf9f25002939.ashx	<u>60</u>			
<u>292</u>	For IESO's role: http://www.ieso.ca/sector-participants/system-reliability/reliability-standards-framework ;	<u>60</u>			
<u>293</u>	See the Handbook to Utility Rate Applications, October 13, 2016, https://www.oeb.ca/oeb/Documents/Regulatory/OEB_Rate_Handbook.pdf and the Report of the Board: Performance Measurement for Electricity Distributors: A Scorecard Approach, March 5, 2014, https://www.oeb.ca/oeb/Documents/EB-2010-0379/Report_of_the_Board_Scorecard_20140305.pdf	<u>61</u>			
<u>294</u>	For more information on the scorecard metrics: https://www.oeb.ca/utility-performance-and-monitoring/what-are-electricity-utility-scorecards/scorecard-filing-and-the-Report-of-the-Board-cited-above .	<u>61</u>			
<u>295</u>	See section 4.5 Performance Standards of the Transmission System Code, https://www.oeb.ca/oeb/Documents/Regulatory/Transmission_System_Code.pdf ; Transmitter-specific CDDP are	<u>61</u>			

	<u>posted online by the transmitters.</u>				
<u>296</u>	<u>www.ieso.ca/-/media/files/ieso/document.../18.../methodology_rtaa_2017mar.pdf</u>	<u>61</u>			
<u>297</u>	<u>See OEB consultations RP-2003-0190, EB-2008-0001, EB-2010-0249, EB-2014-0189, EB-2015-0182.</u>	<u>61</u>			
<u>298</u>	<u>Electric Outage Service Credits, Michigan Agency for Energy and Michigan Public Service Commission, http://www.michigan.gov/documents/mpsc-ca_electricoutageservicecredits_276711_7.pdf</u>	<u>62</u>			
<u>299</u>	<u>Performance Measurement for Electricity Distributors: A Scorecard Approach, March 5, 2014, https://www.oeb.ca/oeb/Documents/EB-2010-0379/Report_of_the_Board_Scorecard_20140305.pdf; For more information on the scorecard metrics: https://www.oeb.ca/utility-performance-and-monitoring/what-are-electricity-utility-scorecards/scorecard-filing-and-the-Report-of-the-Board-cited-above.</u>	<u>62</u>			
<u>300</u>	<u>See Hydro One's Transmission Rate Application, 2017/18, Transmission System Plan, Section 5. Reliability Performance, PDF pages 66-77, http://www.hydroone.com/RegulatoryAffairs/EB20160160/HONI_Tx_Appl_Ex_B1_20160531.pdf; See also Hydro One's proposed scorecard, in Exhibit B2, T1, Schedule 1, PDF page 5-6, http://www.hydroone.com/RegulatoryAffairs/EB20160160/HONI_Tx_Appl_Ex_B2_20160531.pdf</u>	<u>62</u>			
<u>301</u>	<u>FNEI 2016 Transmission Rate Application, Exhibit 4, Tab 1, Schedule 2, See PDF pages 268-276, http://www.fivenations.ca/index.php/regulatory/regulatory-2/item/download/183_c66a51fef9e93139c3f8312ed16a9dc6</u>	<u>62</u>			
<u>302</u>	<u>Source needed</u>	<u>63</u>			
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<u>309</u>	<u>Source needed</u>	<u>64</u>			
<u>310</u>	<u>Source needed</u>	<u>64</u>			
<u>311</u>	See OEB Order EB-2015-0297 (http://www.rds.ontarioenergyboard.ca/webdrawer/webdrawer.dll/webdrawer/rec/514364/view/); OEB Order EB-2016-0284 (http://www.rds.ontarioenergyboard.ca/webdrawer/webdrawer.dll/webdrawer/rec/552233/view/); and the SME's application for case EB-2016-0284 (http://www.rds.ontarioenergyboard.ca/webdrawer/webdrawer.dll/webdrawer/rec/545198/view/SME_LtrAppLicence_20160930.PDF)	<u>64</u>			
<u>312</u>	<u>Source needed</u>	<u>65</u>			
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<u>314</u>	<u>Source needed</u>	<u>65</u>			
<u>315</u>	<u>Source needed</u>	<u>65</u>			
<u>316</u>	https://www.ontario.ca/laws/statute/S16010	<u>65</u>			
<u>317</u>	See Provincial Policy Statement, Part V: Policies, 1.0 Building Strong Healthy Communities, page 6, http://www.mah.gov.on.ca/AssetFactory.aspx?did=10463	<u>66</u>			
<u>318</u>	See Provincial Policy Statement, Part V: Policies, 1.1.1 g), 1.2.1 d), 1.6.1, 1.6.8.1, 1.6.11.1, and 1.7.1 b),	<u>66</u>			

	http://www.mah.gov.on.ca/AssetFactory.aspx?did=10463				
<u>319</u>	Growth Plan for the Greater Golden Horseshoe (2017), 3. Infrastructure to Support Growth, 3.2.5 a) Infrastructure Corridors, see page 35 and definition of infrastructure on page 74, http://placestogrow.ca/images/pdfs/ggh2017/en/growth%20plan%20%282017%29.pdf	<u>67</u>			
<u>320</u>	Growth Plan for the Greater Golden Horseshoe (2017), 3. Infrastructure to Support Growth, 3.2.5 b) Infrastructure Corridors, see page 35 and definition of infrastructure on page 74, http://placestogrow.ca/images/pdfs/ggh2017/en/growth%20plan%20%282017%29.pdf	<u>67</u>			
<u>321</u>	IESO, Northwest GTA IRRP, pages 8 and 66-74, http://www.ieso.ca/-/media/files/ieso/document-library/regional-planning/northwest-greater-toronto/2015-northwest-gta-irrp-report.pdf?la=en	<u>67</u>			
<u>322</u>	IESO, Northwest GTA IRRP, page 1 and 70, http://www.ieso.ca/-/media/files/ieso/document-library/regional-planning/northwest-greater-toronto/2015-northwest-gta-irrp-report.pdf?la=en	<u>67</u>			
<u>323</u>	IESO, Northwest GTA IRRP, page 8, http://www.ieso.ca/-/media/files/ieso/document-library/regional-planning/northwest-greater-toronto/2015-northwest-gta-irrp-report.pdf?la=en	<u>67</u>			
<u>324</u>	IESO, Northwest GTA IRRP, pages 72-73, http://www.ieso.ca/-/media/files/ieso/document-library/regional-planning/northwest-greater-toronto/2015-northwest-gta-irrp-report.pdf?la=en IESO, Northwest GTA IRRP – Appendices – OPA, Assessment of the Long-Term Electricity Transmission System Requirements within Northwest GTA, November 10, 2014, page 8/11, http://www.ieso.ca/-/media/files/ieso/document-library/regional-planning/northwest-greater-toronto/2015-northwest-gta-irrp-appendices.pdf?la=en	<u>67</u>			
<u>325</u>	IESO, Northwest GTA IRRP – Appendices – OPA, Assessment of the Long-Term Electricity Transmission System Requirements within Northwest GTA, November 10, 2014,	<u>67</u>			

	page 8/11, http://www.ieso.ca/-/media/files/ieso/document-library/regional-planning/northwest-greater-toronto/2015-northwest-gta-irrp-appendices.pdf?la=en				
326	Source needed	67			
327	Source needed	68			
328	Source needed	68			
329	Source needed	68			
330	Source needed	68			
331	Source needed	69			
332	Source needed	69			
333	Internal Ministry estimate based on data presented in the 2005, 2006 and 2015 OEB Yearbooks of Electricity Distributors, https://www.oeb.ca/utility-performance-and-monitoring/natural-gas-and-electricity-utility-yearbooks	69			
334	Source needed	69			
336	IESO 2015 Conservation Results Report, page 15	69			
337	Electricity for Cities of Kingston and Stratford - 2015 OEB Yearbook of Electricity Distributors: http://cf.oeb.ca/oeb/Documents/RRR/2015_Yearbook_of_Electricity_Distributors.pdf	69			
338	Internal Ministry estimate developed based on data reported by Enbridge and Union for 2005-2015 DSM programs. Assumes, average Ontario home consumes 2,200m3 of natural gas per year (based on OEB data), https://www.oeb.ca/industry/policy-initiatives-and-consultations/natural-gas-demand-side-management-dsm	70			
339	Source needed	70			

<u>340</u>	<u>IESO 2015 Conservation Results Report, page 5</u>	<u>70</u>			
<u>341</u>	<u>IESO 2015 Conservation Results Report, page 5</u>	<u>70</u>			
<u>342</u>	<u>IESO 2015 Conservation Results Report, page 1</u>	<u>70</u>			
<u>343</u>	<u>IESO 2015 Conservation Results Report, page 7</u>	<u>70</u>			
<u>344</u>	<u>2015 Natural Gas DSM Annual Verification Report, calculated based on data presented on page ii and page iv</u>	<u>71</u>			
<u>345</u>	<u>2015 DSM Draft Annual Reports, calculated based on data presented on page 36 (Enbridge report) and page 16 (Union report)</u>	<u>71</u>			
<u>346</u>	<u>Source needed</u>	<u>71</u>			
<u>347</u>	<u>Calculated based on data presented in the 2015 Natural Gas DSM Annual Verification Report and the 2015 DSM Draft Annual Reports.</u>	<u>71</u>			
<u>348</u>	<u>Source needed</u>	<u>71</u>			
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<u>353</u>	<u>Source needed</u>	<u>71</u>			
<u>354</u>	<u>February 6, 2017 DR Update Note from IESO – Verified by email on June 23, 2017</u>	<u>71</u>			
<u>355</u>	<u>Source needed</u>	<u>72</u>			
<u>356</u>	<u>Source needed</u>	<u>72</u>			
<u>357</u>	<u>OEB Conservation and Demand Management Report- 2015 Results, Page 3, https://www.oeb.ca/oeb/Documents/CDM/OEB_2015_CDM_Results_Report.pdf</u>	<u>72</u>			

<u>358</u>	<u>Source needed</u>	<u>72</u>			
<u>359</u>	<u>Source needed</u>	<u>73</u>			
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<u>365</u>	<u>Source needed</u>	<u>73</u>			
<u>366</u>	Helping Homeowners Cut Energy Bills with Retrofits and Renovations." October 31, 2016. https://news.ontario.ca/opo/en/2016/10/helping-homeowners-cut-energy-bills-with-retrofits-and-renovations.html	<u>74</u>			
<u>367</u>	"Helping Homeowners Cut Energy Bills with Retrofits and Renovations." October 31, 2016. https://news.ontario.ca/opo/en/2016/10/helping-homeowners-cut-energy-bills-with-retrofits-and-renovations.html	<u>74</u>			
<u>368</u>	Whole Home Pilot Program launch, http://ieso.com/en/sector-participants/ieso-news/2017/06/whole-home-pilot-program-launch	<u>74</u>			
<u>369</u>	<u>Source needed</u>	<u>74</u>			
<u>370</u>	<u>Source needed</u>	<u>75</u>			
<u>371</u>	<u>Source needed</u>	<u>75</u>			

<u>372</u>	<u>Ontario's Five-Year Climate Change Action Plan 2016-2020, pages 29 and 69</u>	<u>75</u>			
<u>373</u>	<u>Source needed</u>	<u>76</u>			
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<u>378</u>	<u>O.reg. 20.17</u>	<u>77</u>			
<u>379</u>	<u>O.reg. 20.17</u>	<u>77</u>			
<u>380</u>	<u>Source needed</u>	<u>78</u>			
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<u>385</u>	<u>CCAP 2016, pg. 83</u>	<u>79</u>			
<u>386</u>	<u>Source needed</u>	<u>79</u>			
<u>387</u>	<u>Source needed</u>	<u>79</u>			
<u>388</u>	<u>2017 Navigant Report – Considerations for Deploying IFMC Technologies in Ontario, Page 6</u>	<u>79</u>			
<u>389</u>	<u>Source needed</u>	<u>80</u>			
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<u>397</u>	<u>Source needed</u>	<u>82</u>			
<u>398</u>	<u>IESO, Power Data – Supply Overview -</u> <u>http://www.ieso.ca/power-data/supply-overview</u>	<u>80</u>			
<u>399</u>	<u>Source needed</u>	<u>83</u>			
<u>400</u>	<u>IESO, Ontario Planning Outlook forecast and Environment</u> <u>Canada and Climate Change National Inventory Report (NIR).</u> <u>Will need to be confirmed with IESO once updated</u> <u>modelling for 2017 LTTP is finalized.</u>	<u>83</u>			
<u>401</u>	<u>Source needed</u>	<u>83</u>			
<u>402</u>	<u>From IESO Ontario Planning Outlook, Sept. 2016</u>	<u>84</u>			
<u>403</u>	<u>IESO Supply Data of December 31, 2016</u>	<u>84</u>			
<u>404</u>	<u>Source needed</u>	<u>84</u>			
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<u>414</u>	<u>Source needed</u>	<u>85</u>			
<u>415</u>	<u>IESO Website, 2016 Year-End Data -</u> <u>http://www.ieso.ca/corporate-ieso/media/year-end-data</u>	<u>85</u>			
<u>416</u>	<u>Source needed</u>	<u>86</u>			
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<u>418</u>	<u>Source needed</u>	<u>86</u>			
<u>419</u>	<u>IESO transmission connected wind generation, 2016.</u> <u>http://www.ieso.ca/power-data/supply-overview/transmission-connected-generation</u>	<u>86</u>			
<u>420</u>	<u>Source needed</u>	<u>86</u>			
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<u>426</u>	<u>Source needed</u>	<u>87</u>			
<u>427</u>	<u>2016 Annual Report of the Office of the Auditor General of Ontario, pp. 89-90. Accessed June 29, 2017:</u> <u>http://www.auditor.on.ca/en/content/annualreports/arreports/en16/v2_107en16.pdf</u>	<u>87</u>			
<u>428</u>	<u>Fuels Technical Report, pp. 7.</u> <u>Ontario Planning Outlook, pp. 2. Accessed June 29, 2017:</u> <u>www.ieso.ca/-/media/files/.../ontario.../ontario-planning-outlook-september2016.pdf</u>	<u>87</u>			
<u>429</u>	<u>Source needed</u>	<u>87</u>			
<u>430</u>	<u>Source needed</u>	<u>88</u>			
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<u>436</u>	<u>Source needed</u>	<u>88</u>			
<u>437</u>	<u>Source: Hydrogenics Selected for 2 Megawatt Energy Storage Facility in Ontario.</u> <u>http://www.hydrogenics.com/about-the-company/news-updates/2014/07/25/hydrogenics-selected-for-2-megawatt-energy-storage-facility-in-ontario</u>	<u>89</u>			
<u>438</u>	<u>Source needed</u>	<u>89</u>			
<u>439</u>	<u>Source: Hydrogenics Selected for 2 Megawatt Energy Storage Facility in Ontario.</u> <u>http://www.hydrogenics.com/about-the-company/news-updates/2014/07/25/hydrogenics-selected-for-2-megawatt-energy-storage-facility-in-ontario</u> <u>Source: Fuels Technical Report: The State of the System: 10-</u>	<u>89</u>			

<u>451</u>	<u>Source needed</u>	<u>91</u>			
<u>452</u>	<u>Source needed</u>	<u>91</u>			
<u>453</u>	<u>Source needed</u>	<u>91</u>			
<u>454</u>	<u>Source needed</u>	<u>91</u>			
<u>455</u>	Market transformation strategies for energy-using equipment in the building sector, Supporting the transition to a low-carbon economy, Energy and Mines Ministers' Conference St. Andrews-by-the-Sea, New Brunswick, August 2017 http://www.nrcan.gc.ca/sites/www.nrcan.gc.ca/files/emmc/pdf/Market-Transformation-Strategies_en.pdf	<u>91</u>			
<u>456</u>	<u>Source needed</u>	<u>92</u>			
<u>457</u>	<u>Source needed</u>	<u>92</u>			
<u>458</u>	http://www.reidsheritagehomes.com/net-zero and http://www.cbc.ca/news/canada/kitchener-waterloo/reids-heritage-net-zero-homes-incentives-1.3707640 Reid' sReid' sReid' sReid' sReids <u>Source:</u> http://www.coragroup.com/project/evolv1/ (to be approved by The Cora Group) <u>Source:</u> http://west5.ca/ and http://london.ctvnews.ca/provincial-officials-visit-ontario-s-first-net-zero-community-in-london-1.3272767# (to be approved by Sifton)	<u>92</u>			
<u>459</u>	<u>Source needed</u>	<u>93</u>			
<u>460</u>	<u>Source needed</u>	<u>94</u>			
<u>461</u>	Ontario Climate Consortium et al. (2015). Climate Change Vulnerability Assessment of Ontario's Electrical Transmission Sector: Public Technical Report	<u>94</u>			
<u>462</u>	Canadian Electricity Association (2016). Adapting to Climate	<u>94</u>			

	<u>Change: State of Play and Recommendations for the Electricity Sector in Canada https://electricity.ca/wp-content/uploads/2016/02/Adapting to Climate Change- State of Play and Recommendations for the Electricity Sector in Canada.pdf</u>				
<u>463</u>	<u>Durham Region (2016). Towards Resilience: Durham Community Climate Adaptation Plan 2016.</u>	<u>94</u>			
<u>464</u>	<u>Chartered Professional Accountants of Canada (2015). Adaptation Case Study #5: Horizon Utilities Corporation https://www.horizonutilities.com/ourCompany/publications/Articles/2015/Climate-Change-Adaptation-Case-Study-5-Horizon-Utilities-Corporation-October-2015.pdf</u>	<u>95</u>			
<u>465</u>	<u>Hydro Ottawa (2015). 2015 Annual Report. At https://static.hydroottawa.com/documents/publications/annual-report/2015-Annual-Report-EN.pdf</u>	<u>95</u>			
<u>466</u>	<u>IESO data. FIT 526 (1,084 MW), LRP 13 (319.9 MW), Other (785.5 MW) = Total</u>	<u>96</u>			
<u>467</u>	<u>Source needed</u>	<u>96</u>			
<u>468</u>	<u>IESO data</u>	<u>96</u>			
<u>469</u>	<u>Text Box: OPG and media news release</u>	<u>96</u>			
<u>470</u>	<u>Source needed</u>	<u>97</u>			
<u>471</u>	<u>Political Accord between First Nations and Government of Ontario –Ontario Newsroom 2015</u>	<u>97</u>			
<u>472</u>	<u>Ontario and Metis Nation Renew Framework Agreement- Ontario Newsroom 2014</u>	<u>97</u>			
<u>473</u>	<u>Text Box: First Nations, Ontario sign Political Accord- Ontario Newsroom 2015</u>	<u>98</u>			
<u>474</u>	<u>Source needed</u>	<u>98</u>			

<u>475</u>	<u>Source needed</u>	<u>98</u>			
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<u>480</u>	<u>Source needed</u>	<u>99</u>			
<u>481</u>	<u>Ontario Cutting Electricity Bills by 25 Per Cent- Newsroom 2017</u>	<u>99</u>			
<u>482</u>	<u>Preparing Remote First Nation Communities for Grid Connection- Ontario Newsroom 2014</u>	<u>99</u>			
<u>483</u>	<u>Source needed</u>	<u>100</u>			
<u>484</u>	<u>Wataynikaneyap Power data</u>	<u>101</u>			
<u>485</u>	<u>Source needed</u>	<u>102</u>			
<u>486</u>	<u>Source Needed</u>	<u>102</u>			
<u>487</u>	<u>Cannot insert endnotes into text boxes: OPG-GBFN facts substantiated by OPG & GBFN.</u>	<u>102</u>			
<u>488</u>	<u>Source needed</u>	<u>102</u>			
<u>489</u>	<u>Source needed</u>	<u>103</u>			
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<u>496</u>	<u>IESO ACEP data</u>	<u>104</u>			
<u>497</u>	<u>Ontario's Action on Climate Change developed by the Ministry of the Environment and Climate Change-February 2017</u>	<u>104</u>			
<u>498</u>	<u>IESO Education and Capacity Building Program Overview</u>	<u>105</u>			
<u>499</u>	<u>IESO Energy Partnerships Program Overview</u>	<u>105</u>			
<u>500</u>	<u>Source needed</u>	<u>105</u>			
<u>501</u>	<u>Text box: Ontario Financing Authority: Aboriginal Loan Guarantee Program Overview</u>	<u>106</u>			
<u>502</u>	<u>Overview of the Aboriginal Loan Guarantee Program (ALGP). (2017). Retrieved from https://www.ofina.on.ca/algp/program/overview.htm</u>	<u>106</u>			
<u>503</u>	<u>[Verification needed]</u>	<u>106</u>			
<u>504</u>	<u>MERE Text box: [Verification needed]</u>	<u>106</u>			
<u>505</u>	<u>[Reference forthcoming. Facts were provided by Mother Earth Renewable Energy project staff; ENERGY staff cross-referencing at the moment]</u>	<u>106</u>			
<u>506</u>	<u>Sources: http://rainyriverfirstnations.com/wp-content/uploads/2013/06/Solar-Project-lan.14.pdf http://rainyriverfirstnations.com/wp-content/uploads/2013/06/RRFN-Solar-Generation-Project-2013.pdf</u>	<u>107</u>			

<u>507</u>	MERE Text box: Canadian Environmental Assessment Agency: M'Chigeeng First Nation Mother Earth Renewable Energy Project Archive 10-01-55899 Prioritization of Call Out boxes/Case Studies 1. <u>Conservation on the Coast</u> 2. <u>The Mother Earth Renewable Energy (MERE) Project</u> 3. <u>Ontario Power Generation and Gull Bay First Nation</u> 4. <u>Wataynikaneyap Power</u> 5. <u>ACEP Case Study: North Caribou</u> 6. <u>Rainy River First Nations Solar Project</u> 7. <u>The First Nations-Ontario Political Accord</u> 8. <u>What is the Aboriginal Loan Guarantee Program</u> 9. <u>The recently completed 28-MW Peter Sutherland Generating Station</u> 10. <u>Comments made during First Nation and Métis LTEP Engagements Sessions</u>	<u>107</u>			
<u>508</u>	<u>Source needed</u>	<u>108</u>			
<u>509</u>	<u>Source needed</u>	<u>108</u>			
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<u>514</u>	<u>Source needed</u>	<u>109</u>			
<u>515</u>	Greenhouses Grow Ontario, An Economic Impact Study of the Greenhouse Industry in Ontario, 2006, page iv, http://www.planscape.ca/planscapePDFs/50-plan1.pdf	<u>110</u>			
<u>516</u>	IESO, Windsor-Essex Region Integrated Regional Resource Plan, April 2015, p 16-17, http://www.ieso.ca/-/media/files/ieso/document-library/regional-planning/windsor-essex/2015-windsor-essex-irrp-report.pdf?la=en	<u>110</u>			
<u>517</u>	<u>Source Needed</u>	<u>110</u>			

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<u>530</u>	<u>Source needed</u>	<u>111</u>			
<u>531</u>	<u>Ontario's Five Year Climate Change Action Plan, 2016-2020, p. 33 https://www.ontario.ca/page/climate-change-action-plan</u>	<u>112</u>			
<u>532</u>	<u>Ontario's Five Year Climate Change Action Plan, 2016-2020, p. 32 https://www.ontario.ca/page/climate-change-action-plan</u>	<u>112</u>			
<u>533</u>	<u>Source needed</u>	<u>112</u>			
<u>534</u>	<u>Municipal GHG Challenge Fund: http://www.grants.gov.on.ca/GrantsPortal/en/OntarioGrants/GrantOpportunities/PRDR017538</u>	<u>112</u>			

<u>535</u>	<u>Source needed</u>	<u>112</u>			
<u>536</u>	Ottawa : http://www.ieso.ca/-/media/files/ieso/document-library/regional-planning/greater-ottawa/letter-to-h1-ottawa.pdf?la=en http://www.ieso.ca/-/media/files/ieso/document-library/regional-planning/greater-ottawa/faqs-south-nepean-hand-off-letter.pdf?la=en http://www.ieso.ca/-/media/files/ieso/document-library/regional-planning/greater-ottawa/ieso-handoff-letter-re-south-nepean.pdf?la=en http://www.ieso.ca/-/media/files/ieso/document-library/regional-planning/greater-ottawa/engagement/ottawa-lac-april-19-2017-final.pdf?la=en Toronto : http://www.ieso.ca/en/get-involved/regional-planning/gta-and-central-ontario/-/media/files/ieso/document-library/regional-planning/toronto/engagement/Toronto-LAC-Presentation-20160128.pdf North of Dryden: http://www.ieso.ca/en/get-involved/regional-planning/northwest-ontario/north-of-dryden York Region: http://www.ieso.ca/en/get-involved/regional-planning/gta-and-central-ontario/york Windsor Essex: http://www.ieso.ca/en/get-involved/regional-planning/southwest-ontario/windsor-essex	<u>113</u>			
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<u>546</u>	<u>Source needed</u>	<u>117</u>			
<u>547</u>	https://news.ontario.ca/opo/en/2014/11/agreements-reached-at-quebec-ontario-joint-meeting-of-cabinet-ministers.html	<u>117</u>			
<u>548</u>	<u>Source needed</u>	<u>118</u>			
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