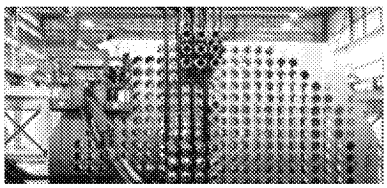
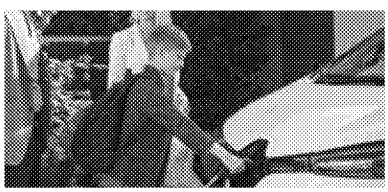


ONTARIO'S LONG-TERM ENERGY PLAN 2017

Delivering Fairness and Choice



Ontario

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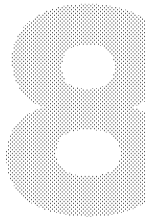

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Minister's Message

Ontario's 2017 Long-Term Energy Plan is principally focused on the consumer while ensuring a reliable and innovative energy system. *Delivering Fairness and Choice* makes an important commitment: we will strive to make energy more affordable, and give customers more choices in their energy use, ensuring that Ontarians and their families continue to be at the center of everything we do.

Ontarians are benefiting from the years of investment we have made in the province's electricity system. We can be proud of what we have all accomplished. These investments mean we no longer have to worry about brownouts or blackouts. By eliminating coal-fired generation, we now have an electricity system that is more than 90 per cent free of emissions that cause climate change. The phase-out of coal-fired generation and our investments in clean generation have contributed to dramatically improved air quality in Ontario – smog advisories have dropped from 53 as recently as 2005 to zero in 2016. This means that our children can play outside without their health being threatened by smog and air pollution. Our investments are delivering a robust supply of electricity, one that is expected to meet Ontario's electricity demand into the middle of the next decade, and makes us well positioned to plan for and meet future challenges. Our success in building a clean and reliable electricity system means we can maintain our focus on helping Ontarians and their families.

We have already taken steps through Ontario's Fair Hydro Plan to make the electricity system as affordable as possible. Ontario's Fair Hydro Plan reduced electricity bills for residential consumers by an average of 25 per cent and will hold any increases to the rate of inflation for four years. These benefits aren't limited to residential consumers; as many as half a million small businesses and farms are also benefiting from the reduction. Lower-income Ontarians and those living in eligible rural and northern communities are receiving even greater reductions, as much as 40 to 50 per cent. These measures were the right thing to do. They're better for Ontario, and fairer for families.

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Delivering Fairness and Choice would not have been possible without your suggestions and advice. This Plan is the product of the most extensive consultations and engagements my ministry has ever undertaken. Thousands of organizations, communities, businesses and citizens wrote to us. Hundreds came to the 17 open houses that were held across the province. We also engaged with representatives of more than 100 different First Nation and Métis organizations and communities.

In written submissions and at meetings, you told us that affordability is a top priority and that you wanted more control and choice over how you use and pay for electricity. Our government has listened to what you had to say. *Delivering Fairness and Choice* recognizes that a retired couple in London uses energy differently than a condo-dweller living in Vaughan. Pricing pilots are underway to help inform new electricity pricing plans that could give consumers greater choice, and the ability to reduce their monthly electricity bills.

Delivering Fairness and Choice ensures that consumer protection remains a top priority for this government. We have already given the Ontario Energy Board the authority to prohibit disconnections when customers are more vulnerable, such as over the winter months. We will now give added protection to consumers living in condominiums and other multi-unit residential buildings who are billed for electricity by private companies that provide metering services to their unit. These consumers will benefit from increased oversight of fees charged by those providers. Consumers will also benefit from the Board's new *Consumer Charter*, which ensures all energy consumers have the right to a fair, reasonable and timely process for resolving their complaints.

On another front, the Ministry of Energy is working with local distribution companies to redesign electricity bills to give consumers easily accessible information they find valuable and can use. The electricity bill is, after all, the most common way for consumers to receive information about their electricity system.

Ontario is helping consumers keep pace with rapidly changing technology. The costs of new wind and solar energy installations are coming down, and new smart grid and storage technologies are becoming more readily available. Updates to the Province's net metering framework will increase the ability of consumers to generate their own renewable electricity and receive a credit on electricity bills for any extra power they send to their local distribution company.

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All of this is possible because Ontario has a stable electricity system that produces a steady supply of electricity. *Delivering Fairness and Choice* is using this opportunity to move ahead with innovative ideas for managing the system and reducing costs. Initiatives such as Market Renewal will ensure the province has appropriate sources of electricity at the lowest possible price. This initiative could save Ontarians up to $5.2 billion over a 10-year period.

Energy is key to the well-being and prosperity of the people of Ontario. Our plan will ensure we can all depend on a clean and reliable supply of affordable energy to power our households and businesses for many years to come. From this position of strength, we are able to make an important commitment to Ontario's energy consumer: that we will strive to give consumers more choices in their energy use and ensure that Ontarians and their families will continue to be at the heart of everything we do.

Glenn Thibeault
Minister of Energy

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EXECUTIVE SUMMARY

Overview

The 2017 Long-Term Energy Plan, *Delivering Fairness and Choice*, builds on the years of investment that Ontarians made to renew and clean up the province's electricity system. As a result of phasing out coal-fired electricity generation in 2014, emissions for Ontario's electricity sector are forecast in 2017 to account for only about two per cent of the province's total greenhouse gas emissions. The province's 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 *Fair Hydro Act, 2017* reduced electricity bills for residential consumers by an average of 25 per cent and will hold any increases to 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 per cent. *Delivering Fairness and Choice* will continue our focus on managing electricity system costs over the long term.

Since the release of the 2013 Long-Term Energy Plan (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, 2016*, the introduction of Ontario's cap and trade program, and the release of the first Climate Change Action Plan. *Delivering Fairness and Choice* builds on the province's leading role in the global fight against climate change.

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Key Elements of Delivering Fairness and Choice

Below is a summary of the key initiatives identified in *Delivering Fairness and Choice.*

Chapter 1. Ensuring Affordable and Accessible Energy

The projected residential price for electricity will remain below the outlooks published in the 2010 and 2013 LTEPs. The projected electricity prices for large consumers will, on average, be in line with inflation over the forecast period. This is the result of previous investments that delivered a cleaner and more reliable energy system, anticipated benefits from Market Renewal, and cost-reduction measures.

- Ontario's Fair Hydro Plan reduced electricity bills by an average of 25 per cent for residential consumers and will hold any increases to the rate of inflation for four years. 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.
- Residential customers served by local distribution companies (LDCs) with some of the highest rates are getting enhanced distribution rate protection. This will save eligible customers as much as 40 to 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.
- The government will enhance consumer protection by giving the Ontario Energy Board (OEB) increased regulatory authority over unit sub-meter providers.
- The government will continue to support expanded access to natural gas, giving consumers greater choice and aiding in the economic development of their communities.

Chapter 2. Ensuring a Flexible Energy System

While the demand for electricity is expected to remain steady, and the demand for fossil fuels is expected to decline, Ontario needs a flexible energy system that can meet any of the possible future outlooks. Market Renewal in the electricity sector will allow the province to adjust to changes and cost-efficiently acquire the electricity resources that are needed to meet future demand.

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- Market Renewal will transform Ontario's wholesale electricity markets and ultimately result in a more competitive and flexible marketplace.
- The Market Renewal process will develop a "made in Ontario" solution, taking lessons learned from other jurisdictions while collaborating with domestic market participants and taking into account the Province's greenhouse gas (GHG) emission reduction targets.
- Ontario's cap and trade program, as well as programs and initiatives in the Climate Change Action Plan will support efforts to decarbonize the fuels sector.
- *Delivering Fairness and Choice* aims to maximize the use of Ontario's existing energy assets in order to limit any future cost increases for electricity consumers.
- Cap and trade will increase the price of fossil fuels and affect how often fossil-fueled generators 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.
- The government will direct the Independent Electricity System Operator (IESO) to establish a formal process for planning the future of the integrated provincewide bulk system.
- Ontario will continue to exercise strict oversight of nuclear refurbishments and ensure they provide value for ratepayers.

Chapter 3. Innovating to Meet the Future

Innovative technologies have the potential to transform Ontario's energy system. New pricing plans, net metering, energy storage and the electrification of transportation will give customers more control and choice over how they generate, use and pay for energy.

- The government 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 ways to participate in clean, renewable energy generation and 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 government's vision for grid modernization in Ontario focuses on providing LDCs the right environment to invest in innovative solutions that make their systems more efficient, reliable and cost-effective, and provide more customer choice. The government 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.

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- The IESO will work with the government to develop a program to support a select number of renewable distributed generation demonstration projects that are strategically located and help inform the value of innovative technologies to the system and to customers.
- The government intends to fund international demonstration projects to help Ontario's innovative energy companies diversify to foreign markets.
- The Province will collaborate with the federal government, universities and industry to support the province's nuclear sector.
- The government will work with the IESO to explore the development of a pilot project that explores the energy system benefits, and GHG emission reductions, from the use of electricity to create hydrogen.
- Innovative uses for Ontario's natural gas distribution system will be pursued.

Chapter 4. Improving Value and Performance for Consumers

As the energy sector becomes more consumer-focused, users will want increased transparency and accountability from the companies and agencies that provide energy services. Utilities and regulators will need to respond by renewing their focus on efficiency and reliability, and looking at new ways of doing business.

- The Province expects the OEB to continue to enhance its efforts to improve the performance of LDCs.
- The government will look to the OEB to identify additional tools and powers that could be used to make utilities more accountable to their customers, promote efficiencies and cost reductions, encourage partnerships, and ensure regulatory processes are cost-effective and streamlined while also accommodating changing utility business models.
- The government 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 government will look to the OEB to review the standards for reliability and quality of service for transmitters and distributors and for options to improve the standards and will ask the IESO to review how its planning and policies can improve reliability for customers.
- The government will direct the IESO to develop a competitive selection or procurement process for transmission, and to identify possible pilot projects.
- The government will look to the IESO and the OEB to promote the right-sizing of transmission and distribution assets at their end of life.

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- A new transmission corridor is needed in the northwest Greater Toronto Area given the size of the forecasted growth. Further studies will identify a specific corridor.
- The Province 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 is committed to putting conservation first, both as a resource for the energy system and as a tool for consumers to manage their energy costs. The government and its agencies will continue to assess the achievable potential for energy conservation, explore how to integrate existing conservation programs with new Green Ontario Fund programs, and empower consumers with access to data and tools, such as through the Green Button initiative. The transition to a capacity auction will present opportunities for demand response to grow further and compete with other resources, based on system needs.

- Demand Response capacity realized each year will depend on system needs and the competitiveness of demand response with other resources.
- The government 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 government and its agencies will further encourage LDCs to pursue energy efficiency measures 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.
- The government is committed to expanding Green Button provincewide and intends to propose legislation that would, if passed, enable it to require electricity and natural gas utilities to implement Green Button Download My Data and Connect My Data.
- Beginning July 1, 2018, combined heat and power projects that use supplied fossil fuels to generate electricity will no longer be eligible to apply 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.

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Chapter 6. Responding to the Challenge of Climate Change

Ontario's robust supply of electricity will play a key role in enabling the transition to a low-carbon economy. The Province will continue to work to support the deployment of clean energy technologies.

- Ontario remains committed to an electricity system that includes renewable energy generation and supports the goals of Ontario's Climate Change Action Plan.
- The government will encourage the construction of near net zero and net zero energy and carbon emission homes and buildings to reduce emissions in the building sector.
- The government is proposing to expand the options for net metering to give building owners more opportunities to access renewable energy generation and energy storage technologies.
- The government 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 current activities, the government 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 showing leadership in Ontario's energy sector, with an unprecedented level of involvement. At the same time, First Nations and Métis face unique challenges in accessing clean, reliable and affordable energy – challenges the province and its agencies will work with them to address.

- The government will review current programs in order to improve the availability of conservation programs for First Nations and Métis, including communities served by Independent Power Authorities.
- The Province, working with the federal government, will continue to prioritize the connection of remote First Nation communities to the grid and support the four First Nation communities for which transmission connection is not economically feasible.
- The Aboriginal Community Energy Plan program will be expanded to help communities implement their energy plans and support Ontario's Climate Change Action Plan.
- The government will engage with First Nations and Métis to explore options for supporting energy 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.

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- Innovative financing models and support tools will be investigated to address barriers to the financing of projects led or partnered by First Nations or Métis.
- The government will report back to First Nations and Métis between LTEPs to provide updates on the Province's progress and seek ongoing feedback.
- The government'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 is working with regions and local communities to develop plans for meeting their diverse energy requirements.

- The government 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 government is directing the 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 the government's continued support for them.
- The Province has established seven pipeline principles to evaluate oil and natural gas pipelines, and is committed to public engagement when it undertakes reviews of major pipeline projects.

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ENSURING AFFORDABLE AND ACCESSIBLE ENERGY

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ENSURING AFFORDABLE AND ACCESSIBLE ENERGY

Ontario's electricity system is well positioned to meet any challenges and pursue any opportunities that may occur over the next 20 years.

Nearly $70 billion has been invested in the electricity system since 2003. These investments have several benefits, including providing a clean, reliable electricity system.

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.

WHAT WE HEARD FROM 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
- Promote the benefits of conservation for both customers and the system
- Delivery charges should be the same provincewide
- Expand access to natural gas

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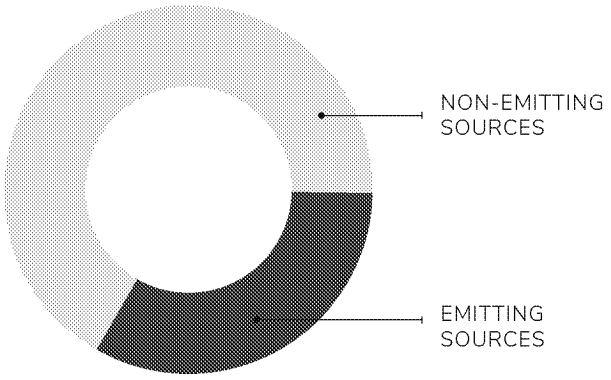
FIGURE 1. 2003 Total Generation By Emitting and Non-Emitting Sources (TWh)



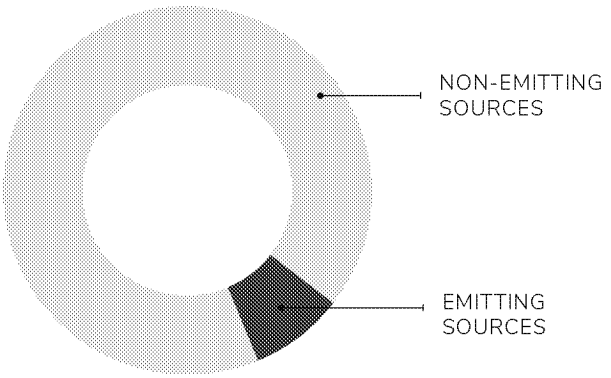
Non-Emitting Sources
99.1 TWh
67%

Emitting Sources
48.3 TWh
33%

TOTAL GENERATION
147.4 TWh

Source: IESO

FIGURE 2. 2016 Total Generation By Emitting and Non-Emitting Sources (TWh)



Non-Emitting Sources
143.8 TWh
92%

Emitting Sources
12.8 TWh
8%

TOTAL GENERATION
156.6 TWh

Source: IESO

DID YOU KNOW?

In 2003, the electricity sector represented about 20 per cent of Ontario's total greenhouse gas emissions. As a result of phasing out coal-fired electricity generation in 2014, emissions for Ontario's electricity sector are forecast in 2017 to account for only about two per cent of the province's total greenhouse gas emissions.

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Making Energy Affordable

The much-needed investments in our electricity system have led to higher electricity prices. 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:

- Deferring the construction of two new nuclear reactors at the Darlington Nuclear Generating Station, avoiding an estimated $15 billion in new construction costs;
- 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 reduced the cost of renewable energy generation by at least $3 billion, compared to the forecast in the 2013 Long-Term Energy Plan (2013 LTEP);
- 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 LTEP;
- Renegotiating the Green Energy Investment Agreement with Samsung, reducing contract costs by $3.7 billion;
- 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 LTEP; 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 million.

Ontario's Fair Hydro Plan

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

- Reduces electricity bills by an average of 25 per cent for residential consumers, and will hold any increases to the rate of inflation for four years. As many as half a million small businesses and farms are also benefiting from the reduction;
- 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;

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- 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 eligible customers save as much as 40 to 50 per cent on their electricity bills. The enhanced distribution rate protection broadens the support provided under the existing Rural or Remote Electricity 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 eligible customers with an average monthly benefit of $85;
- Shifts the funding of the OESP and most of the RRRP program from electricity bills to provincial revenues. 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). This gives them a strong incentive to lower their consumption during peak hours and can reduce their bills by an average of one-third;
- Includes the 8 per cent rebate that took effect on January 1, 2017, a reduction equal to the provincial portion of the Harmonized Sales Tax; and
- Establishes an Affordability Fund to help Ontarians who do not qualify for low-income conservation programs to make energy efficiency improvements to their homes, improvements that could not otherwise be done without the support.

Additional Details on Ontario's Fair Hydro Plan

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 on their electricity bills by 50 per cent. This means that:

- A single customer earning under $28,000 can now receive $45 per month, up from $30;
- A family of four with combined earnings under $48,000 can now receive $40 per month; and
- Seven or more people living together who earn a total of $39,000 or less can receive $75 per month, up from $50.

Electricity customers are eligible if they meet the program's household size and income requirements. The amounts of the basic credits are in figure 3.

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FIGURE 3.

Amounts of Monthly Credits of Ontario Electricity Support Program (OESP) by Household Income Level

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 their primary heating source, has certain electrically intensive medical devices, or is Indigenous or lives with Indigenous family members, the OESP provides an enhanced credit (see figure 4).

FIGURE 4.

Amounts of Monthly Credits of Ontario Electricity Support Program (OESP) by Household Income Level – Energy Intensive

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 social assistance programs will help get more vulnerable consumers into the program so they can receive the support they need on electricity bills. This includes ensuring that anyone deemed financially eligible for Ontario Works or the Ontario Disability Support Program will automatically be eligible for the OESP.

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Distribution Rate Protection

The RRRP program lowers the distribution rates paid by rural and remote customers who face higher distribution costs compared to other areas.

Ontario has expanded this rate protection to provide distribution rate relief to residential customers served by LDCs with some of the highest rates. About 800,000 customers 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 Algoma. The level of benefits differs from utility to utility.

First Nations Delivery Credit

The First Nations Delivery Credit benefits approximately 21,500 residential customers living on reserves.

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

> "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." "Poverty, lack of opportunity and choosing to pay for electricity over food is a reality that affects our people. Ontario's commitment is commendable and allows a path forward for greater quality of life for First Nations in Ontario."
>
> **Ontario Regional Chief Isadore Day**

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Industrial Conservation Initiative

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

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.

Affordability Fund

Ontario offers a suite of conservation and energy efficiency programs that can help customers manage their energy usage and reduce their costs over the long-term. The government has recently taken steps to improve the availability of programs so that all Ontarians can take advantage of conservation opportunities (see Chapter 5). Among these, the government has launched an Affordability Fund to help those Ontarians not eligible for low-income conservation programs and who need support to improve the energy efficiency of their homes. 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 refrigerators.

The Affordability Fund is administered by an independent trust that distributes funds to the LDCs that apply. LDCs, working with community partners, are in the best position to provide energy efficiency improvements to consumers in need of assistance.

Refinancing the Global Adjustment to Ensure Intergenerational Fairness

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

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 thus provide additional benefits to Ontarians in the future.

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Present-day consumers should not be burdened with paying a disproportionate share of investments that provide benefits for decades to come. To relieve the burden on 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 time. This refinancing, which reflects the expected longer life cycle of existing facilities, provides significant and immediate rate relief and helps ensure intergenerational fairness.

Expanding the Low-Income Conservation Program

To enhance and improve the availability of conservation programs helping low-income customers, the government directed the Independent Electricity System Operator (IESO) in August 2017 to centrally design, fund and deliver a conservation program for low-income customers. The program, to start in January 2018, is expected to enhance and increase access to the Save on Energy Home Assistance Program. LDCs may continue to deliver their own program if the IESO determines they have demonstrated a commitment to serve this sector.

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 help reduce their electricity costs. 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 for Home programs, which help households to become more energy efficient; and
- The Northern Ontario Energy Credit, for eligible families and individuals living in Northern Ontario.

In addition, new incentives programs, to be created under the Climate Change Action Plan, will provide increased benefit to low-income households.

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Existing Help for Businesses and Industry

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

- The Industrial Accelerator Program (IAP), 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 though energy audits, retrofits and process and system improvements; and
- The Northern Industrial Electricity Rate (NIER) Program, which provides rate rebates to Northern energy-intensive industries facing competitiveness pressures due to higher energy costs. The program also assists industrial consumers in developing and implementing energy management plans to manage their usage and reduce costs.

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). The government and the Ontario Energy Board (OEB) are working together on potential approaches to regulatory changes including how the GA is charged to these consumers, also known as non-RPP Class B consumers. For these consumers, the GA is charged at the same rate regardless of the time that they consume electricity. A GA charge that varies with time of use would lower prices for some Class B consumers and encourage more efficient consumption. Consultations will take place before any changes would be made.

Ontario will continue to explore innovative ways to provide assistance to these mid-sized consumers, while striving to increase system efficiency. The government will continue to engage with businesses and industry to explore options to reduce costs for these consumers. The government is collaborating with the Ontario Chamber of Commerce to raise awareness about energy efficiency and the savings programs available for small and medium businesses.

Program offerings through the new Green Ontario Fund will help Ontario businesses and industries increase their use of low-carbon technologies while also reducing costs.

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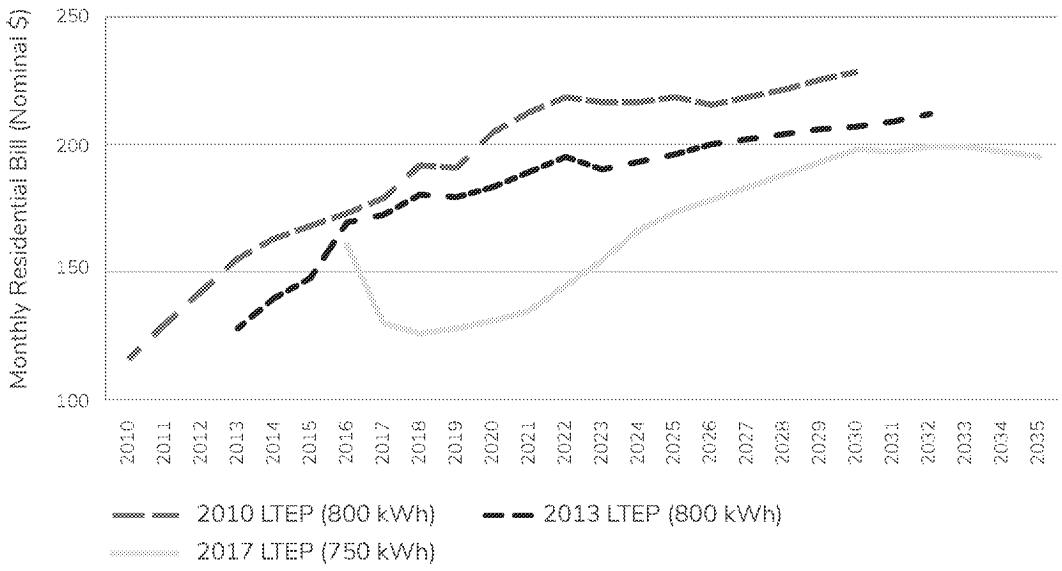
Electricity Price Forecast

The 2017 LTEP's outlook for residential prices shows progress compared to earlier outlooks in the 2010 and 2013 LTEPs. The residential price outlook in the 2017 LTEP remains below the 2013 LTEP outlook for the full forecast horizon due to the Ontario Fair Hydro Plan, removing costs from the electricity system, the anticipated benefits from implementing Market Renewal initiatives, and more efficient consumption of electricity. 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 outlook.

FIGURE 5. **Electricity Price Outlook – Residential Consumers**



Source: IESO, Ministry of Energy

Note: Forecasts used in *Delivering Fairness and Choice* reflect prevailing patterns of consumption. Between late-2009 and mid-2016, the OEB defined the typical residential customer as a household that consumed 800 kWh of electricity per month. As of May 2016, the OEB changed their typical residential consumption to 750 kWh per month, due to declining household consumption.

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Electricity Price Outlook – Residential Consumers

	2010 LTEP (800 kWh)			2013 LTEP (800 kWh)			2017 LTEP (750 kWh)		
	Monthly Residential Bill (Nominal $)	Annual Change ($)	Annual Change (%)	Monthly Residential Bill (Nominal $)	Annual Change ($)	Annual Change (%)	Monthly Residential Bill (Nominal $)	Annual Change ($)	Annual Change (%)
2010	$114								
2011	$128	$14	12%						
2012	$141	$13	10%						
2013	$154	$13	9%	$125					
2014	$162	$8	5%	$137	$12	10%			
2015	$167	$5	3%	$145	$8	6%			
2016	$172	$5	3%	$167	$22	15%	$158		
2017	$178	$6	3%	$170	$3	2%	$127	-$31	-20%
2018	$191	$13	7%	$178	$8	5%	$123	-$4	-3%
2019	$190	-$1	-1%	$177	-$1	-1%	$125	$2	2%
2020	$204	$14	7%	$181	$4	2%	$128	$3	2%
2021	$212	$8	4%	$187	$6	3%	$132	$4	3%
2022	$218	$6	3%	$193	$6	3%	$142	$10	8%
2023	$216	-$2	-1%	$188	-$5	-3%	$152	$10	7%
2024	$216	$0	0%	$191	$3	2%	$164	$12	8%
2025	$218	$2	1%	$194	$3	2%	$171	$7	4%
2026	$215	-$3	-1%	$198	$4	2%	$176	$5	3%
2027	$218	$3	1%	$200	$2	1%	$181	$5	3%
2028	$221	$3	1%	$202	$2	1%	$186	$5	3%
2029	$225	$4	2%	$204	$2	1%	$191	$5	3%
2030	$228	$3	1%	$205	$1	0%	$196	$5	3%
2031				$207	$2	1%	$195	-$1	-1%
2032				$210	$3	1%	$197	$2	1%
2033							$197	$0	0%
2034							$195	-$2	-1%
2035							$193	-$2	-1%

Note: The Ontario Energy Board (OEB) determined rates effective July 1, 2017 under Ontario's Fair Hydro Plan (OFHP) that resulted in an average bill of $121, which is 25 per cent lower than the $162 bill that would have been in place absent the OFHP. All data series in Figure 5 represent average monthly bills for each calendar year.

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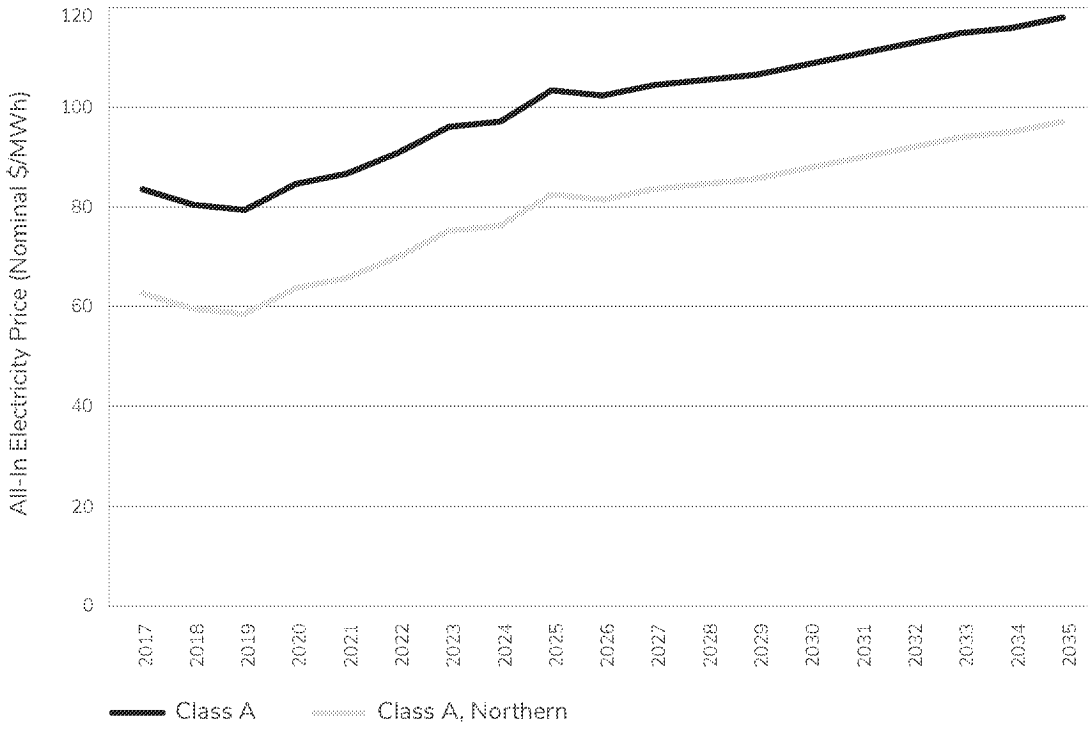
As shown in Figure 6, the 2017 LTEP price outlook for large industrial electricity consumers reflects average increases in line with inflation over the forecast period. The actual price paid by a large industrial electricity consumer is dependent on their consumption patterns and can vary among industries and specific consumers.

Currently, the electricity price for industrial electricity consumers in Ontario is lower than the average price in the Great Lakes region as reported by the U.S. Energy Information Administration. Consumers in Northern Ontario that participate in the NIER Program can achieve even lower rates.

FIGURE 6. Electricity Price Outlook – Large Industrial Consumers



Source: IESO, Ministry of Energy

Note: Commodity price based on forecast Hourly Ontario Energy Price (HOEP) and GA averaged across Class A. Actual prices for Class A are dependent on each consumer's participation under ICI. Class A above reflects a transmission-connected facility. Participants in the NIER Program, which is funded through provincial revenues, receive a $20/MWh reduction.

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Electricity Price Outlook – Large Industrial Consumers

	Class A			Class A, Northern		
	All-In Electricity Price (Nominal $/MWh)	Annual Change ($)	Annual Change (%)	All-In Electricity Price (Nominal $/MWh)	Annual Change ($)	Annual Change (%)
2017	$83			$63		
2018	$80	-$3	-4%	$60	-$3	-5%
2019	$79	-$1	-1%	$59	-$1	-2%
2020	$84	$5	6%	$64	$5	8%
2021	$86	$2	2%	$66	$2	3%
2022	$90	$4	5%	$70	$4	6%
2023	$95	$5	6%	$75	$5	7%
2024	$96	$1	1%	$76	$1	1%
2025	$102	$6	6%	$82	$6	8%
2026	$101	-$1	-1%	$81	-$1	-1%
2027	$103	$2	2%	$83	$2	2%
2028	$104	$1	1%	$84	$1	1%
2029	$105	$1	1%	$85	$1	1%
2030	$107	$2	2%	$87	$2	2%
2031	$109	$2	2%	$89	$2	2%
2032	$111	$2	2%	$91	$2	2%
2033	$113	$2	2%	$93	$2	2%
2034	$114	$1	1%	$94	$1	1%
2035	$116	$2	2%	$96	$2	2%

Note: Data table shows the all-in electricity prices in nominal $/MWh.

Increasing Consumer Protection

The Province has been working consistently to increase protection for electricity consumers. 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 contracts. Additionally, the Protecting Vulnerable Energy Consumers Act, 2017 gave the OEB the authority to prohibit disconnections during certain periods of time, such as winter. The Province will now turn its attention to protecting consumers who live in condominiums and other multi-unit residential buildings and are served by unit sub-meter providers (USMPs).

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

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 for. That is why the government will enable the OEB to increase its oversight of sub-metering companies and bring in new consumer protection measures.

Improving consumer protection and strengthening the OEB's regulatory powers over USMPs would ensure that their fees and charges are just and reasonable, and that customers served by these companies receive value for money. It would also give the OEB more insight into how these companies determine their costs and set their rates and how they set up their contractual agreements with developers.

The Province intends that broader USMP regulation will enable consumers living in condominiums and other multi-unit residential buildings to enjoy similar protections as LDC customers. Consumers served by USMPs could benefit from:

- Clarity about what goes into the prices they are charged;
- Practices regarding disconnections; and
- Access to the OEB's processes to resolve issues regarding the quality of service USMPs provide to their customers.

The Minister of Energy will request that the OEB make it a priority to review these issues.

Natural Gas Expansion

Ontario is expanding access to natural gas to give consumers greater choice in their energy supply and to aid the economic development of their communities. To do this, the government launched a new $100 million Natural Gas Grant Program in April 2017. It supports both the expansion of natural gas pipelines and the construction of new infrastructure for liquefied or compressed natural gas. The average consumer could save an estimated $1,100 a year under this program by switching from heating with oil to natural gas.

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A new regulatory framework issued by the OEB in November 2016 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 compete 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. Natural gas is one of several different energy options that provide greater consumer choice and can help to reduce overall energy costs.

Summary

- Ontario's Fair Hydro Plan reduced electricity bills by an average of 25 per cent for residential consumers and will hold any increases to the rate of inflation for four years. 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.
- 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 to 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.
- 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.
- The government will enhance consumer protection by giving the Ontario Energy Board increased regulatory authority over unit sub-meter providers.
- The government will continue to support expanded access to natural gas, giving consumers greater choice and aiding in the economic development of their communities.

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ENSURING A FLEXIBLE ENERGY SYSTEM

2

ENSURING A FLEXIBLE ENERGY SYSTEM

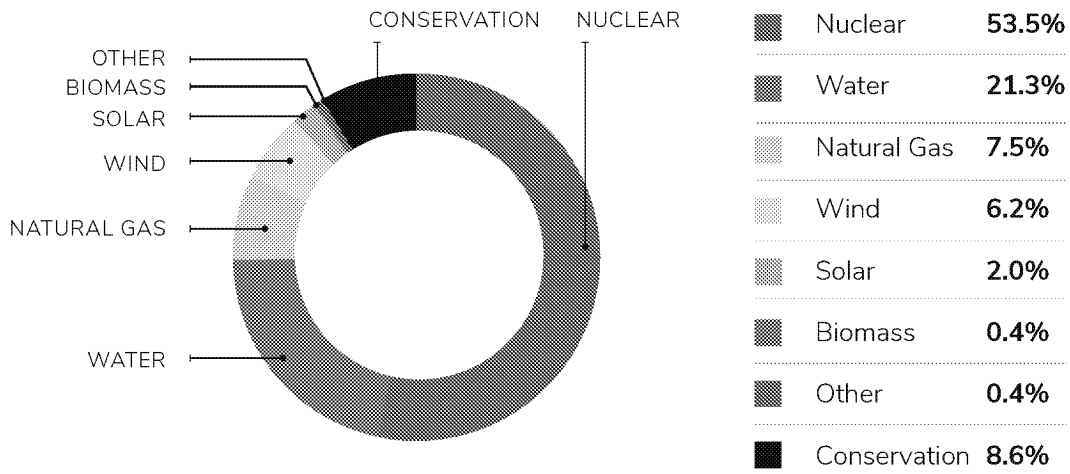
Ontario has made significant progress in rebuilding its electricity system. Nearly $70 billion has been invested in Ontario's electricity system since 2003.

Ontario now has an electricity system that is well-positioned to pursue emerging opportunities and meet future challenges, including the fight against climate change.

In 2016, Ontario produced more than 50 per cent of its electricity from nuclear, with renewable resources providing about 30 per cent and emitting generation providing less than 10 per cent. Conservation reduced energy consumption by about nine per cent.

FIGURE 7.

Ontario's Electricity Generation and Conservation, 2016 (TWh)



Source: Ministry of Energy

Note: Generation reflects the sum of transmission and distribution connected sources. Conservation value represents persistent savings in 2016 from programs and codes and standards since 2006.

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WHAT WE HEARD FROM YOU

- 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 various forms of generation
- Innovation should include storage solutions

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 manufacturing. Ontario's clean and reliable electricity system provides the province with the energy to increase electrification and reduce greenhouse gas (GHG) emissions. The province's existing network of pipelines and retail outlets can also be used to deliver future alternative fuels, such as renewable natural gas.

The Need for Flexibility

Ontario's current robust supply provides us with the opportunity to explore and efficiently implement new approaches to procuring electricity resources. These approaches will need to be designed to be flexible enough to ensure that Ontario is well positioned to accommodate and benefit from emerging energy technologies, while also ensuring that system needs are met at the lowest cost to ratepayers.

Ontario is moving away from relying on long-term electricity contracts and is enhancing its market-based approach to reduce electricity supply costs and increase flexibility. Electricity system operators in New England, New York and the Pennsylvania-New Jersey-Maryland Interconnection have successfully implemented this type of approach.

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 2030 and forms a key component of the government's plan to bring down the cost of electricity.

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The Market Renewal Initiative consists of three work streams: energy, capacity and operability. The IESO will continue its work on the design of mechanisms for these streams in order to maximize the benefits to the system while ensuring reliability and affordability. When new supply needs are identified, the IESO would use competitive mechanisms to procure new supply resources. An example of a market-based mechanism that could be used is an incremental capacity auction.

Generators, demand response providers, importers and emerging new technologies could all participate in the auction, with the most cost-effective resources winning out. Market Renewal will ensure that resources will be able to 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.

Market Renewal is expected to result in a more competitive marketplace that more flexibly and efficiently meets system needs and government policy goals. Market Renewal will be aligned with the objectives of Ontario's Climate Change Action Plan, and will be designed to meet system needs, reduce ratepayer costs and reduce GHG emissions. It can be flexible enough to meet various scenarios from higher demand due to increased electrification of our economy to lower demand scenarios as a result of increased use of distributed energy.

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. This will help meet our climate change and GHG reduction commitments. The IESO, together with its sector partners, has identified the need to ensure that this new framework can properly value environmental attributes and the benefits they provide to the system. At the same time, existing resources will be able to continue to meet system needs in the redesigned electricity markets. Maximizing the use of these assets will allow Ontario to limit future cost increases.

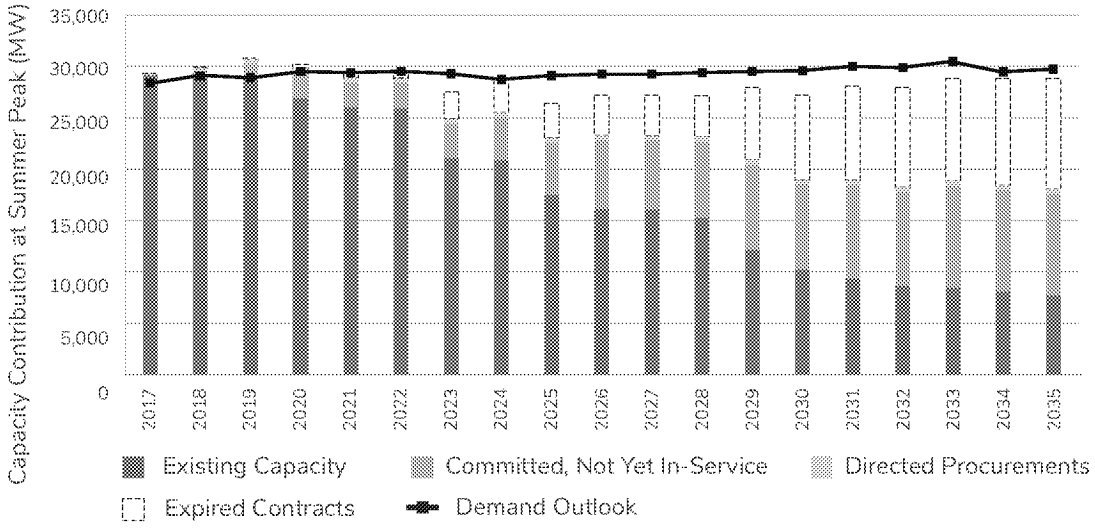
A reformed electricity market would not only help reduce costs, but also increase two-way electricity trade with other jurisdictions. Imports and exports could be scheduled more frequently on the interties, which are the transmission lines going to states and other provinces. This could allow more imports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

The IESO is working closely with partners in the electricity sector to design the significant changes that will become the foundation of Market Renewal and a plan for bringing them into effect. The plan will specify the 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 and lay a solid foundation for a more competitive and flexible energy market that can meet future needs.

Electricity Supply and Demand

While there is currently an adequate supply of electricity, a shortfall in capacity is expected beginning in the early-to-mid 2020s as the Pickering Nuclear Generating Station reaches its end of life, and nuclear units at Darlington and Bruce are temporarily removed from service for refurbishment.

FIGURE 8. Supply and Demand Outlook (2017-2035)



Source: IESO

This need for additional capacity will be met through initiatives under Market Renewal. The auction will allow existing and new clean generation facilities to compete in a robust market with clean imports, demand-side initiatives and new emerging technologies. In addition, the continued growth of distribution-connected wind and solar power is expected to reduce local demand and the need for LDCs to draw electricity from the province's transmission networks.

The demand for electricity is forecast to be relatively steady over the planning period. In the long-term, the IESO projects an increase in overall demand as electrification of the economy increases. The possibility of electrification exists in nearly every part of the energy system. In particular, there is a great potential in the transportation sector, where electrification would be an economical and clean alternative to fossil-fuel powered engines. The outlook assumes the equivalent of approximately 2.4 million electric vehicles by 2035. The outlook also includes the electrification of the GO rail system, as well as new light rail transit projects in Hamilton, Mississauga, Kitchener, Toronto and Ottawa.

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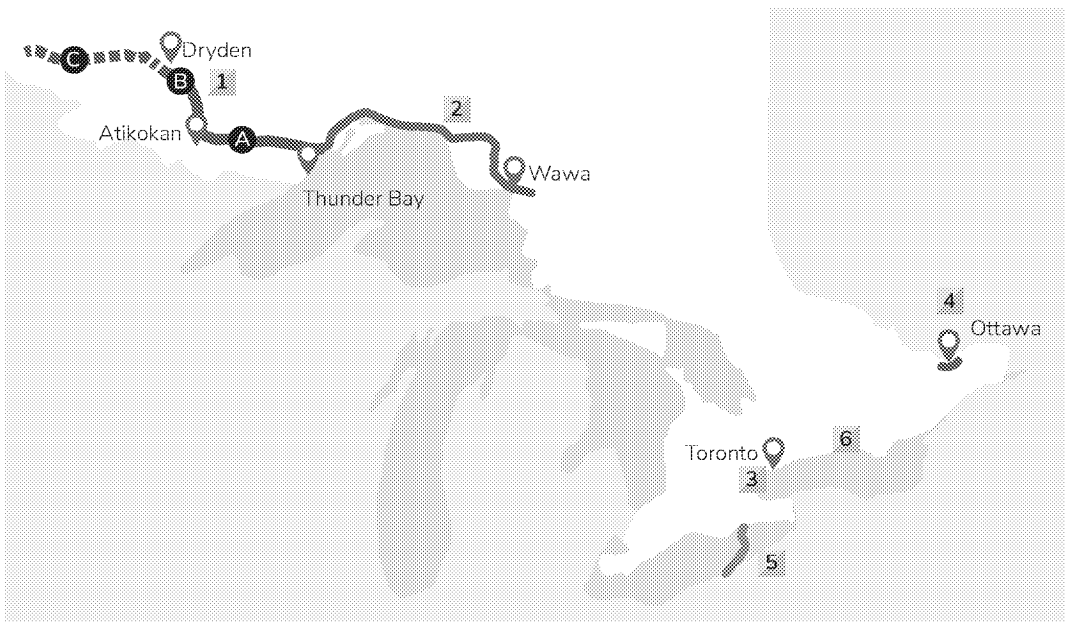
Transmission

The IESO's demand outlook indicates that there will be no need for any major expansion of the province's transmission system beyond the projects already planned or under development. See figure 9 for some of the major projects planned or underway on the high-voltage transmission system. Regional electricity needs are discussed in Chapter 8.

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

FIGURE 9. **Major Transmission Projects Under Development Across Ontario**



Note: All projects are subject to regulatory approvals.

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1 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,** a line from Thunder Bay to Atikokan, should come into service as soon as is practical, and no later than 2024.
- **Phase Two,** a line from Atikokan to Dryden, should come into service by 2034 unless the IESO's outlook on the demand forecast suggests an earlier date.
- **Phase Three,** a line from Dryden to the Manitoba border, could be needed after 2035 (or earlier if recommended by the IESO) to enable the better integration of provincial electricity grids.

Development work for Phases One and Two will proceed at the same time.

2 East-West Tie Transmission Line

The East-West Tie Line would provide a long-term, reliable supply of electricity to meet the growth in demand and changes to the supply mix in Northwest Ontario. As the project has moved through development, estimates on its total cost have increased. This is a concern, as Ontario is focused on making the electricity system more cost-effective. The government will review all options to protect ratepayers as the project continues to be developed.

3 Greater Toronto Area West Bulk Reinforcement

Growth in demand, the eventual retirement of the Pickering Nuclear Generating Station and new renewable generation all impact the bulk transmission system in the western section of the Greater Toronto Area (GTA). 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 Switching Station to Hurontario Switching Station) and expanding station facilities at the existing Milton switching station.

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4 Hawthorne to Merivale

The 230 kV circuits between the Hawthorne and Merivale transformer stations require upgrades to their capability to serve growth in western Ottawa and optimize the use of its interties with Québec. This project is being developed by Hydro One and is expected to be in service in 2020.

5 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 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.

6 Clarington Transformer Station

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. Hydro One expects to bring the station into service in 2018.

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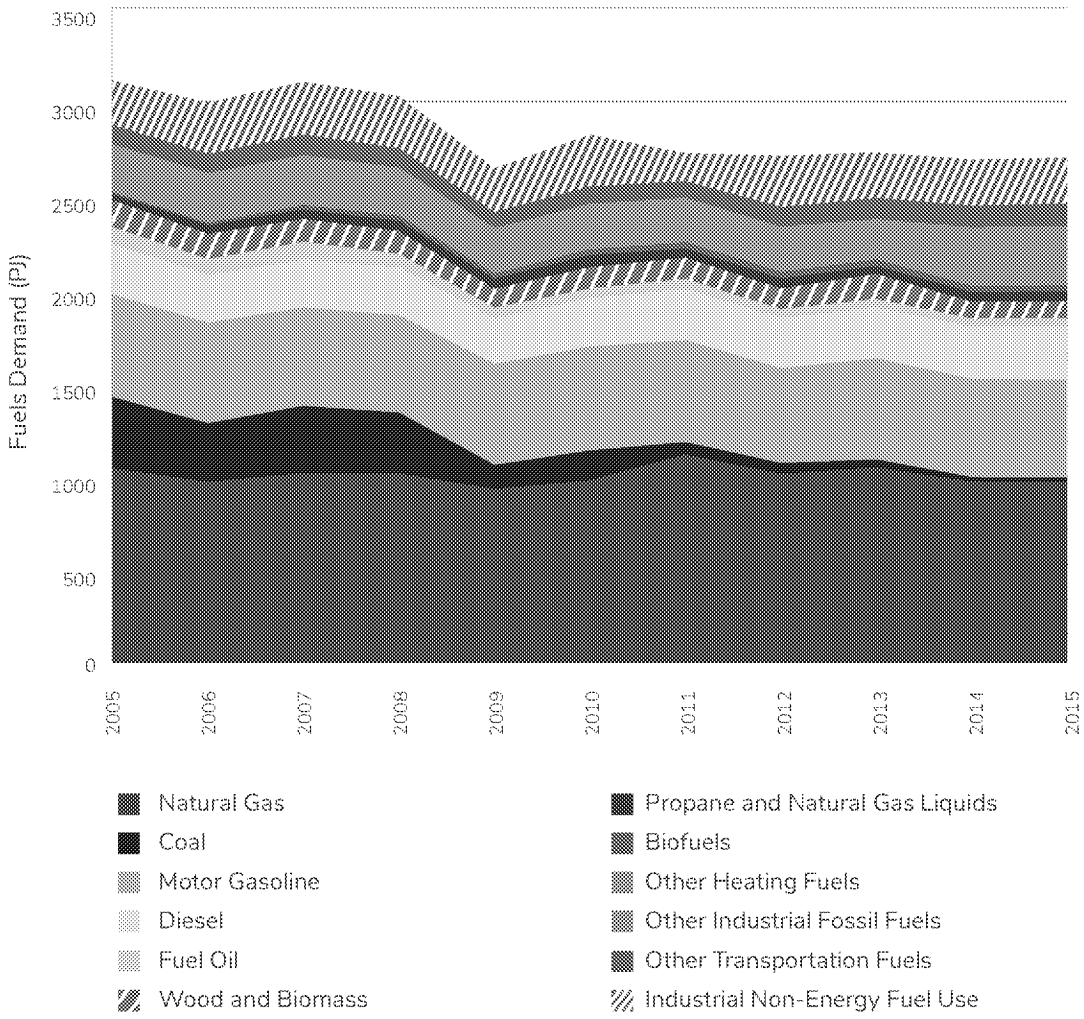
Fuels Supply and Demand

Fuels are an important component of the province's economy, and are critical for households, businesses and industry. 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 Ontario's fuels supply. There are also a variety of other fuels such as propane, wood, aviation fuel and biofuels.

FIGURE 10. Historical Fuels Energy Use



Source: Fuels Technical Report, 2016

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Fuels consumption has generally declined between 2005 and 2015, largely due to the retirement of coal-fired generating stations. In the past few years, fuels consumption has been relatively flat with lower use of natural gas being offset by higher use of transportation fuels. About 10 per cent of Ontario's fuels are used for non-energy uses such as feedstock for manufacturing.

Ontario's fuel supply is produced and delivered through a variety of means and markets, including supplies of crude oil and natural gas from outside of the province. 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 and delivered by the Green Ontario Fund will further support efforts to decarbonize the fuels sector. Over the next 20 years, the electrification of transportation, enhanced conservation and switching to lower-carbon fuels are expected to transform the fuels sector. As a result, both the demand for fuels and the emissions they release are expected to decline.

The outlook for the supply and demand of fuels will depend on policy and program decisions over the next 20 years, as well as on technological innovation and adoption. Given these uncertainties, the government 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, the Province implemented a cap and trade program. This program is a flexible, market-based program that will be a cornerstone in Ontario's fight against climate change, and is the most cost-effective way of achieving reductions in GHG emissions. In addition, all proceeds from the cap and trade program will be used to fund actions to reduce GHG emissions, such as supporting Ontarians in shifting away from fossil fuels and investing in emerging clean technologies.

The price of fossil fuels such as natural gas, gasoline, diesel and propane includes a carbon cost as a result of the cap and trade program. The price signal provided by the cap and trade program will help move the province's energy system to even cleaner sources.

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The costs that regulated natural gas utilities incur when they comply with cap and trade, including the cost of acquiring emission allowances, are subject to approval by the OEB. These costs are included in the rates charged to consumers. Natural gas utilities whose rates are not regulated by the OEB and large facilities that must independently comply with cap and trade will decide on their own how to manage their compliance costs. Alternative fuels that do not incur cap and trade charges – like renewable natural gas – could be used to reduce emissions and mitigate cap and trade costs in the natural gas sector.

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 regulations and are expected to pass through their compliance costs to retail consumers. Switching to renewable fuels like ethanol, bio-based diesel and renewable diesel, and to lower-carbon transportation fuels such as natural gas are ways for consumers and obligated parties to reduce emissions and lower their cap and trade costs.

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. This can be achieved because many of the electricity generation facilities built in the last decade-and-a-half will be able to generate power beyond their planned contract life.

Renewable Energy

Contracts for over 4,800 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 2030. While wind and solar contracts last for 20 years and hydroelectric contracts for 40 years, wind turbines and photovoltaic panels are often able to still generate electricity after their contracts expire, and we know from experience that hydroelectric facilities can operate for as long as a century.

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

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

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

As part of the IESO's ongoing work to find efficiencies and the best value for ratepayers, maximizing value from existing assets is key for Market Renewal, which will provide an open platform for project upgrades to participate in meeting Ontario's future resource adequacy.

Natural Gas

The natural gas generating stations that produce electricity in Ontario can respond quickly to match any changes in demand. The province relies on these generators to meet its needs during the periods of highest demand, 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.

Most of Ontario's natural gas generating stations could operate beyond the life of their contracts. This will be important over the coming decade during ongoing nuclear refurbishments and with the retirement of the Pickering Nuclear Generating Station in 2024. In the early-to-mid 2020s, it is forecasted that there will no longer be enough contracted and rate-regulated facilities to meet reliability requirements.

Many of the existing generation contracts will expire over the same time frame. These natural gas facilities could continue to be available during times of peak demand by participating in a capacity auction being considered under Market Renewal, but only if they are more competitive relative to other resources.

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Nuclear

Refurbishing Nuclear

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

The Darlington Nuclear Generating Station, in the Municipality of Clarington, and the Bruce Nuclear Generating Station, in the Municipality of Kincardine, are two of the world's best-performing nuclear power plants. Together, Darlington and Bruce provide around 50 per cent of the province's electricity needs.

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

Ontario Power Generation (OPG) is taking a phased approach to refurbishing the Darlington Nuclear Generating Station. 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 work.

In November 2015, OPG's Board of Directors approved a total estimated cost of $12.8 billion for refurbishing all four Darlington units. This includes all spending to date, interest and inflation, and is $1.2 billion lower than OPG's original estimate in 2009.

In January 2016, the government gave OPG approval to proceed with refurbishing the first of the Darlington units. In April 2017, OPG announced it had successfully completed the first of four major phases in refurbishing Unit 2 and isolated the unit from the rest of the Darlington plant. 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.

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

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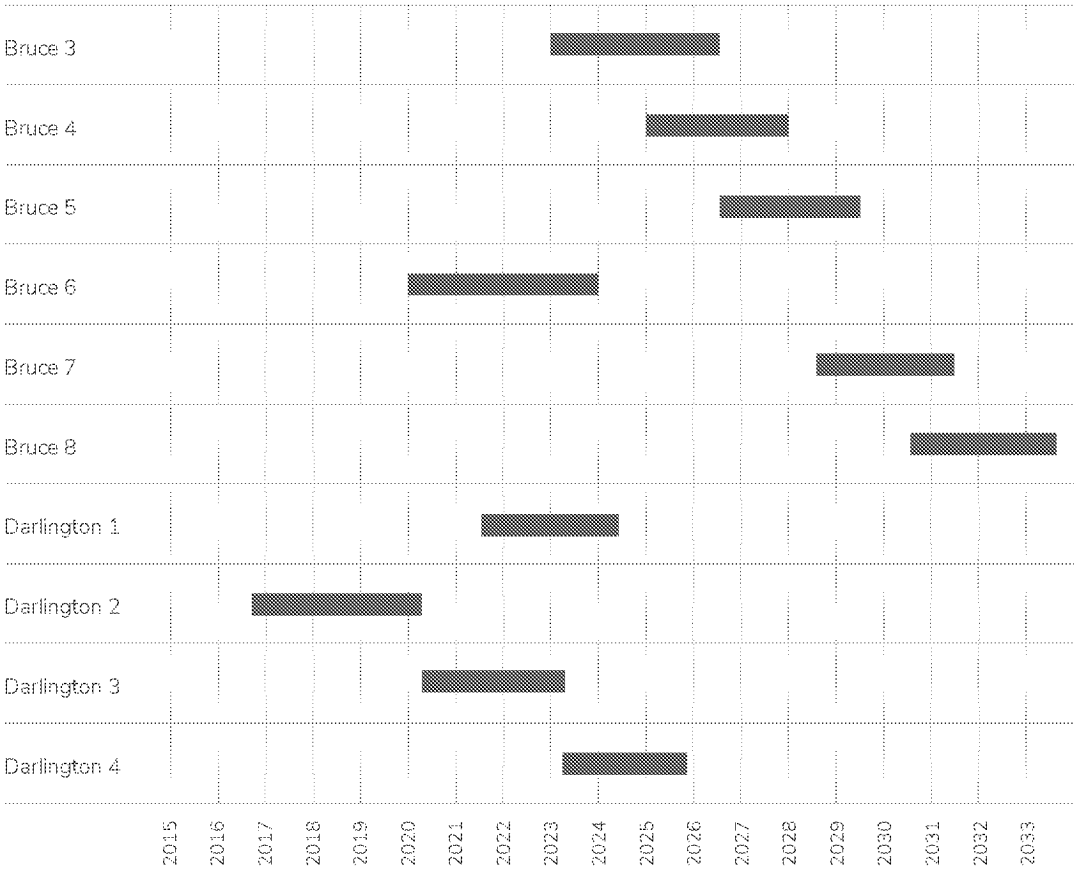
In December 2015, the IESO updated its contract with Bruce Power for the refurbishment of six nuclear units at the Bruce Nuclear Generating Station. Bruce Power plans to invest approximately $13 billion of its own funds in the project. Ontario further adjusted the schedule for refurbishment to get the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

FIGURE 11.

Nuclear Refurbishment Schedule



Source: IESO

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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 another.

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 operation.

The MOU addressed a key objective of the 2013 LTEP: 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 in support of the Bruce refurbishments and their long-term operation, 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;
- Executing contracts with suppliers across Ontario, including BWXT Canada and SNC-Lavalin; and
- Developing a regional network of suppliers to benefit local communities in the Bruce region.

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

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CAMECO

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

In May 2017, Cameco agreed to continue supplying 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.

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. 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 employs 850 people in Ontario, including at its headquarters in Cambridge and facilities across the province such as Peterborough and Arnprior. The company is a leader in the design, manufacturing, commissioning and servicing of nuclear power generation equipment.

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

BWXT will also supply eight new steam generators for the Bruce refurbishment. That contract is worth about $175 million and will secure more than 100 jobs.

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ONTARIO PARTNERS WORKING ON NUCLEAR REFURBISHMENT

LAKER

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

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

ONTARIO'S LABOUR UNIONS – POWER WORKERS' UNION AND SOCIETY OF ENERGY PROFESSIONALS

For more than four decades, Ontario's electricity sector labour unions have been key partners in Ontario's nuclear industry. Today, Power Workers' Union and Society of Energy Professionals together represent 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 come.

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LABOURERS' INTERNATIONAL UNION OF NORTH AMERICA

Labourers' international Union of North America (LiUNA) is a building trades union representing more than 100,000 members and retirees in Canada. LiUNA members are involved in the construction of highways, bridges, waterways and dams, hospitals, schools and government institutions. Today, LiUNA is an important partner in Ontario's refurbishment program. To ensure the smooth and successful execution of refurbishments, LiUNA and 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, 2032.

Managing the Risks

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

The Province has established off-ramps for the Darlington refurbishment that may be used in the event of OPG failing to adhere to the approved costs and schedule. This could result in the Province not proceeding with the remaining units.

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 $2 billion in cost overruns that occurred when two of the Bruce units were refurbished and restarted in 2012.

Under its recently updated agreement with the IESO, Bruce Power will be assuming the risk of any cost overruns during the execution of the 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 emerge.

Ontario is protecting ratepayers by strictly controlling the cost and timetable of refurbishments. There is strict oversight of OPG and Bruce Power to ensure that they complete the refurbishments on time and on budget.

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

The government 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 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. The continued operation of Pickering will ensure Ontario has a reliable source of emission-free baseload electricity to replace the power that will not be available during the Darlington and initial Bruce refurbishments. The continued operation of Pickering would also reduce the use of natural gas to generate electricity, saving up to $600 million for electricity consumers and reducing GHG emissions by at least eight million tonnes.

The Province announced in January 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 2024. The OEB will ensure that the costs of OPG's plan for continued Pickering operation are prudent, while the CNSC will ensure that Pickering operates safely during this period. OPG will still need to get final approval from the government to proceed with the continued operation of Pickering after these regulatory reviews are completed. OPG will also update the government on the safety and operational performance of Pickering as part of its regular reporting and business planning.

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Summary

- Market Renewal will transform Ontario's wholesale electricity markets and ultimately result in a more competitive and flexible marketplace. This Market Renewal process will develop a "made in Ontario" solution, taking lessons learned from other jurisdictions while collaborating with domestic market participants and taking into account the Province's greenhouse gas emission reduction targets.
- Ontario's cap and trade program, as well as programs and initiatives in the Climate Change Action Plan will support efforts to decarbonize the fuels sector.
- *Delivering Fairness and Choice* aims to maximize the use of Ontario's existing energy assets in order to limit any future cost increases for electricity consumers.
- Cap and trade will increase the price of fossil fuels and affect how often fossil-fueled generators 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.
- The government will direct the Independent Electricity System Operator to establish a formal process for planning the future of the integrated provincewide bulk system.
- Ontario will continue to exercise strict oversight of nuclear refurbishments and ensure they provide value for ratepayers.

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INNOVATING TO
MEET THE FUTURE

3

INNOVATING TO MEET THE FUTURE

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 home. 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 their energy use. Customers' expectations of their utilities are rising.

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
- 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

Modernizing the System

These new technologies present a significant opportunity to make Ontario's electricity systems more efficient, reduce costs and give customers more choice.

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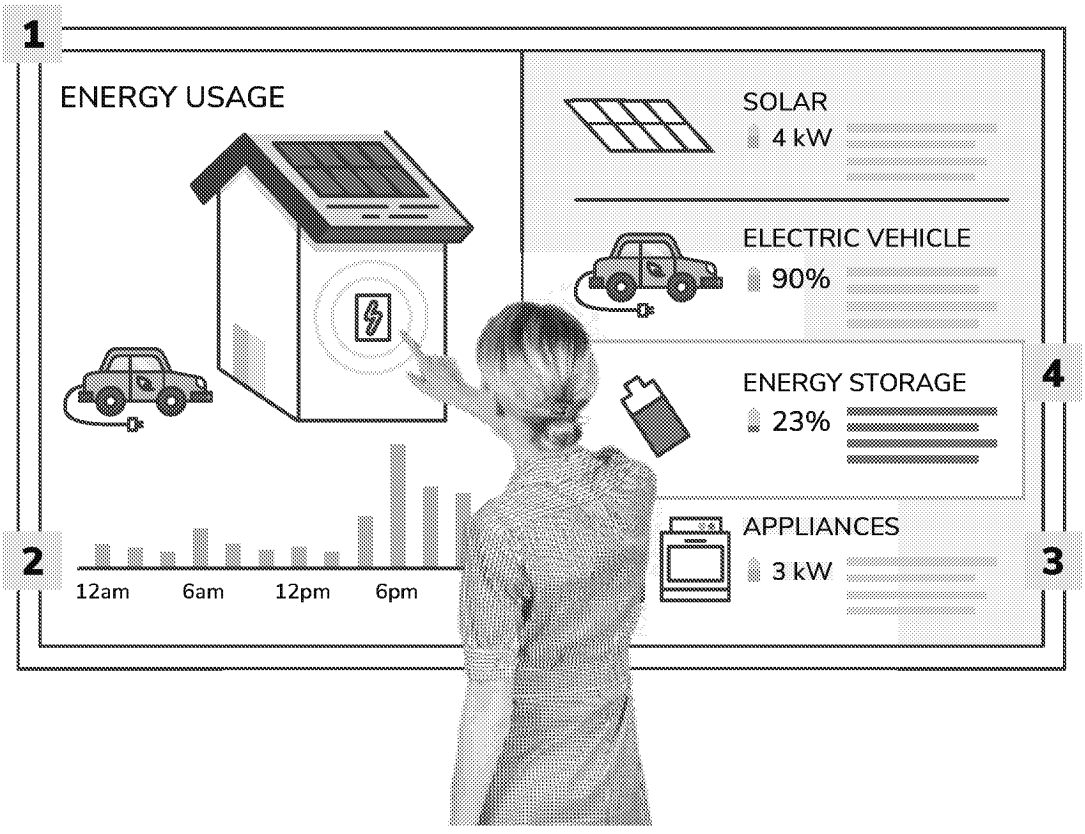
FIGURE 12. Customer of Tomorrow



1 **Energy Management System** – An energy management system can give users real time information on how they are using electricity, reduce their electricity bills, and can balance their preferences with the needs of the system to make the best use of energy.

2 **Flexible Pricing** – Consumers can choose the electricity pricing plan 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.

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Innovative Pricing Plans

The government is working with the Ontario Energy Board (OEB) to give consumers more choice in their electricity price plans. As part of its review of the Regulated Price Plan (RPP), the OEB is using pilot projects to test innovative time-of-use price structures. 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 produce. 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 pilot projects are testing 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 have begun rolling out and will run for at least one calendar year. The results will help guide OEB decisions on potential new price plans that could give customers greater control, reduce their bills and help improve system efficiency.

In addition to these pilot programs, the government and the OEB are considering changes to the way the Global Adjustment 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. Consultations will take place before any changes would be made.

Net Metering

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

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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.

FIGURE 13. How Net Metering Works

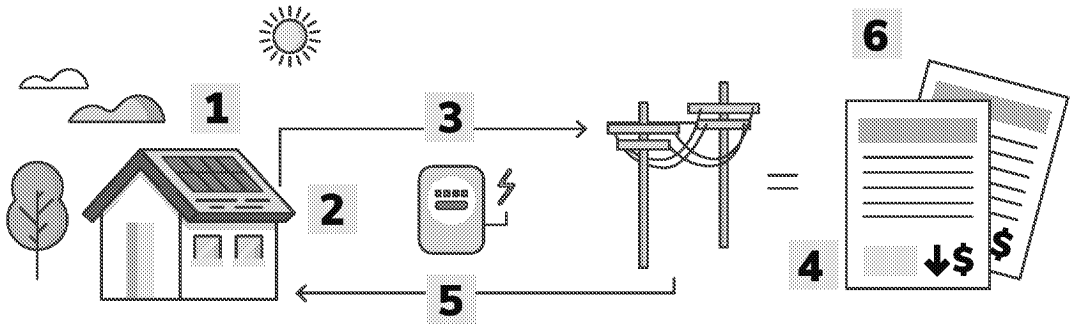

Figure 13 describes a rooftop solar net metering arrangement for a typical home. Other types of renewable energy can also be net-metered in Ontario.

1. Solar panels mounted on the roof of a house generate electricity.
2. The electricity generated is used to power the house first.
3. Any extra electricity generated is sent to the local grid.
4. Net-metered customers receive credits on their electricity bill for electricity sent to the local grid.
5. Electricity is drawn from the local grid when the home's electricity needs are higher than the amount of electricity generated by the solar panels.
6. Net-metered customers' monthly electricity charges are calculated based on the difference between the amount of electricity used from the local grid and the credits received from any electricity sent to the local grid from the solar panels.

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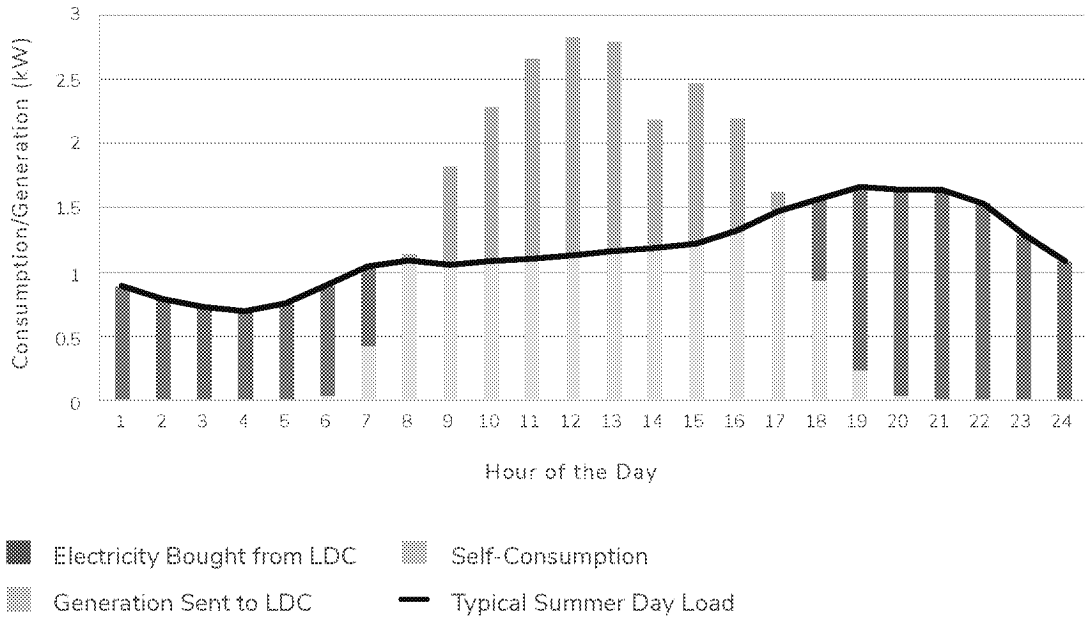
Figure 14 shows the electricity generated by a typical net-metered solar installation on a residential rooftop in the summer:

- The blue columns show the electricity bought from their LDC;
- The yellow columns show the electricity generated and used on-site; and
- The green columns show the electricity that is generated and sent back to their LDC.

FIGURE 14.

Residential Net-Metering with 4 kW Rooftop Solar PV



Source: Ontario Ministry of Energy

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

The government 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-metered renewable energy systems can also help reduce peak demand and defer or avoid the need for LDCs to invest in certain costly upgrades to their networks.

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The government will also propose legislative and regulatory amendments that would enable the deployment of demonstration projects for virtual net metering. The government will work with the Independent Electricity System Operator (IESO) to develop a program to support a select number of innovative renewable distributed generation demonstration projects, as well as virtual net-metering 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. Proposed legislative amendments are expected to be brought forward in fall 2017. Pending passage of legislative amendments, regulatory changes would be made in 2018.

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

OXFORD COUNTY

In 2015, Oxford County became the first municipality in Ontario to commit to 100 per cent renewable energy by 2050. This means that Oxford County will meet or exceed 100 per cent of its net energy demand from renewable sources. Oxford's 100 per cent Renewable Energy Plan outlines the county's investment in innovative technologies and approaches like renewable energy, conservation, energy storage, microgrids and sustainable transportation. *Delivering Fairness and Choice* supports communities like Oxford County in achieving its community sustainability goals.

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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.

Energy storage can offer benefits throughout the grid, from large-scale facilities that can reduce the need to build new supply, import electricity or use GHG-emitting generation sources, to smaller-scale devices that can provide backup services to buildings.

The Province has made it a priority since 2013 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 and test the full range of their capabilities on distribution systems; and
- undertaking studies that look at realizing the different benefits of storage.

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

Customer-connected energy storage could also provide benefits to the grid, particularly if the LDCs partner with these customers to share both the cost and the benefit. However, as discussed in the Barriers to Innovation section later in this chapter, the rules are not clear about how these partnerships could work. The Government and its agencies will move forward to provide the right environment for LDCs and customers to partner on storage where it makes sense for both parties.

The unique aspects of energy storage come into conflict with some of the rules governing the electricity system. The government started to understand these challenges in the 2013 LTEP, and since that time has been engaging with agencies and the energy storage industry to target the barriers that unfairly disadvantage this technology.

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The government has now identified these market and regulatory barriers and is updating regulations, including addressing how the GA is charged for storage projects. Concurrently, it is seeking support from the IESO and OEB to take similar steps with their respective codes and rules that prevent the cost-effective development of energy storage where it can provide value to customers and the electricity system.

Electrification of Transportation

Ontario's Climate Change Action Plan focuses significant attention on using low-emission transportation to drive down greenhouse gas emissions in the province. This is critical to establishing a low carbon economy. The continued adoption of EVs will have an impact on our distribution networks. If too many EVs in a neighbourhood charge at the same time, important parts of the distribution system could be strained. 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, a clean tech firm based in Waterloo, 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 network. Burlington and Oakville Hydro 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.

The government 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 facilitate investments in technologies such as residential smart chargers that would avoid more costly system upgrades. These new technologies could also use incentives to give more choices to EV owners. For example, an EV owner could be rewarded for allowing the car to be charged at times when the distribution network is being used less. The customer would work with the LDC to find the right combination of preferences so both parties can benefit from smart charging.

The government 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. Beyond personal EVs, the government is broadening its attention to include other types of mobility, including electrified transit and school buses.

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GOLDCORP AND ELECTRIC MINING

Goldcorp produces roughly half of Ontario's yearly gold production. The company employs over 3,000 Ontarians, 99 per cent of them in Northern Ontario.

Goldcorp is developing an all-electric mine in Borden. Teaming up with Sandvik Mining and MacLean Engineering, nearly all the underground vehicles at Borden will be powered by batteries. 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 propane.

Vehicle-Grid Integration

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

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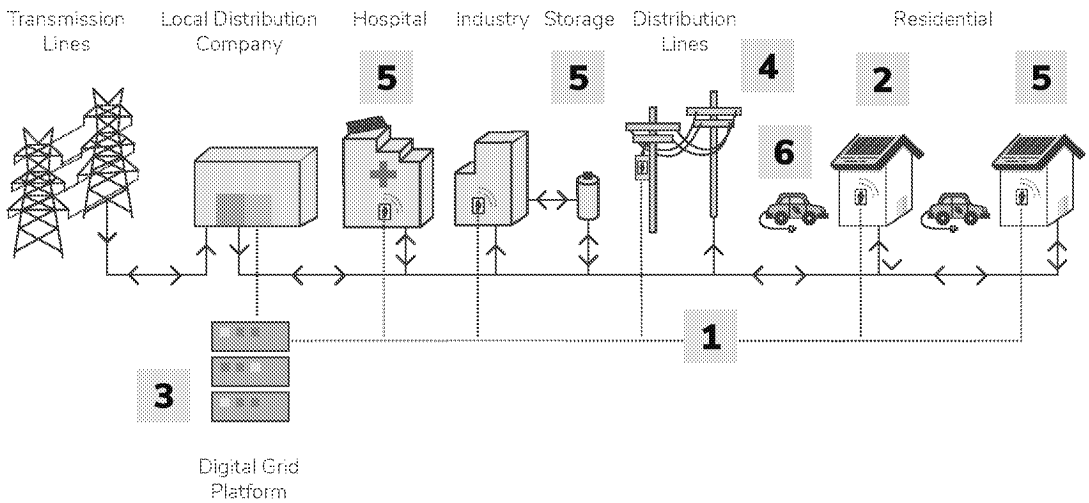
Grid Modernization

Electricity distribution is a critical piece of Ontario's grid. The province's LDCs are the final step in a system that delivers electricity from generators to homes and businesses. Ontario is a world leader in deploying smart meters, which are the foundation for a smart grid. 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 consumers.

A modern grid is a digital grid. 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.

FIGURE 15. **Distribution Grid Modernization**



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 can also be used for distributed energy resources (DERs) and large consumers to provide even more information on how the grid is operating.

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3 **Digital 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** – 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 Digital Grid Platform.

6 **Vehicle Grid Integration (VGI)** – In the future, 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 customers.

Now is the time to build on our investments in smart meters and the smart grid. A study by an expert third party 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. A modern grid would be more resilient to the effects of climate change and utilize the real-time data 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. LDCs, for example, are challenged by diffuse benefits. This is when they bear the costs of technologies such as energy storage, but do not get the benefits, which can accrue to customers other parties in the electricity sector. Without clear rules for addressing diffuse benefits, LDCs are less motivated to explore 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. Blockchain uses secure, distributed databases to enable, for example, the management of EVs, the trade of renewable electricity and peer-to-peer demand response opportunities.

Combining other distributed energy resources with Blockchain technology holds the potential to provide significant value to the electricity sector, including:

- Increasing system reliability by providing greater visibility on where and how distributed energy resources and loads are affecting the system;
- More efficient balancing of the needs of the provincial grid with those of the local distribution system;
- Allowing DERs to participate and provide service in Ontario's electricity markets;
- Facilitating new business models like community-owned DERs and virtual net metering;
- Providing instantaneous feedback on how DERs are responding to price signals; and,
- Encouraging new participants in the electricity sector, which can lead to greater customer choice.

Transactive energy and Blockchain pilots are being undertaken in many jurisdictions. These models are also being studied and developed in Ontario, and the government plans to explore how Blockchain and other transactive energy models could benefit Ontarians.

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Enhancing the Smart Grid Fund

The Smart Grid Fund was launched in 2011 to support innovation in Ontario's electricity sector. 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 customers.

The Smart Grid Fund is also supporting jobs and growth in the province. 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 cyber security firm with over 100 utility customers in North America;
- Utilismart's distribution monitoring software, which has been installed by over 140 utility customers; and
- A transformer sensor manufactured in Ontario by GRID20/20, which has been tested in 11 countries.

As part of the government's grid modernization strategy, 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 encouraging a culture of innovation within the electricity sector that explores new solutions for integrating many technologies, tests new business models, integrates electricity and other energy resources and generates new ideas for advancing grid modernization.

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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.

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.

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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;
- **Microgrid** – a mini network that can operate independently when it is disconnected from the main electricity grid;
- **Energy efficiency** – measures to reduce overall electricity use, either behind the customer's meter, or on the distribution system (see Chapter 5); 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, the biggest gains occur 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 photovoltaic (PV) 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 LDCs and their customers: utilities can defer or avoid certain 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 their network is not available.

The government will work with the IESO to develop a program to support a select number of innovative renewable distributed generation demonstration projects strategically located and paired with other DERs and smart grid technologies, as well as virtual net metering demonstration projects. These demonstration projects will help inform the value of DG and DER to customers and the grid, and inform future grid modernization and net-metering policies, guide the treatment of renewable DG by regulators and energy markets, and steer further integration of these resources into Ontario's energy system.

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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 government 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.

The government 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. The OEB also established a Smart Grid Advisory Committee in 2013 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 organizations. Nevertheless, the Electricity Distributors Association found that half of Ontario LDCs still approach innovation in a gradual or incremental way. 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 government 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 that provide value to customers;
- The use of innovative, non-wires solutions that could, among other things, allowing utilities to manage their systems better and encourage customer choice including the principles of efficiency and cost-effectiveness;
- The regulatory treatment of LDC capital and operational expenditures, which can inhibit the uptake of these non-wires solutions;
- 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);

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- The ability of utilities to make non-traditional distribution system investments and 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.

Taking these actions should create the right environment for LDCs to overcome barriers and modernize their businesses and systems. In such an environment, LDCs will have more clarity on how they can pursue the innovation contemplated under the *Strengthening Consumer Protection and Electricity System Oversight Act, 2015* and invest in solutions that make the most sense for the systems and their customers.

As part of this effort, the government 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 the future by laying the foundation through Market Renewal, which will develop a made-in-Ontario solution to create better price signals and establish more competitive market-based mechanisms to meet system needs. The long-term goal of Market Renewal is to create a more dynamic market where all resources, including new technologies, have the opportunity to compete alongside traditional forms of supply for a variety of system products such as energy, capacity and operability. As costs come down and new business models are developed, emerging technologies, often at the 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.

Market Renewal also aims to enhance and improve existing market mechanisms and create new mechanisms that will allow new technologies like energy storage to compete on an equal footing with traditional assets and showcase the different values they provide in meeting system needs, including managing surplus baseload generation, regulation, operating reserve and flexibility.

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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 Ontario and led to the creation of thousands of new jobs across many trades and professions. That explains why a broad coalition of employers, labour and industry groups, including the International Union of Operating Engineers, the Laborers' International Union of North America (LiUNA) and the Aboriginal Apprenticeship Board of Ontario, support Ontario's investment in renewable energy.

Ontarians have every reason to expect that these economic benefits will continue. According to a report from an expert third-party, the renewables sector is forecast to contribute nearly $5.4 billion to Ontario's gross domestic product and create 56,500 jobs between 2017 and 2021. 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.

Ontario-based manufacturers of hydroelectric components have been successfully exporting to the United States for years. Many of Ontario's solar manufacturers are also reporting increased export activity to the U.S., despite strong global competition. Wind component manufacturers have also developed expertise that will help them succeed in nearby American markets that are replacing coal-fired generation with renewables and other clean sources of electricity.

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Exporting Ontario's Energy Expertise

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

A NORTHERN ONTARIO SUCCESS IN MANUFACTURING

Heliene Canada has been manufacturing solar PV panels in Sault Ste. Marie since 2010. The company's manufacturing facility uses state of the art technology and currently exports over half of its modules to the U.S. and other markets. Heliene collaborates with other industry players and universities, such as ePower, the micro-electronics laboratory of Queen's University and the Rotman School of Business at the University of Toronto, to create a link between academic research and industrial applications.

The government continues to support the dynamic and innovative business climate that made this possible and will expand assistance to Ontario companies wanting to diversify their energy-related goods, services and expertise, by:

- Working with the federal and other provincial 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.

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In consultation with industry and the federal government, the government intends to 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.

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

Nuclear Innovation

Ontario's expertise in nuclear energy has enabled it to be a leading jurisdiction in nuclear research and nuclear medicine. 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 of lower costs from mass production. In 2016, the government released a consultant's study on the feasibility of SMRs for remote mining applications in Ontario, which found that SMRs could be an economic and emission-free alternative to diesel power. The government continues to monitor SMR technologies and engage with key stakeholders involved in advancing these innovative 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 reactors.
- **Hydrogen:** Ontario's nuclear technology could be used for the large-scale production of hydrogen. Hydrogen is a source of low-carbon energy that could, in the future, replace gasoline for transportation or natural gas for heating.

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.

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MEDICAL ISOTOPES

Ontario's nuclear reactors transform chemical elements, such as cobalt, into isotopes that can diagnose and treat life-threatening diseases. These isotopes can also sterilize medical equipment such as hospital gowns, gloves, masks, implantable devices and syringes, as well as some food products.

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 B. The isotope is used for 10 million cancer therapy treatments around the world every year, as well as for medical imaging, equipment sterilization and non-invasive brain surgery. Bruce Power has also established a new long-term supply of medical-grade cobalt from Bruce B that will help replace the supply from Chalk River's reactor when it is closed in March 2018.

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.

The Ottawa-based health-sciences company Nordion is exploring the use of the Bruce A and Darlington reactors to expand the production of Cobalt-60.

Innovative Uses for Ontario's Natural Gas System

Renewable Natural Gas

Renewable natural gas (RNG) can be an innovative Ontario-made source of energy. 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 plants. Because it comes from organic sources, the use of RNG does not release any additional carbon into the atmosphere. Ontario's new *Waste-Free Ontario Act, 2016* and its Organic Waste Action Plan, will create more opportunities to use organic waste to produce clean energy. As an added benefit, RNG can use the existing natural gas distribution system to replace the use of conventional natural gas in today's stoves and furnaces.

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A PILOT PROGRAM FOR RENEWABLE NATURAL GAS IN TRANSPORTATION

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

The government is now developing a pilot program that would extract methane from agricultural materials or food waste and use it for vehicle fuel. The 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 upgrade their vehicles and fueling infrastructure to use RNG.

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

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, another type of fuel. Hydrogen can be stored or transported in existing natural gas pipelines and used to heat homes and fuel vehicles.

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 Hydrogenics, an Ontario-based manufacturer of electrolysis and fuel cell technology, to provide electricity grid services during the production of hydrogen.

Using electricity to create hydrogen is one way to help decarbonize the natural gas supply. The Province has acknowledged the potential versatility of this fuel and is undertaking a feasibility study of using hydrogen to fuel GO Transit passenger trains.

To support this technology going forward, the government will work with the IESO to evaluate the development of a pilot project that explores the energy system benefits and GHG emission reductions from the use of electricity to create hydrogen.

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Summary

- The government will work with the Ontario Energy Board to provide customers with greater choice in their electricity price plans.
- The net metering framework will continue to be enhanced to give customers new ways to participate in clean, renewable energy generation and 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's vision for grid modernization focuses on providing LDCs the right environment to invest in innovative solutions that make their systems more efficient, reliable, and cost-effective, and provide more customer choice.
- The government 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 Independent Electricity System Operator will work with the government to develop a program to support a select number of renewable distributed generation demonstration projects that are strategically located and help inform the value of innovative technologies to the system and to customers.
- The government intends to fund international demonstration projects to help Ontario's innovative energy companies diversify to foreign markets.
- The Province will collaborate with the federal government, universities and industry to support the province's nuclear sector.
- Innovative uses for Ontario's natural gas distribution system will be pursued.
- The government will work with the IESO to explore the development of a pilot project that evaluate the energy system benefits, and GHG emission reductions from the use of electricity to create hydrogen.

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IMPROVING VALUE AND PERFORMANCE FOR CONSUMERS

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IMPROVING VALUE AND PERFORMANCE FOR CONSUMERS

The government 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. The Province expects transmission and distribution utilities to deliver high-quality service while finding efficiencies and opportunities to lower costs.

WHAT WE HEARD FROM YOU

- Eliminate regulatory barriers
- Encourage consolidation and partnerships
- Expedite approvals for new technologies
- Support innovative business models
- Improve reliability

Continued innovation in the electricity sector enables customers to use data and information in their decision-making and gives them the additional choice they have in many other parts of their lives. However, more choice requires more information, so consumers will need more openness and information from energy companies and agencies. The government is making this change possible by ensuring that the standards and performance of the sector's entities are readily accessible.

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Modernizing the Utility Business

Ontario's local distribution companies (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 as to how they conduct their business. New and innovative technologies and companies are ready to respond to 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.

The Ontario Distribution Sector Review Panel determined in 2012 that the consolidation of LDCs could reduce costs from the distribution sector by $1.2 billion over 10 years. The Ontario Energy Board (OEB) must lead, innovate and provide LDCs with incentives to become more cost-effective and efficient. The OEB has made improving LDC performance a priority.

The OEB's Performance Scorecard uses several key measures, such as resolving customer complaints during the first phone call or the first visit, to track whether LDCs have improved their performance. The Scorecard also allows customers to see if the service they receive from their LDC meets OEB standards. The OEB is planning to enhance this framework to encourage greater efficiencies and make LDCs more accountable to consumers.

The government 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 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.

LDCs are already responding to the changing landscape and finding opportunities to achieve further efficiencies and savings.

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Improving Grid-Connection Processes

Increasing efficiency and transparency in our electricity sector supports Ontario's Open for Business strategy. This strategy includes a Red Tape Challenge to cut unnecessary red-tape to save businesses time and money. As part of this initiative, the government will engage the mining sector and other large industrials to discuss opportunities to improve grid-connection processes so that they do not pose barriers to investment in Ontario.

Enhancing Reliability

Ontario's market participants must comply with standards that define the reliability requirements for planning and operating the interconnected North American bulk electricity system. The North American Reliability Corporation defines standards which address physical and cyber security, emergency planning and response, power system modelling and planning, and real time operating practices for the bulk electricity system. The Independent Electricity System Operator (IESO) is responsible for compliance monitoring and enforcement of the reliability standards in Ontario.

The OEB also sets reliability and quality of service standards for transmission and distribution utilities. Distributors report the frequency and duration of outages in their annual performance scorecard to the OEB. Transmitters also have customer standards, including a process to address areas of poor performance.

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. The OEB has considered a number of ways to improve reliability over the years and the government will look to the OEB to examine further cost-effective steps that could help provide customers with useful knowledge about the reliability of their service and opportunities to resolve their concerns.

The Province believes that an enhanced framework for the reliability and quality of service of transmission and distribution utilities could provide customers with increased benefits, for example by:

- Introducing incentives and consequences to ensure utilities are held to account for performance. For example, as in done in some other jurisdictions, Ontario customers could receive an on-bill credit when service standards are not met;

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- Establishing new standards and measurements of reliability that, in addition to the current system-wide averages, give customers more detailed insights into the reliability 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.

The government will look to the OEB to review the standards that transmission and distribution utilities currently have for reliability and quality of service and for options to improve the standards. The government will also ask the IESO to review how its planning and policies can improve customer reliability.

EXAMPLES FROM OUTSIDE ONTARIO: COMPENSATING CUSTOMERS FOR POOR SERVICE

In Michigan, residential customers 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 period.

RAISING AWARENESS OF LOCAL ISSUES

More detailed information about reliability would create greater transparency for customers and the regulator. This is particularly relevant for large transmitters and distributors.

For example, the current LDC scorecard requires Ontario distributors to report their system-wide reliability. This means a small distributor, like Whitby Hydro with approximately 40,000 customers, reports the same level of detail as a large distributor like Hydro One with 1.3 million customers.

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Changing Business Models

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

Non-wires alternatives represent an opportunity for LDCs to adopt new approaches to how they deliver electricity and conduct business. While traditional investments are capital-intensive, non-wires alternatives often involve expenditures that the OEB considers "operational" in nature. The current regulatory framework inherently favours LDCs' capital investments over operational investments, reducing the incentive for utilities to explore these innovative solutions. As part of its review of barriers to innovation (Chapter 3) the government will look to the OEB for ways to appropriately address the treatment of LDC expenditures to ensure cost-effective outcomes for ratepayers.

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 partnerships.

ENCOURAGING PARTNERSHIPS AND EFFICIENCIES

GridSmartCity Cooperative is a partnership of 13 LDCs created to improve service to electricity customers by increasing 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 procurement.

The government 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 continue to promote efficiencies in its own rules and requirements so that LDCs and transmitters benefit from further regulatory streamlining.

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Making Electricity Bills More Understandable

Electricity bills need to be clearer and more understandable. They are the customer's main window into the electricity system. Consumers have told both the Province and LDCs that they find current bills confusing and inaccessible. Action is underway to address this. Hydro One is introducing a redesigned electricity bill for its low-volume consumers in late 2017. Hydro One's redesigned bill, the product of testing and research into consumer behaviour, is expected to increase customers' understanding of their electricity charges.

To expand this effort across Ontario, the government is working 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 devices.

Improving Customer Choice through Data Accessibility

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

- The Ontario Energy Report, an online portal that provides consumers and stakeholders with an up-to-date snapshot of Ontario's energy sector;
- Green Button, a data standard that can give consumers access to data on their energy and water consumption. Green Button can also allow consumers to securely and automatically transfer that data to various applications that can help them manage and conserve energy and water; and
- Enhancing the Meter Data Management and Repository (MDMR), Ontario's central repository for smart meter data. The IESO Smart Metering Entity is leading a project that will support more rigorous analysis of consumption data across the province, with the end goal of making better planning decisions and improving services to customers.

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The government will continue to improve peoples' ability to use data to make decisions. But it cannot stop there. Ontario's energy sector as a whole must continue to improve its ability to analyze data and use advanced mapping tools and other cutting-edge technologies to further modernize our grid. This is discussed further in Chapter 5.

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

Cyber Security

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

Cyber security standards for the bulk electricity system are defined by the North American Electric Reliability Corporation. These Critical Infrastructure Protection standards have been adopted in Ontario and are enforced by the OEB and the IESO. Generators, transmitters and other industry participants are required to implement and comply with the standards.

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 government is working with both the IESO and the OEB to ensure that cyber security is being addressed in the electricity system and that there is appropriate regulatory oversight to mitigate cyber risks and threats.

In the spring of 2017, the OEB issued a draft framework that will define cyber security guidance and reporting requirements for LDCs. This framework will be in place by the end of 2017.

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Competitive Transmitter Selection

To help ensure lowest-cost solutions for transmission, the Energy Statute Law Amendment Act, 2016 enabled the IESO to use a competitive process to select companies or consortia for the construction of new transmission lines in Ontario.

As a first step in implementing the new legislation, the government 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.

Right-Sizing

The aging of transmission and distribution infrastructure across the province presents 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 means downgrading or removing equipment if demand is expected to decrease and upgrading equipment in communities with growing 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 and consequence of asset failure, the forecast of growth, changing customer requirements and the impact of new technologies, 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 government will look to the IESO and the OEB to 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.

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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. The statement connects the planning for land use and energy infrastructure by endorsing the planning and protection of transmission corridors and discouraging development that could preclude or limit the use of a planned corridor.

The Provincial Policy Statement is the foundation of the Growth Plan for the Greater Golden Horseshoe (2017), 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 should also protect existing and planned corridors to meet current and projected needs.

The IESO's regional plan identifies that the northwest Greater Toronto Area has a long-term need for a transmission corridor (Figure 16). The IESO relied on the population and employment forecasts included in the Growth Plan to forecast demand for the area. The transmission corridor would supply portions of the Regions of Halton, Peel and York.

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. 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. Further studies will identify a more specific corridor.

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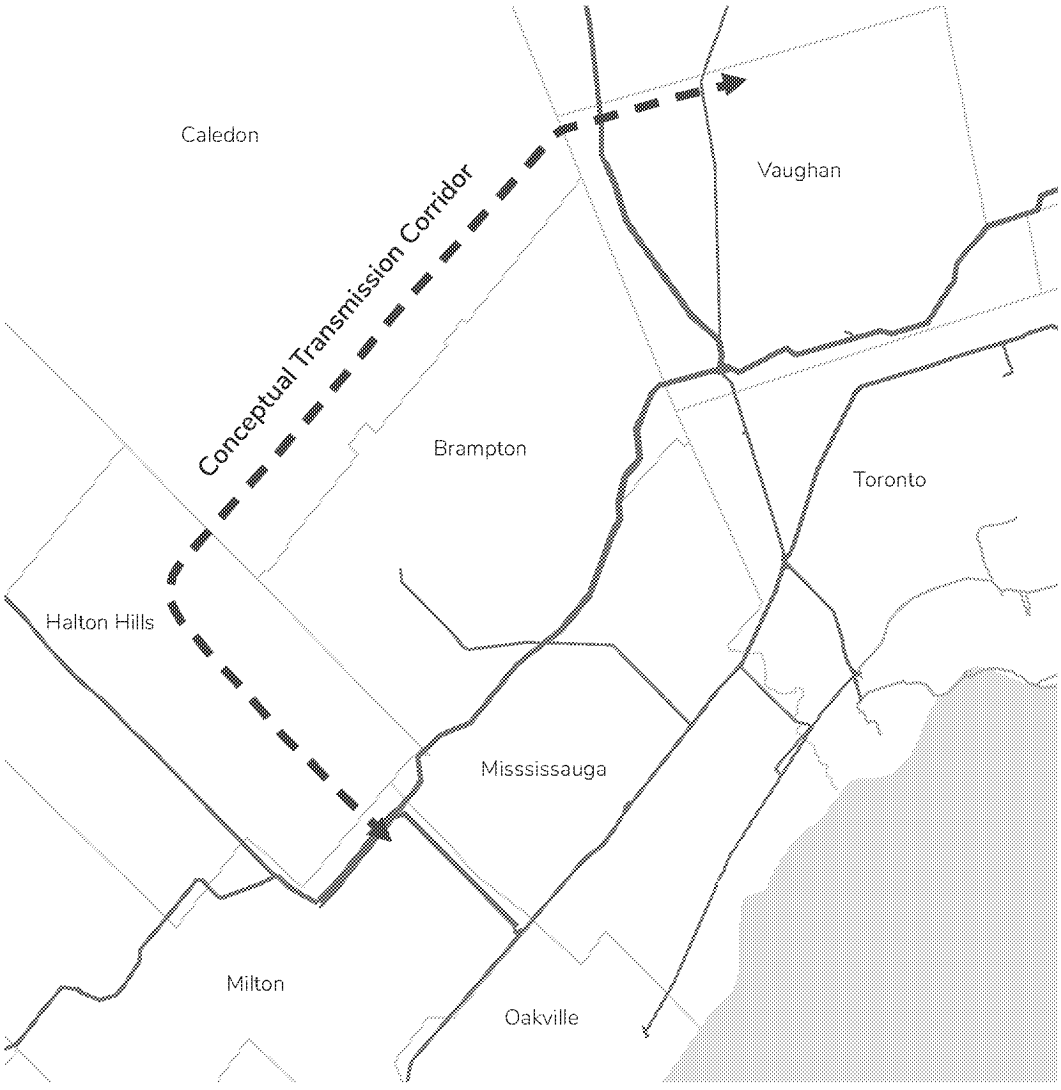
FIGURE 16. Future Transmission Corridor in the West GTA



For illustrative purposes only

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Transparency for Consumers on Gasoline Pricing

Many Ontario consumers pay attention to their gasoline prices. 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 businesses have requested more information about how gasoline and diesel retail prices are set.

As a result, the government asked the OEB in November 2016 to review the operation of Ontario's retail market for gasoline and diesel fuel. 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.

The OEB expects to report on its findings by the end of 2017. The government will review the OEB's report in detail and consider the information in its future decision-making.

The government monitors the supply and price of gasoline in the province and other jurisdictions, and makes this information publicly available through the quarterly Ontario Energy Report.

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Summary

- The Province expects the Ontario Energy Board (OEB) to continue to enhance its efforts to improve the performance of local distribution companies (LDCs).
- The government will look to the OEB to identify additional tools and powers that could be used to make utilities more accountable to their customers, promote efficiencies and cost reductions, encourage partnerships, and ensure regulatory processes are cost-effective and streamlined, while also accommodating changing utility business models.
- The government 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 government will look to the OEB to review the standards for reliability and quality of service for transmitters and distributors, and options for improving the standards, and will ask the Independent Electricity System Operator (IESO) to review how its planning and policies can improve reliability for customers.
- The government will direct the IESO to develop a competitive selection or procurement process for transmission, and to identify possible pilot projects.
- The government will look to the IESO and the OEB to promote the right-sizing of transmission and distribution assets at their end of life.
- A new transmission corridor is needed in the northwest Greater Toronto Area given the size of the forecasted growth. Further studies will identify a specific corridor.
- The Province will provide greater transparency for consumers on gasoline pricing through the OEB's transportation fuels review.

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STRENGTHENING OUR COMMITMENT TO ENERGY CONSERVATION AND EFFICIENCY

5

STRENGTHENING OUR COMMITMENT TO ENERGY CONSERVATION AND EFFICIENCY

Ontario has been building a culture of conservation since 2005 and 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 investing in energy-efficiency upgrades to increase their productivity and residents are choosing to install energy-efficient equipment in their homes, often with the help of Ontario's suite of residential and business conservation and demand management programs. Between 2005 and 2015, the average monthly household consumption of electricity decreased from more than 800 to about 750 kilowatt-hours (kWh).

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 the Climate Change Action Plan
- Expand conservation to other fuels
- Encourage energy efficiency on the distribution system

Energy efficiency is becoming more of a part of our everyday lives. Between 2006 and 2015, Ontario conserved 13.5 terawatt-hours (TWh) of electricity. That is equivalent to the electricity used annually by 1.5 million households, or the amount of electricity that powered the cities of London, Kingston, Ottawa, Peterborough and Thunder Bay in 2015. During the same time, the conservation programs delivered by Ontario's natural gas utilities saved more than 1,700 million cubic meters of natural gas, equivalent to the natural gas used by about 800,000 homes in a year, or taking about 750,000 cars off Ontario's roads for one year.

IESO-N-0008859

Since the 2013 Long-Term Energy Plan (2013 LTEP), the government, 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. Ontario is enhancing its commitment to Conservation First to improve affordability and choice for people, businesses and communities, and to co-ordinate its conservation programs with Ontario's climate change objectives.

Additionally, the government will help Ontario homes and businesses transition to a low-carbon future by expanding program offerings through the new Green Ontario Fund.

The Savings from Conservation and Energy Efficiency

ELECTRICITY

1.01 billion kilowatt-hours — Energy savings achieved in 2015 through business conservation programs.

4.1 million — The coupons for energy-efficient products redeemed across the province in 2015.

$2 — The added costs that are traditionally avoided in the electricity system every time $1 is invested in energy efficiency.

$0.04 per kWh — Cost of electricity conservation programs in 2015, which is cheaper than most forms of new supply.

NATURAL GAS

Over 80 million cubic metres — The amount of natural gas saved in 2015 through conservation programs for businesses.

8,000+ — The energy efficiency projects completed through home energy audit and retrofit programs in 2015.

$7 to $11 per month — A typical household that participates in residential natural gas conservation programs can save about $7 to $11 per month.

$0.04 per cubic metre — The cost of natural gas conservation programs in 2015, significantly cheaper than the cost of purchasing natural gas.

IESO-N-0008859

Getting More from Conservation

Ontario has an adequate supply of energy. Any additional demand for electricity supply is not expected to appear until the early-to-mid 2020s. In this context, the Province will continue to use conservation programs and improved energy efficiency standards to drive toward its long-term target of saving 30 TWh of electricity in 2032, helping to offset almost all of the forecast growth in electricity demand. The government 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.

The IESO is currently conducting a mid-term review of the 2015-2020 Conservation First Framework and the Industrial Accelerator Program for electricity conservation. The Ontario Energy Board (OEB) is conducting a similar review of the Demand Side Management Framework for natural gas programs. These reviews are looking at how the programs are meeting customer needs, distributor budgets and targets for conservation savings, and co-ordination with the Province's climate change objectives, including Green Ontario Fund programs.

The IESO is also using the mid-term review to look at how conservation programs can better meet the needs of local and regional electricity planning.

Demand Response

Demand response programs reward electricity customers for reducing their electricity use when needed. Demand response provides benefits to Ontario's electricity system by enhancing reliability, as well as reducing system costs and greenhouse gas (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 using multi-year contracts to secure demand response, holding an annual competitive auction instead. The demand response auctions held in 2015 and 2016 reduced the cost of obtaining demand response resources by up to 27 per cent when compared to previous contracts. The IESO is now working with industry partners to use demand response to better respond to rapid increases or decreases in electricity demand. Demand response is spurring innovation in new technologies, such as smart thermostats, energy management software and communication technologies.

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Through collaborative efforts by the IESO and the Demand Response Working Group, Ontario's demand response resources have grown significantly above the 2013 LTEP projections, and demand response has become a mature and competitive resource. Demand Response capacity realized each year will depend on system needs and the competitiveness of demand response with other resources.

DEMAND RESPONSE

Ontario has a number of initiatives that contribute towards its demand response capacity. These include the Industrial Conservation Initiative, demand response auctions, demand response pilots and time-of-use pricing. In 2015, demand response resources amounted to about 1,750 MW, which is over 20 per cent higher than what was projected in the 2013 LTEP.

Ensuring a Customer-Centred Approach

The current conservation frameworks encourage electricity and natural gas distributors to collaborate in providing more efficient programs and a streamlined experience for customers. Such partnerships can offer energy consumers a co-ordinated, one-window approach 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. Partnerships can enable multi-fuel programs to improve customer convenience and expand choice.

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 provincewide 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.

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

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BUSINESS REFRIGERATION INCENTIVE

Donaleigh's Irish Public House in Barrie installed energy efficient motors on its refrigeration units and reduced its annual electricity costs by $2,394. The project was implemented at no cost to the owner, as the Save on Energy Business Refrigeration Incentive Program covered the entire cost of $2,536 for materials and labour. The local electricity utility, Alectra Utilities, helped identify the specific energy-saving opportunity and developed a customized Energy Action Plan for the restaurant and pub.

"This is beneficial to the company and to our environmental footprint. We try to look at our footprint and make it as small as possible."

Don Kellett, Owner, Donaleigh's Irish Public House

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 of the project's total cost and is reducing annual natural gas consumption by 45,000 cubic meters.

"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 Corporation

IESO-N-0008859

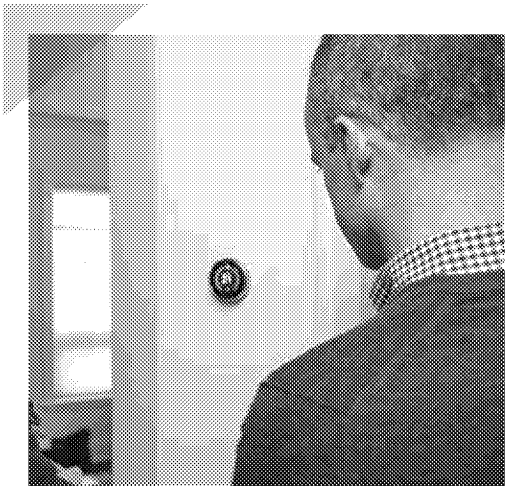
Expanding Home Retrofits

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 wood. They can improve the energy efficiency of their homes, reduce their energy bills and cut GHG emissions by participating in enhanced audit and retrofit programs offered by Enbridge Gas Distribution and Union Gas.

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

The Province 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 participants. This 'Whole Home' approach is now providing residential consumers with a co-ordinated, one-window approach to energy efficiency improvements.

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 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. 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.

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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.

Smart Thermostats

Smart thermostats can be an important piece of technology for homeowners or businesses who want to reduce their heating and cooling 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 government's August 2017 direction enables the IESO to design and deliver, with the support of the Green Ontario Fund, a provincewide rebate program for smart thermostats. In addition, the Green Ontario Fund has launched the GreenON Installations program, which provides, on a limited basis and at no cost, a smart thermostat installation and in-home energy review.

Green Button

Ontario's Climate Change Action Plan committed to expanding the Green Button initiative. 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 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. In the long-term, implementing Green Button provincewide would support the Province's continued efforts to put conservation first and help drive toward its long-term target of saving 30 TWh of electricity in 2032.

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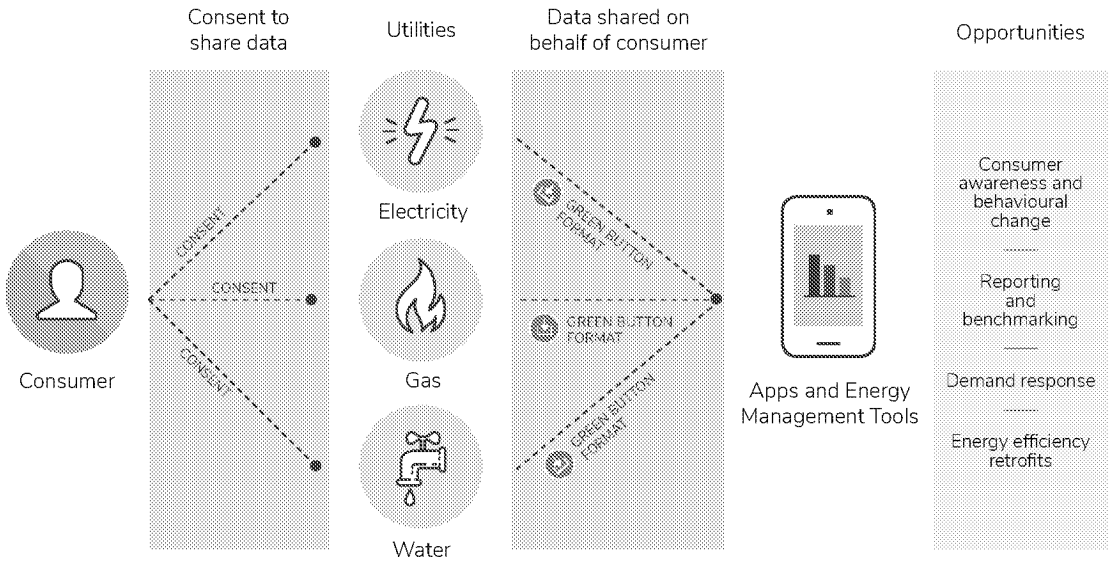
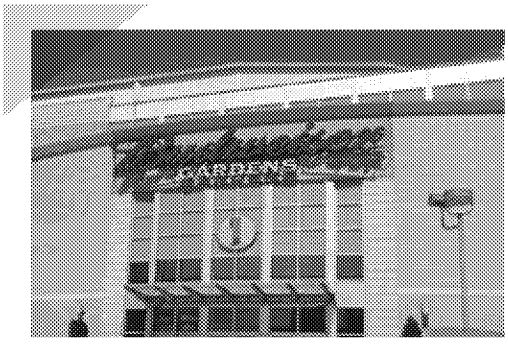
The government is committed to expanding Green Button provincewide and intends to propose legislation that would, if passed, allow Ontario to require electricity and natural gas utilities to implement Green Button Download My Data and Connect My Data. In addition, the government will collaborate with the province's electricity, natural gas and water utilities to adapt the Green Button standard, update existing guidance documents for LDCs and create new guidance documents for natural gas and water utilities. Guidance documents for water utilities will support those utilities with metering infrastructure to implement Green Button on a voluntary basis.

FIGURE 17. Green Button Connect My Data



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 Gardens

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Energy Benchmarking

The Province'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. Fifteen 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.

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. Building on this success, as well as on lessons learned from similar programs in the United States, the government has introduced a requirement for energy and water reporting and benchmarking for large private sector buildings as well.

Starting 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 buildings' use of energy and water and their GHG emissions to the Province. 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 Climate Change Action Plan envisions providing free energy audits for pre-sale homes in order to include energy ratings in real estate listings. The Province is examining options to deliver a Home Energy Rating and Disclosure program that would improve customer awareness by allowing homebuyers to compare homes by energy rating and encourage uptake of retrofit incentive programs.

Access to Energy Efficiency Financing

The Province 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.

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Raising the Bar for Energy and Water Efficiency

The Province continues to play a leading role in improving the energy efficiency of the equipment in homes, offices and factories. Since 2013, the government has improved or set new energy efficiency standards for more than 60 products. The gains in energy efficiency have endured and have 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.

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

DID YOU KNOW?

Ontario recently updated energy and water efficiency standards for clothes washers. Because of these improvements, in 2032 we expect to save:

- The amount of water that flows over Niagara Falls in 2.75 hours; and
- The amount electricity consumed by the City of Stratford in 2015.

The government 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

The Province 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.

> "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."
>
> **Climate Change Action Plan 2016, pg. 83**

IESO-N-0008859

Expanding the Scope of Conservation

The government 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 gas, and are exploring how to further integrate this policy into their planning processes (see Chapter 8). During the LTEP consultations and engagements, LDCs and technology vendors expressed interest in using in front of the meter conservation (IFMC) technologies to help meet electricity conservation targets and reduce peak demand.

DID YOU KNOW?

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

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

The government 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 process. The OEB will also identify steps for pursuing energy efficiency measures on the distribution system.

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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. Several programs to increase energy choices for Ontarians are being introduced, funded by the proceeds from auctions in the carbon market.

The Green Ontario Fund 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 the province.

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

The government and its agencies will explore how to further integrate conservation and low-carbon technology programs for both electricity and fuels.

Under current conservation programs, combined heat and power projects that use supplied fossil fuels to generate electricity on-site are eligible for incentives because they can significantly reduce demand on the electricity grid. To help meet the Province's climate change goals, these projects will no longer be eligible to apply for incentives under the Conservation First Framework and the Industrial Accelerator Program (IAP), starting July 1, 2018.

Because of their energy efficiency and environmental 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 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.

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Summary

- Demand Response capacity realized each year will depend on system needs and the competitiveness of demand response with other resources.
- The government will continue to set advanced efficiency standards for products and appliances and is exploring setting or updating energy efficiency standards for key electrical equipment in drinking water and wastewater treatment plants.
- The government and its agencies will further encourage distributors to pursue energy efficiency measures 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.
- The government is committed to expanding Green Button provincewide and intends to propose legislation that would, if passed, enable the government to require electricity and natural gas utilities to implement Green Button Download My Data and Connect My Data.
- Beginning July 1, 2018, combined heat and power projects that use supplied fossil fuels to generate electricity will no longer be eligible to apply 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.

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RESPONDING TO THE CHALLENGE OF CLIMATE CHANGE

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 will play a role in meeting the challenge. The robust supply of electricity will give it a central task in assisting the transition to a clean economy. At the same time, Ontario must strengthen its energy infrastructure and make it more resilient to lessen the damage that climate change can cause.

WHAT WE HEARD FROM YOU

- Support increased electrification of transportation
- Support options for home storage, including electric vehicle (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 supply

Ontario's cap and trade program came into effect on January 1, 2017. 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.

IESO-N-0008859

Cap and trade creates a market to provide incentives to reduce emissions. Large emitters must have enough allowances to cover their GHG emissions. Switching from high carbon fossil fuels to lower carbon alternatives, including renewable fuels, is one way for large emitters to reduce emissions.

Putting a price on carbon through cap and trade will also impact the operation of the fuels market. Renewable alternatives do not incur cap and trade costs and, consequently, will become relatively more attractive than carbon intensive fuels. This could increase the adoption and use of fuels like renewable natural gas, ethanol and renewable diesel. Similarly, in the transportation sector, lower carbon alternatives like natural gas may become more attractive compared to diesel.

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. Companies that emit more than their allocation can buy additional allowances through government auctions or from other companies that have more allowances than emissions.

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. Proceeds are projected to be $1.8 billion in 2017-18 and $1.4 billion annually, starting in 2018-19. These funds will help to fight climate change, reduce greenhouse gas emissions and transition Ontario to a low-carbon economy.

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 towards a 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. 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.

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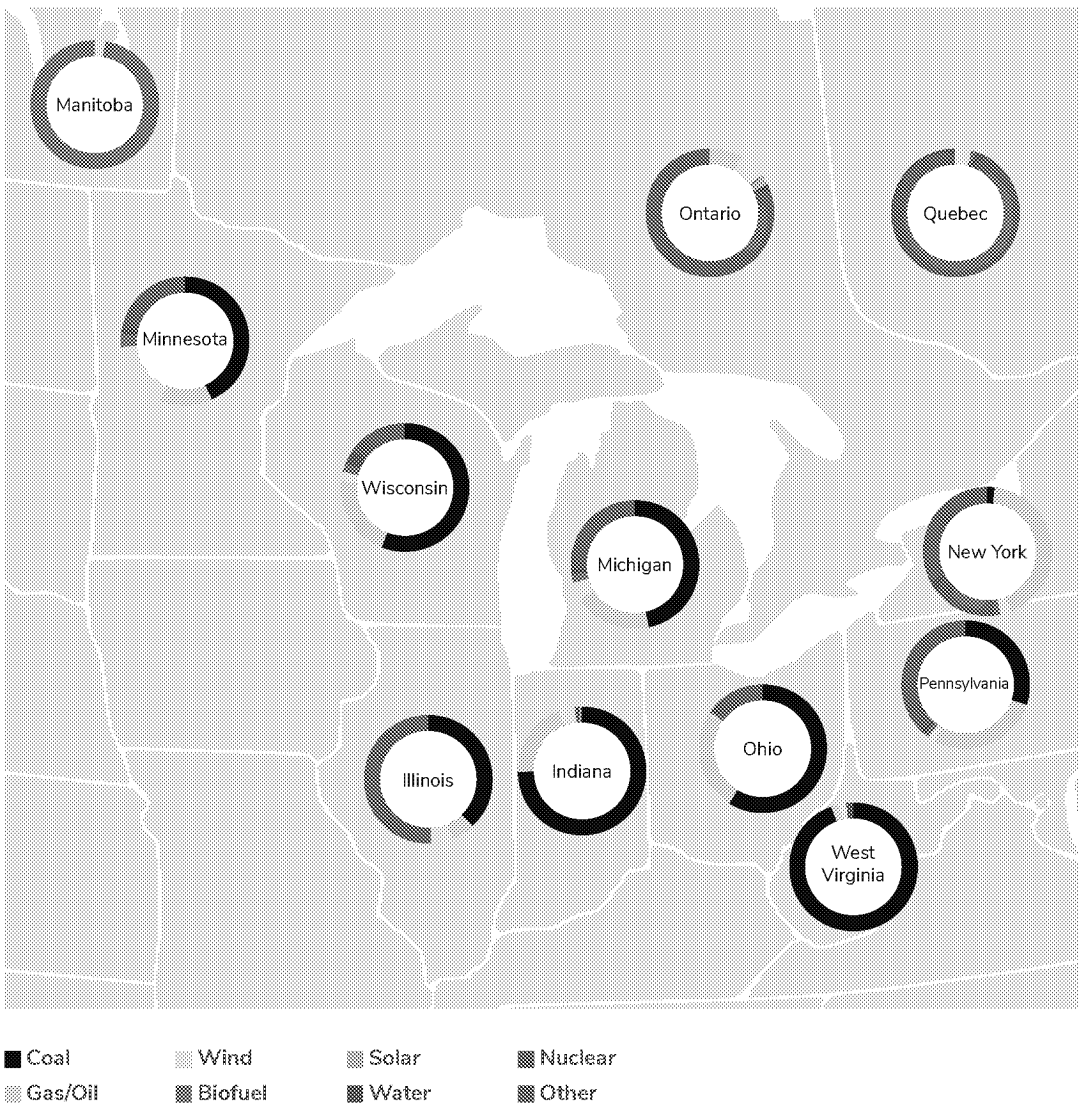
Building on a Clean Electricity System

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. Our investments in these types of clean generation sources, along with the elimination of coal-fired electricity generation, have significantly reduced GHG emissions in the province.

In comparison to neighbouring states such as Michigan, Minnesota, Ohio, Pennsylvania and New York, which still rely heavily on fossil fuel-fired electricity generation, Ontario has a much cleaner electricity system. We have accomplished this without the abundant hydroelectric resources enjoyed by Québec and Manitoba.

FIGURE 18.

Ontario's Clean Generation Mix



Source: IESO, U.S. Energy Information Administration, Manitoba Hydro, Hydro Quebec
Generation data for US states is from 2015; Ontario, Manitoba and Quebec Data is from 2016
Ontario generation data includes both transmission-connected and distribution-connected (embedded generation).
Data for Manitoba, Quebec and US states is for transmission-connected generation only

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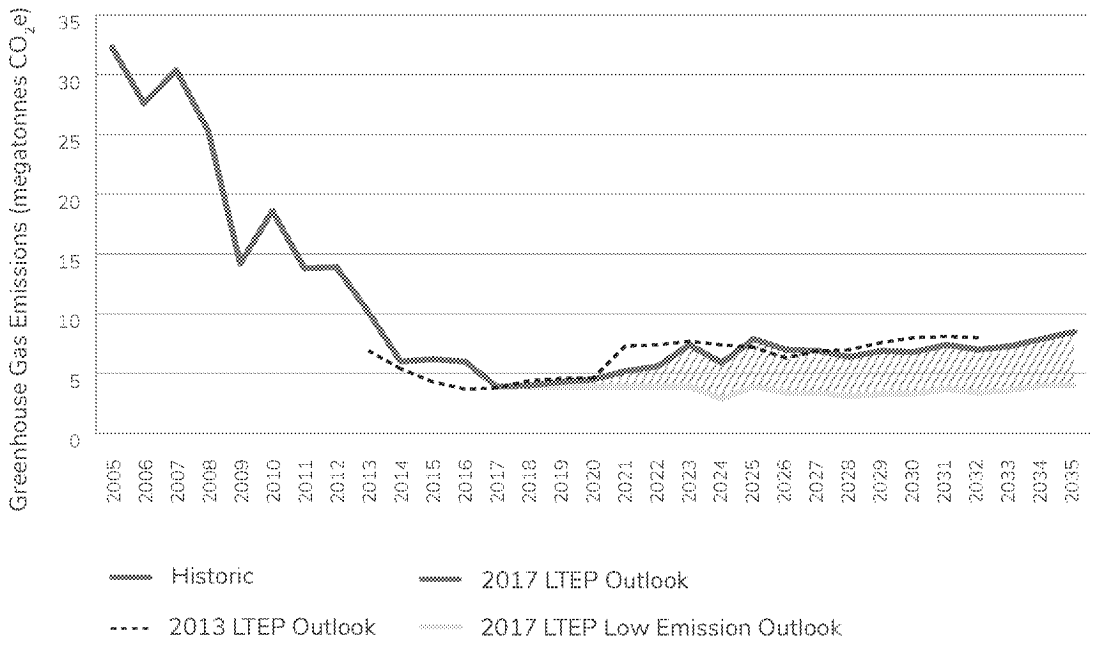
Thanks to these investments, Ontario's electricity sector is forecast to account for only about two per cent of Ontario's total GHG emissions in 2017 and the emissions are forecast to be more than 80 per cent below 1990 levels. As shown in figure 19, emissions are expected to remain well below historical levels and to be relatively flat over the planning period. Ontario will continue to look for ways to keep GHG emissions in the electricity sector low, and work with carbon-free market participants to meet the Province's emissions targets.

FIGURE 19. **Electricity Sector GHG Emissions Outlook**



Source: IESO, Environment Canada and Climate Change

These investments have significantly decarbonized Ontario's electricity sector, leaving it well positioned to help the province move towards a low-carbon economy and meet its emission reduction commitments. Ontario's clean and reliable electricity system gives the province a strong foundation on which to pursue increased electrification, including the use of more EVs.

The province's robust supply of energy will also allow 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 from cap and trade auctions will help fund the further application of these technologies. By making the best use of our existing energy sources and infrastructure, a more integrated energy system will allow the Province to chart the most effective course for achieving its goals for reducing GHG emissions.

IESO-N-0008859

Renewable Energy Success

Ontario is Canada's leader in installed wind and solar power. There is more wind and solar capacity in 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 2005. Currently, Ontario has 18,300 megawatts (MW) of wind, solar, hydroelectric and bioenergy generation capacity in operation or under development.

The introduction of the Large Renewable Procurement (LRP) process in 2014 resulted in strong competition between developers of large renewable projects, drove down prices and secured clean, reliable generation. This significantly reduced the costs of wind and solar energy, saving money for electricity ratepayers.

The results of the final Feed-in-Tariff (FIT) procurement were announced in September 2017, with a total of 390 contracts offered for small-scale renewable energy projects representing about 150 MW of clean generation.

A highlight of Ontario's renewable energy programs has been the success that individuals, schools, municipalities, co-operatives and Indigenous communities have had in participating in clean energy projects. In the FIT 5 procurement, more than 80 per cent of successful applications had Indigenous, municipal, public sector or community participation. From smaller home or farm-sized projects to larger community-scale projects, Ontarians are using renewable energy to help meet their community's electricity needs and reduce their demand on the provincial electricity grid.

Since 2009, prices paid for new electricity from FIT and microFIT projects have been reduced between 50 and 75 per cent, reflecting the decreasing costs of equipment and ensuring value to ratepayers.

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.

IESO-N-0008859

COMMUNITIES BENEFITING FROM RENEWABLE ENERGY

The Municipality of Chatham-Kent is widely recognized as one of Ontario's leading green energy communities, which has helped spur local economic development. The municipality has received significant benefits for hosting a number of wind energy projects. Recent and proposed wind projects will deliver an estimated $27 million in community benefits and property tax revenue over a 20-year period for the municipality.

Renewable energy companies have also invested heavily in the social fabric of the community through partnerships with local organizations for sponsorship of projects such as splash pads.

A Strong Renewable Future

The Province's renewable energy policies have made Ontario's 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 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. Ontario is poised to take advantage of advances being made in distributed energy resources and smart-grid technologies that can help deliver a more efficient and cleaner electricity system. The government remains committed to having an electricity system where renewable energy generation plays an essential role, supporting the goals of the Climate Change Action Plan.

Wind

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

Wind power is also being produced more efficiently. Turbines use state-of-the-art controls to adjust their blades and orientation to get the maximum output of energy in changing wind conditions. The Independent Electricity System Operator (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. Actively controlling wind energy generation results in the more efficient operation of the electricity system.

IESO-N-0008859

Solar

Ontario has become a North American leader in the development of solar photovoltaic (PV) systems with about 2,300 MW of capacity online, enough to power about 300,000 homes each year. 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 performance and a significant decline in costs, 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 continues to come from the province's hydroelectric facilities, which provided 23 per cent of Ontario's total generation in 2015. Ontario has approximately 8,800 MW of installed hydroelectric capacity.

Assessments over the years, including the November 2013 Northern Hydro Assessment – Waterpower Potential in the Far North of Ontario, have identified significant remaining waterpower potential in the province. These potential resources are mostly concentrated in Northern Ontario and major transmission enhancements would be required to effectively contribute to Ontario's electricity supply.

Additionally, there are opportunities to redesign older hydroelectric projects to improve performance by using new, more efficient turbines.

Bioenergy

Bioenergy refers to electricity that is generated by burning biomass, such as plant or animal by-products and wastes. 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. Bioenergy systems also support the implementation of the Province's Strategy for a Waste-Free Ontario.

IESO-N-0008859

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, an 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 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 bio-based diesel;
- Making renewable liquid fuels available to more regions of the province;
- Adding biofuels to the crude oil that Ontario refineries process; and
- Lowering the carbon intensity of renewable fuels produced by Ontario manufacturers.

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 of light-duty vehicles and the use of alternative fuels, including bioenergy for long-haul road freight and aviation, technological innovation remains inherently unpredictable. 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 use natural gas for space heating, domestic hot water, steam and process heat. There were about 3.6 million natural gas customers in Ontario in 2016. Natural gas was also used to generate about 10 per cent of Ontario's electricity in 2015.

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

The government 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.

The government is also investing proceeds from the auctions in the carbon market to help introduce RNG in the province. The investment will help consumers with the cost of shifting to RNG, as it currently costs more than conventional natural gas.

Integrated Energy Solutions

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

Power-to-Gas

Electrolysis, also known as power-to-gas, uses surplus electricity to break down water molecules into hydrogen and oxygen. 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.

Power-to-gas could potentially become a new and important link between the province's electricity and natural gas 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.

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Heating and Cooling with Renewable Energy Technologies

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

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 total fuels energy demand in Ontario homes, making it an important area to target for reducing GHG emissions.

The government will continue to work with its agencies, including the IESO and the Green Ontario Fund, to encourage the deployment of thermal and alternative technologies for residential, commercial, industrial and institutional buildings. This will involve planning how to integrate the technologies and the delivery of conservation and low-carbon technology programs into the province's energy system.

Solar Air and Hot Water Heating

A typical residential solar hot water system can supply between 40 to 60 per cent of a home's hot water needs. Solar air systems capture air warmed by the sun and circulate it to heat buildings.

Ground Source and Air Source Heating and Cooling

Ground-source heat pumps, also known as geothermal energy systems, use buried pipes to absorb heat from the ground and transfer it to a home or building, and can reduce heating bills by up to 70 per cent. Air-source heat pumps take air from outside, extract the heat and transfer it to the air inside a home or building. A heat pump, running on electricity, concentrates the heat from both sources, and moves it to where it is needed. The same systems can also be used to provide cooling in the summer; and more advanced air-source systems can even provide domestic water heating.

In July 2017, the Save on Energy Heating and Cooling Incentive program began offering incentives of up to $4,000 to help Ontarians who live in electrically-heated homes to purchase and install air-source heat pumps.

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District Heating and Cooling

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

District heating and cooling can use local energy resources such as biomass, geothermal energy and mechanical waste heat from industrial operations to reduce GHG emissions.

Implementation can be made easier if underground district energy pipes are incorporated into the initial design of new residential or commercial developments. When used in more densely populated areas, district energy systems can be more cost-effective than providing heating and cooling systems for each individual building.

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 OR. 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 generates chilled water, steam, hot water and electricity which is distributed to more than 155 buildings in downtown Toronto. Their Deep Lake Water Cooling system is one of the world's largest sustainable cooling systems, using Lake Ontario to recycle energy from more than 70 buildings in downtown Toronto to the city's potable water system. Currently, this system reduces peak electrical demand by 61MW, with plans underway to expand.

The London system is a Combined Heat and Power (CHP) system that currently provides 15MW of electricity to the grid, and serves 60 customers with a steam and chilled water system. There are plans to increase the CHP plant capacity by an additional 18MW in the near future.

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Near and Net Zero Carbon Emission Buildings

The Climate Change Action Plan aims to reduce emissions in the building sector by encouraging the 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. New programs will also be offered through the Green Ontario Fund.

New high-performance standards for space and water heating equipment could significantly reduce the energy use, environmental footprint and GHG emissions of new and existing homes and buildings and lower consumers' energy costs.

Working with the federal and other provincial governments, Ontario is exploring opportunities to develop markets for new high efficiency technologies, such as air source heat pumps, supporting the joint aspirational goals on achievable energy performance levels and the transition to a low-carbon economy.

In addition, planned updates to the Ontario Building Code would make a significant contribution to reducing GHG emissions in the building sector and support Ontario's Climate Change Action Plan.

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. Once that has been done, some type of on-site renewable energy generation is generally required to achieve net zero energy or carbon emission status. The government is taking steps to expand and enhance its net metering framework, which would give building owners increased opportunities to integrate renewable energy generation and energy storage technologies.

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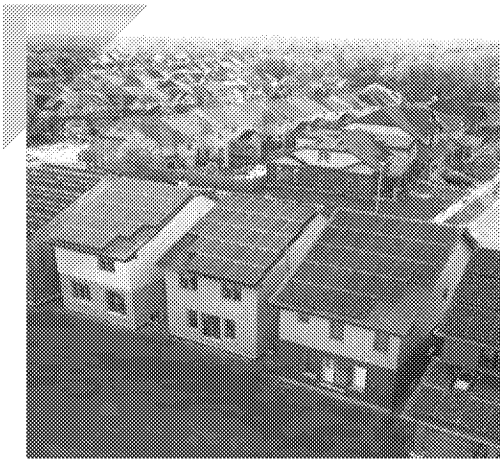
REID'S HERITAGE HOMES – GUELPH



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.

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; and
- Rainwater harvesting.

IESO-N-0008859

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 lower the flows of rivers and the water levels and temperatures of lakes, possibly reducing the ability to generate electricity.

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 studied Ontario's transmission system and found it resilient enough to substantially withstand most extreme weather scenarios. 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 part of Alectra Utilities) conducted vulnerability assessments of their systems. A leader in this regard in Canada, Toronto Hydro is addressing climate change vulnerabilities by 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 identified extreme weather as a driver for its capital and maintenance expenditures.
- Local distribution companies (LDCs) 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.

Building on its current activities, the government 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.

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The government and its agencies will facilitate the exchange of information and knowledge 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 co-ordinated with other public services, the Province 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 government 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.
- 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.

ADAPTATION INITIATIVES BY LOCAL DISTRIBUTION COMPANIES

Building on its distribution system vulnerability assessment, the former 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 LDC's geographic information and outage management system reduce response times.

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 LDC's budget for vegetation management was reduced by $750,000.

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Summary

- Ontario remains committed to a clean electricity system that includes renewable energy generation and supports the goals of the Climate Change Action Plan.
- The government will encourage the construction of near net zero and net zero carbon emission homes and buildings to reduce emissions in the building sector.
- The government is proposing to expand the options for net metering to give building owners more opportunities to access renewable energy generation and energy storage technologies.
- The government 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 current activities, the government 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.

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SUPPORTING FIRST NATION AND MÉTIS CAPACITY AND LEADERSHIP

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 2,200 megawatts (MW) of clean energy capacity.
- First Nations lead, or are partners with, transmission companies on several major transmission lines.
- Nearly 100 First Nations are participating in the Independent Electricity System Operator's (IESO) Aboriginal Community Energy Plan program. These community-led energy plans assess a community's current energy needs and priorities and explore options for conservation and renewable energy.

The Province 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.

IESO-N-0008859

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 communities

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. The Province is committed to working together with First Nations and Métis to identify issues and propose actions that advance reconciliation and healing.

The Chiefs of Ontario and the Province signed the First Nations-Ontario Political Accord on August 25, 2015, creating a formal bilateral relationship framed by the recognition of the treaty relationship.

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

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

ONTARIO-MÉTIS NATION OF ONTARIO (MNO) 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. Reflecting the Province's strong energy supply position, *Delivering Fairness and Choice* responds to the concerns heard through the LTEP engagement process and the ongoing dialogue between the government, its agencies and First Nation and Métis partners.

Building on the conversations during the LTEP engagement process, the Province 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 about the Province's energy commitments and have opportunities to provide insight and feedback.

Addressing Electricity Affordability

A major priority for Indigenous and non-Indigenous electricity consumers is to improve the affordability of their electricity. The government 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).

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First Nation Delivery Credit

The Province 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. The problem of higher distribution rates is often exacerbated by energy-inefficient homes on reserves that lead to higher levels of energy consumption.

To address these unique energy affordability challenges, First Nation leaders recommended the elimination of delivery charges for electricity transmission and distribution when they met with the Minister of Energy and other energy sector leaders at the First Nations-Ontario Energy Table in April 2016.

The minister 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. Acting on the OEB's findings and feedback from First Nations, the Province collaborated with the Chiefs of Ontario to develop the First Nations Delivery Credit. The First Nations Delivery Credit was implemented on July 1, 2017 and provides a credit equal to 100 per cent of the electricity delivery charge on the bills of on-reserve First Nation residential customers of licenced distributors. This collaborative effort between the Province and First Nations is another example of the Political Accord 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. The Province 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.

The Province has made it a priority to connect these remote First Nations. 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.

Connection to Ontario's low-carbon electricity grid will not only improve the quality of life of these communities and enable their economic development, but it will also reduce local pollution, greenhouse gas (GHG) emissions, and the environmental risks associated with transporting and storing diesel fuel.

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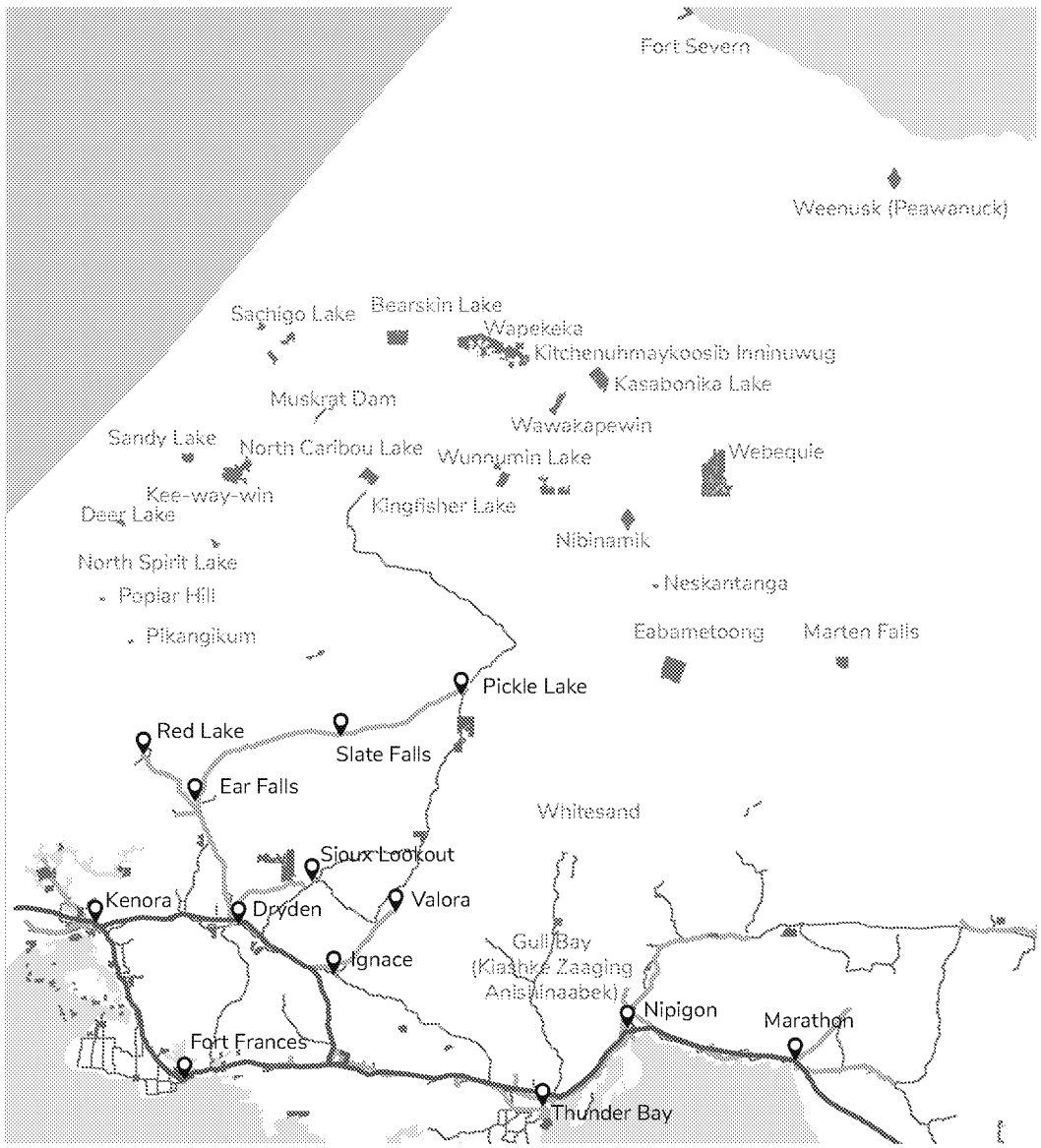
FIGURE 20. Reducing Diesel Generation in Remote First Nation Communities



Remote communities proposed for connection through the Wataynikaneyap power project

Remote communities that could be connected through future proposals

Remote communities uneconomical to connect where other diesel reduction initiatives will be pursued

Other First Nations

First Nation settlements

Roads

Transmission Line

230 kV

115 kV

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For these reasons, the government 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;
- Creating a mechanism for funding a portion of project costs; and
- Advocating for a fair cost-sharing arrangement with the federal government that ensures the project is fully funded and can proceed to construction.

ONTARIO POWER GENERATION AND GULL BAY FIRST NATION

Left to right: Gillian MacLeod, Anthony "AJ" Esquega, Wayne King and Ryan Morin

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.

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 development, construction and operation of the project will create additional opportunities for capacity building and employment.

The Province 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 their connection when proposals are brought forward.

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Grid connection is not currently feasible for four of the 25 remote First Nations in Ontario. Each of these communities has begun the planning and development work to add sustainable technologies that will reduce their reliance on diesel. Projects that reduce diesel reliance could include renewable microgrids, battery storage, and other innovative technologies that meet identified community needs.

The government 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 in 2017 to connect this First Nation.

Conservation

Over 40 First Nations participated in the Aboriginal Conservation Program between 2013 and 2015. The program funded energy efficiency upgrades such as new insulation, appliances and lighting for approximately 3,000 First Nations households.

Through the 2015–2020 Conservation First Framework, First Nation and Métis customers also have access to other energy efficiency and conservation programs, such as the Save on Energy programs offered by local distribution companies.

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, using the name Conservation on the Coast (COTC).

COTC began in 2013 by conducting annual energy audits in the three communities.

By October 2017, 30 homes per community will have LED bulbs, power bars, low flow aerators and showerheads, hot water pipe wrap, and improved insulation. This has reduced electricity usage by 20 to 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.

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WIKWEMIKONG FIRST NATION

In June 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.

It is estimated this will save the community more than $157,000 per year in energy costs, a 58 per cent 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 Save on Energy Program and private debt financing.

Wikwemikong First Nation 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 include a solar generation plant, improvements to the energy efficiency through insulation and replacements of high energy heating and cooling systems of five community buildings and the development of a microgrid software program. This project will receive funding through the Small Communities Fund, co-funded by the Ontario and the federal governments.

While conservation programs are working well in some First Nation and Métis households, participants in *Delivering Fairness and Choice* engagement sessions 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 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.

The Climate Change Action Plan allocates $85-$96 million from cap and trade auction proceeds for collaboration with Indigenous communities. This includes establishing a fund for community level GHG reduction projects and for community energy and climate action planning in First Nation communities, particularly to reduce emissions from buildings and infrastructure, and for the development of carbon sequestration projects.

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. The Province is committed to continuing this funding.

But energy plans are just a first step and the Province 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 the Climate Change Action Plan.

The IESO will engage with First Nation and Métis communities and organizations to identify the strengths and weaknesses of the current ACEP program, explore the use of conservation projects or other community-directed energy initiatives, and then recommend changes that allow community energy plans to flourish. Funding will come from the $10 million the IESO has dedicated annually for this and other support programs.

Supporting Local Opportunities

Building Sector Knowledge and Capacity

The IESO's Education and Capacity Building (ECB) program supports the education, training and skill building of First Nations and Métis. The ECB program will continue to support initiatives that help build local business skills, energy literacy, and youth engagement.

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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 support:

- Financial, legal and technical due diligence so First Nations 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
- Initiatives that reduce the reliance on diesel fuel for the four First Nations that can't be feasibly connected to the transmission grid.

The government will engage further and explore how to change these programs so they better reflect the needs of First Nations and Métis within the current energy system. This may include an examination of how programs can 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

The development of energy projects requires significant financial and human capital. Barriers can prevent First Nation and Métis communities and organizations from accessing this capital so they can actively participate 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.

The Aboriginal Loan Guarantee Program has helped First Nations and Métis obtain lower-cost financing to participate in large-scale energy projects. However, Ontario recognizes that barriers to financing remain, particularly for smaller-scale projects. As a result, the government will engage with First Nations and Métis to identify gaps in financing, possible changes to existing programs, and alternative financing models.

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WHAT IS THE ABORIGINAL LOAN GUARANTEE PROGRAM?

Launched in 2009, the $650 million Aboriginal Loan Guarantee program (ALGP) provides a provincial guarantee to support a First Nation or Métis corporation borrowing to purchase up to 75 per cent of the corporation's equity in a qualifying energy project application, to a maximum of $50 million. To date, the ALGP has supported First Nation or Métis equity interests in nine projects, including the 438MW Lower Mattagami hydro-electric project, the Bruce to Milton transmission reinforcement project, the 28MW Peter Sutherland hydro-electric project, and the 4MW Mother Earth Renewable Energy wind project.

The government 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.

The Province also appreciates the unique social benefits that can accrue to First Nations and Métis with their participation in energy projects. Measuring and assessing these non-financial benefits could help the government take a broader and more inclusive view of outcomes when deciding on energy policies and projects.

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 their community. The cost of the projects was around $154 million, of which $19 million was guaranteed by the ALGP.

Rainy River First Nations partnered with Clark, Conner and Lunn for the project. The projects are expected to generate around 37 million kilowatt-hours of electricity a year, enough to meet the needs of approximately 3,000 households.

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Building on these and other successes across the province, Ontario will take the following actions to increase First Nation and Métis access to financing:

- Engage with leaders, organisations and financing experts to identify financing gaps and barriers to the participation of First Nations and Métis in energy projects;
- Investigate 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. Access to natural gas is an important issue, especially for First Nations.

To assist with natural gas expansion, the government launched a new $100 million Natural Gas Grant Program in April 2017. Through the program, municipalities and First 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 state that special consideration will be given to projects located in Northern Ontario or located within First Nation reserves. Successful applicants under this program can then apply to the OEB for leave-to-construct approval for their expansion projects.

Over the coming years, the Province looks forward to seeing natural gas expansion projects deliver greater consumer choice and economic growth to municipalities and First Nations in Ontario.

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Summary

- The government will review current programs in order to improve the availability of conservation programs for First Nations and Métis, including communities served by Independent Power Authorities.
- The Province, working with the federal government, will continue to prioritize the connection of remote First Nation communities to the grid and support the four First Nation communities for which transmission connection is not economically feasible.
- The Aboriginal Community Energy Plan program will be expanded to help communities implement their energy plans and support Ontario's Climate Change Action Plan.
- The government will engage with First Nations and Métis to explore options for supporting energy 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 address barriers to the financing of projects led or partnered by First Nations or Métis.
- The government will report back to First Nations and Métis between Long-Term Energy Plans to provide updates on the province's progress and seek ongoing feedback.
- The government's Natural Gas Grant Program will support the expansion of natural gas access to First Nation communities.

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SUPPORTING REGIONAL SOLUTIONS AND INFRASTRUCTURE

8

SUPPORTING REGIONAL SOLUTIONS AND INFRASTRUCTURE

Different regions and communities may require different solutions to address their specific energy needs and the local impacts of large energy infrastructure projects on their communities.

For example, some regions may experience an increase in demand due to population growth, while others may be more concerned about the reliability of their energy supply.

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 to identify their electricity needs and develop cost-effective solutions for meeting them. It could mean additional supply from transmission lines, 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.

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
- Programs should meet customer and regional needs

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ESSEX COUNTY

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. Greenhouses, food processing operations and increasing wineries-related tourism are adding to electricity demand, particularly in the summer months.

At the same time, other needs in the area are triggering infrastructure upgrades that would benefit not just the local agri-business sector, but those looking to connect distributed generation, other customers in the Windsor-Essex region and Ontario ratepayers as a whole.

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 over $20 million less. Collaborative solutions like these are critical to realizing the benefits of the enhanced regional planning.

Regional planning gives communities the opportunity to consider all the cost-effective resources for meeting their regional needs. It promotes the principle of Conservation First by first incorporating conservation targets into the forecasts of net regional electricity demand. Only then are other economical solutions considered, such as new supply, distributed generation, additional conservation and demand management or investments in transmission and distribution.

In order to increase the range of cost-effective solutions, barriers to non-wires solutions such as conservation, demand response and other distributed energy resources must be reduced.

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"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."

Anthony Haines, CEO Toronto Hydro Corporation

The Ontario Energy Board (OEB) is also working to integrate conservation into regional and local planning for natural gas infrastructure. The OEB's 2015-2020 Demand Side Management (DSM) Framework says natural gas utilities need to consider conservation as a key principle in their infrastructure planning. As part of the mid-term review of the DSM Framework that is currently underway, natural gas utilities are expected to propose transition plans to integrate natural gas conservation into their planning for future infrastructure.

ROLE OF CONSERVATION

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 distribution companies (LDCs) in Ottawa, Toronto, Barrie-Innisfil and Parry Sound-Muskoka to determine whether targeted conservation initiatives can defer costly upgrades to specific local distribution and transmission infrastructure. 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.

Local advisory committees have helped their communities to understand regional electricity issues. These committees allow residents to provide input, and their advice improves the implementation and the regional plan. Community engagement is also crucial to linking regional energy plans with community energy planning.

Now that the first cycle of regional planning has been completed, the government 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.

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Community Energy Planning

Ontario's Municipal Energy Plan 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. Communities are encouraged to develop their own energy plans that identify opportunities for conservation and priorities for infrastructure. The resulting community energy plans have helped communities recognize opportunities to conserve energy, improve energy efficiency and reduce greenhouse gas (GHG) emissions. More information on the ACEP program can be found in Chapter 7.

ABORIGINAL COMMUNITY ENERGY PLAN

Funding is available:

- For up to $90,000 to create a new community energy plan.
- For up to $25,000 to update an existing plan.
- For remote communities, an additional $5,000 for both streams.

MUNICIPAL ENERGY PLAN

Funding is available:

- For 50 per cent of eligible costs, up to a maximum of $90,000 to develop a new plan.
- For 50 per cent of eligible costs, up to a maximum of $25,000 to enhance an existing energy plan.

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Ontario's Climate Change Action Plan has reinforced the importance of community energy and community GHG plans, and indicated Ontario will continue to support them. The Climate Change Action Plan also includes a funding for projects to reduce GHG emissions proposed by a municipality that has completed a community energy or community GHG plan and meets program eligibility criteria. The government launched the Municipal GHG Challenge Fund in August 2017. 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. Municipal Energy Plan program participation is one path to eligibility for the Municipal GHG Challenge Fund.

REGIONAL AND COMMUNITY ENERGY PLANNING BY THE NUMBERS:

21 Electricity Regions

11 Active Local Advisory Committees (including both general and First Nations)

97 Aboriginal Community Energy Plans underway

36 Municipalities have Municipal Energy Plans underway or complete

19 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.

16 Integrated Regional Resources Plans (IRRP) completed. An IRRP, led by the IESO, integrates a range of resource options to address the electricity needs of the region.

More information on your region can be found by entering your postal code online at http://www.ieso.ca/en/get-involved/regional-planning

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FIGURE 21. Regional Highlights

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; and
- 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 systems in Pickle Lake and Red Lake to meet demand.

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Wataynikaneyap Power is the proponent of the 230-kilovolt (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 2020.

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.

Ottawa

Work is underway or complete on five transmission projects to address the near-to-medium 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 transformer station and transmission line to meet the growing electricity needs of new developments in South Nepean.

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, system reliability and resilience, and aging infrastructure 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 stations will ensure new customers can be connected to the grid.

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.

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Windsor-Essex

Agri-business is growing in the rural portion of Essex County, increasing the demand for electricity. Hydro One is building a new transmission line, a new transformer station near Leamington, and refurbishing the Kingsville and Keith transformer stations to address this growth and improve restoration timelines. The new line and transformer station are expected to be in service by 2018.

York Region

Several 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 sub-regions' 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.

CITY OF TEMISKAMING SHORES

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 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.

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Setting Standards for Pipelines

Apart from a small share of domestic production, Ontario's oil and natural gas is delivered from outside the province by interprovincial and international pipelines. These pipelines are under federal jurisdiction and regulated by the National Energy Board (NEB). The 2013 Long-Term Energy Plan outlined a set of principles that Ontario will use to evaluate oil and natural gas pipelines. In November 2014, Ontario and Québec agreed on the following seven principles for pipeline reviews:

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

The Province is committed to public engagement on major pipeline developments. In November 2013, the government asked the OEB to conduct provincewide 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, Métis and local communities; and
- The short and long term economic impacts of the project in Ontario.

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The OEB undertook an extensive consultation and review process. It hired experts in the 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, 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 about 10,000 written submissions during its review.

In August 2015, the OEB published its report *Giving a Voice to Ontarians on Energy East*. The report concluded there was not an appropriate balance between the economic and environmental risks of the project and its expected benefits for Ontarians. 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, the government 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 to ensure major energy projects are reviewed in a predictable manner that increases public confidence.

Summary

- The government 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 government is directing the Independent Electricity System Operator 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 the government's continued support for them.
- The Province has established seven pipeline principles to evaluate oil and natural gas pipelines, and is committed to public engagement when it undertakes reviews of major pipeline projects.

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CONCLUSION

Delivering Fairness and Choice sets out a vision for the future of Ontario's energy sector and highlights the commitment to a clean, affordable and reliable energy system. The primary focus is on Ontario's energy consumers.

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 for approval. The implementation plans will outline the steps these agencies will take to implement the policies and programs outlined in the implementation directives. The government looks forward to working with Ontario's energy sector in the implementation of *Delivering Fairness and Choice*.

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GLOSSARY

Aboriginal Rights – Rights held by Indigenous peoples though long-standing use and occupancy of the land, protected under Section 35 of the *Constitution Act, 1982*.

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

Behind-the-Meter Applications – A range of technologies that are installed on the customer's electricity system to help manage the customer's load.

Beneficiary Pays – An approach to cost allocation where consumers pay for an asset in proportion to the benefits they derive from it. This protects ratepayers from paying for infrastructure that benefits only a few customers.

Bioenergy – The conversion of energy from organic matter to produce electricity. Sources for bioenergy generation can include agricultural residues, food processing by-products, animal manure, waste wood and kitchen waste.

Biofuels – Unlike other renewable energy sources, biomass can be converted directly into liquid fuels, called "biofuels," to help meet transportation fuel needs. The two most common types of biofuels in use today are ethanol and biodiesel.

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 creates a long-term framework for climate action. 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 – Conservation First is Ontario's policy that makes conservation the first resource considered, wherever cost-effective, in planning to meet the province's energy needs.

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

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

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

Distributed Generation (also known as Embedded Generation) – Electricity produced by small, decentralized generators, such as wind turbines and solar panels.

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

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

Energy Storage – Equipment or technology that is capable of withdrawing electrical energy from the grid for the purposes of re-injecting it back into the grid; storing it as another form of energy to offset electricity demand at a later time; or for converting and storing electricity as an alternative form of energy for secondary, non-electric uses.

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).

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Global Adjustment (GA) – The GA is the difference between the total payments made to certain contracted or regulated generators and demand management projects, and market revenues. The GA serves a number of functions in Ontario's electricity system: it provides more stable electricity prices for Ontario's consumers and generators; it maintains a reliable energy supply; and it recovers costs associated with conservation initiatives that benefit all Ontarians. The GA is calculated each month by taking into account the following components: generation contracts administered by the Ontario Electricity Financial Corporation; OPG's nuclear and baseload hydroelectric generation; and IESO contracts with generators and suppliers of conservation services.

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

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

In-Front-of-the-Meter Technologies – A range of technologies that are deployed on distribution networks or transmission networks. Examples include technologies that reduce line losses and optimize voltage levels.

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 delivers key services across the electricity sector including: managing the power system in real-time, planning for the province's future energy needs, enabling conservation and designing a more efficient electricity marketplace to support sector evolution.

Independent Power Authority – An unlicensed LDC that serves one of 10 First Nation communities in Northwestern Ontario.

Kilovolt (KV) – One thousand volts.

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

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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 linking smaller sources of electricity with nearby uses such as homes, businesses and institutions. In the event of a failure of the larger network, a microgrid can seal itself off and continue to provide power locally.

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

Net Metering – A billing arrangement allowing customers to generate their own electricity on site for their personal use and receive bill credits for any extra 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 OEB is the independent agency that regulates Ontario's electricity and natural gas sectors in the public interest.

Pumped Storage – A form of energy storage that uses electricity to pump water from a lower reservoir to a higher reservoir. When required, the water in the upper reservoir can be returned through turbines to the lower reservoir to generate electricity.

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

Terawatt-Hours (TWh) – One billion kilowatts of electricity used for one hour.

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

Virtual Net Metering – A billing arrangement allowing customers 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. The electricity conveyed into the grid from the renewable energy system creates bill credits which can be used by one or more participating customers to offset charges on their electricity bills.

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

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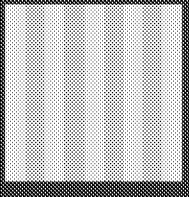
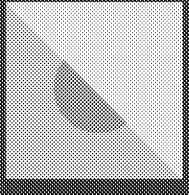
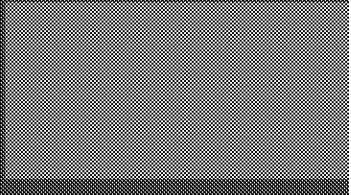
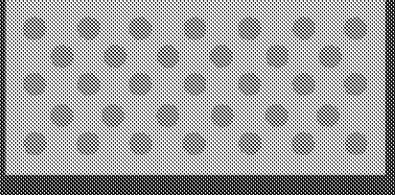
ONTARIO'S LONG-TERM ENERGY PLAN 2017

Delivering Fairness and Choice









© Queen's Printer for Ontario, 2017

Published by the Ministry of Energy

ISBN 978-1-4868-0734-5 Print
ISBN 978-1-4868-0735-2 PDF
ISBN 978-1-4868-0736-9 Digital PDF

Ontario