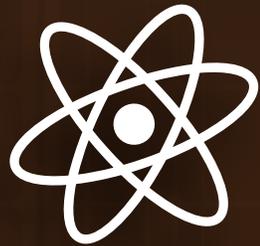




Achieving Balance

Ontario's Long-Term
Energy Plan





ACHIEVING BALANCE Minister's Message

Ontario has come a long way since 2003, when we were faced with aging energy infrastructure, a shortage of supply and a system that relied on expensive imports and dirty coal.

Our government has made significant progress transforming our electricity system into one that Ontarians can count on.

To build and maintain a clean, reliable and affordable electricity system, more than \$11 billion has been invested in transmission and distribution networks by Hydro One alone since 2003. This investment has contributed to the province's annual gross domestic product (GDP) by an average of \$835 million and supported 8,000 direct and indirect jobs. Beyond that, Ontario's other distributors have invested a further \$8 billion since 2003. Also, more than \$21 billion has been invested in cleaner generation. Ontario has virtually eliminated coal from our electricity system, with the last plant to close in 2014. The phase out of coal is the single largest climate change initiative in North America. Coal use had accounted for \$4.4 billion per year in financial, health and environmental costs.

Today, Ontario is a world leader in energy technology, innovation and smart grid solutions. Smart meters and consumer demand response programs are allowing ratepayers to control and understand their electricity consumption better while additional smart grid technologies are being used by utilities to operate an advanced, more efficient and modern grid. All told, our investments are making Ontario's grid modern, clean and reliable and a foundation for future growth and prosperity.

Ontario's energy use has changed substantially in the last decade. As our economy continues to grow, our homes, businesses and industries are becoming more efficient. Our demand projections have been updated to reflect this new reality and to address areas of growth around the province.

This review of the Long-Term Energy Plan was the most comprehensive consultation and engagement process the Ministry of Energy has ever undertaken. Sessions were held online and around the province with municipalities, Aboriginal communities, stakeholders and the public. This process informed the direction of the Long-Term Energy Plan and we will make continued engagement a priority.

Communities must be allowed to take a more central role when implementing provincial policy objectives. The opportunity for communities to participate in energy infrastructure must be balanced with their responsibility to take ownership of local decisions.

Ontario has adopted a policy of Conservation First, focusing on rate mitigation over major investments in generation or transmission to curb costs for ratepayers. This will mean pursuing lower-cost options to meet energy needs when and where we need it.

The Long-Term Energy Plan will be flexible; Ontario will plan for a lower demand scenario, with the ability to adjust to potential demand changes. For that reason, an annual Ontario Energy Report will be issued to provide an outline of how supply and demand are tracking and also to review progress in implementing the Long-Term Energy Plan.

A major advantage of Ontario's supply mix is the diversity of our generation, which includes solar, wind, natural gas, nuclear, combined heat and power, bioenergy, hydroelectric and waste to energy. Rate mitigation will be top of mind as we leverage this diversity to maximize value for ratepayers.

Ontario will continue to invest in new renewable generation, and explore flexible options such as storage technologies by applying balanced planning principles in a measured and sustainable way.

Nuclear generation will continue to be the backbone of Ontario's supply, and we have confirmed our commitment to nuclear with the refurbishment of the Bruce and Darlington sites. Due to the strong supply situation, we have deferred the construction of new nuclear generating units.

Finally, we will work with our agencies and the province's local distribution companies to ensure they operate more efficiently and produce savings that will benefit Ontario's ratepayers.

This updated Long-Term Energy Plan will encourage conservation, and provide the clean, reliable and affordable energy Ontario will need now and into the future. Our plan will build on our past accomplishments, and achieve a better balance.

Bob Chiarelli
Minister of Energy
December 2013

Executive Summary

Ontarians are benefitting from a clean, reliable and affordable energy system.

By the end of 2014, Ontario will be coal free. At the same time, increased energy efficiency and the changing shape of Ontario's economy have reduced the demand for electricity.

Ontario is currently in a strong supply situation and has time to consider how to address future needs. Ontario is committing the resources to meet electricity demand growth that will be lower than anticipated as the economy continues its transition to an efficient, lower energy intensive future. We are ensuring we have the supply to meet the likely demand, and are keeping options open to meet higher demand if needed. We will report annually on the outlook for supply and demand. This will give us the opportunity to make adjustments so we can be both prudent and flexible in our energy investments.

The 2013 Long-Term Energy Plan (LTEP) takes a pragmatic approach. The plan is designed to balance the following five principles: cost-effectiveness, reliability, clean energy, community engagement and an emphasis on conservation and demand management before building new generation.

The 2013 LTEP, by taking a pragmatic and flexible approach and balancing these five principles, builds on the foundation laid in the 2010 LTEP while also lowering the projected total system costs. The key elements of the 2013 LTEP include:

Conservation First

- The Ministry of Energy will work with its agencies to ensure they put conservation first in their planning, approval and procurement processes. The ministry will also work with the Ontario Energy Board (OEB) to incorporate the policy of conservation first into distributor planning processes for both electricity and natural gas utilities.
- The province expects to offset almost all of the growth in electricity demand to 2032 by using programs and improved codes and standards. This will lessen the need for new supply. Our long-term conservation target of 30 terawatt-hours (TWh) in 2032 represents a 16% reduction in the forecast gross demand for electricity, an improvement over the 2010 LTEP.
- Ontario is aiming to use Demand Response (DR) to meet 10% of peak demand by 2025, equivalent to approximately 2,400 megawatts (MW) under forecast conditions. To encourage further development of DR in Ontario, the Independent Electricity System Operator (IESO) will evolve existing DR programs and introduce new DR initiatives.

- The IESO will continue to examine and consult on the potential benefits and development of a capacity market, where different generation and demand resources compete to address capacity needs.
- The government is committed to promoting a co-ordinated approach to conservation and will encourage collaboration of conservation efforts among electricity and natural gas utilities.
- The government will work to make new financing tools available to consumers starting in 2015, including on-bill financing for energy efficiency retrofits.
- To help consumers choose the most efficient products for their homes and businesses, Ontario will provide information and incentives; it will also continue to show leadership in establishing minimum efficiency requirements for products such as water heaters, clothes dryers, televisions, fluorescent lamps, motors and boilers.
- The Green Button Initiative will give consumers access to their energy data and the ability to connect to mobile and web-based applications so they can analyze and manage their energy use.
- Social benchmarking can increase awareness of energy use and promote conservation. A social benchmarking pilot program is under way, led by the Ontario Power Authority (OPA) to test different approaches that enable consumers to compare their energy consumption with other similar consumers. Pending the success of the pilot program, the government will explore expanding social benchmarking and including other sectors.
- The government is also working with Ontario EcoSchools to bring more resources about energy conservation to the curriculum for students and teachers.

Annual Reporting

- An annual Ontario Energy Report will be issued to update the public on changing supply and demand conditions, and to outline the progress to date on the LTEP.

Nuclear

- Ontario will not proceed at this time with the construction of two new nuclear reactors at the Darlington Generating Station. However, the Ministry of Energy will work with Ontario Power Generation (OPG) to maintain the site licence granted by the Canadian Nuclear Safety Commission (CNSC).
- Nuclear refurbishment is planned to begin at both Darlington and Bruce Generating Stations in 2016.
- During refurbishment, both OPG and Bruce Power will be subject to the strictest possible oversight to ensure safety, reliable supply and value for ratepayers.
- Nuclear refurbishment will follow seven principles established by the government, including minimizing commercial risk to the government and the ratepayer, and ensuring that operators and contractors are accountable for refurbishment costs and schedules.
- The Pickering Generating Station is expected to be in service until 2020. An earlier shutdown of the Pickering units may be possible depending on projected demand going forward, the progress of the fleet refurbishment program, and the timely completion of the Clarington Transformer Station.
- Ontario will support the export of our home-grown nuclear industry expertise, products and services to international markets.

Renewable Energy

- By 2025, 20,000 MW of renewable energy will be online, representing about half of Ontario's installed capacity.
- Ontario will phase in wind, solar and bioenergy over a longer period than contemplated in the 2010 LTEP, with 10,700 MW online by 2021.
- Ontario will add to the hydroelectricity target, increasing the province's portfolio to 9,300 MW by 2025.
- Recognizing that bioenergy facilities can provide flexible power supply and support local jobs in forestry and agriculture, Ontario will include opportunities to procure additional bioenergy as part of the new competitive process.
- Ontario will review targets for wind, solar, bioenergy and hydroelectricity annually as part of the Ontario Energy Report.
- The Ministry of Energy and the OPA are developing a new competitive procurement process for future renewable energy projects larger than 500 kilowatts (kW), which will take into account local needs and considerations. The ministry will seek to launch this procurement process in early 2014.
- Ontario will examine the potential for the microFIT program to evolve from a generation purchasing program to a net metering program.

Natural Gas/Combined Heat and Power

- Natural gas-fired generation will be used flexibly to respond to changes in provincial supply and demand and to support the operation of the system.
- The OPA will undertake targeted procurements for Combined Heat and Power (CHP) projects that focus on efficiency or regional capacity needs, including a new program targeting greenhouse operations, agri-food and district energy.

Clean Imports

- Ontario will consider opportunities for clean imports from other jurisdictions when such imports would have system benefits and are cost effective for Ontario ratepayers.

Rate Mitigation and Efficiencies

- The 2013 LTEP cost and price forecasts are lower than previously forecast in 2010.
- Significant ratepayer savings will be realized as a result of reduced Feed-in Tariff (FIT) prices, the ability to dispatch wind generation, the amended Green Energy Investment Agreement, and the decision to defer new nuclear.
- The government will continue to work with its agencies—Hydro One, OPG, the IESO, the OPA and the OEB—to develop business plans and efficiency targets that will reduce agency costs and result in significant ratepayer savings.
- The government will encourage OPG and Hydro One to explore new business lines and opportunities inside and outside Ontario. These opportunities will help leverage existing areas of expertise and grow revenues for the benefit of Ontarians.
- The Distribution Sector Review Panel, which delivered its report in late 2012, identified the potential for significant savings among the province's Local Distribution Companies (LDCs). The government expects that LDCs will pursue innovative partnerships and transformative initiatives that will result in electricity ratepayer savings.
- The government will look closely at key features of the OEB's new regulatory framework for LDCs such as the Scorecard, which will report annually on key LDC performance metrics, to develop further distribution sector policy options.

Enhanced Regional Planning

- The government will implement the IESO and the OPA recommendations for regional planning and the siting of large energy infrastructure.
- The ministry, the IESO and the OPA will work with municipal partners to ensure early and meaningful involvement in energy planning.
- Municipalities and Aboriginal communities will be encouraged to develop their own community-level energy plans to identify conservation opportunities and infrastructure priorities. The Municipal Energy Plan Program and the Aboriginal Community Energy Plan Program will support these efforts.

- Regional plans will promote the principle of Conservation First while also considering other cost-effective solutions such as new supply, transmission and distribution investments.

Transmission Enhancements

- Hydro One will be expected to begin planning for a new Northwest Bulk Transmission Line to increase supply and reliability to the area west of Thunder Bay. The area faces growth in demand, some of which is beyond what today's system can supply. Hydro One and Infrastructure Ontario will be expected to work together to explore ways to ensure cost-effective procurement related to the line.
- Connecting remote northwestern First Nation communities is a priority for Ontario. Ontario will continue to work with the federal government to connect remote First Nation communities to the electricity grid or explore on-site alternatives for the few remaining communities where there may be more cost-effective solutions to reduce diesel use.
- All regions of the province can expect timely local transmission enhancements as needs emerge. Upgrades and investments will meet system goals, such as maintaining or improving reliability or providing the infrastructure necessary to support growth.

Aboriginal Engagement

- The government understands the importance of First Nation and Métis participation in the development of energy and conservation projects. The government will continue to review participation programs to ensure they provide opportunities for First Nation and Métis communities.
- Ontario will launch an Aboriginal Transmission Fund in early 2014 to facilitate First Nation and Métis participation in transmission projects.
- The province expects that companies looking to develop new transmission lines will, in addition to fulfilling consultation obligations, involve potentially affected First Nation and Métis communities, where commercially feasible and where there is an interest.

- The government will continue to encourage Aboriginal participation, including through the FIT program and future large renewable energy procurements, in a way that reflects the unique circumstances of the First Nation and Métis communities.

Energy Innovation

- Ontario's energy sector is an innovation leader. The government will seek to expand the Smart Grid Fund and build on previous success. The Smart Grid Fund has created more than 600 jobs and supported 11 projects developing innovative technologies.
- The government intends to initiate work, on a priority basis, to address regulatory barriers that limit the ability of energy storage technologies to compete in Ontario's electricity market.
- By the end of 2014, the government will include storage technologies in our procurement process, starting with 50 MW and assessing additional engagement on an ongoing basis.
- The new competitive procurement process for renewable energy projects larger than 500 kW will also provide an opportunity to consider proposals that integrate energy storage with renewable energy generation.

Oil and Natural Gas

- Ontario relies on oil and natural gas to support basic needs such as heat and transportation. These fuels are also essential to Ontario's economy and quality of life.
- The government will work with gas distributors and municipalities to pursue options to expand natural gas infrastructure to service more communities in rural and northern Ontario.
- Ontario has adopted principles it will use to review large scale pipeline projects to ensure that they meet the highest environmental and safety standards as well as benefit Ontario's economy.

1



Where We Are Now

Ontario can be proud of what it has accomplished in energy in the past decade. The elimination of coal-fired electricity generation is the single largest greenhouse gas reduction measure in North America. This is helping to improve Ontarians' health, environment and quality of life.

Last year, coal accounted for less than 3% of total generation, and Ontario will be coal free by the end of 2014. This is a big change from a decade ago, when coal-fired generation provided 25% of Ontario's electricity supply. This has produced a real improvement in air quality in Ontario. Since 2003, the emissions of sulphur dioxide coming from coal-fired

generation in the electricity sector have dropped by 93%, there has been a 90% reduction in nitrogen oxides, and mercury levels are at their lowest in 45 years. Greenhouse gas emissions have been reduced by almost 90%.

The province now has a reliable foundation on which to build. In 2004, Ontario's supply outlook

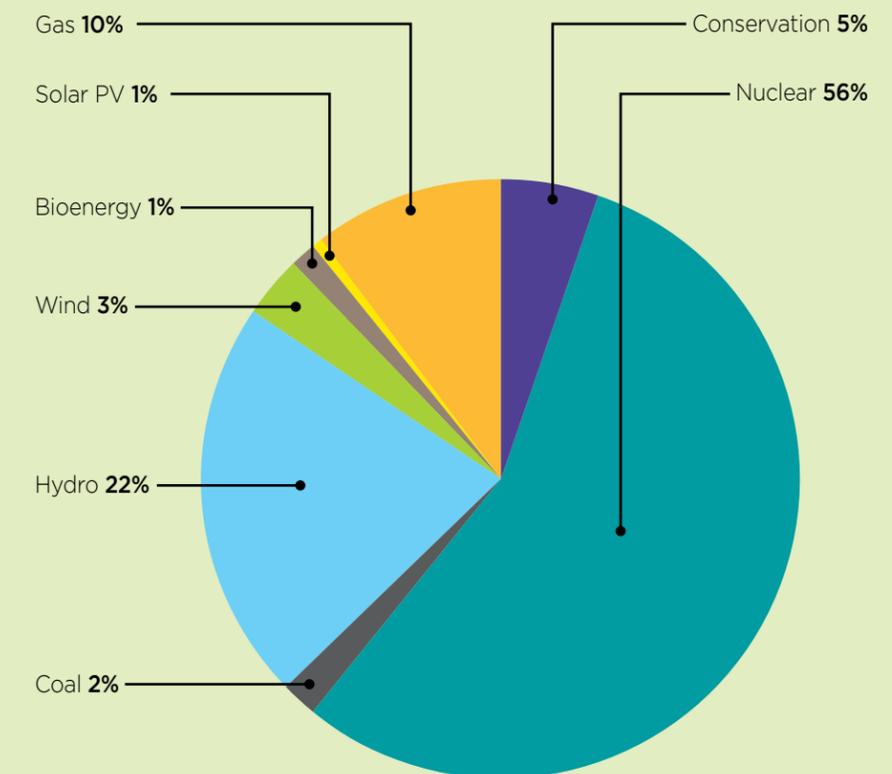
was not sufficient to meet North American reliability standards. Today's margins are above required levels. This reflects the strong supply of electricity the province is enjoying. Ontario has gone from a deficit of 3,800 MW in 2003 to a comfortable surplus in 2013.

Figure 1 shows the current supply mix (generation and conservation) on which Ontarians rely.

Ontario is in a strong supply position and is benefitting from a decade of investments in conservation, generation, transmission and distribution.

- The province has added about 12,000 MW of new and refurbished generation since 2003 – enough electricity to power both the Greater Toronto Area and the City of Ottawa. Wind-powered generation now provides more electricity than coal-fired generation.

Figure 1: Ontario's Electricity Production and Conservation, 2013 (TWh)



Source	Energy Production and Conservation (TWh)
Conservation	8.6
Gas	16.6
Solar PV	1.0
Bioenergy	2.0
Wind	5.4
Hydro	35.5
Nuclear	90.8
Coal	3.0
Total	162.9

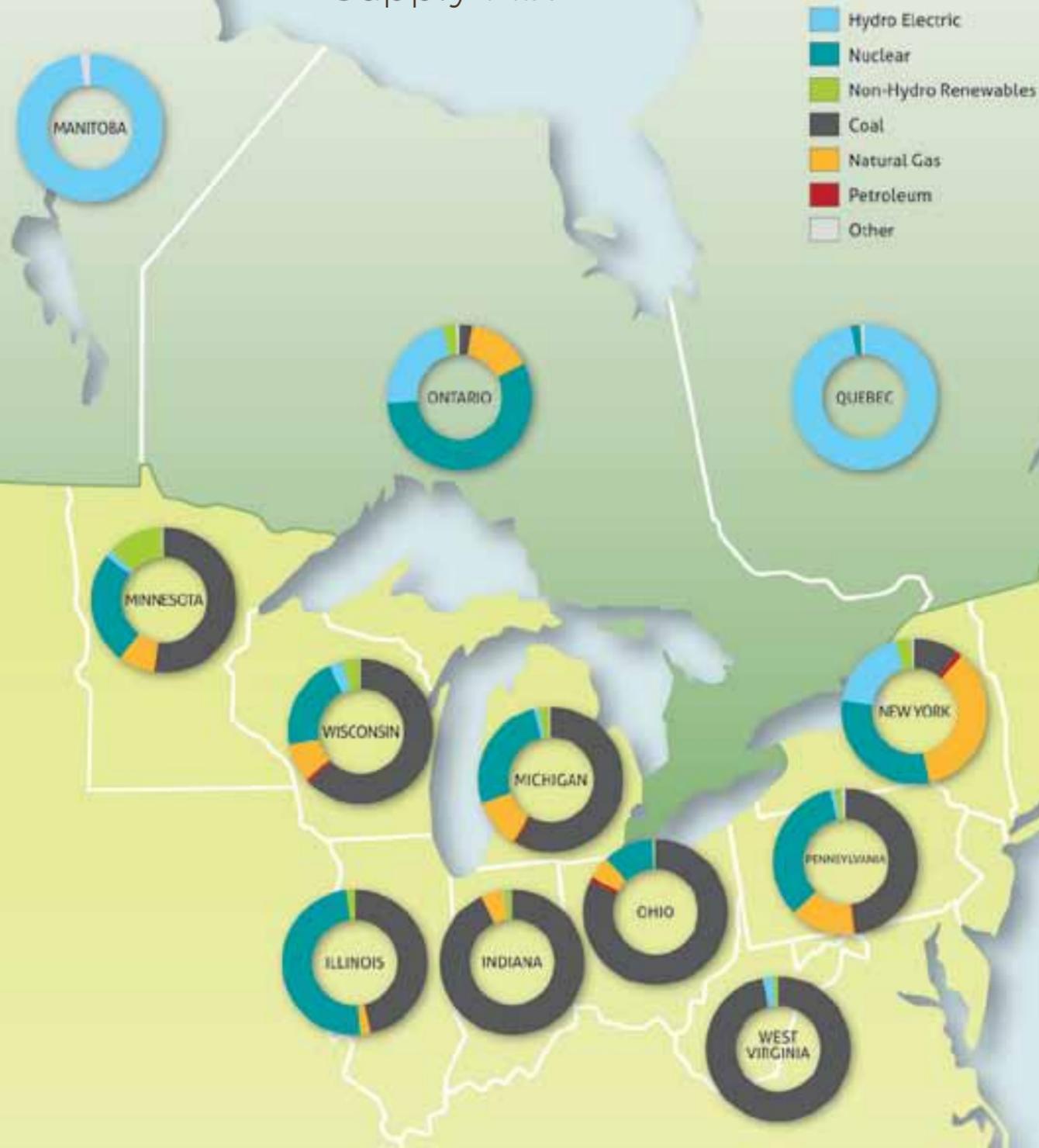
Source: Ontario Power Authority, November 2013

Note: Numbers represent actual production up to October 2013 and forecast for November and December.

Conservation values represent actual verified results to 2012 and forecast for 2013.

Figure 1 does not include diesel fuel. In 2013, diesel fuel is expected to generate about 0.1 TWh of electricity in remote First Nation communities in northwestern Ontario.

Figure 2: Ontario's Clean Supply Mix



Note: Supply mix data of the US states is from 2010, Manitoba and Quebec from 2011, Ontario from 2012.

- From 2005 to the end of 2013, it is projected that Ontarians will have conserved 8.6 TWh of electricity — enough to power a city about the size of Mississauga.
- Water is now flowing through the third tunnel at Niagara Falls, producing enough electricity to power 160,000 homes, or a city the size of Barrie.
- The Lower Mattagami project will add almost 440 MW of new hydroelectric capacity when completed. Construction on the project is currently underway, and about 1,600 workers are employed, including more than 250 First Nation and Métis individuals. This \$2.6-billion investment in Northern Ontario will upgrade four generating stations located about 70 km northeast of Kapuskasing.
- More than 35 First Nation and Métis communities are involved in wind, solar and hydroelectric projects. They are participating in 239 projects, representing over 1,000 MW of clean electricity.
- Since 2003, Hydro One has upgraded more than 10,000 km of its transmission and distribution lines. That is equivalent to a round trip from Montreal to Vancouver. These investments have contributed to increasing the province's transmission capacity by about 10,000 MW.

These accomplishments have produced a cleaner electricity system than those of our neighbours in the United States. We have done this without the abundant supply of hydroelectric resources enjoyed by Manitoba and Quebec.

As we look to the future, we must acknowledge that forecasting is not an exact science. In the 2010 LTEP, the government developed its plans to accommodate a moderate amount of growth in the demand for electricity. However, events since 2010 demonstrate why plans should be flexible to meet changing conditions.

In the past few years, demand for electricity in Ontario has declined because of across-the-board reductions by the average household, business and industrial user; changes in the composition of Ontario's industrial sector; notable increases in the efficiency of energy use; and savings from conservation programs.

The future promises to be less energy-intensive than the past, because the demand for energy is no longer as closely linked to economic growth, due to improvements in residential, commercial and industrial electricity intensity. While economic activity is increasing as the recovery takes hold, the demand for electricity continues to be relatively flat, and is expected to remain so for the next decade. This is certainly a welcome development because while economic growth continues to be positive and productivity increases, demand for electricity remains flat.

The energy profile of the Ontario economy has changed for a variety of reasons. In 2005, the five largest industrial sectors of transmission-connected electricity consumption (pulp and paper, mining, iron and steel manufacturing, petroleum products and auto manufacturing) accounted for 12% of total electricity consumption in the province. By

2012, this share had fallen to 9%, for a total decline of 5.5 million kWh, roughly the equivalent of the annual production from one of Ontario's nuclear units.

There was new growth as well. Low electricity demand no longer means low economic growth. Recent gains in energy efficiency and improvements in commercial and industrial electricity intensity have reduced the system costs associated with economic growth. As we continue to support a growing economy with less energy, Ontario's net economic productivity will increase. In the past decade, Ontario has seen a burgeoning advanced technology sector that holds much promise for the future growth of the provincial economy. These new industries require less energy to produce goods and support jobs.

Energy efficiency has also reduced demand. Ontario's Building Code has been updated, requiring the construction of more energy-efficient homes, offices and industrial facilities. At the same time, homeowners and businesses are buying more energy-efficient products, as they replace their existing equipment, technology and appliances.

It is clear that we need to prepare for an energy-efficient future in Ontario. That's why Ontario is committing resources to meet a lower-demand forecast while maintaining flexibility to respond to higher needs. In the future, a new annual energy reporting process will help us identify changes in demand and plan prudently for more resources if and when they are needed.

Figure 3: Residential Electricity Intensity*
Households are becoming more efficient

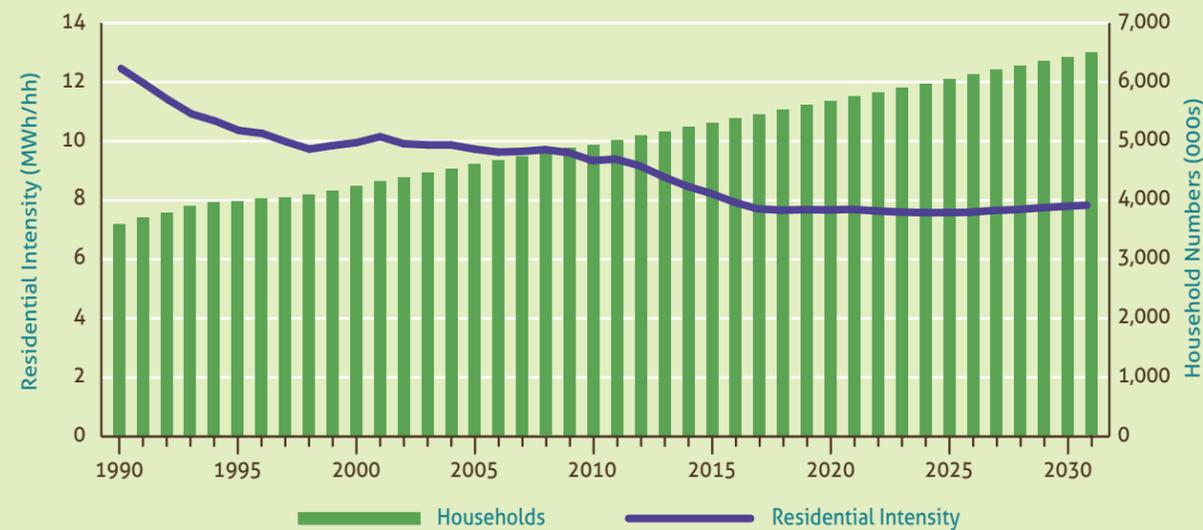
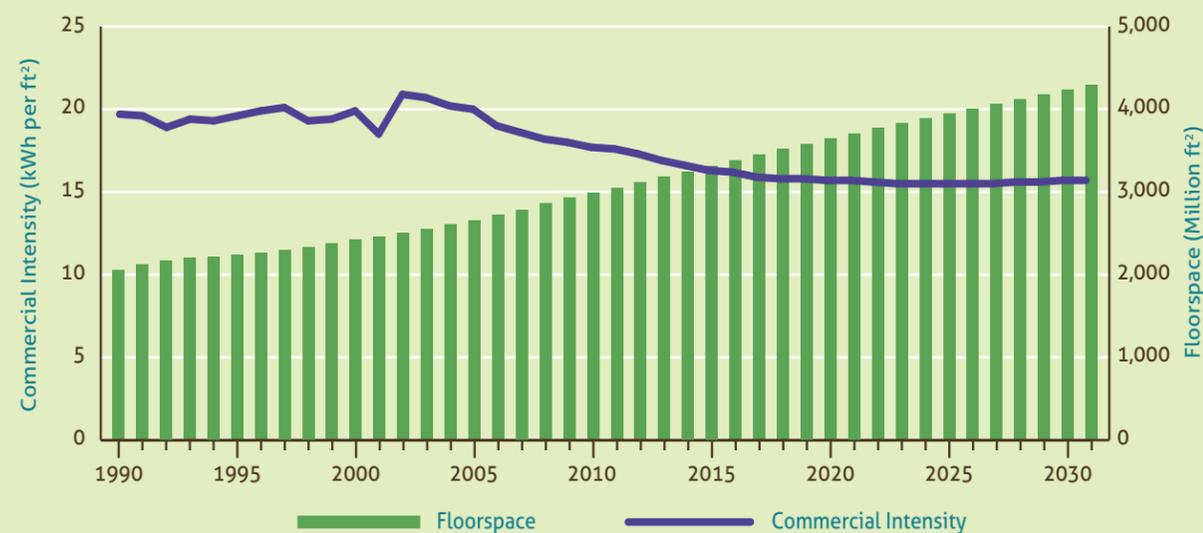


Figure 5: Industrial Electricity Intensity*
Industries require less energy to produce goods and support jobs



*Source: NRCan 1990-2004, OPA from 2004 onwards.
Note: Intensity based on gross demand forecast. Opportunity for planned conservation initiatives would further reduce electricity intensity.

Figure 4: Commercial Electricity Intensity*
Businesses are becoming more efficient



MANAGING ELECTRICITY COSTS

The government introduced the Ontario Clean Energy Benefit (OCEB), which gives residential customers, small businesses and farms a 10% reduction on their electricity bills for the first 3,000 kWh they use every month until the end of 2015. Beyond 2015, the OCEB program's future would require legislative changes and would need to take into account a number of factors including the province's fiscal position.

The government is committed to ensuring that where possible and appropriate, industrial electricity rate mitigation programs can help support a dynamic and innovative climate for business to thrive, grow and create jobs.

Northern Industrial Electricity Rate (NIER) Program

The province has extended the NIER program to 2016 to support continued growth and development in the northern resource and manufacturing sector. Originally set to end in 2013, the \$360-million program extension (\$120 million per year) provides electricity price rebates of 2 cents per kWh to qualified large northern industrial consumers. This represents about a 25% reduction in electricity prices and helps qualified facilities that commit to an energy management plan.

Industrial Electricity Incentive (IEI) Program

This program assists in the management of electricity demand by encouraging increased industrial production.

Eligible companies in the manufacturing and resource-extraction sectors can qualify for a reduced electricity rate for bringing new investment and employment opportunities to the province. The benefits of incremental industrial electricity demand to the electricity system include reduced surplus energy volumes. The IEI program offers up to 5 TWh of annual electricity consumption, and is currently allocated in two distinct streams:

- Stream 1 is capped at 3 TWh and is for industrial consumers willing to operate a facility and undertake a large capital investment in technologies, products or processes that are not currently being used or produced in Ontario.
- Stream 2 is capped at 2 TWh and is for current consumers that will expand their existing, or build a new, industrial facility.



The government will actively pursue opportunities to broaden this program, based on updated supply forecasts to align with the power needs of industry looking to make investments in Ontario. The government will seek to open a new program intake window in 2014.

Industrial Conservation Initiative

This initiative helps the province's largest industrial and manufacturing facilities reduce their electricity consumption during peak periods, lower their costs and increase competitiveness. Charging the Global Adjustment (GA) based on peak demand is a form of demand response that incents Ontario's largest customers to shift their consumption away from peak periods thereby improving reliability and lowering system costs. About 200 of Ontario's largest energy consumers are part of this initiative.

This contributed to industrial rates for large users (more than 5 MW) being on average 25% lower in 2012 than those forecast in the 2010 LTEP.

Industrial Accelerator Program

The Industrial Accelerator Program is run by the OPA and helps transmission-connected electricity users fast-track capital investment in major energy-efficiency projects.

The program provides attractive financial incentives to encourage investment in innovative process changes and equipment retrofits so that the rate of return is competitive with other capital projects. In exchange, participants will commit under contract to deliver specific conservation savings within a set period of time and to maintain them over the expected life of the project.

Global Adjustment Review

The IESO is undertaking an independent review of the GA to examine the possibility of greater responsiveness from customers. Stakeholders have been consulted to ensure that the approach and analysis in this review are comprehensive. The IESO will publish a report on its findings.

ADDITIONAL MEASURES: ELECTRICITY RATE MITIGATION AND SECTOR EFFICIENCY

Currently in Ontario, the electricity system costs about \$18 billion per year to operate. That makes it essential for all the players in the sector—agencies, generators, transmitters, distributors and the like—to operate as efficiently as possible.

Reducing future capital investments will mitigate upward pressure on rates. The province has undertaken a wide range of initiatives to help reduce electricity rates outlined below.

Amending the Green Energy Investment Agreement

The province, in collaboration with the Korean Consortium, revised provisions of the Green Energy Investment Agreement (GEIA). The revised GEIA reduces contract costs by \$3.7 billion, assures continued clean energy investment by the Korean Consortium, and protects existing job commitments to 2015, while adding a commitment to job creation that extends to 2016.

Feed-in Tariff Program (FIT) Prices

The OPA achieved further cost savings with a significant reduction in the purchase price of

renewable electricity in new FIT contracts. The lower FIT prices have reflected the reduction of domestic content requirements and a reduction in technology prices, saving \$1.9 billion.

Non-Utility Generators (NUG) Negotiations

The government has directed the OPA to negotiate new contracts with the province's thermal non-utility generators (NUGs) as they expire, only if the new contracts result in cost and reliability benefits for Ontario's electricity consumers. The new contract structure will reduce NUG costs and greatly reduce NUGs' contribution to surplus baseload generation.

Sector Efficiencies

Over the past three years, Hydro One and OPG have achieved efficiency savings of approximately \$500 million. These are driven by transformative initiatives that are

tailored to the needs and realities of each organization. For example, OPG has increased productivity by centralizing and streamlining corporate and support functions. Hydro One has improved the efficiency of its operations as a result of investments in intelligence tools designed to augment the availability and performance of its key assets.

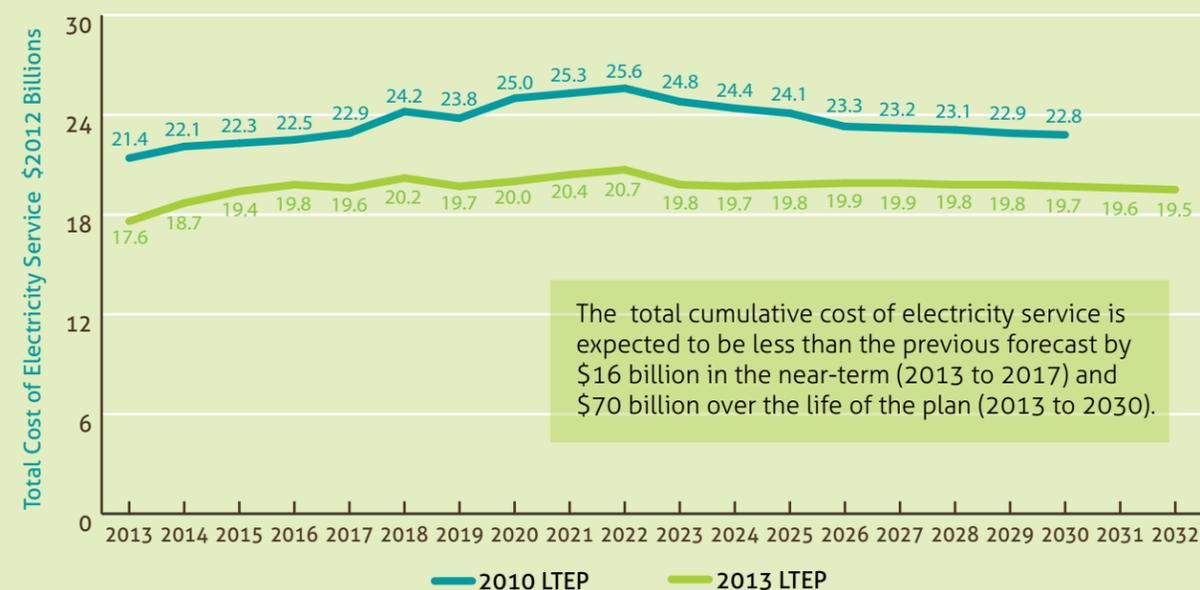
Wind Dispatch

The IESO has brought in new rules to allow transmission-connected wind generation to be dispatched when the system does not require it. This could save ratepayers up to \$200 million per year. In addition, related OPA contract amendments could save ratepayers up to \$65 million over the next five years.

Deferral of New Nuclear

Due to lower forecast demand growth, the government recently announced that the construction

Figure 6: Total Cost of Electricity Service Forecast





of two new nuclear units at OPG's Darlington site will be deferred. This represents up to \$15 billion in capital investments that are not currently required.

Early Coal Closure

In early 2013, Ontario announced it would cease coal-fired generation at the Lambton and Nanticoke plants by the end of 2013, one year earlier than previously planned. Ratepayers will save \$95 million with the early closure of these stations. Savings will arise from reduced maintenance and project costs.

The work to mitigate electricity rate increases and secure efficiencies in the electricity sector will not end there:

- The government will encourage OPG and Hydro One to explore new business lines and opportunities inside and outside Ontario. These opportunities would allow OPG and Hydro One to leverage their existing areas of expertise and grow revenues for the benefit of Ontarians.

- The government will also work with its energy agencies to develop efficiency targets, reduce costs and save money for ratepayers. For example, over a five-year period, ratepayers could expect to save close to \$400 million if energy agencies were to reduce their operations, maintenance and administration expenses by 2%.
- Since distribution costs play an important part in consumers' electricity bills, the government established the Distribution Sector Review Panel. The panel, which delivered its report in late 2012, identified the potential for significant savings and recommended the consolidation of the province's LDCs. As a result, the government expects that LDCs will pursue innovative partnerships and transformative initiatives to drive efficiencies that will result in ratepayer savings.

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

- The OEB is currently implementing a renewed regulatory framework for the electricity distribution sector. This framework is expected to set performance outcomes that improve productivity and drive efficient investment in the distribution sector. As this is implemented, the government will look closely at some of its key features, such as the Scorecard, to develop further distribution sector policy options. The Scorecard will help measure performance; distributors will be required to report their progress annually based on key performance outcomes such as customer service, operational effectiveness, public policy responsiveness and financial performance.

2013 LTEP COST AND PRICE FORECASTS

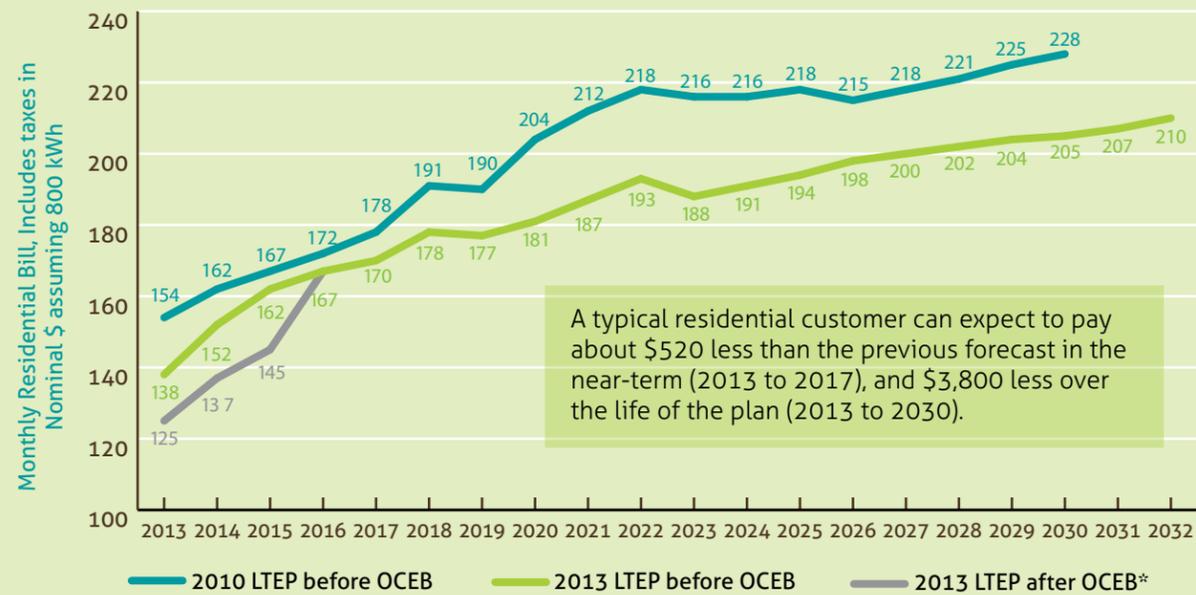
Since the 2010 LTEP, electricity prices have not increased as much as they were forecast to at that time.

Figures 6, 7 and 8 illustrate the 2013 LTEP forecasts for the total cost of electricity service, for a typical monthly residential bill, and for industrial electricity prices. These forecasts are based on the 2013 LTEP conservation and supply mix elements, including Conservation First and DR targets, anticipated demand, renewable targets and planned nuclear refurbishments as well as the other elements described throughout this document.

Overall electricity costs show a decrease from the 2010 projections for all years, based on several factors, including lower demand forecasts and the various rate mitigation measures enacted by government, described in the previous section. Recent decisions, such as the deferral of new nuclear and the reduction in FIT contract pricing, as well as an emphasis on conservation, are responsible for the significantly lower projections after 2018. Containing costs and mitigating rate increases will continue to be a priority as the 2013 LTEP is implemented. Since the 2010 LTEP, the Ontario government has taken strong action that has started to mitigate rate increases and decrease the pressure on Ontario electricity consumers.

Rate mitigation measures undertaken by the government, in collaboration with energy agencies as well as private sector partners, result in savings that last over the life of the plan.

Figure 7: Typical Residential Electricity Bill Forecast



* Beyond 2015, the OCEB program's future would require legislative changes and would need to take into account a number of factors including the province's fiscal position.

In Summary

- The 2013 LTEP cost and price forecasts are lower than previously forecast in 2010.
- Significant ratepayer savings will be realized as a result of reduced Feed-in Tariff (FIT) prices, the ability to dispatch wind generation, the amended Green Energy Investment Agreement, and the decision to defer new nuclear.
- The government will continue to work with its agencies — Hydro One, OPG, the IESO, the OPA and the OEB — to develop business plans and efficiency targets that will reduce agency costs and result in significant ratepayer savings.
- The government will encourage Ontario Power Generation and Hydro One to explore new business lines and opportunities inside and outside Ontario. These opportunities will help leverage existing areas of expertise and grow revenues for the benefit of Ontarians.
- The Distribution Sector Review Panel, which delivered its report in late 2012, identified the potential for significant savings among the province's Local Distribution Companies (LDCs). The government expects that LDCs will pursue innovative partnerships and transformative initiatives that will result in electricity ratepayer savings.
- The government will look closely at key features of the OEB's new regulatory framework for LDCs such as the Scorecard, which will report annually on key LDC performance metrics, to develop further distribution sector policy options.
- An annual Ontario Energy Report will be issued to update the public on changing supply and demand conditions, and to outline the progress to date on the LTEP.

Figure 8: Industrial Electricity Price Forecast



* A typical large industrial customer has a demand of 5 MW and a 75% capacity factor.

2



Putting Conservation First

As we plan for Ontario’s electricity needs for the next 20 years, conservation will be the first resource to be considered. It is the cleanest and most cost-effective energy resource, and it offers consumers a way to reduce their electricity bills. The government intends to ensure that conservation will be considered before building new generation and transmission facilities, and will be the preferred choice wherever cost-effective.

The ministry will work with its agencies to ensure that they put conservation first in their planning, approval and procurement processes. The ministry will also work with the OEB to incorporate the policy of Conservation First into distributor planning pro-

cesses for both electricity and natural gas utilities.

Our agencies and partners will achieve this goal with a combination of tools, including the Total Resource Cost Test, the Program Administrator Cost Test and a hurdle rate, to screen program

proposals. A hurdle rate would consider the cost of delivering a conservation program against the avoided cost of procuring supply.

Ontarians are making considerable progress in embracing a culture of conservation. Since 2005, conservation efforts have

increased significantly, and it is projected that by the end of 2013, Ontarians will have conserved 8.6 TWh of electricity — enough to power a city about the size of Mississauga.

The province expects to offset most of the growth in electricity demand to 2032 using programs and improved codes and standards. This will lessen the need for new supply. Our long-term conservation target of 30 TWh in 2032 represents a 16% reduction in forecast gross demand for electricity — the equivalent to more than all the power used by the City of Toronto in 2012 — an improvement over the 2010 LTEP.

Putting conservation first will require a number of changes to our approach. In collaboration with its agencies and partners, the ministry will work on new conservation initiatives, significantly increase Demand Response capability, and give LDCs a greater role and more flexibility to address local conditions.

The government is committed to promoting a co-ordinated approach for all customers, including both electricity and natural gas utilities.

The government will work to make new financing tools available to consumers starting in 2015. These tools will include on-bill financing to help them with the upfront cost of making energy efficiency retrofits to conserve electricity and natural gas. The government has already enabled municipal governments to offer Local Improvement Charges to

recover energy efficiency and renewable energy investments with repayment through property taxes. This allows consumers to save money on their energy bill and pay off conservation investments over time as they receive the benefits of conservation.

To help consumers choose the most efficient products for their homes and businesses, Ontario will provide information and incentives and continue to show leadership in establishing minimum efficiency requirements for products such as water heaters, clothes dryers, televisions, fluorescent lamps, motors and boilers.

The government, its energy agencies and its partners are also developing new ways to get consumers the information they need to make more informed decisions about their energy consumption.

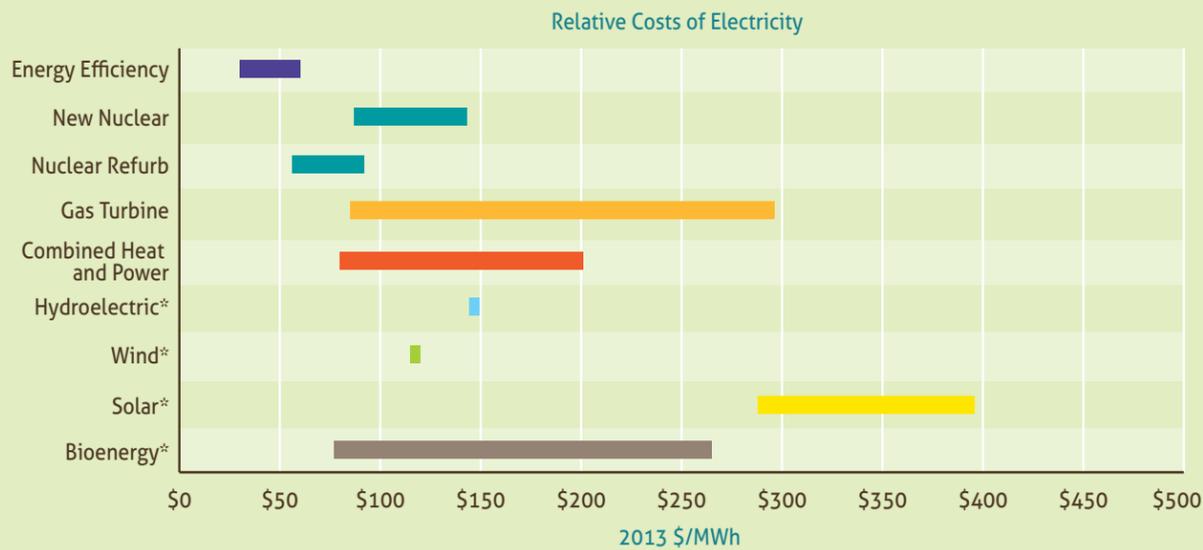
On-Bill Financing



Manitoba Hydro offers a financing program that makes energy efficiency accessible to homeowners. Using on-bill financing, the Power Smart PAYS Financing Program provides Manitoba residential customers with a convenient option for completing energy-efficient upgrades to their homes while keeping the upfront costs and future monthly finance payments as small as possible.

Source: Manitoba Hydro

Figure 9: Generation and Conservation Cost of Options



* Updated for January 2014 Feed-in Tariff prices-

The Green Button Initiative gives consumers access to their energy data and the ability to connect to mobile and web-based applications so they can analyze and manage their energy use. The combination of data and the innovative applications could also guide them in making the investment decisions necessary to improve their energy efficiency.

The government looks forward to releasing the results of the innovative, forward-looking *Energy Apps for Ontario Challenge* in early 2014. This consumer-friendly initiative will enable Ontarians to better manage and track their electricity use and encourage conservation.

Social benchmarking can increase awareness of energy use and promote conservation. A social benchmarking pilot program is under way, led by the OPA, to test

different approaches that enable consumers to compare their energy consumption with other similar consumers. Pending the success of the pilot program, the government will explore expanding social benchmarking.

From the outset, Green Button was designed with privacy and security principles embedded into the standard. Social benchmarking initiatives will also take proactive steps to ensure consumer privacy is protected by embedding privacy directly into the design of technologies, business practices and networked infrastructures.

The government is also working with Ontario EcoSchools to bring more information about energy conservation into classrooms. Ontario EcoSchools uses the local school as an energy education resource, encouraging students to reduce energy use in the

classroom and providing them with skills they can take back home.

Demand Response

Ontarians may not be familiar with the concept of Demand Response (DR), but many practice it every day with their smart meters and time-of-use (TOU) pricing. DR occurs when people and businesses shift electricity use from periods of peak demand to periods of lower demand, or reduce use during peak periods. This helps avoid the cost of building costly generation and transmission to meet a few short periods of peak demand a year.

Ontario consumers can participate in DR programs in several different ways. One program is *peaksaver PLUS*, where homeowners agree to reduce their electricity consumption during critical periods

of peak demand. Another program encourages large commercial and industrial facilities to make firm commitments to reduce energy use during high demand periods. This can mean turning off lights or motors or shifting production to other times of the day.

Ontario is aiming to use DR to meet 10% of peak demand by 2025, equivalent to approximately 2,400 MW under forecast conditions. To encourage further development of DR in Ontario, the IESO will evolve existing programs and introduce new initiatives. This will allow the IESO to work directly with large electricity consumers such as commercial and industrial facilities, and other large facilities that can reduce their electrical consumption on demand in response to system need. The IESO, as the system operator, is in the best position

to enable these large consumers to provide DR to the grid in a manner that puts DR on par with comparable generation options.

Additionally, the IESO will continue to examine and consult on the potential benefits and development of a capacity market, where different generation and demand resources, including electricity storage technologies, conservation initiatives and clean imports compete to address capacity needs.

Conservation and Demand Management Framework

Ontario has achieved a great deal through conservation, but we did not accomplish this alone. LDCs are the face of electricity conservation for most Ontarians, delivering programs to their local communities.

In 2010, the government established a Conservation and Demand Management Framework that included mandatory conservation targets for LDCs. While we've made real progress, full achievement of our goals has been difficult because of reduced opportunities for conservation. This came about because of the decreased demand for electricity and the constrained financial circumstances that made many businesses reluctant to invest in conservation. Challenges associated with the Framework itself, such as a lack of flexibility and slower than expected roll-out of programs, also made it difficult to achieve the conservation targets.

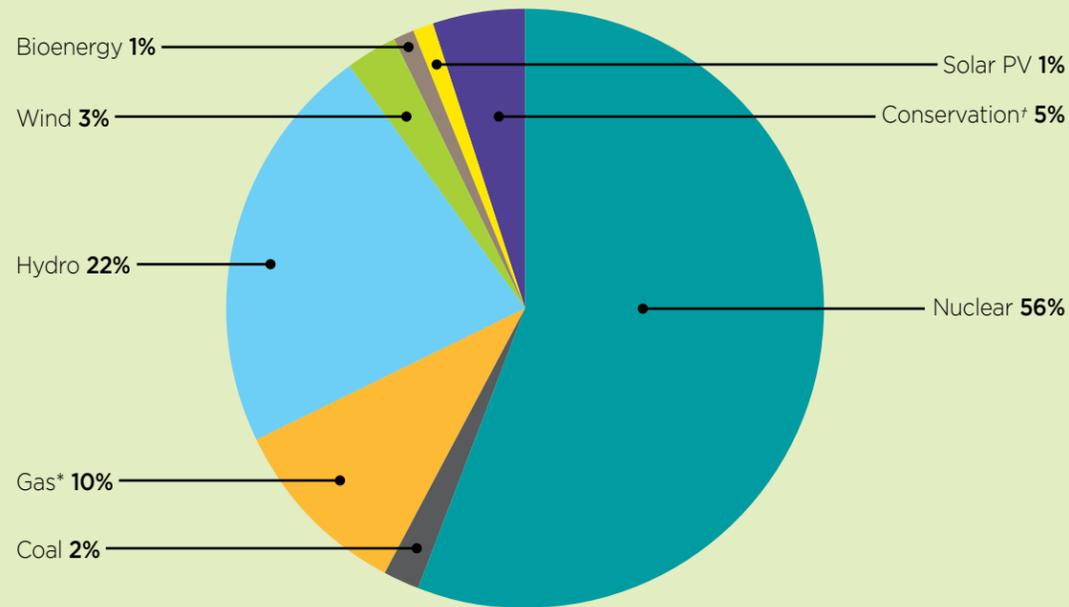
The government, in co-operation with LDCs and energy agencies, is developing a new Conservation and Demand Management Framework to begin in January

Figure 10: THE VALUE OF CONSERVATION

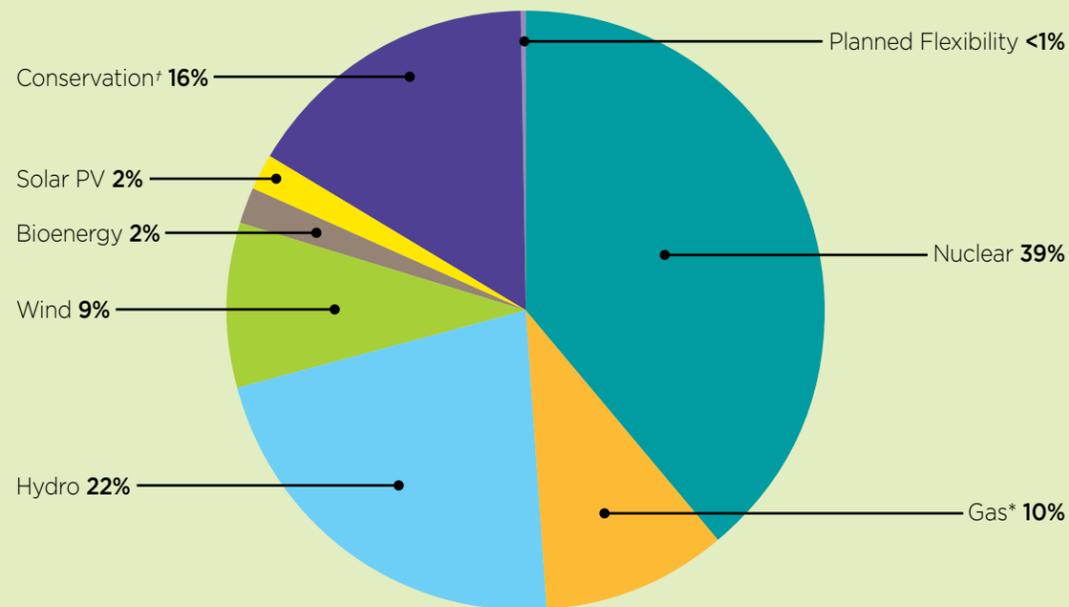


Figure 11: The Role of Conservation is Growing

Forecast Energy Production (TWh) 2013



Forecast Energy Production (TWh) 2032



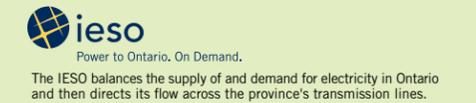
Note: Charts represent total forecast energy production. For comparative purposes, total production has been increased by the amount of energy conserved to demonstrate the role of conservation.

† Conservation is forecast to contribute 30 TWh of energy efficiency in 2032, which is equal to 16% of the forecast gross demand.

* Includes Lennox Generating Station - dual fueled with natural gas and oil.

Figure 12: How Much is a Kilowatt Hour?

Electricity helps us perform everyday tasks such as cooling our homes and cooking meals. Here's a quick guide to what one kilowatt-hour of electricity will do for you:



Brew 90 cups of coffee



Iron 11 shirts



Surf the web for five hours



Blow dry your hair three times



Bake one birthday cake



The typical Ontario household uses between 800 and 1000 kWh a month, often more in the summer when air conditioners are running. You can see changes in the province's demand for electricity throughout the day at the IESO web site at www.ieso.ca

THE SMALL PRINT: Electricity consumption varies by appliance model and use. You can use a plug-in energy meter to find out exactly how much energy your appliances use.

Ontario EcoSchools

Ontario EcoSchools is an environmental education and certification program for grades K-12 that helps school communities develop both ecological literacy and environmental practices to become environmentally responsible citizens and reduce the environmental footprint of schools.

The key areas of focus and achievement are: Teamwork and Leadership, Energy Conservation, Waste Minimization, School Ground Greening, Curriculum, and Environmental Stewardship.

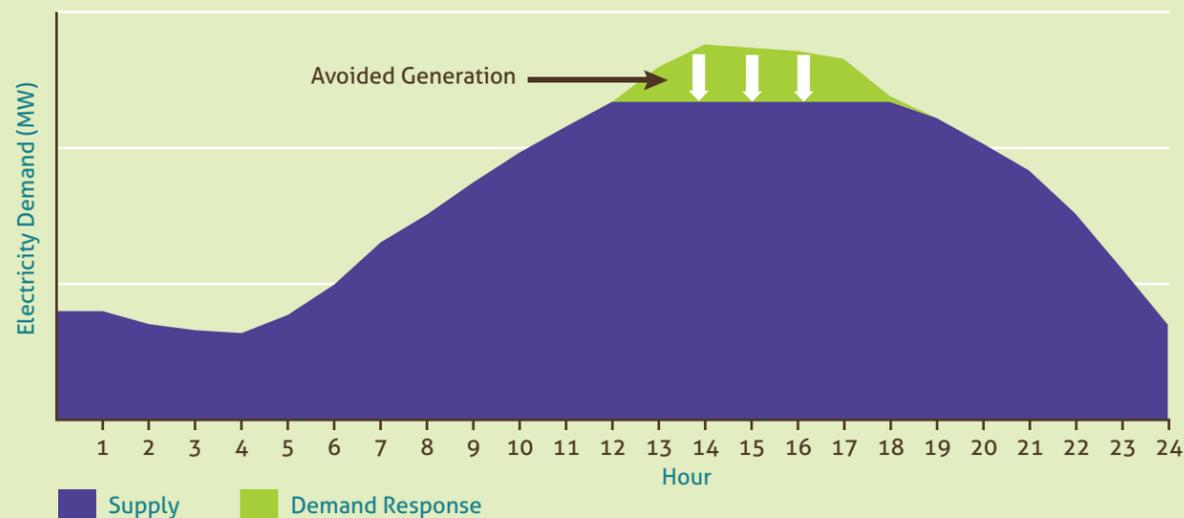
Schools may use the program free of charge.

Source: <http://ontarioecoschools.org/>



Figure 13: Demand Response

Demand Response programs can reduce the need to build costly peaking generation that would only be required during the highest demand hours of a hot summer day.



Note: For illustrative purposes only, not to scale.

2015, lasting for six years and replacing the one that is currently winding down. Subject to further discussion with our partners, the government intends to build the new Framework on the following principles:

- There will be long-term, stable funding for conservation so that customers and LDCs have the certainty they need to implement and deliver programs.
- Customers will be given more program choice along with streamlined oversight and administration.
- LDCs will have accountability for meeting their assigned conservation goals, and will

be provided the authority and means for meeting them cost-effectively.

- The new Framework will encourage innovation and the adoption of new technologies.
- While there will be conservation programs available for all residential, commercial and industrial sectors, the value of conservation investments may be higher in some sectors than others.
- There will be renewed efforts to deepen consumer awareness of conservation, and more broadly, of the electricity system.
- Conservation programs for low-income residential customers will be improved.

- For Aboriginal communities, the role of LDCs in the delivery of conservation programs will be enhanced, particularly for on-reserve First Nation customers.
- Industrial and transmission-connected customers will continue to have access to the OPA's conservation programs, which will be expanded to facilitate broader program choice and financing flexibility.

To ensure value for ratepayers, the new Framework will continue to provide cost-effective conservation programs at less than the cost of new supply.

In Summary

- The Ministry of Energy will work with its agencies to ensure they put conservation first in their planning, approval and procurement processes. The ministry will also work with the Ontario Energy Board (OEB) to incorporate the policy of conservation first into distributor planning processes for both electricity and natural gas utilities.
- The province expects to offset almost all of the growth in electricity demand to 2032 by using programs and improved codes and standards. This will lessen the need for new supply. Our long-term conservation target of 30 terawatt-hours (TWh) in 2032 represents a 16% reduction in the gross demand for electricity, an improvement over the 2010 LTEP.
- Ontario is aiming to use Demand Response (DR) to meet 10% of peak demand by 2025, equivalent to approximately 2,400 megawatts (MW) under forecast conditions. To encourage further development of DR in Ontario, the Independent Electricity System Operator (IESO) will evolve existing DR programs and introduce new DR initiatives.
- The IESO will continue to examine and consult on the potential benefits and development of a capacity market, where different generation and demand resources compete to address capacity needs.
- The government is committed to promoting a co-ordinated approach to conservation and will encourage collaboration of conservation efforts among electricity and natural gas utilities.
- The government will work to make new financing tools available to consumers starting in 2015, including on-bill financing for energy efficiency retrofits.
- To help consumers choose the most efficient products for their homes and businesses, Ontario will provide information and incentives; it will also continue to show leadership in establishing minimum efficiency requirements for products such as water heaters, clothes dryers, televisions, fluorescent lamps, motors and boilers.
- The Green Button Initiative will give consumers access to their energy data and the ability to connect to mobile and web-based applications so they can analyze and manage their energy use.
- Social benchmarking can increase awareness of energy use and promote conservation. A social benchmarking pilot program is under way, led by the Ontario Power Authority (OPA) to test different approaches that enable consumers to compare their energy consumption with other similar consumers. Pending the success of the pilot program, the government will explore expanding social benchmarking and including other sectors.
- The government is also working with Ontario EcoSchools to bring more resources about energy conservation to the curriculum for students and teachers.

3



A Reliable and Clean Supply

While Conservation First is an important element of the LTEP, a clean, reliable and affordable supply of electricity also requires a diversity of generation types. Ontario will continue to develop new sources of supply to ensure that we reach these goals.

Nuclear

Ontario has made important investments in nuclear generation. The Canadian Manufacturers and Exporters reports that 15,600 people are employed in the operation and support of nuclear plants in Ontario, and 9,000 more would be employed for the refurbishment of the Ontario plants, for a total employment

of approximately 25,000 people during the refurbishment period. The Organization of Canadian Nuclear Industries reports that an additional 30,000 people are employed in the nuclear manufacturing, engineering, construction and consulting, fuel fabrication, research and development, and medical isotopes sectors, in support of domestic and offshore nuclear projects.

The industry has been successful in exporting Canadian technology around the world to countries including Argentina, South Korea, China, Romania and India. International opportunities to use the nuclear expertise based in Ontario will continue to be explored.

Nuclear power is also part of Canada's science and innovation advantage, involving more than

Workers complete installation of a mock calandria in the Darlington Energy Centre. It will be used to test tooling and train workers before beginning refurbishment work inside the reactor vaults of the Darlington Nuclear Generating Station

30 universities and six major research centres, many of them in Ontario. The nuclear industry generates \$2.5 billion in direct and secondary economic activity in Ontario every year. Retaining this nuclear expertise is crucial.

The province's nuclear generating stations at Darlington, Bruce and Pickering have historically provided about half of the province's electricity supply. The 2010 LTEP forecast that new capacity would need to be built at Darlington. New nuclear capacity is not needed at this time because the demand for electricity has not grown as expected, due to changes in the economy and gains in conservation and energy

efficiency. The decision to defer new nuclear capacity helps manage electricity costs by making large investments only when they are needed.

Ontario continues to have the option to build new nuclear reactors in the future, should the supply and demand picture in the province change over time. The ministry will work with OPG to maintain the licence granted by the Canadian Nuclear Safety Commission, to keep open the option of considering new build in the future.

The government will ensure a reliable supply of electricity by proceeding with the refurbishment of the province's existing nuclear fleet taking into account future demand levels. Refurbishment received strong, province-wide support during the 2013 LTEP consultation process. The merits of refurbishment are clear:

- Refurbished nuclear is the most cost-effective generation available to Ontario for meeting baseload requirements.
- Existing nuclear generating stations are located in supportive communities, and have access to high-voltage transmission.
- Nuclear generation produces no greenhouse gas emissions.

Ontario plans to refurbish units at the Darlington and Bruce Generating Stations. The refurbishment has the potential to renew 8,500 MW over 16 years. The province will proceed with caution to ensure both flexibility and ongoing value for Ontario ratepayers. Darlington and Bruce plan to begin refurbishing one unit each in 2016. Final commitments on subsequent refurbishments will take into account the performance of the initial refurbishments with

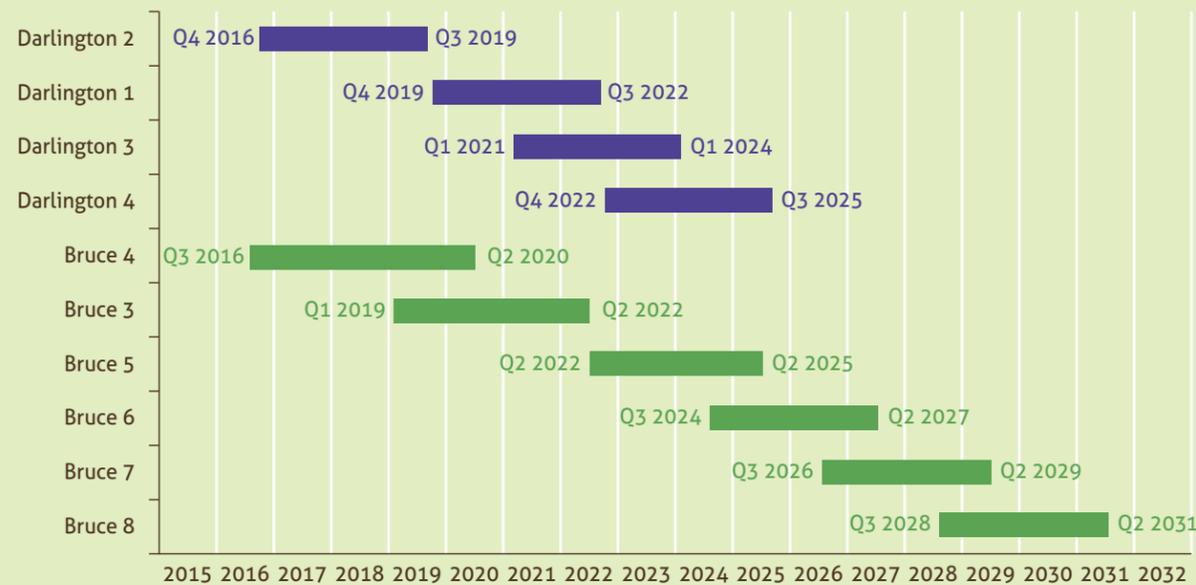
respect to budget and schedule by establishing appropriate off-ramps.

The nuclear refurbishment sequence shown in Figure 14 will be implemented subject to processes designed to minimize risk to ratepayers and to government. For example, appropriate off-ramps will be implemented should operators be unable to deliver the projects on schedule and within the established project budget.

The nuclear refurbishment process will adhere to the following principles:

1. Minimize commercial risk on the part of ratepayers and government;
2. Mitigate reliability risks by developing contingency plans that include alternative supply options if contract and other objectives are at risk of non-fulfillment;
3. Entrench appropriate and realistic off-ramps and scoping;
4. Hold private sector operator accountable to the nuclear refurbishment schedule and price;
5. Require OPG to hold its contractors accountable to the nuclear refurbishment schedule and price;
6. Make site, project management, regulatory requirements and supply chain considerations, and cost and risk containment, the primary factors in developing the implementation plan; and
7. Take smaller initial steps to ensure there is opportunity to incorporate lessons learned from refurbishment including collaboration by operators.

Figure 14: Nuclear Refurbishment Sequence



These principles reaffirm rate-payer value as the fundamental driver behind decisions on future refurbishment. The government will encourage the province's two nuclear operators, Bruce Power and OPG, to find ways of finding ratepayer savings through leveraging economies of scale in the areas of refurbishment and operations. This could include arrangements with suppliers, procurement of materials, shared training, lessons learned, labour arrangements and asset management strategies.

The continued operation of Pickering facilitates the refurbishment of the first units at Darlington and Bruce by providing replacement capacity and energy without greenhouse gas emissions while managing prices. However, an earlier shutdown of the Pickering units may be possible depending on projected demand, the progress of the fleet refurbishment program, and the timely completion of the Clarington Transformer Station.

The government is committed to nuclear power. It will continue to be the backbone of our electricity system, supplying about half of Ontario's electricity generation.

Renewables

Since launching the Feed-in Tariff (FIT) program in 2009, Ontario has firmly established itself as a North American leader in renewable energy.

To date, Ontario has more than 18,500 MW of renewable energy online or announced, which includes more than 9,000 MW of hydroelectric capacity and more than 9,500 MW of solar, wind and bioenergy capacity.

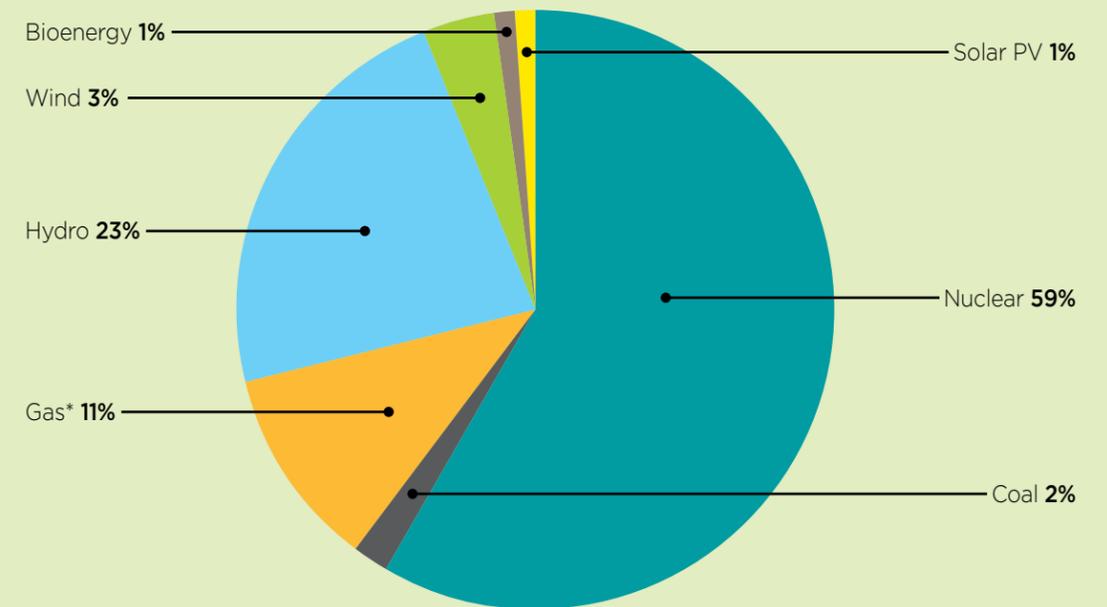
This is remarkable progress, and Ontario is proud of the role renewable energy is playing in the supply mix. This investment in clean, renewable energy sources is helping Ontario reduce its reliance on fossil fuels. The coal phase-out is the single largest climate change

initiative in North America, reducing greenhouse gas emissions and air pollution. Coal use had accounted for \$4.4 billion per year in health, environmental, and financial costs. At the same time, Ontario's clean energy initiatives have attracted billions of dollars in new private sector investment, and have contributed to the creation of more than 31,000 clean energy jobs across the province.

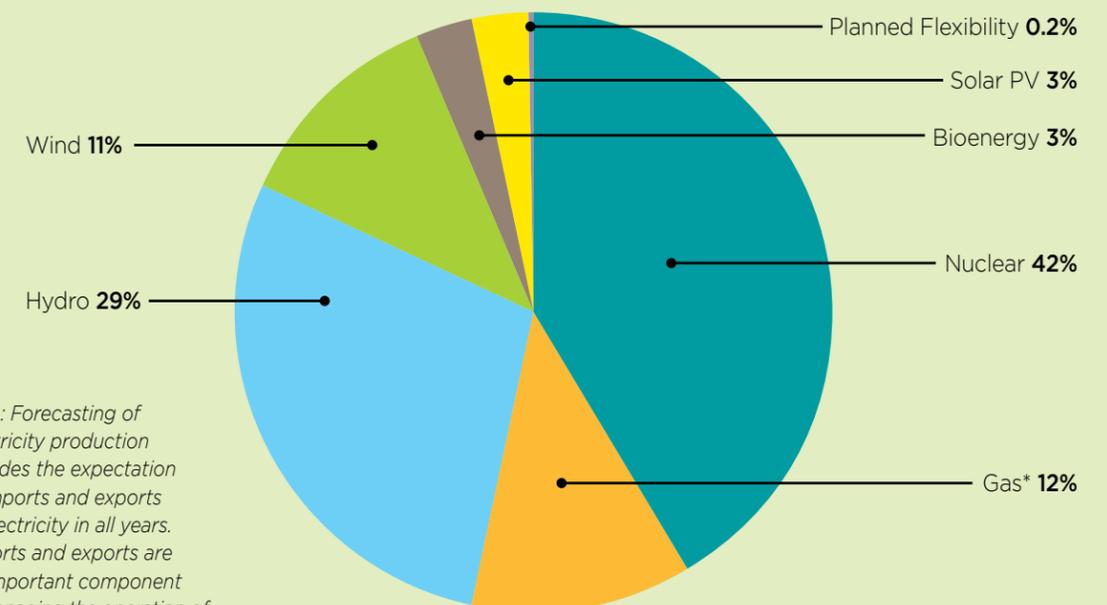
Earlier this year, the government committed to making 900 MW of new capacity available between 2013 and 2018 for the FIT (systems larger than 10 kW up to 500 kW) and microFIT programs. Starting in 2014, FIT will have an annual procurement target of 150 MW, with a 50 MW annual target for microFIT. These projects are expected to create more than 6,000 jobs while producing enough electricity each year for more than 125,000 homes. Annual price reviews for these programs are expected to reduce costs, as we saw in the recent price reviews.

Figure 15: Nuclear Will Remain a Major Source of Baseload Power

Forecast Energy Production (TWh) 2013



Forecast Energy Production (TWh) 2025



Note: Forecasting of electricity production includes the expectation of imports and exports of electricity in all years. Imports and exports are an important component in managing the operation of the electricity system. As a result, electricity production forecast exceeds the forecast Ontario consumer demand.

** Includes Lennox Generating Station - dual fueled with natural gas and oil.*

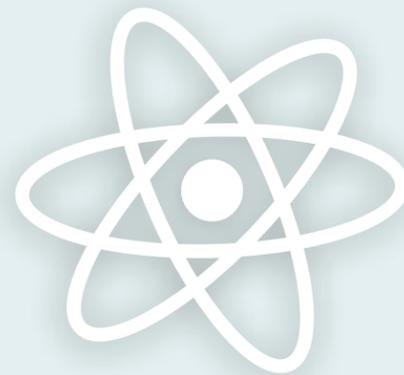
Exporting Ontario's Nuclear Expertise

Commercial nuclear power plants have been operating in Ontario for approximately 45 years. This has resulted in the development and growth of supporting industries to provide products and services. These may be exported to jurisdictions where nuclear generation currently exists, as well as to developing nations currently seeking to build nuclear power plants.

Ontario's power workers have developed expertise in the successful day-to-day operation of large nuclear power plants. In 2012, OPG's Darlington Generating Station was awarded the Institute of Nuclear Power Operators award of excellence in recognition of its world-class performance. In addition, expertise in the execution of complex projects, such as unit refurbishments and safe storage shutdowns successfully completed by Ontario's plants, is worthy of export to other jurisdictions.

The refurbishment of Ontario's nuclear fleet represents a multi-billion dollar investment and continued support of the province's nuclear supply chain and operations for decades to come. This will create a strong foundation where Ontario's nuclear suppliers can market their products and services to a global nuclear industry that could reach over 500 reactors by 2030. By working with Ontario's nuclear operators, Bruce Power and OPG, these suppliers will demonstrate their capability to deliver domestically and internationally, creating jobs and economic opportunities for the province. The province will encourage operators to compete internationally and consider opportunities and partnerships.

Expertise in the design of sophisticated systems for current and future reactors and required structures, systems and components exist in the skilled and knowledgeable engineering and technical staff working at laboratories in several Ontario communities. Both domestic and offshore nuclear projects are supported by Ontario's nuclear supply chain through companies largely located in Ontario. For example, Babcock and Wilcox Canada Limited, headquartered in Cambridge, employs experts in the design and fabrication of nuclear plant specific equipment, such as steam generators. The company plans to export nuclear components to the Tennessee Valley Authority in support of the development of Small Modular Reactors. Laker Energy Products of Burlington is another company that has exported nuclear reactor components to Romania, China and Argentina for several years. Atikokan Generating Station



The government decided to end large renewable procurements through the standard offer FIT program (projects greater than 500 kW), instead directing the OPA to move to a competitive procurement model. The competitive procurement model will allow for the consideration of contract awards for cost-efficient and well-supported projects. The OPA will consult with the public, municipalities, Aboriginal communities and other stakeholders on the design of the program in early 2014, and seek to launch the procurement process for new large renewables before the end of the first quarter of 2014.

The program will adhere to the following principles:

- Follow a provincial and/or regional electricity system need;
- Consider municipal electricity generation preferences;

- Engage early and regularly with local and Aboriginal communities;
- Occur in multiple successive rounds, providing opportunity for a diverse set of participants;
- Identify clear procurement needs, goals and expectations; and
- Encourage innovative technologies and approaches, including consideration of proposals that integrate energy storage with renewable energy generation.

Further, the government would like to provide the renewable sector with a predictable procurement schedule. The government will extend the existing target of 10,700 MW for wind, solar, and bioenergy to 2021, and expand the existing hydro target of 9,000 MW to 9,300 MW by 2025. By 2025, 20,000 MW of renewable energy will be online, representing about half of Ontario's installed

capacity. Annualized renewable energy procurement targets will be realized through a new competitive process.

Ontario plans to make available for procurement up to 300 MW of wind, 140 MW of solar, 50 MW of bioenergy and 50 MW of hydroelectric capacity in 2014. In 2015, the targets would be up to 300 MW of wind, 140 MW of solar, 50 MW of bioenergy and 45 MW of hydroelectricity. Any capacity that is not procured under these procurements, or not developed under existing contracts, would be reallocated for procurement in 2016 for each renewable technology. Through annual reporting and the next LTEP update, Ontario will review and consider expanded targets for wind, solar, hydroelectricity and bioenergy.

This procurement schedule will provide proponents the predictability and stability for large

A Bruce Power mechanical maintainer completes a task in the fuel handling maintenance shop



Atikokan Generating Station

The Atikokan Generating Station is located approximately 200 km west of Thunder Bay. In 2008, a biomass testing program was implemented using wood pellets to produce electricity. In September 2012, Atikokan burned its last piece of coal. The conversion from coal to biomass is on track to be completed in 2014.

The conversion project represents an investment of \$170 million – growing clean power capacity in Ontario and supporting jobs in the community. The project is expected to help sustain jobs in the forestry sector, create more than 150 new jobs through the fuel supply contracts, and create approximately 200 construction jobs. Plant modifications were required for the conversion, involving the construction of a fuel storage and handling system that can deliver up to 90,000 tonnes of biomass fuel annually from two, new 43-metre tall storage silos.

Upon completion, the 205 MW facility will be one of the largest biomass plants in North America and provide peaking capacity to northwestern Ontario. Atikokan is expected to generate 150,000 MWh of renewable power annually – enough to power approximately 15,000 homes each year.



Thunder Bay Generating Station

As part of Ontario's effort to phase out coal-fired generation by the end of 2014, the government intends to convert one unit at the Thunder Bay Generating Station to run on advanced biomass over a five-year term, starting in 2015, preserving operational capacity for the future. Ontario is also maintaining the option to convert the second coal-fired unit to run on advanced biomass in the future.

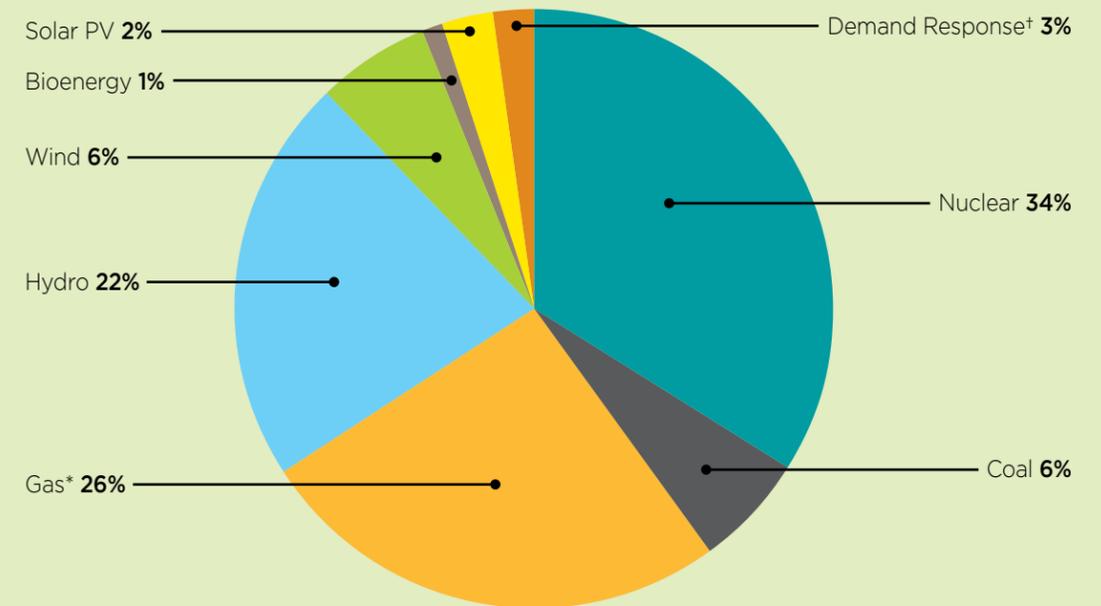


An advanced biomass conversion can be done with minimal capital expenditure, and the fuel is well suited to the type of valuable peaking operation that coal plants have historically provided to the province.

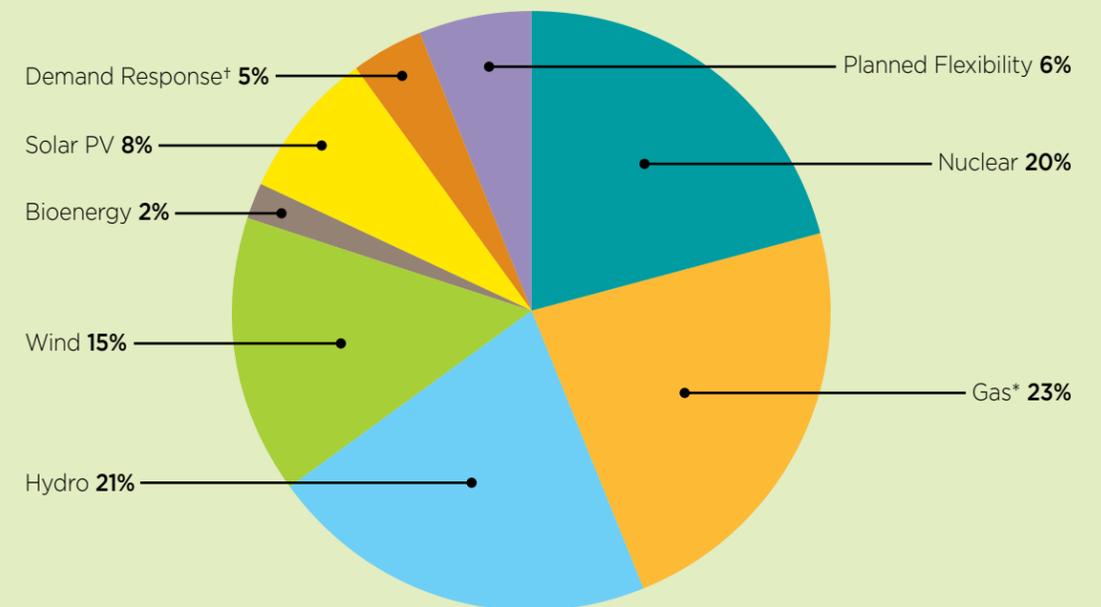
The conversion will be the first of its kind globally and will put Ontario on the leading edge of the emerging advanced biomass industry. This enables Ontario to develop knowledge and expertise that can be exported around the world to enable cost-effective conversion of coal plants to renewable fuels.

Figure 16: Renewables will grow to 46% of Ontario's generating capability by 2025.

Installed Capacity (MW) 2013



Installed Capacity (MW) 2025



Note: Total installed capacity represents the total generating capability of all resources. Adjustments are applied to calculate the capacity available at the time of peak demand.

† The Demand Response capacity consists of the DR programs and the dispatchable customer loads under contract in the market. When considered together with Demand Response from Time-of-Use rates and the Industrial Conservation Initiative, total demand response resources are equal to 10% of the forecast net demand in 2025.

* Includes Lennox Generating Station – dual fueled with natural gas and oil.

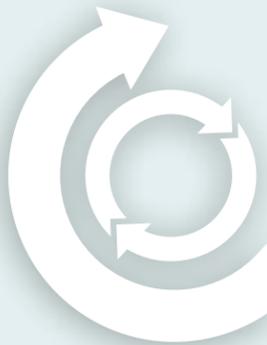


Kipling
Generating
Station
expansion in
Kapuskasing is
a joint project
of Ontario
Power
Generation
and Moose
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What is Combined Heat and Power?

Combined Heat and Power (CHP) is the simultaneous production of electricity and heat using a single fuel such as natural gas or biomass. In most applications, heat produced from the electricity generating process (for example, from the exhaust system of a gas turbine) is captured and used to produce steam or hot water that can be used for industrial and commercial heating or cooling purposes. Alternatively, waste heat can be captured at the end of a process and used to power a turbine and generator to produce electricity.

Assuming that the heat is well-used, CHP can achieve the highest use of the energy available from a fuel, making it the most efficient way to use fossil fuels while generating electricity. CHP can achieve up to 80% overall efficiency when it is designed to follow the heat load.



renewable procurements that have previously been announced for FIT and microFIT programs.

A key aspect of attainable renewable energy targets is ensuring there is space on the transmission system to incorporate safely and effectively the power generated by additional renewable energy facilities. Factoring in generators' responsibility for connecting their projects to the grid, both the 2021 target for wind, solar and bioenergy, and the 2025 hydroelectric target are expected to be accommodated on the existing transmission system. This can be done without the need for new major transmission projects beyond those already in progress, such as upgrades to key area stations or the rewiring of a line west of London.

Wind

Wind projects are an important part of Ontario's energy mix, creating thousands of jobs across Ontario and providing clean,

renewable energy to power our homes and businesses.

Ontario now has more than 2,300 MW of wind power online, which is expected to produce enough electricity each year to power more than 600,000 homes.

A clean, reliable energy system relies on a balance of resources. When clean energy from the wind is available, it reduces our need to rely on fossil fuel sources of electricity that contribute to smog, pollution and climate change.

Wind energy creates new, high-value jobs, and provides economic benefits and opportunities to municipalities and local businesses. Development of wind power in Ontario has created opportunities for landowners, local community co-operatives, Aboriginal communities and municipalities to partner with wind project developers, or lead their own wind projects, which ensures that the benefits of the project remain in the local community.

Ontario has been working to integrate wind energy more fully into Ontario's electricity system. This includes improved forecasting of when wind energy will be available to supply power to the grid. New rules will allow the IESO to tell wind generators to reduce or stop producing power when the electricity system does not require it. From a system perspective, the IESO estimates that these changes to the market rules could save ratepayers up to \$200 million per year. Related OPA contract amendments could save ratepayers up to \$65 million over the next five years.

Solar

Ontario is a leader in the use of solar photovoltaic (PV) electricity to power our homes and businesses. Ontario has the most solar PV capacity of any jurisdiction in Canada, with more than 900 MW of generation capacity online. This amount is expected to produce enough electricity to power more than 100,000 homes each year.

District Energy

District Energy systems can make effective and efficient use of CHP technology to heat, cool and power densely populated areas such as city centres, university campuses and hospitals.

Markham District Energy - (5.85 MW)

Markham District Energy's two most recent OPA supported plants at Bur Oak and Birchmount are due to become operational in September 2014.

The Bur Oak Energy Centre CHP facility will have 3.25 MW of OPA- contracted capacity and will supply thermal energy to buildings in the area, including the Markham Stouffville Hospital, East Markham Community Centre, a fire station, a health services building and new developments in the vicinity.

The Birchmount Energy Centre will have 2.6 MW of OPA- contracted capacity and will provide space heating and domestic hot water to buildings served by the Markham Centre District Energy System, owned and operated by Markham District Energy Inc., as well as electricity generation.

London Cogeneration Facility (12 MW) - London

London Co-generation Facility is a natural gas-fired 12 MW CHP facility. In addition to electricity production, steam from the co-generation facility will be used to provide space heating and cooling to nearby commercial, government and residential buildings.

Durham College District Energy (2.3 MW) - Oshawa

Durham College District Energy is a natural gas-fired 2.3 MW CHP facility at Durham College in Oshawa. In addition to behind-the-meter electrical production, hot water is provided to Durham College for space heating and domestic use.

Greenhouse Operations

Greenhouse operations are a particularly suitable candidate for CHP. They consume electricity for lighting, pumping and refrigerated storage of produce. They also require heat to supplement solar gain, especially at night. In addition to these benefits, greenhouses can also use the CO₂ produced by the generation to enhance the growth of plants. This is sometimes called tri-generation (electricity, heat and CO₂ are all used).

Rosa Flora Limited (4.04 MW) - Dunnville

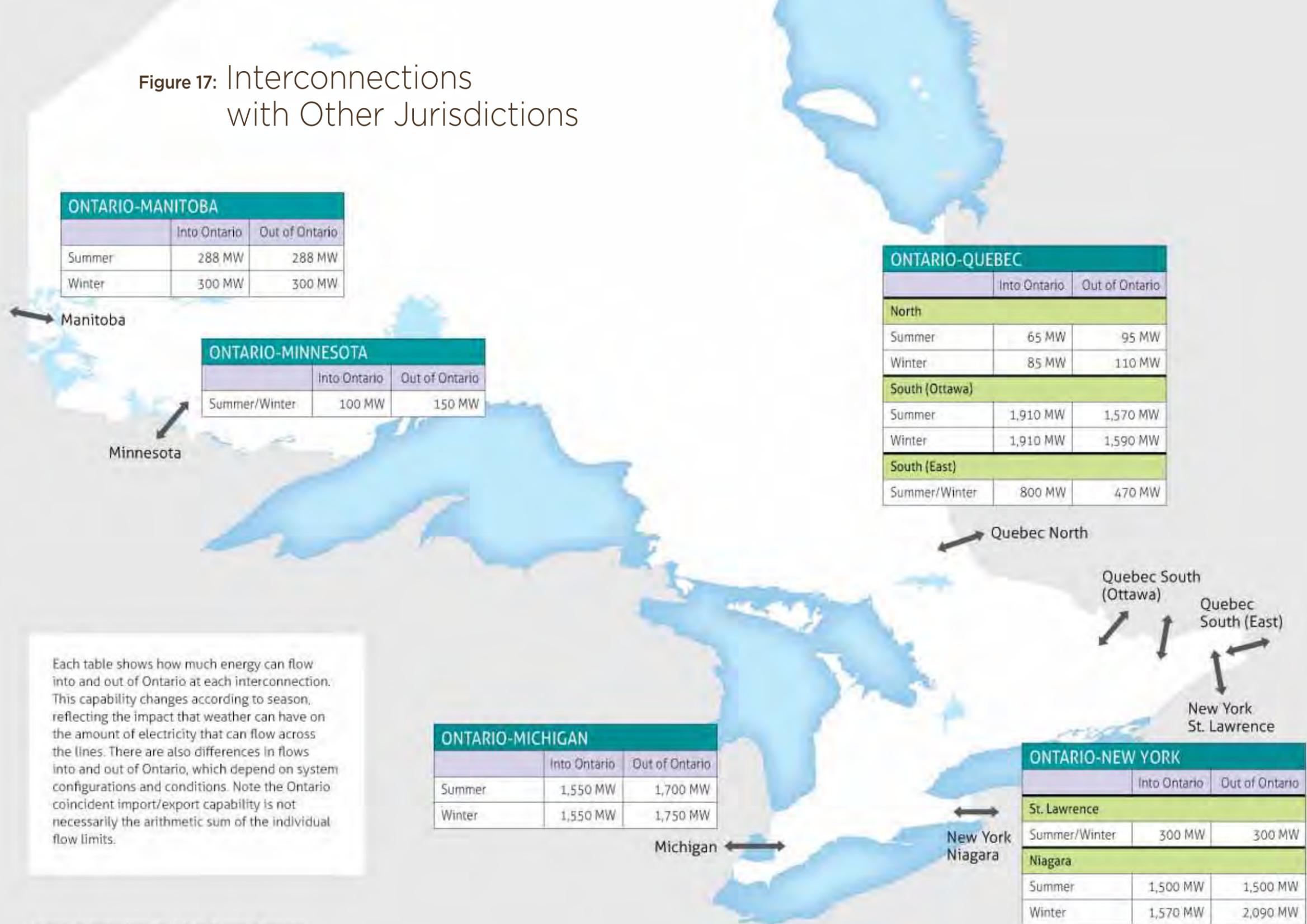
Rosa Flora, one of Canada's largest cut-flower producers, recently entered into a combined heat and power contract with the OPA to produce 4.04 MW of electricity to stay ahead in a highly competitive international market. This project will provide greenhouse heating and electricity that can be used internally for lighting, pumps and other uses, or exported to supply grid needs.

Great Northern Hydroponics (11.3 MW) - Kingsville

The Great Northern tri-generation facility is a natural gas-fired 12 MW combined heat and power facility that operates on the property of Great Northern Hydroponics, in Kingsville. Great Northern Hydroponics specializes in tomato production through the application of state-of-the-art hydroponics technology.

In addition to electricity production, hot water and carbon dioxide from the co-generation facility is used by Great Northern Hydroponics for heating and fertilizing crops in the existing 50-acre hydroponics greenhouse.

Figure 17: Interconnections with Other Jurisdictions



Source: Independent Electricity System Operator

Solar PV systems produce most of their power during the afternoon, which helps us meet summer peak electricity demand from air conditioning systems. This peak shaving helps our grid operate more effectively, and reduce the use of fossil fuel electricity generation on hot, smoggy days. When solar PV systems are located on rooftops that are close to electricity users, this reduces the need for the grid to transport electricity long distances, and may help offset future requirements for grid upgrades.

The cost of solar PV systems has previously been affected by high material costs. New innovations and global market expansion are helping to substantially reduce the cost of these systems. Since the FIT and microFIT programs were launched in 2009, Ontario has seen a reduction in the average costs for new solar PV systems - of at least 40% - and the industry aspires to reach grid parity.

Reductions in costs and the ability to deploy solar energy systems close to the customer also offer the opportunity to expand and enhance net metering, where homeowners use solar-generated power to offset their own electricity needs. Ontario will examine the potential for the microFIT program to evolve from a generation purchasing program to a net metering program.

In addition, homes and businesses can use solar thermal systems to heat water and supplement their space heating needs.

Bioenergy

Energy from organic material is another key clean and renewable resource. Currently, there are almost 300 MW of bioenergy generation capacity online in Ontario, including biomass, biogas and landfill gas systems.

Figure 18: Ontario's Planned Supply Mix (MW)

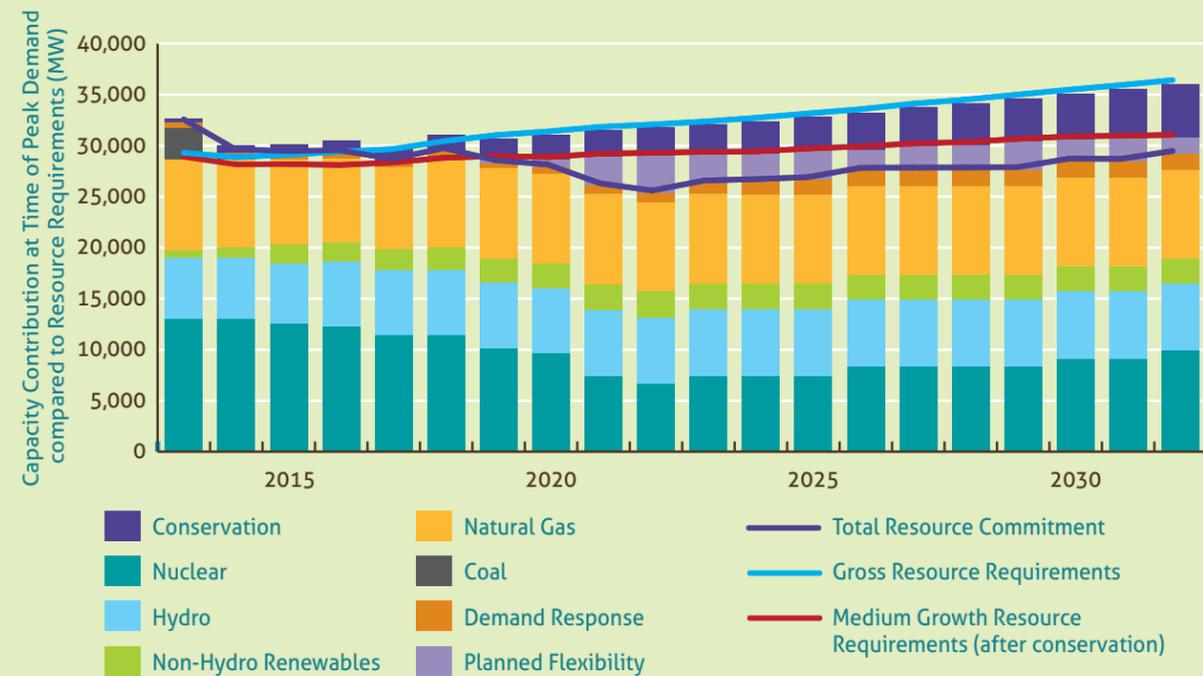
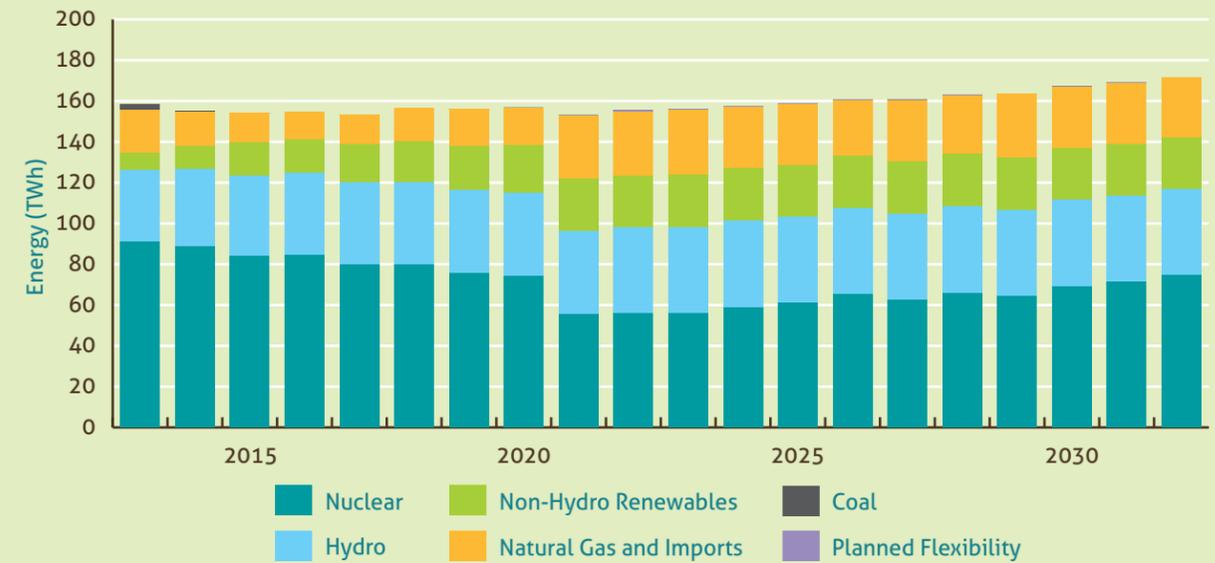


Figure 19: Ontario's Forecast Electricity Production (TWh)



Notes: The Planned Flexibility identified in Figure 19 is required to meet peak requirements and represents less than 1 TWh of energy per year. Forecasting of electricity production includes the expectation of imports and exports of electricity in all years. Imports and exports are an important component in managing the operation of the electricity system. As a result, electricity production forecast exceeds the forecast Ontario consumer demand.

Bioenergy systems are valued for their ability to turn organic waste streams into a renewable, flexible and clean source of power particularly suited to rural and remote communities.

Using bioenergy helps to support Ontario's forestry and agricultural industries, and optimizes the use of available biomass resources. Bioenergy systems can also be closely integrated with local jobs and industry in small rural communities.

Biomass systems can use residues from forestry and agriculture to generate electricity and useful heat. Biogas systems can help manage farm waste while generating electricity, and also produce organic by-products that can be added to the soil.

Biomass and biogas systems can adjust their output to generate power during times of peak

electricity demand. This helps reduce our reliance on fossil fuel during peak times. Biomass and biogas systems can also operate constantly, helping contribute to our baseload electricity supply.

Generating electricity from landfill gas not only offsets fossil fuel use but also reduces the greenhouse gas impact of methane on the environment. It is truly a win-win situation for Ontario.

Hydroelectric

Ontario has a long and productive history with water power. More than half of Ontario's renewable energy supply comes from hydroelectric facilities, which continue to provide more than 20% of the province's electricity. Existing hydro has been the lowest-cost form of generation in Ontario, and in many cases, has provided reliable generation to

meet peak demand. The province's hydroelectric resources generated the energy to power approximately 3.5 million homes in 2012. This shows that hydroelectric power will continue to play a significant role in Ontario's diverse supply mix.

Today, Ontario has well over 8,000 MW of water power in service and enough projects contracted and under development to meet our 2010 LTEP target of 9,000 MW of installed hydroelectric capacity by 2018. Earlier this year, the government directed the OPA to procure additional hydroelectric capacity, including up to 40 MW from existing facilities with the potential to expand capacity, and up to 60 MW from new municipal projects under the recently launched Hydroelectric Standard Offer Program. In addition, the government directed the OPA to enter into negotiations with OPG and

the Taykwa Tagamou Nation for a power purchase agreement to procure electricity from the proposed New Post Creek hydroelectric generating station, with a capacity of approximately 25 MW.

The government will continue to build on this foundation by adding to the hydroelectricity target, increasing the province's hydroelectric portfolio to 9,300 MW by 2025. With this increased target, Ontario will maximize the potential for new large-scale hydro facilities on what the current transmission system can support.

Ontario will continue to work with the sector to assess future hydroelectric development carefully, so it is ready to generate power when and where we need it. The ministry is reviewing the potential of both large and small hydroelectric sites in Northern Ontario,

including projects close to off-grid First Nation communities. The ministry will also continue to work with the sector to examine the use of existing dam sites to generate hydroelectric power.

Pumped Hydro Storage

Pumped hydro storage can be used to store energy when it is not needed and deliver it to the grid during periods of peak demand. Projects will continue to be examined to determine their cost-effectiveness and their ability to provide value to ratepayers.

Natural Gas

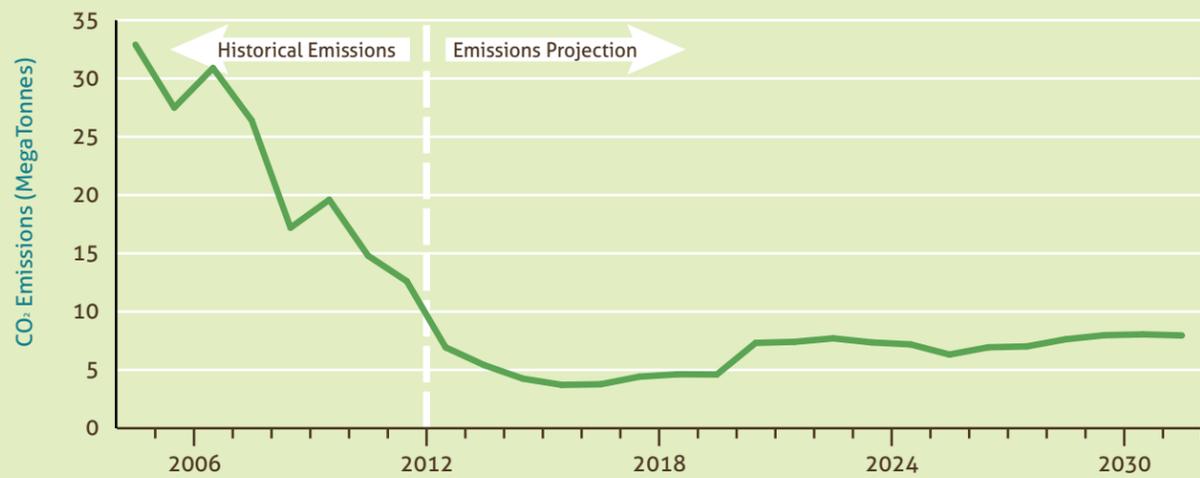
While the government will not require new natural gas procurement to fill province-wide needs over the near term, this form of energy will still be an essential element of our responsive and flexible electricity system. Natural

gas generation is cost effective to operate and can provide some of our lowest-cost capacity. Its output can be dispatched quickly to match changes in demand, and supports variable resources such as wind and solar. From 2003 to 2012, as Ontario succeeded in phasing out coal-fired generation, natural gas generation increased by 38%, from approximately 16 TWh to approximately 22 TWh.

Ontario's natural gas fleet has capacity and flexibility to fill energy needs arising during the nuclear refurbishment period.

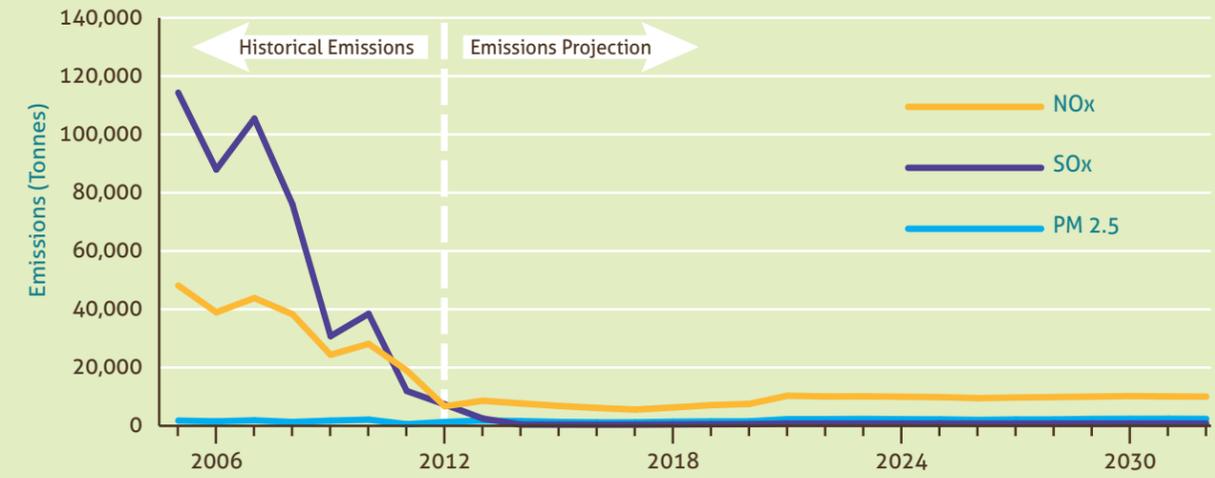
The province's existing NUGs, contracted in the 1990s with the former Ontario Hydro, currently provide 1,200 MW of natural gas generation. The contracts for 75% of that capacity will expire by the end of 2018. The OPA has been directed to enter into new contracts with the NUGs after

Figure 20: Greenhouse Gas Emissions Forecast



Note: Emissions in any one year could be higher, or lower, than the projection depending on the specific operating conditions experienced in the system. For example, changes in demand and/or energy production from non-emitting resources could contribute to higher or lower emissions.

Figure 21: Nitrogen Oxides, Sulphur Oxides and Particulate Matter Emissions Forecast



Note: Emissions in any one year could be higher, or lower, than the projection depending on the specific operating conditions experienced in the system. For example, changes in demand and/or energy production from non-emitting resources could contribute to higher or lower emissions.

the current ones have expired, but only if the contract results in cost and reliability benefits to Ontario ratepayers.

Natural gas prices have declined sharply since 2008, and are expected to remain relatively low over the next decade. The price of natural gas, though is historically quite volatile, and is affected by factors outside of Ontario's control. It is therefore in Ontario's best interest to keep a balanced supply mix, and not depend too heavily on natural gas, as a hedge against this volatility.

Combined Heat and Power

Combined Heat and Power (CHP) can be an efficient way to use natural gas to generate electricity as well as useable heat or steam. Given the right circumstances, CHP can help support regional economic development, and local

energy needs, while reducing carbon dioxide (CO₂) emissions at a competitive cost.

The OPA has run four rounds of competitive procurements and two standard offer programs for small-scale CHP since 2005, resulting in 420 MW of capacity from CHP projects – 414 MW of which are in commercial operation. Approximately 6 MW are under development, and scheduled to be in service in 2014.

We have learned that in general, CHP projects work better if they are driven primarily by the need for heat, with electricity as a by-product. CHP projects need to be the right size, in the right location and at the right price to ensure optimal benefits to the electricity system, in addition to serving the needs of their heat loads.

The OPA has conducted procurements for CHP projects representing a wide range of technologies, applications, industries and geographic locations. Future procurements will focus on considerations such as efficient CHP applications and locations with regional capacity. These could include a new program for CHP at greenhouse operations, agri-food and district energy projects.

The way that CHP supports economic development while reducing CO₂ emissions is best illustrated in the examples on page 39.

Energy from Waste

Energy from Waste (EFW) refers to waste treatment technologies that generate electricity and/or heat by burning various kinds of waste material.

Most EFW facilities burn the waste material directly to obtain energy but there are alternative technologies being developed that promise better efficiency and lower greenhouse gas emissions than conventional EFW.

To encourage the development of these new technologies in Ontario, the OPA is considering projects that have received Ministry of the Environment approval. These Ontario-based projects offer the potential for job creation and export opportunities. Testing will verify whether new technologies can operate successfully with environmental performance superior to conventional EFW technologies.

Clean Imports

Ontario has several interconnections with the provinces of Manitoba and Quebec as well as with the states of Minnesota, Michigan and New York. Taken

together, Ontario has approximately 4,500 to 5,200 MW of import-export capacity. However, actual power flows do not reach these levels because of operational constraints in and outside Ontario.

Ontario exports and imports a significant amount of electricity as part of the regular operation of its electricity market and is expected to have sufficient energy and capacity in the near term to meet province-wide needs. The electricity wholesale market has proven to be extremely effective in enabling power to flow between Ontario and its neighbours.

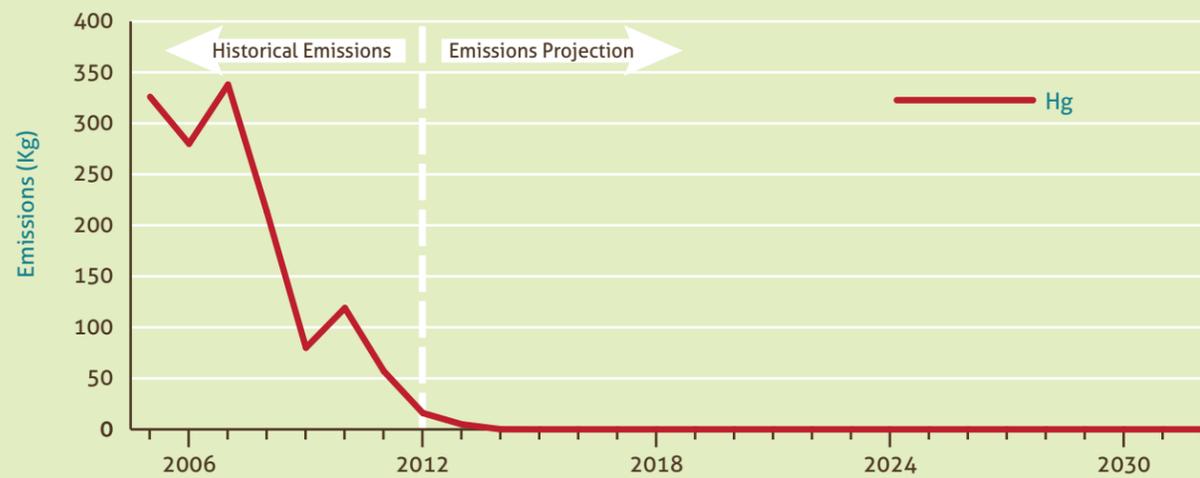
Ontario will continue to rely on the wholesale market to provide flexibility and to balance power flows on a short-term basis. However, an import arrangement with a neighbour to guarantee the firm delivery of clean power could offer a cost-effective alternative

to building domestic supply. Import contracts can be structured to meet multiple system needs such as capacity for peaking, ramping, backup or reserve purposes, or the firm delivery of energy over a specified timeframe, or a combination.

Contracted energy imports can provide value if their price is less than domestic generation. They can also further diversify Ontario's supply. While clean energy imports offer potential benefits to Ontario, the value to Ontario depends on the willingness of those supplying imports to offer a product that matches Ontario needs and represents better value than the domestic alternatives.

Ontario will only pursue contractual arrangements for firm imports where cost effective and well matched to Ontario's electricity needs.

Figure 22: Mercury Emissions Forecast



Planned Flexibility

While the OPA is forecasting lower growth in electricity demand, we must take into account the element of uncertainty inherent in all forecasts. The government has to be prepared to respond if the economy or energy demand does not evolve as expected. In other words, Ontario needs to be flexible to meet the inherent uncertainty of predicting how demand will grow. Therefore, the government will plan for a wide range of possibilities but only commit resources as needs become clearer, while ensuring Ontarians have the energy they need, when and where they need it.

Starting in 2014, an Ontario Energy Report will be issued annually to update Ontarians on the energy supply and demand picture for the province, and review progress in implementing the LTEP.

The LTEP will continue to be updated every three years. These annual reports will give everyone an opportunity to monitor progress and understand developments that will be important in the next formal review.

This is a direct response to what we heard during the LTEP engagement sessions, where ratepayers, members of the public, stakeholders and Aboriginal communities wanted to be involved in an ongoing dialogue about energy planning.

2013 LTEP Supply Mix

Figures 18 and 19 present an integrated picture of the supply mix elements as described above including the Conservation First and DR targets, forecast demand, renewable targets and planned nuclear refurbishments. Reflecting the need to maintain flexibility as circumstances change, future options to be determined are also illustrated here.

Since 2003, greenhouse gas emissions from coal-fired generation in the electricity sector have been reduced by nearly 90%. In addition, the emissions of sulphur dioxide and nitrogen oxides have dropped by 93% and 90%, respectively, while mercury levels are at their lowest level in 45 years.

Figures 20, 21 and 22 are historical and forecast emissions of greenhouse gases, sulphur dioxide, nitrogen oxides, particulate matter and mercury for Ontario's electricity sector.

Air emissions from Ontario's electricity sector are expected to remain at historically low levels, although there may be variations in future emissions attributable to changes in demand, the use of natural gas, clean imports, and demand response.

In Summary

Nuclear

- Ontario will not proceed at this time with the construction of two new nuclear reactors at the Darlington Generating Station. However, the Ministry of Energy will work with Ontario Power Generation (OPG) to maintain the site licence granted by the Canadian Nuclear Safety Commission.
- Nuclear refurbishment is planned to begin at both Darlington and Bruce Generating Stations in 2016.
- During refurbishment, both OPG and Bruce Power will be subject to the strictest possible oversight to ensure safety, reliable supply and value for ratepayers.
- Nuclear refurbishment will follow seven principles established by the government, including minimizing commercial risk to the government and the ratepayer, and ensuring that operators and contractors are accountable for refurbishment costs and schedules.
- The Pickering Generating Station is expected to be in service until 2020. An earlier shutdown of the Pickering units may be possible depending on projected demand going forward, the progress of the fleet refurbishment program, and the timely completion of the Clarington Transformer Station.
- Ontario will support the export of our home-grown nuclear industry expertise, products and services to international markets.

Renewable Energy

- By 2025, 20,000 MW of renewable energy will be online, representing about half of Ontario's installed capacity.
- Ontario will phase in wind, solar and bioenergy over a longer period than contemplated in the 2010 LTEP, with 10,700 MW online by 2021.

- Ontario will add to the hydroelectricity target, increasing the province's portfolio to 9,300 MW by 2025.
- Recognizing that bioenergy facilities can provide flexible power supply and support local jobs in forestry and agriculture, Ontario will include opportunities to procure additional bioenergy as part of a new competitive process.
- Ontario will review targets for wind, solar, bioenergy and hydroelectric annually as part of the Ontario Energy Report.
- The Ministry of Energy and the OPA are developing a new competitive procurement process for future renewable energy projects larger than 500 kilowatts (kW), which will take into account local needs and considerations. The ministry will seek to launch this procurement process in early 2014.
- Ontario will examine the potential for the microFIT program to evolve from a generation purchasing program to a net metering program.

Natural Gas/Combined Heat and Power

- Natural gas-fired generation will be used flexibly to respond to changes in provincial supply and demand and to support the operation of the system.
- The OPA will undertake targeted procurements for Combined Heat and Power (CHP) projects that focus on efficiency or regional capacity needs, including a new program targeting greenhouse operations, agri-food and district energy.

Clean Imports

- Ontario will consider opportunities for clean imports from other jurisdictions when such imports would have system benefits and are cost effective for Ontario ratepayers.

4



Investing in Transmission

Transmission planning and upgrades are driven by system reliability needs, load growth, and integration of generation resources, including renewable resources. Maintaining the high voltage transmission lines that form the backbone of the electricity system is vital to ensure reliability of the grid.

Having the transmission we need to enable our supply mix goals is a key driver of electricity planning. The existing transmission system, including projects in progress, will be sufficient to enable supply mix targets identified in this LTEP.

A Focus on Northwestern Ontario

Northwestern Ontario has recently received a lot of attention when it

comes to electricity planning. That's in part because while provincial demand is generally flat, there could soon be a significant increase in energy demand in northwestern Ontario, largely because of an expected increase in mining activity.

In 2010, Ontario began moving forward with a plan for the northwest, when the new East-West Tie transmission line was identified as a

priority project. As part of an integrated plan to meet the needs of the Northwest, work on that new line has begun. The new East-West Tie line will reduce transmission constraints and allow a greater two-way flow of electricity across Northern Ontario. Efforts are currently focused on detailed engineering work and seeking necessary approvals such as the Environmental Assessment and engagement with First Nation and

Journey person Electrician bolting together a steel structure, Burlington Transformer Station

Ring of Fire

The Ring of Fire, 540 km northeast of Thunder Bay, has the potential to become a significant economic development driver for Northern Ontario and First Nation communities. To help realize this potential, Ontario has:

- Announced its intention to partner with industry, First Nations and the federal government to create an infrastructure development corporation.
- Appointed former Supreme Court of Canada Justice Frank Iacobucci as lead negotiator on behalf of Ontario in community-based discussions with Chiefs of the Matawa Tribal Council on regional considerations in resource development in the Ring of Fire.

Energy is part of the successful development in the Ring of Fire region. We are committed to working with key partners to meet energy needs and maximize benefit for communities.

Ontario has taken a leadership role in planning for development, however, the federal government must step up and provide support. Ontario will continue to work on the smart, sustainable and collaborative development of the Ring of Fire.

Métis communities. The proposed project is expected to be finished in 2018 and will create hundreds of jobs in the service and construction industries for the duration of development and construction.

While the new East-West Tie line will provide a new source of supply for the northwest, the 2013 LTEP anticipates that new resources may also be needed to make sure that users in specific parts of the northwest have the power they need.

Planning for the northwest has a number of different facets, some

of which focus on areas within the region. The OPA's analysis of the needs and solutions for the North of Dryden area identified the need to meet the increased electricity demand from mining. Among other things, the report assessed what needs to be done to the electricity system serving Red Lake and Pickle Lake to increase capacity to serve new demand. The OPA's report looked at transmission and generation options.

The Ring of Fire, the vast mineral-rich area north of Long Lac and east of Pickle Lake on the edge of the Hudson Bay Lowlands, could be a game-changer for the

northern economy. Mining developers have shown significant interest in this area in recent years. The province is committed to ensuring its plans reflect the long-term potential for demand at the Ring of Fire while recognizing the role of electricity customers in planning for their supply needs.

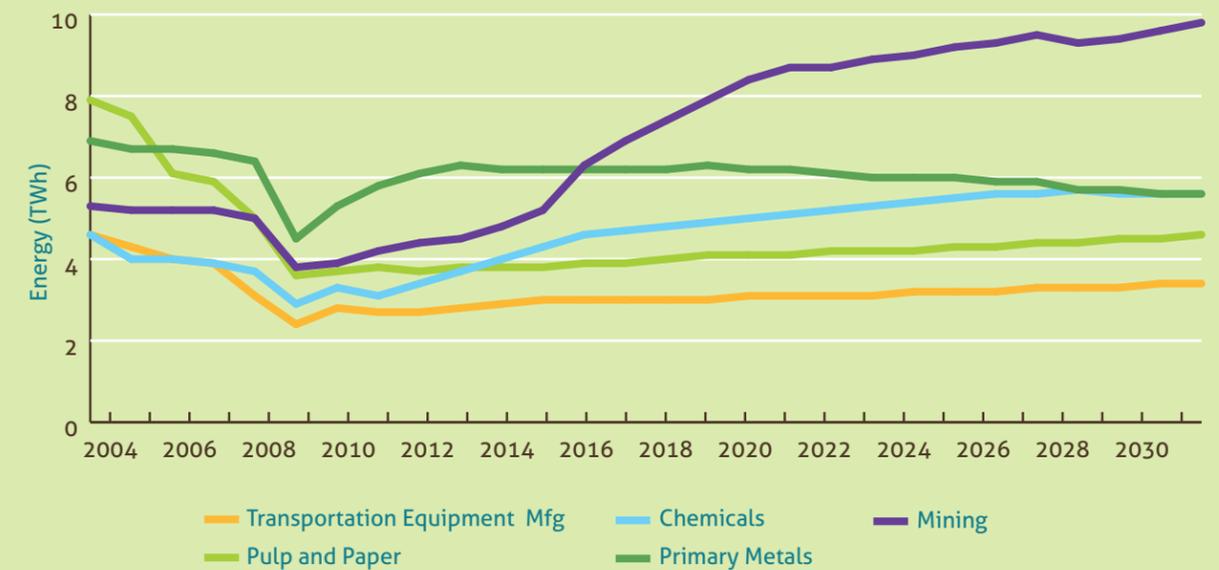
However, mining demand is not limited to the area north of Dryden or the Ring of Fire. There is additional mining potential elsewhere in the northwest, including, for example, in the areas near Fort Frances and Atikokan. Working with Aboriginal communities, local municipalities

Figure 23: Key Areas and Projects in Northwestern Ontario



Area	Projects under Development	Status/Outcome
1 Thunder Bay to Wawa	East-West Tie development	<ul style="list-style-type: none"> Expected to be in service by 2018 Will enhance reliability to the northwest Needs in Greenstone area to be studied
2 Dryden area to Thunder Bay	Northwest Bulk Transmission Line	<ul style="list-style-type: none"> The project could come into service as early as 2020, dependent on demand Will help alleviate transmission constraints within the northwest
3 North of Dryden Region, remote First Nation communities, and Ring of Fire	New Line to Pickle Lake	<ul style="list-style-type: none"> Projects will increase capacity to support new demand, including from mining, connect remote communities and potentially the Ring of Fire
	Improvements on Line from Dryden to Red Lake	
	Remote Connections	

Figure 24: Electricity Consumption by the Industrial Sector



and businesses, the province will ensure adequate supply across the region.

As part of the longer-term set of solutions for the area, the government expects Hydro One to begin planning for a new Northwest Bulk transmission line, west of Thunder Bay, with the project scope to be recommended by the OPA. A new line would increase transmission capacity and provide a means for new customers and growing loads to be served with the clean and renewable sources that comprise Ontario's supply mix. Over the long term, it would also enhance the potential for development and connection of renewable energy facilities, which can be factored into future plans. Because of its importance to the region, this new line has been identified as a priority project.

Hydro One and Infrastructure Ontario will be expected to work together to explore ways to ensure that the project is developed and delivered in a cost-effective manner, and results in value for Ontario electricity customers.

Another driver for transmission investment in the northwest is the move toward a cleaner supply of power in Ontario's First Nation remote communities.

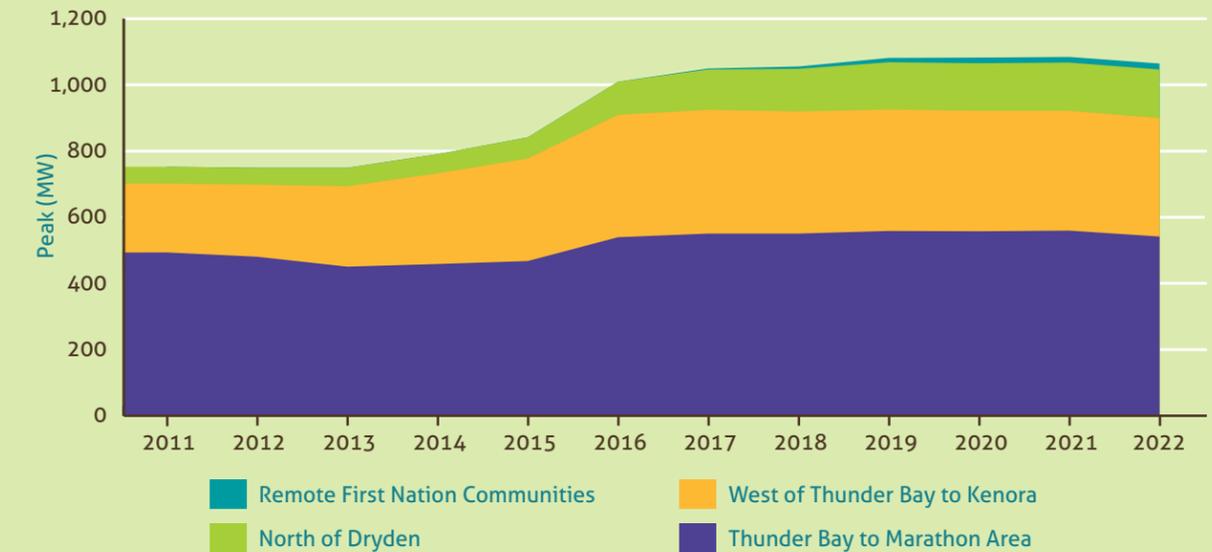
Following up on a commitment made in the 2010 LTEP, the OPA has looked at the costs of connecting the remote First Nation communities in the northwest; these communities are currently not connected to the province's electricity grid and rely instead on expensive diesel fuel to generate their

electricity. Connecting the remote First Nation communities in Northwestern Ontario is a priority, but federal commitment and co-operation will be required to make it a reality. For those communities where grid connection is not feasible, the province, working with key stakeholders, will explore options to reduce reliance on diesel. Chapter 6 - First Nation and Métis Communities discusses the connection of remote First Nation communities in more detail.

Taken together, the tasks of connecting remote communities and meeting the demand from new mining development are likely to require significant investment in transmission capacity. In fact, Ontario has initiated planning that could lead to about \$2.2 billion in



Figure 25: Projected Northwestern Ontario Peak Demand



Source: OPA. For an indication of the approximate areas identified above, see Figure 23.

transmission investments in the northwest over the long term. Projects that are in the planning stage include:

- East-West Tie Expansion;
- A new Northwest Bulk transmission line;
- A new line to Pickle Lake;
- Red Lake Area transmission upgrades; and
- Grid connection of remote communities – depending on federal contributions.

These transmission projects, if implemented, would increase the reliability and flexibility of the system in the northwest. They would also help to ensure sufficient

supply to meet the forecast load growth in the region, or provide new connections for remote communities.

Transmission investment of this magnitude would be expected to support a total of about 1,800 jobs in the services and construction industry and its supplier industries over the course of development and construction.

A new line to Pickle Lake, first identified as a priority in the 2010 LTEP, is integral to regional needs and economic development. It will help serve new demand in the area north of Dryden, as well as provide increased capacity to connect remote communities

north of Pickle Lake. Given its importance to the connection of remote communities, this project continues to be a key priority for Ontario.

Ontario's northwest has been a focus for transmission planning because of the complexity and size of the needs there, but it is not the only place in Ontario where transmission planning and investments have been made.

Many of Ontario's distributors in other areas, such as York Region, Toronto, Ottawa and Leamington, are also seeing growth. They are engaged with the IESO and the OPA on regional planning for specific areas where demand

growth and intensification are leading to new needs and pressures on the electricity system. The focus here is on identifying needs and the options to meet those needs. This is further discussed in Chapter 5 - Regional Planning.

In other regions across the province, planning is complete and new equipment is being put in place. For example, Hydro One's Wood Pole Replacement program is driven by the need to replace and refurbish existing assets that have been in place for decades. Hydro One's re-wiring of a line west of London is ensuring that additional power from clean

and renewable sources can be safely and reliably integrated into the transmission system. Some projects, such as transmission reinforcement in Guelph, are being driven by growth in demand and the need to maintain the dependable, reliable power supply we've come to expect.

These essential investments in new and refurbished transmission and distribution infrastructure ensure the reliable delivery of power, keeping the lights on for customers and supporting jobs and local economies. All told, Hydro One alone has invested more than \$11 billion in its transmission and distribution systems

since 2003 — nearly \$1.5 billion in each of 2011 and 2012, and more than \$600 million in the first half of this year. Hydro One's capital investments since 2003 supported an average of 8,000 jobs, both directly — including through Hydro One's own employees and those of its contractors — and indirectly, through broader supply chains. They have also contributed to Ontario's gross domestic product by an average of \$835 million annually. Some examples of these recent investments are shown on pages 54-57.

ONTARIO

Wood Pole Replacement Program

Province wide

Est. Cost: \$56.8 million

Exp. In-Service: 2013/2014

Hydro One has about 7,000 km of transmission lines that use wood pole structures, most of which are in Northern Ontario. There are about 42,000 of these wood poles in all.

Wood structures deteriorate over time due to environmental factors such as weather, and even the presence of insects and wildlife. Hydro One regularly tests the condition of poles and replaces them as needed.

A total of 1,700 wood pole structures that have reached the end of their service life will be replaced in 2013 and 2014.

CENTRAL ONTARIO

Peterborough-Ottawa Area

C25H Line Refurbishment

Est. Cost: \$80.8 million

Exp. In-Service: 2017

The 170 km high voltage transmission line between Peterborough and the Ottawa area is 84 years old and is at the end of its useful life.

Refurbishing the line will help maintain reliable electricity service for customers and serve future load growth.

South Georgian Bay/Muskoka

Circuit Breaker Replacement at Orangeville Transformer Station

Est. Cost: \$28.1 million

Exp. In-Service: 2014

The Orangeville Transformer Station is a key station that enables the flow of power between south-western and central Ontario. Circuit breakers are being replaced to maintain the reliability of the local system, and reduce the risk of further equipment deterioration.

NORTHEASTERN ONTARIO

Sudbury/Algoma

Circuit Breaker Replacement at Hanmer Transformer Station

Est. Cost: \$26.1 million

Exp. In-Service: 2013

Hydro One is investing \$26 million to replace the circuit breakers in the important Hanmer Transformer Station. The Hanmer Transformer Station is critical for getting electricity from hydroelectric dams in northeastern Ontario to where it can be used.

The project will, among other things, help ensure a reliable supply of electricity for mining and associated operations in the Sudbury area. The work is expected to be completed this year.

North/East of Sudbury

Replacement and Relocation of Circuit Breakers from Abitibi Canyon Switching Station to Pinard Transformer Station

Est. Cost: \$47 million

Exp. In-Service: 2013

Additional circuit breakers are being replaced and moved from the Abitibi Canyon Switching Station to the Pinard Transformer Station. The Abitibi Canyon Switching Station is a key station for getting clean, renewable water power from generation sites in the northeast to places where the power is needed. The enhancement is expected to cost \$47 million, and will be in service in 2013.

East Lake Superior

Replacement of Wooden Line Support Structures in Sault Ste. Marie

Est. Cost: \$4.9 million

Exp. In-Service: 2014

Great Lakes Power is replacing wooden transmission poles and towers with metal structures in Sault Ste. Marie. Many of the deteriorating wooden structures are located close to residences and institutions, so their replacement will enhance public safety, as well as maintain reliability.



SOUTHERN ONTARIO

Hamilton Area

Station Equipment Replacement

Est. Cost: \$13.2 million

Exp. In-Service: 2015

The Kenilworth Transformer Station in Hamilton serves an industrial area vital to the local economy. Hydro One is investing \$13 million to replace equipment that is nearing the end of its expected service life to ensure customers in the Hamilton area continue to receive a reliable supply of electricity.

SOUTHWESTERN ONTARIO

Chatham/Lambton/Sarnia

Equipment Replacement at Wallaceburg Transformer Station

Est. Cost: \$26 million

Exp. In-Service: 2013

Transformer equipment at Wallaceburg Transformer Station required replacement to reduce operational risks and maintain local system reliability.

GREATER TORONTO AREA

Toronto Area

Station Upgrades at Leaside, Hearn and Manby

Est. Cost: \$148 million
Exp. In-Service: 2014-2015

With more than 700,000 customers in Toronto, efforts are under way by Hydro One to upgrade equipment at its Hearn Switching Station and the Manby and Leaside Transformer Stations in Toronto. These three major transmission stations provide Toronto with about 40% of its electricity needs.

The changes will improve local reliability and increase the amount of new and renewable generation that can be connected to distribution systems in the Greater Toronto Area.

Toronto Area

Richview Transformer Station - Air Breaker Replacement

Est. Cost: \$61.2 million
Exp. In-Service: 2017

The City of Toronto relies on eight major supply points for its electricity – seven large transmission facilities and one generating plant.

Hydro One is replacing aging equipment at the Richview Transformer Station, a critical station for the city's west end. This will help maintain the reliability of electricity supply for residents living and working in the west end and downtown Toronto.

Toronto Area

Midtown Transmission Reinforcement

Est. Cost: \$115 million
Exp. In-Service: 2015

A joint effort between Hydro One and Toronto Hydro, the Midtown Transmission Reinforcement project will strengthen the transmission system through midtown Toronto. Replacing aging equipment and building a new transmission line, part of which is underground, will ensure a safe and reliable supply of power to customers and provide adequate supply to meet future load growth through midtown Toronto.

Construction has been underway since 2011.

Toronto Area

New Copeland Transformer Station (formerly Bremner Transformer Station)

Est. Cost: \$195 million
Exp. In-Service: 2014*

Downtown Toronto's power distribution system is currently served by five transformer stations. The new Copeland Transformer Station will ensure reliable supply for the fast-growing downtown core, and take stress off the existing Windsor Transformer Station, which currently serves 9 of the 10 largest buildings in Toronto. It will also provide power to the redeveloped waterfront.

This new station in downtown Toronto will help to alleviate the strain on neighbouring stations and will help to serve the growing customer base. It will also permit critical asset renewal at neighbouring stations to take place.

*First Phase. Source: Toronto Hydro

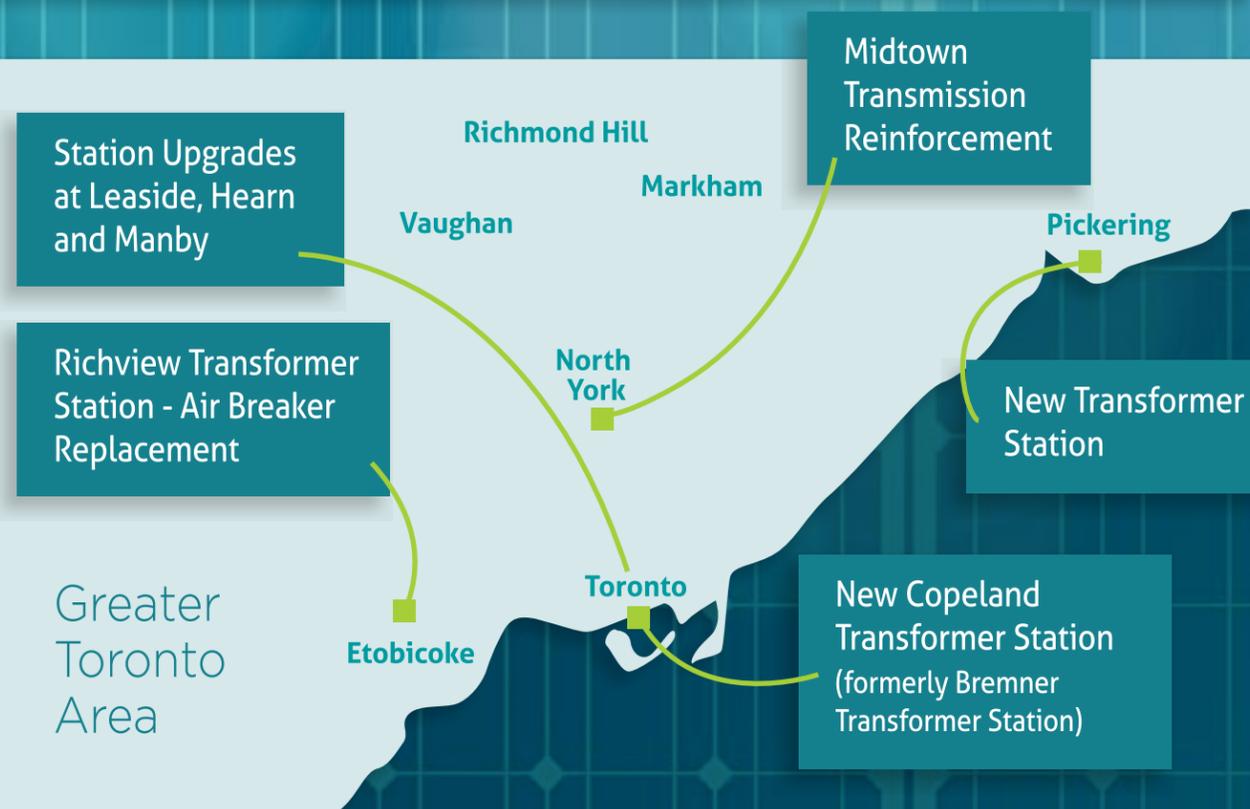
Clarington Transformer Station

New Transformer Station

Est. Cost: \$297 million
Exp. In-Service: 2017

The Pickering Nuclear Generating Station is a critical source of electricity for the eastern part of the Greater Toronto Area. The Clarington Transformer Station, which will connect high voltage 500 kV lines and 230 kV lines in the area, will be required to come into service before Pickering Generating Station can be shut down, to ensure reliable supply for customers in the Eastern Greater Toronto Area.

The station will also enhance the reliability of supply to parts of Durham region. The project is pending a decision from the Minister of the Environment on whether an individual Environmental Assessment is required.



In Summary

- Hydro One will be expected to begin planning for a new Northwest Bulk Transmission Line to increase supply and reliability to the area west of Thunder Bay. The area faces growth in demand, some of which is beyond what today's system can supply. Hydro One and Infrastructure Ontario will be expected to work together to explore ways to ensure cost-effective procurement related to the line.
- Connecting remote northwestern First Nation communities is a priority for Ontario. Ontario will continue to work with the federal government to connect remote First Nation communities to the electricity grid or explore on-site alternatives for the few remaining communities where there may be more cost-effective solutions to reduce diesel use.
- All regions of the province can expect timely local transmission enhancements as needs emerge. Upgrades and investments will meet system goals, such as maintaining or improving reliability or providing the infrastructure necessary to support growth.

5

Regional Planning

Engaging Local Communities

An exchange of information and engagement with municipalities, Aboriginal communities, stakeholders and members of the general public will now be the cornerstone of energy planning discussions.

The release of the 2013 LTEP follows the most comprehensive set of consultations and engagements ever undertaken by the Ministry of Energy. Almost 8,000 people took an on-line survey and shared their views on conservation, energy supply, regional planning and imports. Over 1,000 submissions were received through the Environmental Registry and by the Ministry of Energy.

Staff also sat down with representatives of 50 LDCs to obtain their views and suggestions on how to improve and maximize the delivery of conservation in Ontario.

- Policy makers hear first-hand what Ontarians think about energy policy, and the current issues of the day. They will learn how their policies affect people's day-to-day lives.
- Communities feel they were listened to, that their voices were heard.
- While they may not always agree with the final decision, the public has an increased understanding of the trade-offs involved in what is often a very complex area of policy and system planning.

Ensuring there is a local voice in energy planning is critical. Since 2005, the IESO has had a Stakeholder Advisory Committee with broad representation that meets regularly to provide its Board of Directors and management with advice and recommendations on market initiatives and planning decisions. The OPA has recently created its own Stakeholder Advisory Committee.

In May 2013, the government asked the IESO and the OPA to recommend a new integrated regional energy planning process that would improve how large infrastructure facilities are sited and would propose how to involve municipalities, Aboriginal communities and other stakeholders in developing regional energy plans.

The IESO and the OPA heard that Ontarians wanted to be involved in the siting of large energy facilities, and in the plans for their region's energy use:

"A common theme that emerged from the feed-back received from the engagement sessions and face-to-face meetings was the need for a major education effort about Ontario's electricity needs, including a better understanding of the electricity planning and

siting processes. This would help municipalities, First Nation and Métis communities, stakeholders, and the general public to become involved early and participate effectively in decision-making".

The IESO and the OPA published their report *Engaging Local Communities in Ontario's Electricity Planning Continuum* in August 2013 and the government decided to adopt these recommendations. These recommendations will improve municipal engagement and public consultation and ensure that large infrastructure is located in the right place from the start. The report's recommendations are grouped under the following themes:

Bringing Communities to the Table

- The government and its energy agencies will reach out to local communities early and often. Regional Advisory Committees will be created across Ontario to ensure that representatives of municipalities, First Nation and Métis communities and local businesses can participate in the planning of their regions' energy needs.

Linking Local and Provincial Planning

- Regional electricity needs will be integrated into applicable municipal plans, and the government will enhance regional energy plans, which could include the consideration of social, environmental and economic development objectives. The government has recently launched programs to support the development of Municipal and Aboriginal Community Energy Plans.

Ministry of Energy and agency staff travelled to 12 communities including Kenora, Windsor, Sault Ste. Marie and Ottawa to hear Ontarians' views on the Long-Term Energy Plan. They also met with representatives of close to 100 First Nation and Métis communities and organizations in 10 engagement sessions across Ontario.

Increased public participation and community engagement in the development of energy plans and policy is vital and has a number of beneficial outcomes:



Figure 26: Ontario's 21 Electricity Regions

Reinforcing Planning

- The OPA will give greater consideration to local priorities in the siting of generating facilities.
- The government will work with the OEB to consider standardizing the procurement process for generation, including the requirement for appropriate consultation on siting.

Enhancing Awareness

- The Ministry of Energy and its partner agencies will continue to introduce public education tools to improve energy literacy, including emPOWERme (see page 66).
- The ministry will develop a strategy to increase public understanding of our energy needs, the options for meeting them, and opportunities for people to get involved.
- The IESO and the OPA will set up regional open data web sites, with accessible information on the energy needs and supply options for each of the 21 electricity regions in Ontario.

The ministry has begun working with other provincial ministries, the IESO and the OPA to develop a plan to implement the regional planning recommendations. Where items fall under the responsibility of the IESO and the OPA, the two agencies have already begun to take action.

Much effort has gone into the process that should be followed and the input that's needed in planning infrastructure for regional needs. Much effort has also gone into conducting regional planning for various parts of the province. Below are some current examples that illustrate how regional planning efforts can meet growth needs, prudently manage investments and costs, and provide local input to ensure the planning reflects the region's priorities.

NIPIGON-GREENSTONE



The Nipigon-Greenstone area hosts several energy-related activities. Exploratory mining activity is on-going in the area. There is hydroelectric potential in the region including OPG's Little Jackfish hydroelectric project which would require a transmission line to connect the project to the

grid if it is developed. As the proponents for these and potentially other projects advance their plans, the government is prepared to address the needs of the area as conditions warrant to ensure options are evaluated from an integrated perspective.

KITCHENER-WATERLOO-CAMBRIDGE-GUELPH AREA

Refurbishment and Upgrade

Est. Cost: ~\$110M

Exp. In-Service: 2016

Transmission reinforcements in the growing Kitchener-Guelph-Waterloo-Cambridge area are part of an integrated plan that includes conservation and distributed generation.

Two projects are expected to be in-service in 2016: an upgrade to five-km of transmission line and the expansion of two Guelph area

stations, and an expanded transformer station in Cambridge.

These projects will reinforce electricity supply to South-Central Guelph and to the Kitchener/Cambridge areas. The projects will also accommodate the expected demand growth from new business development in the Hanlon Creek Business Park which, according to the City of Guelph, is expected to attract about 8,500 new jobs over the next eight years.

OTTAWA AREA



The Ottawa area has undergone substantial urbanization in the outlying districts, which are supplied by a relatively sparse electricity system. There are plans for a new transit line, the connection of new government or educational facilities, and the redevelopment of industrial lands.

Hydro One is making substantial improvements to the Hawthorne Transformer Station, and efforts are being focused on meeting requirements in downtown Ottawa, Kanata/Nepean and East Ottawa/Orleans.

YORK REGION



York Region is one of the fastest-growing areas in Ontario. Extensive urbanization means that growth in electricity demand has been greater than the provincial average.

Early planning work has identified two near-term projects: the installation of new equipment at the Holland Transformer Station, and new facilities along the existing Highway 407 transmission corridor.

CENTRAL-DOWNTOWN TORONTO



Toronto is the fourth largest metropolis in North America. Between 2006 and 2011, the population in parts of the city's downtown increased by more than 50 per cent.

A regional planning exercise on long term needs and options to accommodate future growth in electricity demand is underway and consultations are expected in the coming months.

Near-term investments by Hydro One and Toronto Hydro include line refurbishment projects in Midtown and along the lakeshore and a new station downtown.

LEAMINGTON



The Windsor-Essex area has the largest concentration of greenhouse vegetable production in North America. As a result, the region's electricity needs are increasing.

Hydro One is in the early stages of planning for a new line and station to address load growth and anticipated expansion in the agricultural sector. Cost recovery for transmission expansion will be established during the approvals process.



Regional Planning

There are 21 electricity regions in Ontario (refer to Figure 26). These regions were developed by Hydro One and the OPA for regional planning purposes. The boundaries were set by considering common supply systems, electrical interrelationships, shared supply and system performance impacts in the OEB's Renewed Regulatory Framework for Electricity.

Over the next five years, the needs in all 21 electricity regions in Ontario will be assessed, and new regional plans will be developed if required.

If a regional plan is required, the OPA would conduct a scoping assessment. If a transmission and distribution solution is required, a Regional Infrastructure Plan, led by the transmitter, will be developed. If a solution involves conservation, demand management and local generation alternatives, a more comprehensive Integrated Regional Resource Plan, led by the OPA, will be required.

Working with transmitters, LDCs and the IESO, the OPA is already developing comprehensive plans for eight regions of the province: Greater Ottawa, Burlington to Nanticoke, GTA North and GTA West, Kitchener-Waterloo-Cambridge-Guelph, Toronto, Northwestern Ontario and Windsor-Essex.



emPOWERme

Given the complexity of the province's electricity system, it is difficult to understand how it all operates, what it means for ratepayers, and how it impacts a household energy bill.

In response to calls for better tools and resources to improve energy literacy, Ontario has launched emPOWERme, a web feature that uses videos, graphics, interactive tools and fact sheets to explain the fundamentals of electricity in plain language and compelling imagery.

Learn more at Ontario.ca/empowerme

► In Summary

- The government will implement the IESO and the OPA recommendations for regional planning and the siting of large energy infrastructure.
- The ministry, the IESO and the OPA will work with municipal partners to ensure early and meaningful involvement in energy planning.
- Municipalities and Aboriginal communities will be encouraged to develop their own community-level energy plans to identify conservation opportunities and infrastructure priorities. The Municipal Energy Plan Program and the Aboriginal Community Energy Plan Program will support these efforts.
- Regional plans will promote the principle of Conservation First while also considering other cost-effective solutions such as new supply, transmission and distribution investments.



First Nation and Métis Communities

The Ontario government has recognized that Aboriginal participation in the energy sector is one of the keys to the economic development of First Nation and Métis communities. Ontario also understands that these communities need opportunities to engage and participate in ways that align with their unique community needs and interests.

Ontario takes its duty to consult First Nation and Métis communities very seriously. The government is committed to ensuring that First Nation and Métis communities are consulted on any energy activity that could potentially affect their Aboriginal or treaty rights.

Ontario has brought in a range of policies and programs over the past four years to increase the involvement of Aboriginal communities in the sector:

- The Aboriginal Energy Partnerships Program helps communities plan and participate in the development of electricity infrastructure such as clean energy generation projects.
- Aboriginal participation is an important component of the Feed-in Tariff program, with price adders and contract set-asides for Aboriginal led or partnered renewable energy projects.

- The Aboriginal Loan Guarantee Program (ALGP) helps communities secure financing for their equity participation in clean energy and transmission projects. It started with \$250 million, which was expanded to \$400 million.

Ontario will continue to support and encourage participation by both First Nation and Métis communities in new generation and transmission projects and in conservation initiatives.

- Ontario recently launched the Aboriginal Community Energy Plans (ACEP) program, to support the energy planning activities of First Nation and

New Post Creek

OPG and its partner, Coral Rapids Power LP, a wholly owned company of Taykwa Tagamou Nation, are moving forward with the 25-MW New Post Creek hydroelectric development. As an equity owner in the project, the Taykwa Tagamou Nation will benefit from long-term revenues over 50 years to support community development. Construction of this clean, renewable hydro power project is expected to begin in 2014. At peak construction, the development is expected to create up to 100 construction jobs. The project will also provide Taykwa Tagamou Nation members with experience and skills for future opportunities.

Métis communities, including the identification of needs, interests and opportunities for conservation and small-scale renewable generation projects.

- The government expects to see Aboriginal involvement become the standard for the future development of major, planned transmission lines in Ontario. First Nation and Métis communities are interested in a wide range of opportunities — from procurement to skills training to commercial partnerships. When new, major transmission line needs are identified, the province expects that companies looking to develop the proposed lines will, in addition to fulfilling consultation

Grand Renewable Energy Park

The Six Nations community has negotiated a 10% equity interest in Samsung's Grand Renewable Energy Park, a 149 MW wind project and a 100 MW solar project partially located on Ministry of Infrastructure controlled lands in the Haldimand Tract area. Details of the agreement between Samsung and Six Nations include a 10% equity interest in the Grand Renewable Energy Park, estimated to represent up to \$65 million in net profit for the community; and a Capacity Funding Agreement which includes post-secondary scholarship funding and provisions making construction and maintenance jobs at the Grand Renewable Energy Park available to Six Nations members. These benefits to the community will last the 20-year term of the project. In addition, Ontario has committed to the transfer of funds from the province to Six Nations equivalent to the lease payments made by Samsung to the province for the lease of the Ministry of Infrastructure controlled lands.

obligations, work to involve potentially affected First Nation and Métis communities, where commercially feasible and where there is an interest.

- Ontario will also launch the Aboriginal Transmission Fund (ATF) in early 2014 to help First Nation and Métis communities undertake the due diligence required before becoming involved in new major planned transmission line projects. The fund will help Aboriginal communities examine whether economic participation in a proposed transmission line is the right choice for them, and whether a potential partnership is meaningful and will bring lasting benefits to their community members.

- Ontario will continue to encourage Aboriginal participation, including through the FIT program and the future large renewable energy procurement program.

Building local capacity and providing skills training will be critical to driving participation levels and long-term success. The province recently extended education and capacity building funding delivered by the OPA to Aboriginal communities and organizations. This funding will be available to support education and capacity-building activities that better equip First Nation and Métis communities to participate in and develop renewable energy projects and initiatives.

Ontario will work with Hydro One to expand its training and skills development initiatives for Aboriginal peoples seeking to work in the transmission/distribution sector, including working with its existing college consortium to focus on Aboriginal opportunities as it relates to trades and technicians.

Conservation can and will play an important role for Aboriginal communities that identify high electricity costs as a significant challenge. Earlier this year, the OPA launched the Aboriginal Conservation Program, which delivers direct, customized conservation information and programs to First Nation communities on reserve and outreach to urban Aboriginal and Métis peoples.

First Nation and Métis community representatives across the province have expressed a desire for conservation measures that reach a greater number of communities, as well as a desire to work with their local electricity service provider on reducing their bills.

Ontario will give LDCs an enhanced role in the delivery of Aboriginal conservation programs, particularly for on-reserve First Nation customers. Where appropriate, the province will work with federal partners to implement provincial conservation initiatives effectively.

While the government works to ensure First Nation and Métis communities have access to procurement and conservation programs that will support their economic development, it also recognizes the unique problems faced by 25 remote First Nation communities in the province's northwest. They are not connected to the grid, and get their electricity



Photo: Ontario Power Generation

Lower Mattagami

Moose Cree First Nation successfully obtained a loan guarantee under the ALGP to support its purchase of up to 25% equity ownership in the \$2.6-billion Lower Mattagami hydroelectric project. The community is partnering with OPG to build the project, which will add up to 440 MW of clean, renewable energy to Ontario's electricity supply mix when it comes online in 2015. The partnership will also help Moose Cree First Nation develop commercial capacity and infrastructure to take advantage of future development opportunities. Construction on the project is currently under way, with about 1,600 workers employed, including more than 250 First Nation and Métis individuals.

from on-site generators burning diesel fuel. These are increasingly expensive sources of electricity that pollute the environment. For most communities, diesel fuel has to be brought in on ice roads in the winter, even though the shipping season is getting shorter because of warmer winters. When roads are not available, reliance on even more expensive airfreight is often the only option to bring in diesel fuel.

Remote First Nation Communities

The OPA developed a draft plan for connecting many of the remote First Nation communities. The OPA's study shows that there is a strong economic case for connecting up to 21 of the remote First Nation communities with new transmission and distribution lines. The OPA's analysis indicates that over the next

40 years, grid connection could be 30% to 40% less expensive than the continued use of diesel fuel. Such savings would amount to about \$700 million in avoided

costs for the parties who currently subsidize and fund the diesel systems — the federal government and the province.

Figure 27: Remote First Nation Communities



Connecting the remote communities is a priority for Ontario. Ontario will continue to work with the federal government to connect remote First Nation communities to the electricity grid or find alternatives where it is not economically feasible to do so.

Since the release of the draft Remote Community Connection Plan, the OPA has engaged most of the participating communities and received feedback. The OPA is planning to engage the remaining communities so

that the plan can be updated and finalized by the end of 2013. As mentioned in Chapter 4 – Investing in Transmission, a key first step to connecting some of the remote communities will be the new line to Pickle Lake.

Success in connecting the remote communities will depend on contributions from all of the parties that benefit from the new transmission lines and other infrastructure, particularly the federal government, whose commitment and co-operation

will be required to make this priority project a reality. The federal government, which is responsible for supporting First Nation community infrastructure, would also share in the savings, as the costs associated with using diesel fuel would be reduced.

The federal government would receive additional benefits beyond the diesel related savings. Once the remote communities are connected, there would be a reduction in the environmental impact and environmental

liabilities associated with diesel spills, lower greenhouse gas emissions, improved social and living conditions for remote community residents, and increased opportunities for economic development within First Nation communities.

Because of these benefits, and its current responsibility for costs in remote communities, federal participation is a critical element in moving forward to connect remote communities. The project will not be possible without it.

Another important step in the connection of remote communities will be the development of transmission and distribution plans by proponents interested in the connection of remote communities, and securing all required approvals.

While transmission appears to be the most economic solution for up to 21 of the 25 remote First Nation communities, there may be more cost-effective alternatives for the remaining First Nation communities. Ontario will continue

to explore other opportunities to reduce diesel use in the north for these communities.

Preliminary studies by the OPA indicate that, within these First Nation communities, renewable generation can be integrated into the existing diesel-based electricity systems in a cost-effective manner. Alternative options are being considered that could significantly reduce the use of diesel fuel and result in a cost saving of approximately 20%.

The province will work with the federal government, energy partners and communities to support innovative solutions for supplying electricity in these remote First Nation communities, including consideration for on-site renewables, micro-grids and conservation. Ontario has already started focusing on conservation opportunities through its Aboriginal Conservation Program, which has a dedicated category for remote communities.

The OPA will continue to work with these remote communities

to identify and develop on-site options for reducing their dependence on diesel fuel. The implementation plans (expected by the end of 2014) will consider community economic development interests, such as the use of renewable or other generation opportunities that may be identified, as well as the opportunities for federal and provincial funding.

The government remains committed to an on-going and regular dialogue with First Nation and Métis communities. Ontario will work with Aboriginal leadership to identify effective mechanisms to discuss energy issues, such as the cost of electricity for First Nations on reserve, as well as share information in a timely way. Dialogue is the only way to ensure that support programs, conservation initiatives, procurement processes and electricity infrastructure projects reflect the needs, interests and capacity of Aboriginal communities, and maximize opportunities for participation.

In Summary

- The government understands the importance of First Nation and Métis participation in the development of energy and conservation projects. The government will continue to review participation programs to ensure they provide opportunities for First Nation and Métis communities.
- Ontario will launch an Aboriginal Transmission Fund in early 2014 to facilitate First Nation and Métis participation in transmission projects.
- The province expects that companies looking to develop new transmission lines will, in addition to fulfilling consultation obligations, involve potentially affected First Nation and Métis communities, where commercially feasible and where there is an interest.
- The government will continue to encourage Aboriginal participation, including through the FIT program and future large renewable energy procurements, in a way that reflects the unique circumstances of the First Nation and Métis communities.

7



Oil and Natural Gas

Oil and natural gas play an essential role in the daily lives of Ontarians, supplying three-quarters of the province's primary energy use. There are approximately 3.5 million residential, commercial and industrial natural gas customers in Ontario. Natural gas is used for space heating and domestic hot water within our homes and businesses, steam and process heat for industry, as well as providing approximately 15% of the electricity generated within Ontario. Oil continues to be the primary energy source for our vehicles.

Photo: Grafiks Marketing & Communications, Sarnia, Ontario

Almost all of Ontario's oil and natural gas comes from outside the province and is delivered by interprovincial pipelines, which are under federal jurisdiction and regulated by the National Energy Board.

Within our province, the OEB regulates the natural gas sector by approving distribution rates and commodity prices, as well as licensing gas marketers. The oil sector is not subject to economic regulation by Ontario.

It is expected that there will be ample future supply of natural gas from the US Great Lake states for

Ontarians. The adoption of new technologies allows gas to be economically extracted from shale and coal beds. It is estimated that North America now has a 100-year supply of natural gas.

The increase in production of oil in Western Canada, and shale gas from the US has had a significant impact on the oil and natural gas market in Ontario. The government must continue to ensure that Ontario consumers are able to benefit and the interests of its residents are protected.

Ontario's geographic location and natural gas infrastructure put it in a strategic position to take advantage of North America's changing natural gas market. The Dawn and Tecumseh underground natural gas storage facilities play an important role in the delivery of natural gas within Ontario as well as supporting the delivery of natural gas to consumers in Québec and the northeastern United States.

The Union Gas Dawn storage hub in southwestern Ontario is the largest underground storage facility in Canada, with 155 billion cubic feet of highly deliverable storage. The Enbridge Gas Distribution Tecumseh storage facility has 100 billion cubic feet of storage and is located adjacent to Dawn. Both natural gas storage facilities are regulated by the OEB.

These facilities can store massive quantities of natural gas and provide it to customers on demand. Natural gas can be bought and stored when prices are low and then sold when demand and prices are higher. This helps suppliers minimize price volatility and ensure that sufficient gas is available to meet peak heating demand.

It is anticipated that the Dawn and Tecumseh storage facilities will increase in strategic importance as US pipeline infrastructure expansion allows for increased delivery of shale gas from the Marcellus and Utica basins to southwestern Ontario.

Natural gas is a key input for Ontario's petrochemical industry. Focused in Sarnia and employing about 12,000 people, the industry is strategically located to take advantage of Ontario's southwestern natural gas storage facilities.

Ontario wants to make sure communities have access to natural gas to take advantage of the changing North American market and low prices. Natural gas heating is significantly less expensive than that provided by electricity or heating oil. There is also increasing interest in the use of compressed or liquid natural gas as a transportation fuel for corporate car and truck fleets, to reduce costs and the emissions of greenhouse gases.

The quality of life and economic prosperity of Ontario depends on having secure access to competitively priced natural gas and an equally competitively priced natural gas transmission and distribution system.

For the oil market, industry developments have led to major pipeline proposals directly affecting Ontario that require thoughtful consideration. The government must ensure the province's interests are taken into account.

One such undertaking involves the proposed TransCanada Energy East project, which would repurpose a section of its Canadian Mainline natural gas pipeline to crude oil

service across Canada. Within Ontario, the Energy East project would cross northern Ontario, run through North Bay and southeast to Cornwall where a section of new pipeline running to the Québec border is proposed.

While approval of the Energy East project is a federal responsibility, Ontario's input is crucial in making any decision. To that end, the Ministry of Energy has asked the OEB to undertake consultation with the public, including First Nation and Métis communities, local communities, and stakeholders on the proposed Energy East project. These consultations will be broad and transparent, allowing time and opportunity for stakeholders and the public to express their views through oral and written comments.

The government evaluates oil and natural gas energy pipeline projects using the following six principles:

- 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 Aboriginal communities;
- Local municipalities must be consulted;
- Projects should provide demonstrable economic benefits and opportunities to the people of Ontario, over both the short and long term; and
- Economic and environmental risks and responsibilities, including remediation, should be borne



Natural gas storage facilities at Dawn, Ontario.
Photo: Union Gas Limited

exclusively by the pipeline companies, who must also provide financial assurance demonstrating their capability to respond to leaks and spills.

Oil and natural gas, as well as the pipelines that deliver these products are essential to the quality of life and economic prosperity that Ontarians enjoy. Ontario will continue to work with its federal and provincial partners to ensure that oil and natural gas are delivered economically while maintaining the highest safety and the environmental standards.

➤ In Summary

- Ontario relies on oil and natural gas to support basic needs such as heat and transportation. These fuels are also essential to Ontario's economy and quality of life.
- The government will work with gas distributors and municipalities to pursue options to expand natural gas infrastructure to service more communities in rural and northern Ontario.
- Ontario has adopted principles it will use to review large scale pipeline projects to ensure that they meet the highest environmental and safety standards as well as benefit Ontario's economy.

8



Innovation

The history of electricity in Ontario is one of constant innovation and this is still true today. Ontario maintains its place as an innovation leader because of accomplishments with the Smart Grid. The installation of sensors and computer chips into formerly passive distribution networks not only allows many utilities to detect and fix outages quickly, but will also enable Ontarians to better manage their personal energy use.

Demand for services and apps, to enable consumers to better manage, monitor and control their energy use is increasing. According to a recent study by Accenture Consulting, *Actionable Insights for the New Energy Consumer*, an increasing number of consumers ... “are seeking added value, personal connection and products and services that align with their lifestyles – all of which go beyond the traditional energy experience.”

ECHO (ECological HOme) is a ‘smart’ home designed and built by students from Team Ontario – Queen’s University, Carleton University and Algonquin College – to promote sustainable living and participate in the U.S. Department of Energy’s Solar Decathlon 2013.

Photo: Stefano Paltera/U.S. Department of Energy Solar Decathlon

Ecobee delivers intelligent energy management solutions for commercial properties. The company works with local utilities in the deployment of its Programmable Communicating Thermostats, which provide automated energy conservation through demand response programs.



Enbala’s smart grid technology platform is helping Ontario to maintain grid reliability. By connecting a network of large-scale commercial and industrial electricity users to their versatile GOFlex™ platform, they can automatically increase or decrease electricity consumption in response to moment by moment changes in the electricity needs of the grid. This will help Ontario integrate its renewable energy sources more efficiently and reliably.



Team Ontario is a collaboration of more than 100 students from Carleton University, Algonquin College and Queen’s University selected to compete in the US Department of Energy Solar Decathlon. Team Ontario designed and built ECHO (ECological HOme), a “smart” home that incorporates modern technologies such as predictive shading, real-time energy monitoring, an integrated mechanical system and a user-friendly mobile application to control features of the home.



Energate is developing tools that make it easier for consumers to monitor and manage their home energy use and costs. Energate’s software, mobile applications and devices such as smart thermostats and in-home energy displays also help to manage the system by reducing peak demand. The Smart Grid Fund is helping Energate test and demonstrate these tools for consumers in homes across Ontario, including Peterborough, Vaughan, and Cambridge.



Temporal Power, a Mississauga company, develops and manufactures advanced low-loss flywheel energy storage technology systems. In partnership with Hydro One Networks, Temporal Power will demonstrate how novel flywheel technology can help integrate wind energy into the electricity grid.



Ontario has undertaken a number of initiatives to help utilities take on innovation challenges. These initiatives are building a thriving smart grid ecosystem that can lead to innovation that both enhances the grid's operation and improves asset management to help mitigate system and customer costs.

The Smart Grid Fund

The \$50-million Smart Grid Fund was launched in 2011 to help local distribution and Smart Grid companies test and build the technologies needed to modernize the grid. The fund currently supports 11 organizations that are developing applications that track energy use, balance voltage on the grid, and automate control systems for LDCs. These smart grid solutions will also help LDCs integrate new promising technologies into Ontario's electricity system that could help operators use grid assets more efficiently, including storage and electric vehicles.

Technological innovation from the Smart Grid could also help bring clean energy to remote communities that have economic challenges connecting to the province's transmission grid. These communities, which currently rely on diesel fuel to generate electricity, could have their own micro distribution grid. This would integrate and balance diesel generation with the electricity that comes from wind, solar, storage and hydroelectric resources.

The Smart Grid Fund helps Ontario businesses compete with advanced technology companies from around the world. It has already led to the creation of more than 600 jobs. According to the Ontario Centres of Excellence, our growing cluster of energy technology entrepreneurs is developing the products that will drive the jobs of tomorrow. Supporting this emerging industry is in Ontario's best interests.

Energy Data and Green Button

The government believes that smart meter data can be used in ways that go beyond supporting customer billing. While respecting the principles of privacy and security, new value-added services and applications for consumers could be developed by enabling better access and analysis of electricity consumption data. This type of data is essential to designing efficient and effective programs to further benefit consumers.

An important example of providing consumers with access to data is the Green Button Initiative. The Green Button Initiative provides customers with access to their electricity consumption information in a standardized format. Developers will be able to use the data to provide innovative software applications that allow consumers to view and manage their energy use. In October 2013, Ontario

Solantro Pilot Program

The pilot demonstration project will field test technologies for grid-ready (plug-and-play) AC photovoltaic that improve economics, reliability and performance of solar energy. The pilot will focus on Nano and Micro-inverters and DC Optimizer Reference Designs. The project will be conducted between 2012 and 2015.

Inverters play a crucial role in the performance of a solar panel: they convert the direct current from solar panels to alternating current that then can be used directly, stored or fed into the power grid. Reference Designs allow developers to fine tune the DC Optimizer to maximize the energy produced by the solar panel.

The result is a plug-and-play integrated circuit chip (the inverter) on the back of each solar panel that constantly optimizes efficiency and reduces the costs of design and installation.

Figure 28: The Green Button Initiative

HOW IT WORKS



BENEFITS

Energy consumption data can be used to:

<p>Track and analyze your energy use to conserve energy and save money</p>	<p>Assist with retrofit planning to increase the energy efficiency of your home</p>	<p>Optimize the size and cost-effectiveness of rooftop solar panels</p>
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announced the *Energy Apps for Ontario Challenge*, offering \$50,000 to support the best new apps that use the Green Button standard.

Ontario has made significant progress with its Green Button Initiative since it was launched in 2012. Seven LDCs have implemented the first phase of the program, providing access to Green Button to almost 60% of the province's electricity customers. More LDCs have signaled their intention to follow quickly.

The next phase of the initiative, Connect My Data, will allow customers to automate the transfer of data securely to mobile and web applications that can be used on computers, smartphones and tablets. London Hydro and Hydro One launched the first Connect My Data pilots in November 2013, giving their customers innovative and creative applications that will help them manage and conserve their electricity use.

Energy Storage

Energy storage technologies have the potential to revolutionize the electricity system, increasing its efficiency, lowering costs and increasing reliability for the consumer. With storage, electricity could be stockpiled during periods of low cost generation, and then used when demand and prices are highest.

Storage technology offers the potential to increase the useable energy from renewable energy sources.

The IESO has been integrating new technologies to correct small, sudden changes in the electric current frequency to ensure the stability of our electricity system. Ontario is home to a number of innovative companies that are at the forefront of the energy storage sector.

By the end of 2014, the government will include storage technologies in our procurement process starting with 50 MW and assessing additional engagement on an ongoing basis.

This will include:

- Commissioning an independent study to establish the value of energy storage's many applications throughout the system;
- Examining the opportunities for net metering and conservation policies to support energy storage; and
- Providing opportunities for storage to be included in large renewable procurements.

The government also intends to initiate work, on a priority basis, to address regulatory barriers that may limit the ability of stored energy resources to compete in Ontario's electricity market. For example, some energy storage applications are currently required to pay various retail, uplift and Global Adjustment charges twice — once when energy is captured and again by the end-user.

In Summary

- Ontario's energy sector is an innovation leader. The government will seek to expand the Smart Grid Fund and build on previous success. The Smart Grid Fund has created more than 600 jobs and supported 11 projects developing innovative technologies.
- The government intends to initiate work, on a priority basis, to address regulatory barriers that limit the ability of energy storage technologies to compete in Ontario's electricity market.
- By the end of 2014, the government will include storage technologies in our procurement process, starting with 50 MW and assessing additional engagement on an ongoing basis.
- The new competitive procurement process for renewable energy projects larger than 500 kW will also provide an opportunity to consider proposals that integrate energy storage with renewable energy generation.

Conclusion

The government is building on a decade of achievements with this LTEP, and is fine-tuning its policies to meet the future needs of Ontario.

Ontario has virtually eliminated coal from our electricity system. The phasing out of coal is the single largest climate change initiative in North America.

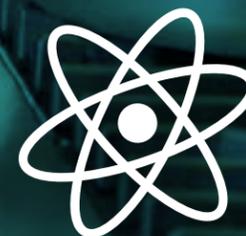
Through this LTEP, the government will ensure the continued delivery of a cost-effective, reliable and clean energy supply, one that is shaped by community engagement and emphasizes conservation and demand management before the construction of new generation.

The government will build on the initiatives it has already put in place to keep electricity rates as low as possible. These have included the Ontario Clean Energy Benefit, the early phase out of coal-fired generation, and the decision not to proceed at this time with the construction of new nuclear facilities.

The government has built flexibility into this LTEP. Forecasting is not an exact science and plans need to be flexible to meet changing conditions. That's why Ontario is committing resources to meet a lower demand forecast while maintaining flexibility to respond to higher needs. Overbuilding the system will unnecessarily increase electricity rates.

Annual energy reporting will also help us prudently plan for more resources if and when they are needed. The Ontario Energy Report will give Ontarians an update of the energy supply/demand picture for the province, and will allow the government to review its progress in implementing the LTEP.

The LTEP will continue to be updated every three years, and these annual reports will give everyone an opportunity to monitor progress for course corrections and to understand developments that will be important in the next formal review.



Glossary

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

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

Demand Response (DR): Programs designed to reduce the amount of electricity drawn from the grid during peak demand periods. Customers could be responding to changes in the price of electricity during the day, incentive payments and/or other mechanisms.

Dispatchable Generation: Generation sources such as natural gas that can be increased or decreased at the request of power grid operators; that is, output can be increased or decreased as demand or availability of other supply sources changes.

Distribution: A distribution system carries electricity from the transmission system and delivers it to consumers. Typically, the network would include medium-voltage power lines, substations and pole-mounted transformers, low-voltage distribution wiring and electricity meters.

Feed-in Tariff (FIT): A guaranteed rate that provides stable prices through long-term contracts for energy generated using renewable resources.

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 OPA contracts with generators and suppliers of conservation services. Consumers on the regulated price-plan (RPP) pay a fixed price set every six months by the Ontario Energy Board which includes the GA, while customers who have a retail contract pay the contract price for their electricity plus the Global Adjustment.

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

Grid Parity: The point at which new generation technologies become cost competitive with conventional technologies.

Integration: The way an electricity system combines and delivers various generation sources, conservation and demand management to ensure consumers have dependable and reliable electricity.

Intermittent Power Generation: Generation sources that produce power at varying times, such as wind and solar generators whose output depends on wind speed and solar intensity.

Kilowatt (kW): A standard unit of power that is equal to 1,000 watts (W). Ten 100-watt light bulbs operated together require one kW of power.

Kilowatt-hour (kWh): A measure of energy production or consumption over time. Ten 100-watt light bulbs, operated together for one hour, consume one kWh of energy.

Load or Demand Management: Measures undertaken to control the level of energy use at a given time, by increasing or decreasing consumption or shifting consumption to some other time period.

Local Distribution Company (LDC): A utility that owns and/or operates a distribution system for the local delivery of energy (gas or electricity) to consumers.

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

Megawatt-hour (MWh): A measure of energy production or consumption over time: a one MW generator, operating for 24 hours, generates 24 MWh of energy.

MicroFIT: A program that allows Ontario residents to develop a very small or micro renewable electricity generation project (10 kilowatts or less in size) on their properties. Under the microFIT Program, they are paid a guaranteed price for all the electricity they produce for at least 20 years.

Net Metering: A program made available to customers with renewable energy installations which allow them to generate electricity for their own use before it is made available to the electricity grid. When renewable energy is made available to the electricity grid from the renewable installation, the customer receives a credit on their electricity bill.

North of Dryden: The North of Dryden area refers to the part of the Ontario transmission system bounded by Dryden to the southwest, Red Lake to the northwest, and Pickle Lake to the northeast, as well as a group of remote First Nation communities, an operating mine and the mine development area known as the Ring of Fire north of the existing transmission system.

Ontario Clean Energy Benefit (OCEB): A five-year program that provides a benefit equal to 10% of the total cost of electricity on eligible consumers' bills, including tax, limited to the first 3,000 kWh of electricity consumed each month. The program is scheduled to end December 31, 2015.

Peaking Capacity: Generating sources typically used only to meet the peak demand (highest demand) for electricity during the day; typically provided by hydro or natural gas generators.

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

Photovoltaic: A technology for converting solar energy into electrical energy (typically by way of photovoltaic cells or panels comprising a number of cells).

Program Administrator Cost (PAC) Test: The PAC Test measures conservation program benefits and costs, from the perspective of a program administrator. For the PAC test, avoided energy costs only include avoided costs associated with the electricity system.

Pumped Storage: The most-deployed and mature energy storage technology in the world that uses off-peak electricity to pump water from lower to upper reservoir, and releases this water to generate electricity on demand.

Smart Grid: A Smart Grid delivers electricity from suppliers to consumers using modern information and communications technologies to improve the reliability and efficiency of the electricity system. It empowers consumers with the ability to manage their energy consumption — saving energy, reducing costs and providing choices.

Supply Mix: The different types of resources that are used to meet electricity demand requirements in a particular jurisdiction. Normally the mix is expressed in terms of the proportion of each type within the overall amount of energy produced.

Terawatt-hour (TWh): A unit of power equal to 1 billion kilowatt-hours. Ontario's electricity consumption in 2012 was around 141.3 TWh.

Total Resource Cost (TRC) Test: The TRC Test measures benefits and costs from a societal perspective. For the TRC Test only, avoided supply costs include avoided energy costs associated with electricity, natural gas, water, fuel oil and propane savings, where applicable. Incentive costs are a transfer from a program-sponsoring organization to participating customers, and consequently do not impact the net benefit from a societal perspective.

Transmission: The movement of electricity, usually over long distance, from generation sites to consumers and local distribution systems. Transmission of electricity is done at high voltages. Transmission also applies to the long distance transportation of natural gas and oil.

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