

Delivering Fairness and Choice

LTEP 2017

Chapter 2. Ensuring a Flexible Energy System

Ontario has made significant progress in rebuilding its electricity system. public appeals to Ontarians to reduce their electricity consumption during summer peaks (or peak hours) in order to ensure reliability. Between 2005 and 2016, Ontario has invested over \$35 billion in electricity generation to ensure the system is clean and reliable. The province now has a healthy supply of energy, and the electricity system is well-positioned to pursue emerging opportunities and to meet future challenges we may in the future.

To meet these challenges, Ontario is moving from relying on long-term contracts for electricity supply to more market-based structures that have been successful in other jurisdictions. While long-term contracts have ensured reliability, , which has contributed to increases in electricity prices. A market based approach not only provides the opportunity for the most cost-effective source of electricity to meet demand regardless of the technology, but new procurement structures can also provide flexibility for the sector to react more quickly to any changes. Markets can provide a cost-effective and reliable source of electricity to meet demand, while also allowing the sector to react more quickly to any changes in the demand or supply of electricity. Markets can also be used to incent investment in generation resources that provide grid services or meet broader system objectives, such as addressing climate change.

The Need for Flexibility

Ontario's current electricity system has ensured a reliable, stable supply of electricity for households and businesses. However, the government.

The supports the intent to increase efficiency given that Ontario's changing supply mix, in particular the addition of large amounts of variable generation, has increased the need for system flexibility. In the last 10 years, over 7,000 MW of wind, solar and bioenergy has been connected to the transmission and distribution networks. Over the same period, the cost of these technologies has declined substantially¹, so moving to a more dynamic marketplace will ensure that these resources, as well as any future resources, deliver the most value and the benefits of competitive, clean power are captured for all Ontarians.

has the potential to

¹ For example, OPO (Pg. 13) reports solar PV module prices have declined by 70-80% over the last decade.

While Ontario currently has a robust supply of electricity to meet demand, that margin is expected to decrease during the refurbishment of reactors at the Darlington and Bruce nuclear facilities and when current procurement contracts expire. The current period of energy security presents an opportunity for Ontario to adopt a different approach to meeting the province's future energy needs.

To meet the long-term needs of the system, the Independent Electricity System Operator (IESO) has embarked on a Market Renewal initiative which proposes a redesign and evolution of the province's electricity markets. Market Renewal is aimed at improving the efficiency and flexibility of the electricity markets while maintaining system reliability.

One key aspect of Market Renewal is also redesigning the market in order to ensure that Ontario's existing generation assets are leveraged and optimized as much as possible to provide additional system benefit, while yielding further cost savings for electricity rate payers. The current market does not fully utilize the existing resources or incentivize innovative solutions to meet system flexibility needs. This causes unnecessary loss of non-emitting resources by curtailing wind, solar and nuclear, and spilling hydro generation.²

Ultimately, Market Renewal will result in a more efficient marketplace with competitive and transparent mechanisms that meet system needs at the lowest cost, while achieving the province's environmental goals. It will also help prepare Ontario for the future by creating a framework that can effectively incorporate new and emerging technologies, and meet Ontario's climate change policy objectives.

The IESO will continue to work closely with stakeholders to develop high-level designs and a work plan for the significant changes that are the foundation of Market Renewal.

When the wholesale electricity market first opened in 2002, a "two-schedule" dispatch system was implemented as an interim measure before moving towards a more efficient "single-schedule" system. The "two-schedule" process does not take into account transmission constraints when establishing the market price for electricity. In a province as vast as Ontario, with many thousands of kilometres of transmission lines, this can lead to inefficiencies in the electricity market. The "two-schedule" system has helped provide revenue stability and sufficient compensation for generators, but there is room to improve efficiency and realize cost savings for ratepayers.

A reformed electricity market not only improves generation commitment and dispatch to minimize costs but, with more efficient scheduling, would better optimize the use of electricity

² Adapted from April 20, 2017 report by The Brattle Group to the IESO entitled: "The Future of Ontario's Electricity Market A Benefits Case Assessment of the Market Renewal Project", available at:

https://encrypted.google.com/url?sa=t&rct=j&q=&esrc=s&source=web&cd=1&cad=rja&uact=8&ved=0ahUKewjI-cXlhonUAhXLbBoKHfesDO8QFggnMAA&url=http%3A%2F%2Fwww.ieso.ca%2F-%2Fmedia%2Ffiles%2Fieso%2Fdocument-library%2Fengage%2Fme%2Fbenefits-case-assessment-market-renewal-project-clean-20170420.pdf%3Ffla%3Den&usg=AFQjCNGOHvNp-x3p9oaWtljMu2Kbi6Kh0w&sig2=ssVs2VKfXkFLv_talH74PA

imports and exports. Increased efficiency in electricity trade would allow for increased imports of lower-cost generation from neighbouring jurisdictions, and greater revenue for Ontario generators through more flexible access to export markets.

Other features that would reform the electricity markets operated by IESO would include improved procurement of resources to meet the province's resource adequacy needs. Currently, Ontario has relied on centralized procurement and long-term contracts to ensure sufficient generating capacity. The IESO is developing an capacity auction that fosters competition from all qualified resources in a technology-neutral manner. Generators, demand response providers, and importers could all participate in the auction, with the lowest cost resources selected.

The work plan for Market Renewal will set out the specific changes that will be implemented over the coming years and will establish timelines for completing the work. This will allow IESO and stakeholders to address the known challenges of our existing markets while laying a solid foundation for a more dynamic energy market that can meet future needs.

Electricity Supply and Demand

[Placeholder for descriptive text once forecast is available and to accompany graphs.]

Supply and Demand Forecast

Transmission Forecast

The need for new transmission and distribution facilities will depend on the demand for electricity. The IESO has indicated that, in an outlook of flat electricity demand, no new transmission investments beyond those currently under development are expected to be needed. See figure x on page x for projects planned or underway on the high-voltage transmission system.

Outlooks with high demand will be driven by the electrification of activities that currently use fossil fuels (such as space and water heating and the transportation of people and goods). New sources of generation would be required as well as additional investments in transmission to connect the generation to users. For instance:

- The development of large scale hydroelectric projects in Northern Ontario would require a major transmission expansion to connect this potential new generation to the provincial electricity grid, and to reinforce this province-wide network as it accommodates greater volumes of electricity.

- The expansion of existing generation sites in Southern Ontario would require the upgrading of transmission lines due to limited capacity.
- Additional firm electricity imports from Québec or Newfoundland would require transmission system investments in eastern Ontario. These include station work and reconductoring and/or upgrading of existing transmission lines depending on the magnitude of the imports.

The Ministry will direct IESO to establish a planning process for the province-wide “bulk” transmission system that will ensure it consults with stakeholders and communities as part of the process. Bulk transmission refers to the high voltage transmission system, which is typically 230 kV and 500 kV in Ontario.

Major Province-Wide Transmission Projects Under Development

Northwest Bulk Transmission Line

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

- Phase One is a line from Thunder Bay to Atikokan and should proceed immediately. It should come into service as soon as is practical, and no later than 2024.
- Phase Two will be a line from Atikokan to Dryden and should come into service by 2034.

Development work for both phases will proceed at the same time. Reinforcements between Dryden and Manitoba may be needed in the future to improve connections between provincial electricity grids.

East-West Tie Transmission Line

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

Ontario declared construction of the line to be a priority in 2016, providing the certainty and intent needed to streamline the approvals process.

NextBridge Infrastructure is engaging with Indigenous communities, the public and stakeholders as it completes development work. It expects to get the necessary approvals to begin construction and bring the line into service in 2020.

GTA West Bulk Reinforcement

The growth in demand, the eventual retirement of Pickering Nuclear Generating Station and new renewable generation west of GTA are all adding stress to the transmission system in the West GTA. Upgrades will connect new transformer stations and address the system's capability to restore power.

Clarington Transformer Stations

The population and electricity needs of the eastern part of the Greater Toronto area are growing.

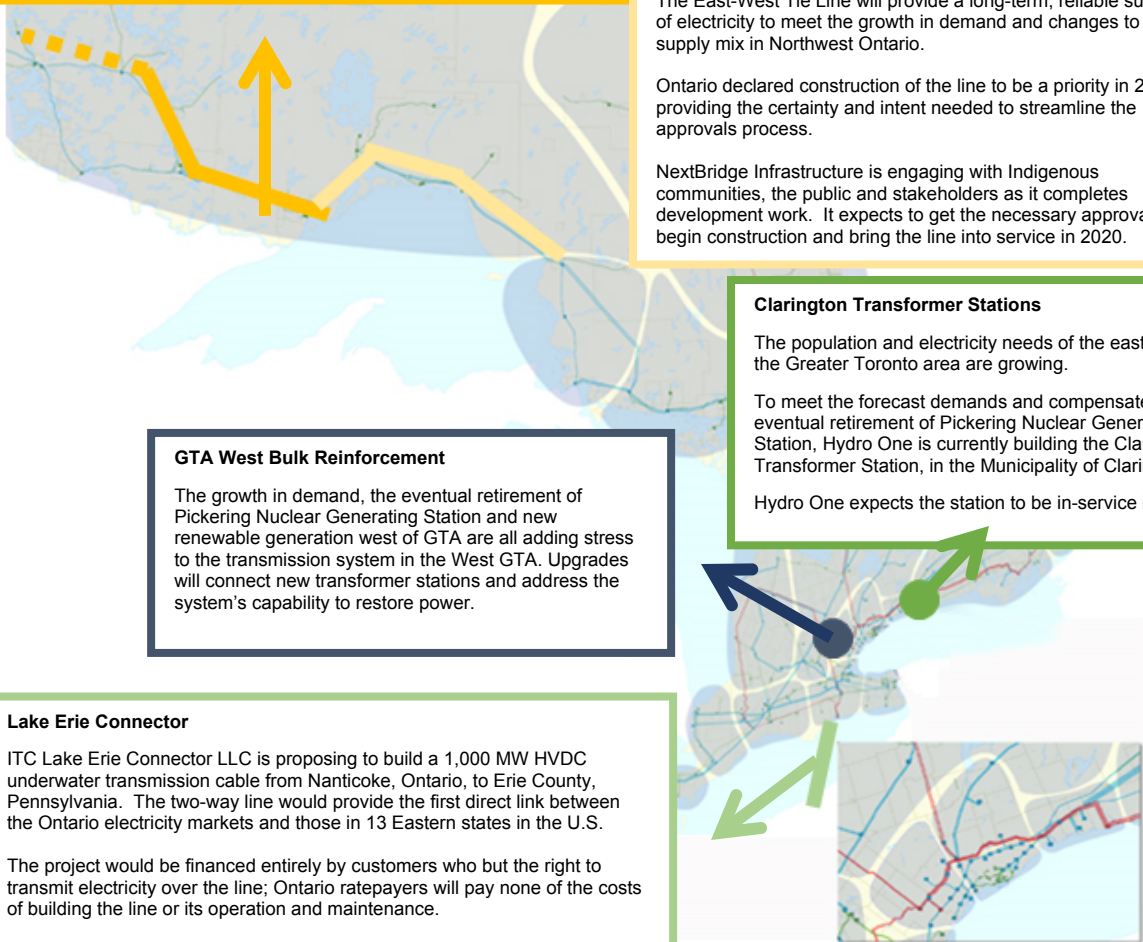
To meet the forecast demands and compensate for the eventual retirement of Pickering Nuclear Generation Station, Hydro One is currently building the Clarington Transformer Station, in the Municipality of Clarington.

Hydro One expects the station to be in-service in 2018.

Lake Erie Connector

ITC Lake Erie Connector LLC is proposing to build a 1,000 MW HVDC underwater transmission cable from Nanticoke, Ontario, to Erie County, Pennsylvania. The two-way line would provide the first direct link between the Ontario electricity markets and those in 13 Eastern states in the U.S.

The project would be financed entirely by customers who buy the right to transmit electricity over the line; Ontario ratepayers will pay none of the costs of building the line or its operation and maintenance.



Fuels Supply and Demand

The 2017 LTEP is not forecasting any issues with the supply of fuels. It assumes there will continue to be appropriate levels of reinvestments and maintenance to the processing, storage, transmission and distribution facilities in Ontario. While the existing infrastructure for conventional fuels is likely to be sufficient, new investments in processing and delivery infrastructure may be required to handle increases in the use of alternative fuels such as ethanol, biodiesel, other biofuels and renewable natural gas (RNG).

In September 2016, the Ontario Ministry of Energy published the Fuels Technical Report (FTR), a comprehensive report on the province's fuels sector prepared by Navigant Consulting. The FTR contains in-depth discussions on future outlooks for the supply and demand of fuels. It is modelled on the same outlooks outlined in IESO's Ontario Planning Outlook (OPO).

The FTR considers five possible outlooks for the demand for the energy from fuels, ranging from 1,800 Petajoules (PJ) to 2,400 PJ in 2035. The demand for fuel energy in 2015 was 2,300 PJ. The outlooks all reflect actions identified in the government's *Climate Change Action Plan* (CCAP) and are consistent with the outlooks presented by IESO in the OPO. They were developed using the same set of assumptions and data on factors such as economic activity, demographics, fuel shares, electrification, pricing and weather.

If there is significant growth in the demand for alternative fuels, higher imports and new ethanol processing facilities and biodiesel refineries may be required, along with additional storage, distribution networks and terminal assets.

[placeholder for key charts/graphs from FTR – to be coordinated with presentation of charts/graph from OPO]

The Influence of the Carbon Market

As of January 1, 2017, Ontario has implemented a cap and trade program. This will influence how we plan the province's energy supply and achieve cost-effective reductions in greenhouse gas (GHG) emissions going forward.

The carbon price paid by fossil-fueled generators will affect how often they get called on to meet the demand for electricity. A natural gas-fired electricity generating facility, for example, would have to factor in the costs of the cap and trade program and increase the price at which it offers electricity into the wholesale market. The cap and trade program will benefit emissions-free increase the competitiveness of non-emitting electricity generation and imports clean , as well as more efficient natural gas generation.

The IESO should ensure that proposed reforms align with Ontario's climate change objectives.

Flexibility in Ontario's Transportation Fuels

The 2017 LTEP recognizes the CCAP commitment to introduce a Renewable Fuel Standard (RFS) for gasoline as an important step towards reducing GHG emissions from the transportation sector. Since it uses the existing fuels infrastructure, the RFS is likely to be among the more flexible and cost-effective ways to increase the use of renewable and low-carbon fuels.

Some of the opportunities to increase the use of renewable and low-carbon transportation fuels include:

- Increasing the use of renewable liquid fuels by existing vehicles and continuing to develop "drop-in" renewable fuels that can be used in existing vehicles. Drop-in fuels such as ethanol can be mixed with gasoline to produce blended fuels such as E10 (10% ethanol content) and used in vehicles in the same manner as regular gasoline;
- Having the existing distribution networks offer higher blends of ethanol and biodiesel;
- Expanding the availability of renewable liquid fuels to more regions of the province;
- Adding biomassbiofuels to the crude oil that Ontario refineries process; and
- Lowering the carbon intensity of renewable fuels produced by Ontario biofuel manufacturers.

One opportunity to reduce GHG emissions from transportation fuels is to increase the amount of ethanol in gasoline. In the United States, the Environmental Protection Agency (EPA) has authorized a blend of 15% ethanol known as E15 for use in gasoline vehicles built since 2001. As older vehicles are taken off the road, gasoline suppliers and distributors can be expected to make E15 as widely available in the coming decade, as E10 is today.

Another opportunity to reduce GHGs from transportation fuels is to supply even higher blends of ethanol for use by specialized "flex-fuel" vehicles capable of accepting this fuel. The E50-E85 blends can contain as much as 50-85% ethanol³. An estimated 510,000 flex-fuel vehicles are on the road in Ontario. They represent approximately 6% of the province's total vehicle fleet.

Additional opportunities to reduce GHG emissions from transportation include the use of lower carbon fuels such as compressed natural gas (CNG), RNG and propane. These alternative fuels require specially equipped vehicles and their own distribution infrastructure. Currently, propane is typically used for high-usage short-range vehicles, including taxis and delivery vans. Compressed natural gas can be found powering more heavy-duty applications, such as urban transit buses. These are known as "return-to-base" fleets, where the vehicles can use private or corporate refuelling facilities. RNG, which is derived from renewable sources, makes use of existing natural gas storage and distribution infrastructure and could also be compressed for use in CNG vehicles.

³ <https://www.tpsgc-pwgsc.gc.ca/ongc-cgsb/publications/nouvelles-news/e50-e85-eng.html>

RNG IN TRANSPORTATION – PILOT PROGRAM

Ontario's Climate Change Action Plan (CCAP) committed to increase the availability and use of lower-carbon fuel. A specific action item is developing a pilot program that uses methane from agricultural materials or food wastes for transportation purposes.

The Ontario Ministry of Agriculture, Food and Rural Affairs (OMAFRA) is developing this program. In May 2017, OMAFRA issued a discussion paper to gather feedback from businesses, stakeholder groups and the public to help guide its program design. It is anticipated that the program will demonstrate the business models and technology necessary for the agricultural and food sectors to produce RNG, and to support businesses to transition their vehicles and fueling infrastructure to use RNG.

RFS is a technology-neutral standard. It supports many different ways for transforming the transportation sector and achieving deep reductions in emissions. While increased electrification is likely for light-duty vehicles and advanced bioenergy is likely to be important in long-haul road freight and aviation, technological innovation remains unpredictable. The technology-neutral approach of the RFS lets the alternatives compete on their merits.

Maximizing Existing Infrastructure

Ontario stands to benefit more than it originally expected from all the investments made in electricity. The 2017 LTEP plans to maximize the use of the province's existing energy infrastructure in order to minimize any future cost increases for electricity consumers.

One example is the contracts for renewable energy that helped give Ontario a majority additional supply of emission-free electricity. Between 2026 and 2035, long-term contracts will be expiring for over 4,500 MW of wind energy and 2,200 MW of solar energy. In many cases, the generation equipment was designed to have a useful life longer than the usual 20-year term of their electricity contract. Many wind turbines and photovoltaic panels will still be able to generate electricity after their contracts expire. Recognizing that the electricity infrastructure that has been built will last for many decades to come led to the development of Ontario's Fair Hydro Plan.

Some renewable energy projects that are currently operating may also be able to be upgraded to increase output, while using the existing equipment. In other situations, some refurbishment or replacement of equipment may be required.

Wind

Placeholder

Solar

Placeholder.

Natural Gas

Most experts agree that natural gas turbines can operate beyond their typical 20-year contract life. Natural gas-fired generation is able to provide the flexibility needed in the electricity system, particularly during peak periods. Natural gas generation also helps to maintain reliability by supporting intermittent generation.

Over the coming decade, the province will face a decline in capacity associated with nuclear refurbishment and the retirement of the Pickering Nuclear Generating Station. By sometime in the early 2020s, there will no longer be enough contracted capacity to meet reliability requirements. Over the same timeframe, many existing contracts will expire, predominantly natural gas generation that started in the 2006–2014 period. There is an opportunity for maximizing the use of existing natural gas generation beyond their contracted life. Natural gas generators are expected to be able to participate in the processes contemplated under Market Renewal, including the capacity auction process. Ontario's Market Renewal initiative mentioned earlier in this chapter could provide opportunities for existing generation projects.

Refurbishing Nuclear

Refurbishing Ontario's nuclear generating stations is the most cost-effective option for meeting the requirements for baseload generation while producing no GHG emissions. As laid out in *2013 LTEP*, Ontario is moving forward with plans to refurbish a total of 10 nuclear units between 2016 and 2033: four units at Darlington and six units at Bruce.

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

The government continues to support Ontario Power Generation's (OPG) plan to seek regulatory approvals for ongoing operation of the Pickering Nuclear Generating Station to 2022/2024. Pickering would be a reliable source of "emission-free" baseload power to replace the electricity that will not be available during the Darlington and initial Bruce refurbishments.

[placeholder for Financial Accountability Officer report on nuclear refurbishments]

The Darlington refurbishment

OPG is undertaking a multi-year phased approach to refurbishing the Darlington Nuclear Generating Station. This approach benefits from the lessons learned during previous refurbishment projects, which highlighted the need for in-depth planning and preparation prior to beginning the work.

Between 2007 and 2009, OPG undertook a comprehensive assessment of the scope of work needed for the Darlington refurbishment. In November 2015, OPG's Board approved a total estimated cost of \$12.8 billion for refurbishing all four Darlington units, which includes all spending to-date, interest and inflation. This is \$1.2 billion lower than OPG's original estimate in 2009.

In January 2016, the government gave OPG approval to proceed with refurbishing the first of the Darlington units, Unit 2. On October 15, 2016, OPG took Unit 2 off-line to begin refurbishment. On January 11, 2017, the first key task, taking the fuel out of Unit 2, was completed within budget and nearly a month ahead of schedule.

On April 13, 2017, OPG announced it had successfully completed Phase One of the Unit 2 refurbishment and isolated the unit from the rest of the Darlington plant. OPG has now moved on to Phase Two and removed key components from the reactor. The entire project is on track to be completed on budget and schedule.

The average cost of power from the Darlington units after their refurbishment is estimated to range from \$72-\$81/MWh, which is within the range 2013 LTEP assumed for refurbished nuclear. The Darlington refurbishment and its continued operation up to 2055 will contribute \$90 billion to Ontario's GDP and add 14,200 jobs across the province a year, including over 2,600 jobs onsite at Darlington.

OPG is working with nuclear supply chain companies across Ontario, from Nu-Tech in Arncliffe to Laker Energy in Burlington to Cameco in Cobourg.

ONTARIO'S NUCLEAR SUPPLY CHAIN SUPPORTING DARLINGTON REFURBISHMENT

PROMATION NUCLEAR

Since 2007, Oakville-based Promotion has been developing, designing, and supplying custom tooling for nuclear plant maintenance and inspection as well as for major refurbishment campaigns for the Canadian CANDU reactor fleet. The company employs over 90 full-time staff, providing well-paid, high-quality engineering and skilled trades jobs.

On December 6, 2016, Promotion shipped a multi-million dollar tooling system to Darlington ahead of time and under budget. The innovative Accessibility Platform Trolley (APT) allows nuclear workers to more safely and efficiently inspect the CANDU reactor during refurbishment. The APT is one in a series of important tools to support the removal and replacement of key reactor components at Darlington (i.e., Retube and Feeder Replacement project).

Promotion is working together with SNC-Lavalin and Aecon to ensure this phase of the Darlington refurbishment project is completed on-time and on-budget.

LIBURDI AUTOMATION INC.

For over 30 years, Hamilton-based Liburdi has pioneered the development of advanced metallurgical processes and technologies for numerous sectors including Aerospace, Oil & Gas, and Nuclear.

Liburdi's highly specific, made-to-order welding technology has played an essential role in maintaining Ontario's nuclear fleet for many years. Welding inside a nuclear reactor has unique requirements including remote deployment and operation. Liburdi's extensive expertise in precision automated welding technology has made the company a key player in the nuclear industry around the world.

Liburdi has been contracted for all welding technology on the Darlington Retube and Feeder Replacement and will help ensure the project is completed with the highest standard of quality.

The Bruce Refurbishment

Bruce Power currently plans to invest approximately \$13 billion of its own funds to refurbish six nuclear units at the Bruce Nuclear Generating Station. Work on the first unit will begin in 2020.

The change in the 2013 LTEP schedule will save electricity customers approximately \$1.7 billion compared to what was forecast for the project in the 2013 LTEP.

Bruce Power is currently undertaking a number of activities and investments, including:

- Implementing an investment program to optimize the life of the Bruce units before and after refurbishment (referred to as “Asset Management”);
- Developing a final cost estimate for refurbishing the first unit, Unit 6, which is expected to begin in 2020; and
- Executing contracts for refurbishments with suppliers including BWXT Canada and SNC-Lavalin.

ONTARIO’S SUPPLY CHAIN SUPPORTING BRUCE POWER REFURBISHMENT

THE BRUCE REACTOR INSPECTION AND MAINTENANCE SYSTEM (BRIMS) TOOL

In February 2017, Bruce Power took delivery of the second generation of a new, state-of-the-art tooling system developed by a coalition of respected Ontario-based companies which will enhance maintenance and inspection activities during Bruce Power’s planned outages.

The Bruce Reactor Inspection and Maintenance System (BRIMS) tool is the result of a multi-company collaboration and innovation involving Bruce Power, ATS Automation, MacDonald, Dettwiler and Associates Ltd., BWXT Canada Ltd. and Candu Energy Inc.

This new tooling will reduce the time and cost associated with reactor inspections and maintenance, as well as improving worker safety.

CAMECO CORPORATION

In May 2017, Bruce Power and Cameco Corporation extended their exclusive uranium fuel supply arrangement for an additional 10 years, and entered an arrangement for Cameco to provide reactor components for all six of Bruce Power’s refurbishments starting in 2020. The total value of the arrangements is estimated to be approximately \$2 billion to 2030.

The arrangement for fuel will deliver an estimated \$200 million in savings over the next decade which go directly to reduce the cost of electricity to ratepayers. Together with the arrangement for reactor components, this stable partnership with Cameco will bring long-term economic benefits to the Northumberland Region.

Cameco is one of the world’s largest uranium producers. The company has a significant presence in Ontario with uranium refining in Blind River, uranium conversion in Cobourg and CANDU fuel manufacturing in Port Hope.

The Bruce refurbishment is expected to generate up to \$6.3 billion in annual economic benefits and increase employment by up to 23,000 jobs a year.

In addition, Bruce Power has launched the Nuclear Economic Development and Innovation Initiative with the County of Bruce to maximize the economic impact of Bruce Power's \$13 billion Life-Extension Program to the region.

The Nuclear Economic Development and Innovation Initiative seeks to ensure the refurbishment benefits Bruce, Grey and Huron county over the long term by:

- Facilitating a coordinated approach to regional economic development and expansion of supplier opportunities;
- Establishing advisory committees to facilitate broad engagement across Grey, Bruce and Huron Counties; and
- Encouraging capacity building to help increase the labour force

As part of this initiative, Bruce Power has asked suppliers invest in the area by opening offices in Bruce, Grey and Huron counties, and by hiring local people, which will boost the region's economy. The company's procurement principles will give preference to selection of suppliers who generate local jobs and economic benefit in Ontario, and where possible, in close geographic proximity to the Bruce nuclear site.

This will result in indirect economic benefits to the region, such as a need for new housing. In fact, to facilitate housing growth, Bruce Power has engaged over 150 developers, realtors and municipal officials from across Bruce, Grey and Huron counties to discuss the expected economic opportunities that will accompany this program.

Ongoing Operation of Pickering

The ongoing operation of the Pickering Nuclear Generating Station to 2022/2024 (i.e., all six Pickering units operating to 2022 and remaining four units operating to 2024) would ensure the province has a reliable source of "emission-free" baseload electricity to replace the power that will not be available during the Darlington and initial Bruce refurbishments. It could also save \$600 million for electricity consumers and reduce GHG emissions by at least eight megatonnes, as it reduces reliance on electricity generated from natural gas.

On January 11, 2016, the government announced it had approved OPG's plan to complete confirmatory work and seek the necessary regulatory approvals for Pickering's continued operation from the Ontario Energy Board and the Canadian Nuclear Safety Commission.

The incremental energy from the Pickering life extension is expected to cost an estimated \$65/MWh, which is cost-effective for meeting baseload requirements. Ongoing operation of Pickering would also protect both 4,500 jobs and \$1.3 billion in local economic activity in the Region of Durham. The life extension is supported by the local community as well as labour and industry groups.

Managing the Risks

Oversight

The government is committed to protecting ratepayers and making sure the refurbishments adhere to cost and schedule. We will proceed with caution. OPG and Bruce Power will be subject to strict oversight to ensure that they complete the refurbishments on time and on budget.

In addition to OPG's internal and external project oversight (i.e., third-party experts hired by OPG), the government has an independent set of eyes on the project at all times. The ministry had an independent advisor who regularly monitored and updated the government on the planning and preparation phase of the project.

Now that the project has moved from the Definition Phase to the Execution Phase, the ministry has updated the oversight structure to ensure effective monitoring. A new independent advisor is ensuring continued and effective oversight during the execution of the project, with support from Infrastructure Ontario. All of OPG's expenditures on nuclear refurbishment will also be reviewed by the Ontario Energy Board as part of its rate setting process.

The updated Bruce contract was negotiated by the Independent Electricity System Operator (IESO) over a two year period. The updated Bruce agreement underwent extensive due diligence by the Province, as well as financial and technical advisors that were engaged by IESO, including an independent fairness opinion.

The IESO will continue to manage the contract and regularly report to government on implementation. Bruce Power will be subject to strict oversight by the IESO, including an "open book" review of costs and full-time IESO representatives at the Bruce site.

Off-Ramps

The 2013 LTEP contained a number of principles for the refurbishing of the province's nuclear generating stations. One of them is the use of off-ramps, which are put in place to ensure that future refurbishments will only be undertaken if they continue to deliver value for ratepayers.

OPG must get government approval before refurbishing each remaining unit at Darlington. These decision points act as “off-ramps” for the project. The government’s decision to proceed will depend on:

- OPG’s performance on preceding refurbishments – including adherence to approved costs and schedules; and
- the ongoing value to ratepayers of the Darlington refurbishments.

In the case of Bruce, under the terms of their agreement with the IESO, Bruce Power assumes the full risk of cost overruns on the refurbishing, as well as the operating risk for the units over the life of the contract.

As with Darlington, contractual off-ramps allow the government to assess Bruce Power's cost estimates for each reactor prior to beginning the refurbishment and stop it if the estimated cost exceeds a pre-defined amount. Bruce refurbishment can also be stopped in the future if demand drops or lower cost resources emerge.