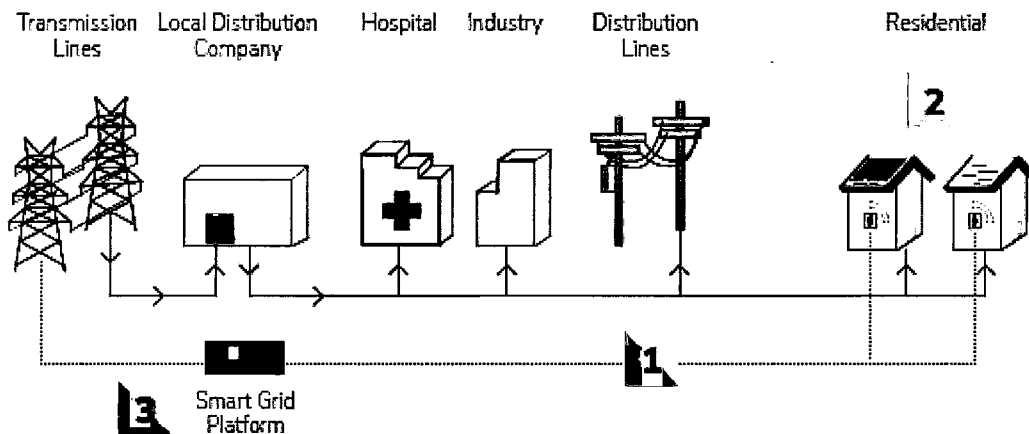


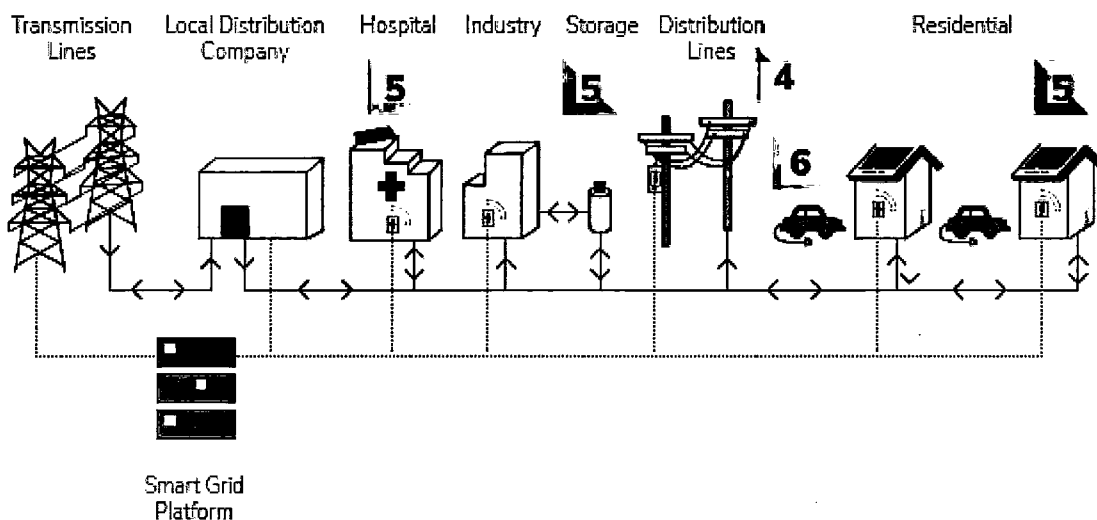
networks run as smoothly as possible. For customers, it means the local network will be ready when you want to buy an electric vehicle, install a battery, put up solar panels, or choose a new pricing plan. It means more tools for you to track your energy usage. It means a more efficient, reliable, and resilient grid. Above all, it means potential savings on your bill.

The Transition in the Electricity Sector

TODAY



FUTURE



1. Communication Lines

Data from smart meters is sent to the LDC using communications infrastructure. In the

future, this will also include data from sensors and other devices monitoring the entire grid.

2. Smart Meters

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

3. Digital Grid Platform

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

4. Sensors

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

5. Distributed Energy Resources (DER)

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

6. Vehicle Grid Integration (VGI)

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

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

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

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

Grid modernization can also support new business models. One exciting opportunity is peer-to-peer frameworks for "transactive energy". One way to implement transactive energy is

through Blockchain - a computer protocol that tracks transactions within a marketplace, Blockchain uses secure, distributed databases to enable, for example, the management of electric vehicles, the trade of renewable electricity, and peer-to-peer demand response opportunities.

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

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

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

Driving Innovation: Enhancing the Smart Grid Fund

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

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

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

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

Text Box: Modernizing the Grid – Success Stories

POWER.HOUSE

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

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

FleetCarma

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

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

Distributed Energy Resources

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

Specific examples of DER include:

- Distributed generation (DG): electricity generated for self-consumption and/or export to the distribution grid;
- Energy storage: energy stored for use close to where it is needed;
- Microgrid: a mini network that can operate independently when it is disconnected from the main electricity grid; and

- Energy efficiency: measures to reduce overall electricity use, either behind the customer's meter, or on the distribution system (see Chapter 5);
- Demand response: a temporary reduction or shift in demand in response to higher prices or requests from a system operator.

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

Renewable Distributed Energy Resources

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

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

Barriers to Innovation

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

The Province has taken a number of steps to encourage innovation in a changing energy sector. In 2010, it directed the OEB to give guidance to utilities on building smart grid technologies into their systems and putting innovation into their business practices. The OEB incorporated these ideas through a new regulatory framework. The OEB also established a Smart Grid Advisory Committee in 2013 to provide it with ongoing assistance in facilitating grid modernization

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

development of new technology and the increase in customer expectations, the time to address these barriers is now.

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

- building a stronger culture of innovation in the sector;
- ensuring that there are no unfair barriers that disadvantage the deployment of energy storage;
- utility participation in residential smart charging;
- the deployment of renewable distributed generation and other distributed energy resources that provide value to customers;
- the use of innovative, non-wires solutions that could, among other things, allow utilities to manage their systems better and encourage customer choice including the principles of efficiency and cost-effectiveness; the regulatory treatment of LDC capital and operational expenditures, which can inhibit the uptake of these non-wires solutions;
- a cost-benefit framework that provides clarity on the treatment of investments, such as those with localized costs that provide benefits to other electricity system participants (also known as the diffuse benefits issue);
- the ability of utilities to make non-traditional distribution system investments and participate in market opportunities that would ultimately reduce ratepayers' costs associated with capital or other investments; and
- opportunities for utilities to partner with their customers to use in-front and behind-the-meter applications to address system needs.

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

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

IESO Market Renewal and Innovation.

The IESO is preparing for the future by laying the foundation through Market Renewal which will develop a made in Ontario solution to create better price signals and establish more competitive market-based mechanisms to meet system needs. The long-term goal of Market Renewal is to create a more dynamic market where all resources including new technologies

will have the opportunity to compete alongside traditional forms of supply for a variety of system products such as energy, capacity and flexibility. As costs come down and new business models are developed, emerging technologies, often at the local level, will be increasingly competitive compared to traditional resources. At the same time the existing and new markets will present opportunities and choice to a wide variety of consumers looking to become more active in Ontario's energy markets.

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

Building on the Success of Renewables

The tremendous growth of Ontario's clean tech and renewable energy sectors has attracted billions of dollars in investment to Ontario and led to the creation of thousands of new jobs across many trades and professions. Estimates show that new renewable energy generation alone has created over 200,000 direct and indirect jobs in Ontario since 2008. That explains why a broad coalition of employers, labour and industry groups, including the Renewable Energy Alliance of Ontario supports Ontario's investment in renewable energy.

Ontarians have every reason to expect these economic benefits will continue. The renewables sector is forecast to contribute nearly \$5.4 billion dollars to Ontario's gross domestic product and create 56,500 jobs between 2017 and 2021.

Many of the companies that participated in Ontario's expansion of renewable energy are now poised to export their expertise and products to foreign markets. This could contribute as much as \$1 billion to Ontario's GDP and could add as many as 10,700 jobs between 2017 and 2021. Ontario-based manufacturers of hydroelectric components have been successfully exporting to the United States for years. Many of Ontario's solar manufacturers are also reporting increased export activity to the U.S., despite strong global competition. And wind component manufacturers have developed expertise that will help them succeed in nearby American markets that are replacing coal-fired generation with renewables and other clean sources of electricity.

Exporting Ontario's Energy Expertise

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

Text Box: A Northern Ontario Success in Manufacturing

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

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

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

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

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

Text Box:

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

Nuclear Innovation

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

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

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

Text Box: Medical Isotopes

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

Cobalt-60 is a key isotope for medical applications. Currently, 70 per cent of the world's supply of the medical-grade Cobalt-60 isotope is produced in nuclear reactors at Chalk River, Pickering and Bruce B. The isotope is used for 10 million cancer therapy treatments around the world every year, as well as for medical imaging, equipment sterilization and non-invasive brain surgery. Bruce Power has also established a new long-term supply of medical-grade Cobalt from Bruce B that will help replace the supply from Chalk River's reactor when it is closed in March 2018.

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

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

Innovative Uses for Ontario's Natural Gas System

Renewable Natural Gas

Renewable natural gas (RNG) is a low-carbon fuel produced by the decomposition of organic materials found in landfills, forestry and agricultural residue, green bin and food and beverage waste, as well as the waste from sewage and wastewater treatment plants. Because it comes from organic sources, the use of RNG does not release any additional carbon into the atmosphere. Ontario's new Waste-Free Ontario Act, and its Organic Waste Action Plan, will create more opportunities to use organic waste to produce clean energy. As an added benefit,

it can use the existing natural gas distribution system to replace the use of conventional natural gas in today's stoves and furnaces.

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

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

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

The Province is now developing a pilot program that would extract methane from agricultural materials or food wastes and use it for vehicle fuel. The pilot is expected to demonstrate the business models and technology that will allow agricultural and food sectors to produce RNG, and support businesses as they upgrade their vehicles and fueling infrastructure to use RNG.

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

Power-to-Gas

Electrolysis, also known as power-to-gas, uses electricity to break down water molecules into hydrogen and oxygen. This transforms electricity into hydrogen gas, another type of fuel. The hydrogen can be stored or transported in existing natural gas pipelines and used to heat homes and fuel vehicles.

Power-to-gas could potentially become a new and important link between the province's electricity system and its natural gas system. The IESO recognizes this, and has already awarded a contract to Hydrogenics, an Ontario-based manufacturer of electrolysis and fuel cell technology, to provide electricity grid services during the production of hydrogen.

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

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

Summary

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

Chapter 4 – Improving Value and Performance for Consumers

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

Text Box: What We Heard from You

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

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

Modernizing the Utility Business

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

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

The Ontario Distribution Sector Review Panel determined in 2012 that the consolidation of LDCs could reduce costs from the distribution sector by \$1.2 billion over 10 years. The OEB, as the independent regulatory tribunal regulating electricity distribution, must lead, innovate and provide LDCs with incentives to become more cost effective and efficient. The OEB has made improving LDC performance a priority since it refreshed its framework for utility regulation in 2011.

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

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

- utilities (LDCs and transmitters) have incentives to cut costs and make annual improvements to productivity and cost-efficiency;
- utilities are constantly striving to improve;
- utilities are held to account when expectations are not met;
- customers get the highest possible value from their electricity services; and

- businesses and other large customers have a timely and predictable process to connect to the grid or modify their existing connections.

The OEB will develop a plan to implement these enhanced requirements in a timely manner.

Enhancing Reliability

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

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

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

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

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

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

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

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

Text Box: Raising Awareness of Local Issues ***

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

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

Reporting in transmission rate applications varies. Hydro One, a large transmitter with hundreds of customer delivery points, reports its system-wide performance, while a small transmitter like Five Nations Energy Inc., with four delivery points, reports the data for each. The OEB's expectation that transmitters have scorecards was implemented prior to the most recent rate cycle; scorecards for some transmitters are expected to be in place soon.

Changing Business Models

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

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

Text Box: More Flexible Regulation

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



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

The Province will look to the OEB to explore ways of facilitating these partnerships where they make economic sense. It will also consult with LDCs on additional ways to realize these savings and provide better customer service. The OEB will continue to promote efficiencies in its own rules and requirements so that LDCs and transmitters benefit from further regulatory streamlining.

Making Electricity Bills More Understandable

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

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

Improving Customer Choice through Data Accessibility

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

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

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

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

Cyber Security

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

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

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

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

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

Competitive Transmitter Selection

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

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

Right-Sizing

The aging of transmission and distribution infrastructure across the Province presents significant challenges for the electricity industry. These challenges include managing costs and the outage requirements necessary to deal with replacing or refurbishing end-of-life equipment, while maintaining safe and reliable service to customers. Equipment reaching end of life also presents opportunities to ensure that the new or refurbished facilities are “right-sized”. That is downgrading or removing equipment if demand is expected to decrease and upgrading equipment in communities with growing demand or increasing reliability needs. New facilities will also consider technological advances and other solutions that may be more cost effective in the long run.

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

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

Transmission Corridors

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

The Provincial Policy Statement is the foundation of the Growth Plan for the Greater Golden Horseshoe (2017), which requires the Province, municipalities and other public agencies to encourage the co-location of linear infrastructure, such as roads and transmission lines, when they are planning for development. The Growth Plan says governments and public agencies should also protect existing and planned corridors to meet current and projected needs.

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

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

Transparency for Consumers on Gasoline Pricing

Many Ontario consumers pay attention to their gasoline prices. A number of components are part of the retail price of gas, including crude oil costs, taxes, the gross refining/wholesale margin and the gross retail margin. Families and businesses have requested more information about how gasoline and diesel retail prices are set.

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

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

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

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

Summary

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

Chapter 5. Strengthening our Commitment to Energy Conservation and Efficiency

Ontario has been building a culture of conservation since 2005 and we can be proud of what has been accomplished. According to the Independent Electricity System Operator's (IESO) 2015 study on Ontario's conservation efforts, businesses are investing in energy-efficiency upgrades to increase their productivity, and residents are choosing to install energy-efficient equipment in their homes, often with the help of Ontario's suite of residential and business conservation and demand management programs. Between 2005 and 2015, the average monthly household consumption of electricity decreased from over 800 to about 750 kilowatt-hours (kWh).

Text Box: What We Heard from You

- *Reaffirm and enhance commitment to Conservation First*
- *Improve building codes and standards*
- *Increase awareness of conservation and demand management programs and the value of conservation*

- *Ensure conservation and demand management programs are in sync with programs in Climate Change Action Plan*
- *Expand conservation to other fuels*
- *Encourage energy efficiency on the distribution system*

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

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

Conservation and energy efficiency require a sustained commitment if they are to achieve persistent savings over the long term. Ontario is enhancing its commitment to Conservation First to improve affordability and choice for people, businesses and communities, and to co-ordinate its conservation programs with Ontario's climate change objectives.

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

Text Box: The Savings from Conservation and Energy Efficiency

Electricity			
915 1.5 million households Energy savings achieved in 2015 through business conservation program	13.5 TWh Energy efficiency coupons for energy-efficient products redeemed across the province	\$1 The added costs are traditionally avoided in the electricity system every time \$1 is invested in energy efficiency	\$0.04 per kWh Cost of electricity conservation programs in 2015, which is cheaper than most forms of new supply
Natural Gas			
Over 80 million cubic metres The amount of natural gas saved in 2015 through conservation	8,000+ The energy efficiency projects completed through home energy audit and retrofit	\$7 to \$11 per month A typical household that participates in residential natural gas conservation	\$0.04 per cubic metre The cost of natural gas conservation programs in 2015, significantly cheaper