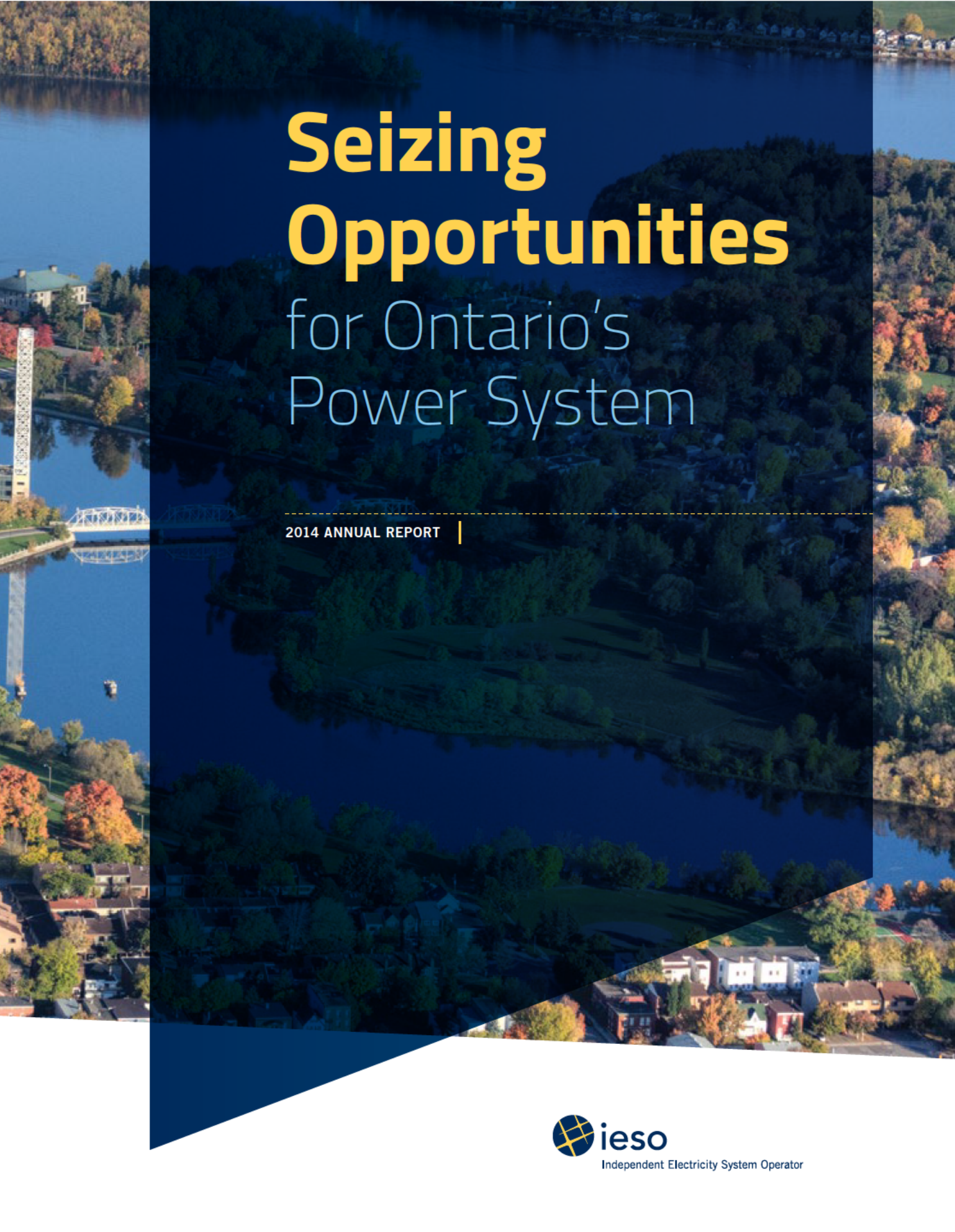




Seizing Opportunities for Ontario's Power System

2014 ANNUAL REPORT |



Independent Electricity System Operator

2014 financial statements for the Independent Electricity System Operator and for the Ontario Power Authority are available in separate reports or online at ieso.ca.

Cover image: Ottawa

Joint Message from Bruce Campbell and Jim Hinds



Jim Hinds (left) and
Bruce Campbell

On January 1, 2015, the Independent Electricity System Operator (IESO) and the Ontario Power Authority (OPA) came together to create one organization combining the mandates of both. The new IESO manages reliability of the province-wide power system, ensuring that real-time electricity needs are met, while also planning and securing energy for the future. We co-ordinate province-wide conservation efforts and put conservation first in planning the electricity system.

By streamlining the support functions within the two organizations, the new IESO is delivering operational efficiencies and reducing costs, and better integrating the planning outlook with operational experience. We have a great foundation from the two predecessor organizations to provide increased value for Ontario and its electricity consumers.

Our expanded scope allows us to coordinate market and resource development, exploring market-based options where efficiency and reliability can be enhanced. We will continue to oversee provincial conservation programs, procure new renewable and other generation, and operate the grid reliably and the market efficiently. And we will do so while supporting innovation along the way.

The scope of the IESO's activities now extends right across Ontario's electricity sector. As we aim to shape a more competitive and efficient electricity system, we will be engaging with a broad range of stakeholders to ensure we deliver solutions that best meet the needs of residential electricity consumers, business and industry, municipalities, and Métis and First Nations communities across the province. We are well positioned to engage with you on key energy issues and develop solutions with you to address them.

Our new organization looks forward to working with you to seize this year's opportunities.

Bruce Campbell
President and Chief Executive Officer
Independent Electricity System Operator

Jim Hinds
Chairman of the Board
Independent Electricity System Operator

Conservation

Working with its partners, the IESO helps guide the province's electricity conservation efforts by developing and supporting programs that foster a culture of conservation, build market capability and promote innovation.

Through **saveOnEnergy** programs, residential, business, institutional, industrial, low-income and Aboriginal customers throughout the province can better manage their electricity use. Using these incentives, Ontario consumers have saved electricity and reduced costs. Their efforts have contributed to significant province-wide electricity savings and helped transform Ontario's electricity sector.

Providing customers with real-time energy-saving data and educational tools to help them better manage their overall energy use will equip them to save even more. All Ontarians benefit from conservation by keeping costs in check and reducing the environmental impact from generating additional electricity. For every dollar invested in conservation, two dollars are saved in avoided generation.

Between 2006 and 2013, Ontarians have conserved 8.7 terawatt-hours (TWh) of electricity, enough to power the cities of Mississauga and Oshawa in 2013.

Through Ontario's new six-year Conservation First Framework, customers across Ontario will soon see new, innovative and cost-effective electricity conservation programs offered to homes, businesses and industries. The new framework is designed for local distribution companies to achieve 7 TWh between 2015 and 2020 and will give them greater flexibility to deliver conservation programs that meet local needs, while strengthening regional collaboration and benefiting both customers and the provincial grid. In addition, the IESO will work with large industrial customers to achieve 1.7 TWh between 2015 and 2020.

The IESO consults regularly with stakeholders on its conservation-related initiatives, particularly with local distribution companies, with whom the Conservation First Framework was developed.

A key success factor is to support the efforts of local utilities through conservation marketing to encourage customers to participate in the **saveOnEnergy** conservation programs and to promote further investment in energy-saving initiatives to industries and businesses.



ONTARIANS MAKE ENERGY-WISE DECISIONS

Each individual's actions and choices have an impact on Ontario's power system. For instance, LED light bulbs use between 75 and 90 percent less energy than traditional incandescent light bulbs and are typically rated to last 20 to 25 times longer. As more people make the switch to LEDs, Ontarians not only save on their monthly bills, they also help reduce peak demand. That is why the IESO focuses on educating consumers about energy efficiency and provides incentives to help promote a culture of conservation.

The **saveONenergy COUPON** program is just one of these incentives that empower consumers to make the switch. Through coupon programs, Ontarians have saved enough electricity to power the City of North Bay for an entire year.

The Tomken Twin Arena in Mississauga completed an LED lighting retrofit in 2013 through a **saveONenergy** program.

Operations and Supply

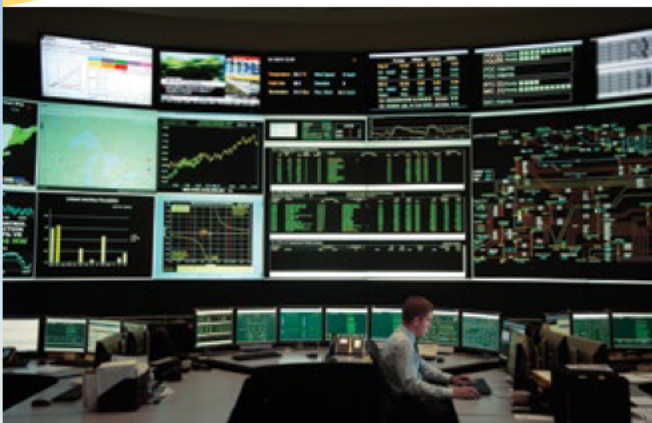
The IESO control centre maintains grid reliability in real time, balancing the supply and demand for electricity on a second-by-second basis. The electricity market ensures the efficient use of generation and other resources to meet consumers' energy needs, efficiently scheduling and dispatching resources at the lowest possible cost to the market and providing valuable price signals to both generators and consumers.

The IESO also has plans in place to ensure an adequate supply of electricity is available to meet future demand for energy. Contracts are in place with a range of suppliers – from grid-scale generators to homeowners or farmers with small-scale projects. New renewable generation as well as combined heat and power projects are contracted to ensure future energy needs, using negotiations as well as competitive and standard offer programs. With nuclear accounting for more than 60 percent of the province's electricity needs in 2014, securing long-term nuclear energy is another critical factor for Ontario's supply mix.

In addition, new market mechanisms can help provide for incremental supply needs. A capacity market for resources to meet short- and medium-term needs could complement long-term planning and procurement, offering greater flexibility to adjust to changing system needs. Demand response can also play an increasingly prominent role in helping to balance the system while providing a revenue stream to participants.

The increased uptake of variable generation sources, the changing characteristics of the demand side of the market and the significant variability in system conditions over short periods of time all require increased flexibility in Ontario's power system. Recent investments in demand forecasting capabilities, outage management protocols and operator training simulations will increase Ontario's ability to react to this changing grid environment. Generators and other sector stakeholders are consulted extensively on any changes that might affect how they operate.

Working with its provincial partners and neighbours, the IESO also oversees emergency preparedness activities for Ontario's power system, monitoring threats and vulnerabilities on a continuous basis.



THE COMMAND CENTRE FOR ONTARIO'S ELECTRICITY SYSTEM NEVER SLEEPS

Keeping the lights on means there is no break for the IESO control room. Running 24 hours a day, 365 days a year, the control room is staffed with highly trained and experienced operators to ensure the smooth operation of the bulk electricity system and market. Leading them is the Shift Superintendent, who makes critical, real-time decisions about Ontario's bulk electricity grid that not even the President and CEO can overrule.

Using state-of-the-art tools and live data streams that light up the giant digital wall-board display, control room operators are prepared to manage any grid emergency with speed and efficiency.

Planning

Good planning ensures a dependable, sustainable electricity system – for today and into the future. Forecasts and assessments of Ontario’s current, short- and long-term electricity demand are the key drivers for determining what options can provide an adequate, reliable and integrated power system. The IESO will identify needed investments in generation, conservation and transmission by planning for a range of possible future scenarios.

In planning the electricity system, conservation is the first resource considered. It is the cleanest and most cost-effective energy resource.

In addition to province-wide planning, each region of the province is closely examined to ensure the regions themselves have adequate supply and electricity infrastructure. Regional plans also enable communities to put conservation first as well as provide local input on other cost-effective solutions such as new supply, transmission and distribution options.

In 2013, a regional planning process was formalized by the Ontario Energy Board and is now being implemented by the IESO, working closely with transmitters and local utilities. Ontario has been divided into 21 areas for this purpose, with each area being studied at least every five years to ensure system adequacy and reliability.

Extending Ontario’s transmission system to remote First Nation communities in Northwest Ontario is an economic opportunity for up to 21 of 25 remote communities that are currently not connected to Ontario’s electricity grid. The IESO is committed to helping connect these 21 communities to the grid and also to working with the remaining four remote communities on options that will displace the diesel generation they currently use.

Stakeholder engagement is an integral part of planning the power system. By consulting with the electricity sector, industry associations, municipalities, Aboriginal communities, other stakeholders and interested groups, the IESO is able to receive a wide range of input that helps inform its planning efforts.



Photo: Nano Debassige

MERE WIND FARM THE FIRST WHOLLY OWNED FIRST NATIONS PROJECT IN ONTARIO

M'Chigeeng First Nation made history on June 15, 2012, when it brought into operation Ontario's first wind project wholly owned by a First Nation community. The four-megawatt Mother Earth Renewable Energy (MERE) wind farm, located on Manitoulin Island, is expected to generate about \$13,800,000 for the community over the course of its 20-year Feed-in-Tariff (FIT) contract.

It's just one of 418 FIT projects with First Nation and Métis communities, totalling 802 megawatts. These renewable energy projects represent the IESO's commitment to work with communities across Ontario to secure clean and reliable sources of power to meet Ontario's energy needs for the years ahead.

Innovation

Fostering innovation within the electricity system helps to put the province at the forefront of energy modernization. Ontario will benefit from new technologies such as smart grids, smart metering and storage, as well as new concepts in conservation.

Ontario has proven to be a North American leader in smart grid technology with more than 4.8 million smart meters rolled out since 2006. In addition, powerful monitoring and automation tools are increasing the ability of energy companies to respond to the changing daily environment, while empowering consumers and businesses to use energy more wisely and effectively. Recent improvements in dispatching capabilities and energy modeling software enable faster and more efficient responses, increasing the ability to control electricity delivery.

Ontario has made a significant investment in smart meters and in the IESO's central data repository for high-quality, consistent electricity consumption data. While currently being used by local utilities to support customer billing on time-of-use rates, this data set also offers significant potential value for designing conservation and demand response programs, system planning, policy development, academic research and to further support innovation in Ontario. The IESO, in consultation with industry, is working to capture the value of consumption data while ensuring privacy by design.

Finding ways to leverage markets further to build greater flexibility into the system will benefit the grid – whether in day-to-day operations or in helping to meet near-term capacity needs. Ontario already has experience with large consumers participating directly in the market

through demand response. With new technologies enabling consumers at all levels to take greater control of their energy use, the IESO, together with the industry, is examining ways to capture the value that consumers can provide and develop ways to compensate them.

Ontario has already begun to integrate emerging storage technologies into its electricity market. In 2013, two energy storage proponents were selected to provide alternative sources of regulation. New contracts were awarded to five companies, totaling 34 MW, in 2014 for ancillary services to support increased reliability and efficiency of the grid. Additional energy storage projects up to 16 MW will be procured in 2015 and will focus on facilities that can provide the best long-term benefit for the ratepayer while enabling suppliers to demonstrate their technologies.

The IESO's Conservation Fund supports the implementation of innovative energy-saving projects and technologies by contributing to their commercialization. In 2014, the fund committed more than \$8 million to 23 new projects. Since 2005, the fund has committed \$57 million in support to 207 projects. These new projects are contributing to overall energy savings, informing policies and programs and promoting awareness of innovative conservation activities.



This lithium battery system located in Strathroy, provides frequency regulation to the power system.



LEADING-EDGE CONSERVATION RESEARCH SUPPORTS ONTARIO BUSINESSES

Finding operational efficiencies is essential for any company's bottom line, but it requires some creative thinking and access to innovative ideas and technologies. That's why, since 2005, the Conservation Fund has supported inventive conservation projects, helping to turn great ideas into commercial products to help keep industry in Ontario competitive and sustainable, while also encouraging a culture of conservation.

One such project includes inMotive's mechatronic variable speed drive (MVSD), a device that adds gears to a standard electric motor used in industrial applications. Most motors are over-sized and run on a single speed to meet peak load conditions, which means they use more electricity than needed. With the MVSD (seen above), a smaller-sized motor can do the same job but more efficiently. This has been proven when the MVSD was tested under real-life working conditions at Walmart's distribution centre in Mississauga.

Independent Electricity System Operator

1600-120 Adelaide Street West
Toronto, Ontario M5H 1T1

Phone: 905.403.6900

Toll-free: 1.888.448.7777

E-mail: customer.relations@ieso.ca

ieso.ca

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