

READY SET GO

Capturing the New-Found
Flexibility in Ontario's
Power Grid

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From the Chairman of the Board



The year 2013 was one of great progress. Much of the planning and preparation made by the IESO over recent years came into effect at precisely the right moment.

This year's annual report gives readers an overview of the sector, where we can look back to see how far we've come, and look forward to the coming year and beyond to the goals that lie ahead. We can zero in on the issues that matter the most and – in this new magazine-style format – examine them at length.

What I've found most interesting over the past year is the discussion of new opportunities and the choices we have to make to shape a more competitive and efficient electricity system.

For 2014, the IESO will continue to update its business, operating procedures and tools to provide the flexibility needed to adapt to the ongoing changes to Ontario's power system.

Achieving success will be challenging and complex, and not without risk. While new technologies can give us more options and benefits, they can also create uncertainties and unintended consequences.

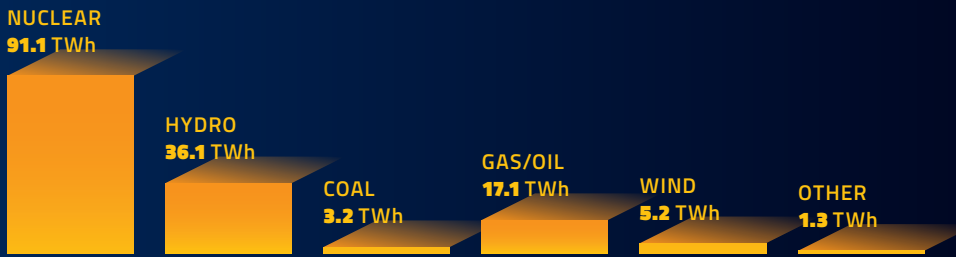
The way to manage this complexity is, of course, through a commitment to working with our stakeholders in a visible and collaborative way. Transparency is central to effective stakeholder engagement.

The IESO promotes transparency in the sector by providing clear and consistent information, whether through this report, our stakeholder engagement initiatives or our new website. These initiatives stress robust information and provide context for this information to help enable sound decision-making.

This culture of consultation and collaboration starts at the top. The Board of Directors and senior management value healthy discussion and the sharing of opinions among each other and stakeholders. It helps drive better decision-making for the organization and the industry, and provide the best value for the ratepayers of Ontario. 🌐

Tim O'Neill
Chairman of the Board
Independent Electricity
System Operator

TOTAL ANNUAL ONTARIO ENERGY OUTPUT BY FUEL TYPE



TOTAL ONTARIO ENERGY DEMAND (2009-2013)

Demand has remained flat the past few years as economic and population growth has been mitigated by expanded embedded generation, demand response and conservation.



JULY 8, 2013

Severe floods resulted in a demand drop of approximately 3,800 MW as thousands of customers lost electricity service across the GTA.

8.57¢/kWh

Total cost of power in 2013. This cost includes the average weighted wholesale market price of 2.65 cents/kWh and the average Global Adjustment of 5.92 cents/kWh.

+ 18.3 TWh
Exports

+ 4.9 TWh
Imports

ELECTRICITY IMPORTS FROM NEIGHBOURING JURISDICTIONS WERE UP SLIGHTLY TO 4.9 TERA-WATT HOURS (TWH) IN 2013, WHILE EXPORTS ROSE TO 18.3 TWH.



NUCLEAR'S TOTAL ENERGY OUTPUT
Increased from **82.5 TWh** in 2009 to **91.1 TWh** in 2013.



WIND CONTRIBUTION TO TOTAL ENERGY OUTPUT
Increased from **1.6%** in 2009 to **3.4%** in 2013.

2013

A YEAR IN REVIEW, ILLUSTRATED

Taking Stock: The IESO and Ontario's Changing Grid



Ontario's electricity sector is at a pivotal point.

The supply shortages the province experienced a decade ago have been addressed through the addition of approximately 12,000 MW of new and refurbished supply. The addition of more than 1,700 MW of variable generation to the grid was anticipated and addressed through numerous operational innovations, including new dispatch capability, a new online limit derivation tool and energy modelling software.

At the same time, demand growth for electricity is expected to remain relatively flat over the next few years, with reduced expectations over the longer term.

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 our power system. Our grid operations have indeed entered a new era.

Flexibility is a key principle of the Long-Term Energy Plan (LTEP) published in late 2013 – flexibility to meet the evolving changes in the demand forecast, and flexibility to address the variability of a power system heavily invested in wind and solar resources.

Flexibility from both supply and demand resources will help keep the system reliable and improve the efficiency of the market while helping us meet an increasing array of challenges.

Today's positive demand-supply outlook is expected to continue for the next few years, offering us a window of opportunity to lay the groundwork for meaningful developments that are needed to enhance the resiliency of the system and of our markets.

Three specific recommendations in the LTEP will help provide the needed flexibility: demand response, storage and capacity markets.

The IESO has long been an advocate of **demand response**. We believe there are opportunities for increased participation from the demand side in Ontario's

electricity market. By participating in this way, customers not only help meet system needs, they also help manage some of the cost pressures they face.

The IESO is committed to exploring the significant potential for **storage** solutions in Ontario's electricity market. In 2014, we will have two new storage providers of regulation services. Consistent with the LTEP, we are also seeking another 35 MW of storage projects for ancillary services and to gain experience with the operation of storage resources on the system.

Capacity markets elsewhere have shown that they can provide flexibility in the short and medium term. A capacity market with annual auctions for resources to compete to meet short- and medium-term needs could complement long-term planning and procurement, giving us greater flexibility to adjust to changing system needs without making unnecessary long-term commitments that could prove costly to consumers.

Given the positive experiences of neighbouring jurisdictions, the IESO believes it is worth exploring opportunities to develop an Ontario capacity market mechanism that fits within the provincial market construct.

While the LTEP sets out important roles and responsibilities for the IESO and other agencies, there is more change on the horizon.

Shortly after becoming President and CEO of the IESO in 2013, I was asked to chair the Ontario Smart Grid Forum, a body whose work the IESO has supported and led for approximately six years.

Over the course of discussions at the Forum, we now recognize that what we call smart grid could in fact challenge the fundamental role of every segment of the electricity value chain – from bulk generation and transmission to distribution and ultimately, consumption.

There are many drivers contributing to this change: solar power is cheaper than ever, a role for storage is emerging, and microgrids are becoming increasingly attractive complements to the more traditional service arrangements.

In 2014, the IESO will expand its dialogue with utilities and other potential new entrants to the smart grid space. Together, we need to better identify and assess technology-driven developments like distributed optimization, transactive energy and other such innovations.

The IESO will celebrate its 15-year anniversary in 2014. For a decade and a half, our employees have carried on the proud tradition of our predecessors while adapting to a changing electricity sector with differing customer needs.

It is clear that Ontario's electricity sector is in the midst of significant change. At the IESO, we see these developments as positive new opportunities – and we are determined to do our part to capture these benefits for Ontario. 🌐



Bruce Campbell
President and Chief Executive Officer
Independent Electricity System Operator

BEHIND THE SCENES AT THE IESO

Get to know IESO employees and how they contribute to the reliability and efficiency of the power system in their daily work.



JIM VERT

When Jim Vert makes a real-time decision about Ontario's bulk electricity grid, no one can overrule him – not even the President of the IESO.

Vert and his fellow control room superintendents have ultimate control over the system while they're on shift, authority that's needed to make scores of critical decisions aimed at keeping the lights on safely.

The role requires a calm demeanour, sound judgement, a rigorous work ethic and extensive knowledge of Ontario's power system. Vert has 23 years' experience in the control room.

Even so, his training never stops, with approximately 15 formal sessions per year in addition to daily briefings on system conditions and operator actions. This training is important for Vert and his colleagues, given that their real-time decisions are often made with limited information.

"We usually don't know exactly what happened or why until days after the fact," he says.

Vert is not daunted by the fact that he has the final word while on shift.

"You sort of get used to it," he says, adding, "I don't make decisions in isolation. I get feedback from many different sources as issues evolve. It's a real team effort. We do well when we're working together."



**RUSSEL
MASCARENHAS**

Russel Mascarenhas is using his co-op placement at the IESO to apply classroom teachings in optimization to real-world problems.

Mascarenhas, an industrial engineering student at the University of Toronto, works as a junior market analyst for the Market Assessment and Compliance Division. There, he processes computerized simulations of various market conditions to help his team assess the various impacts of market participant conduct.

The experience is paying off.

"In school you are assigned a project, you do it once and that's it," he says. "Here it's more of a process. You get to go back and forth until you find a solution that meets everyone's needs."

Mascarenhas is one of approximately 25 co-op students at the IESO at any given time. Most of them perform four-month placements.

The students are drawn from a variety of programs such as finance, engineering and computer science from numerous Ontario colleges and universities.

"The program benefits both the students and the IESO," says François Dekytspotter, Manager of Human Resources at the IESO. "Co-op students bring a lot of enthusiasm and fresh thinking to their roles. As a result, we've seen their contributions grow over the years."



**DAN
ALEXANDRU**

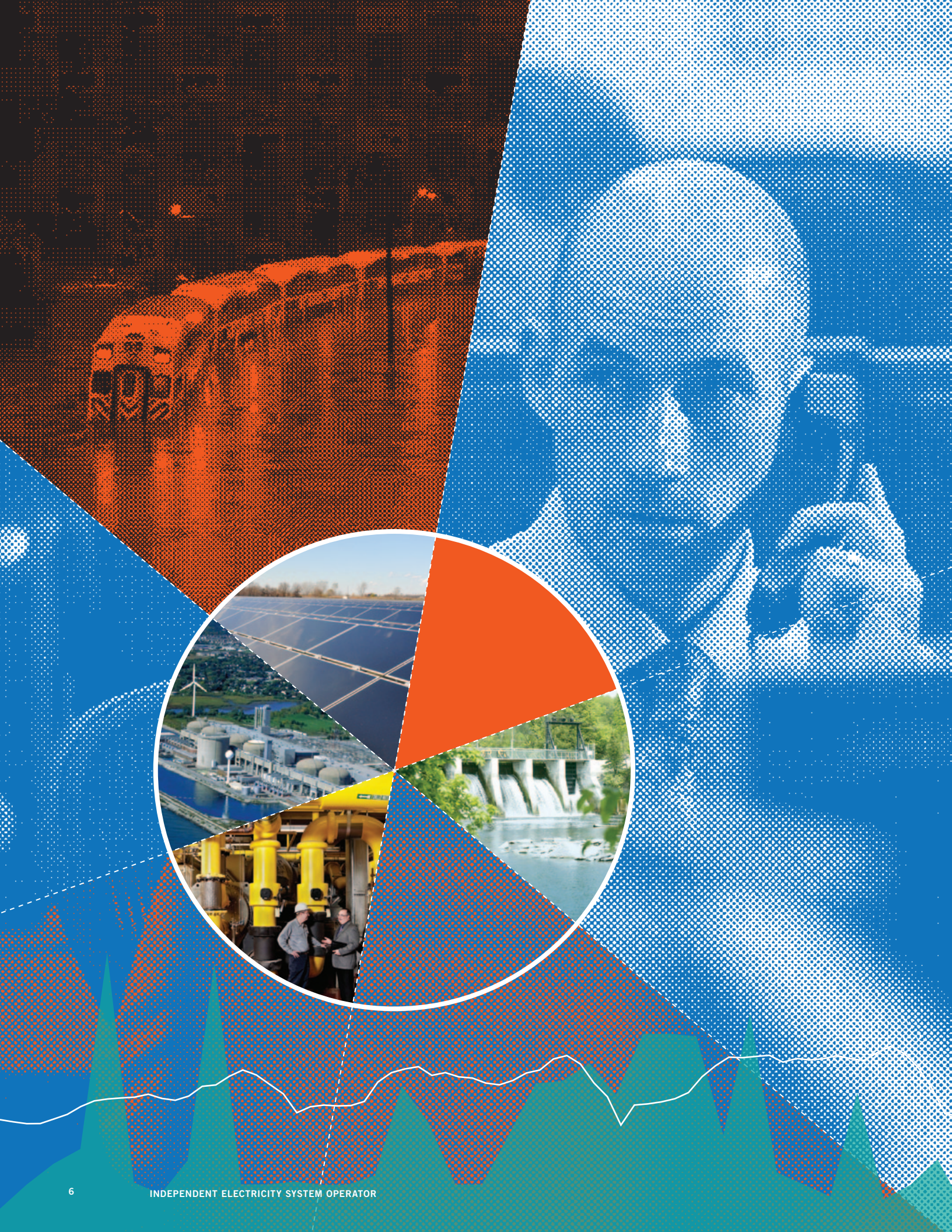
The variety in Dan Alexandru's workload is both one of his biggest challenges and one of the things he likes best.

Alexandru is a settlement coordinator for the IESO's Meter Data Management group.

Each day, his team collects and validates data from more than 4,000 wholesale meters and makes sure it's ready for settlement.

Alexandru also troubleshoots issues market participants may have with their data.

"I enjoy the fact that we don't know what tomorrow is going to bring, but one of the challenges is that I have to handle unexpected changes to our workload," he says. "I help with some of the more complex issues, so I can get pulled aside to assist various colleagues at any time."



RESILIENCY IN AN AGE OF CHANGE

Operating a power system in today's environment depends more on the real-time information you have at your fingertips, and less on what historical patterns can predict. In 2013, the IESO adopted new approaches that are injecting flexibility and resiliency into the provincial power grid.



A late-summer heat wave that began on September 10, 2013

was a welcome surprise to many Ontarians. Patios across the province were bustling with business that day, as people enjoyed the last rays of summer before fall. In the provincial capital, temperatures reached into the 30s, accompanied by high humidity and nearly doubling the nighttime high.

In the IESO control room, operators were contending with what could become an increasingly common event – a one-day 10,000 megawatt (MW) swing in demand.

The event required operators to turn on a dime, shifting their focus from surplus management in the early morning to a potential shortage just hours later. Every available generating unit in the province was pressed into service.

It wasn't that long ago that the operators of Ontario's bulk electricity system were able to rely on decades of tried and true methodologies to help guide them through challenges like the ones posed on that day in September. Extreme fluctuations in supply and demand were less frequent and largely predictable events in those days. Operators had time and years of historical data to rely on.

In 2013, however, the IESO's operating environment was marked by complexity and constant change. There were many instances when the province moved from surplus to potential shortages and back to surplus – all within the same day. At another time, an overloaded circuit in a faraway jurisdiction in Virginia caused ripples that reached all the way into the IESO control room.

This dynamic environment is now considered the 'new normal' for the IESO and is redefining the organization's behaviour, challenging its assumptions and opening the door to new possibilities.

Ontario's New Electricity Landscape

Numerous factors are reshaping the current landscape. The IESO has dozens of new market participants, new technologies and, at times, extreme variations in both supply capability and demand. At the same time, Ontario's reconfigured asset base includes a coal fleet that is in the final stages of being phased out, new natural gas-fired resources, a full nuclear fleet and the addition of large amounts of renewable generation – changes that, all told, amount to lost flexibility that must be found in new places and in new ways.

These changes, while transformative, are not unexpected. The role of the IESO as system operator is to ensure reliability of supply through the market while keeping the grid in balance, regardless of external circumstances. That balancing process starts months – and years – in advance.

Over the past few years, the IESO identified emerging pattern shifts and planned for their onset. Through a steady process of revision, redesign and addition, the organization revamped its real-time operating methods, tools and training programs to prepare for these changes.

THIS INCREASINGLY COMPLEX, INTERWOVEN SYSTEM REQUIRES CREATIVE NEW SOLUTIONS.

From Study to Consultation to Implementation

Many of these tools became operational at precisely the right moment.

For example, security constraints that serve as speed limits for the flow of electricity throughout the province were modernized from rigid and conservative calculations into more dynamic ones. With the Online Limit Derivation tool, the IESO now has the ability to calculate operating limits in close to real time, taking into account dynamic and constantly shifting parameters. The IESO can therefore allow much more power to flow through specific points on the grid, reducing congestion and increasing operational flexibility.

This new tool took centre stage in July 2013, when a record rainfall in the Greater Toronto Area flooded two major high-voltage transformer stations. The transformer stations were taken out of service, ultimately leading to the loss of 3,800 MW of demand – the third-largest such interruption in Ontario's history, behind the province-wide blackouts of 1965 and 2003.

In the past, restoration efforts would have relied on staff experience and partial simulations. The Online Limit Derivation tool changed that, allowing system limit experts to capture the full state of the power system and immediately begin studies using an exact model of the system. Less time was spent on modelling and more time on analysis of the power system.

While the tool laid the groundwork for a speedier restoration process, the restoration effort itself was a collaborative one.

The transmitter and other affected local distribution companies worked diligently to effectively restore all 32 high-voltage circuits. Their work was widely praised, for good reason.

Internally, the effectiveness of the Online Limit Derivation tool in a real-time contingency is now prompting the IESO to consider widening its application in emergency procedures.

Another, more visible addition was the Renewable Integration Initiative (RII), which added a suite of enhancements designed for large amounts of new variable generation resources. Thanks to strong collaboration with stakeholders and agency partners, the RII introduced three significant new features: forecasts, visibility and a new dispatch tool.

Forecasts predict output from wind and solar facilities, using real-time information from hundreds of weather and other monitoring stations as well as output information from registered generators. This rolling projection has added critical information to the IESO's decision-making ability, giving operators substantially more confidence in their operation of grid-connected wind resources, with solar resources soon to be added.

Visibility gives operators an instant glance at output from grid-connected and larger distribution-connected variable resources on the system. This knowledge will gain in importance, with an expected doubling of embedded variable generation resources in the next 18 months.

BEHIND THE SCENES AT THE IESO



JOANNE
HOSICK

JoAnne Hosick, an engineer/technical officer in the IESO's System Performance & Models group, is living proof that the transition from astronomy to power system engineering is not as far-fetched as one might think.

Hosick supplemented her master's degree in astronomy with a degree in power system engineering after working for a spell in the Hydro One control room.

At the IESO, she is part of a team that performs thousands of simulations to determine potential limitations in the power system. The team then codes those limitations into mathematical equations. The equations are entered into real-time monitoring tools designed to set off alarms when the system approaches its limits.

"The complexity of this work is extremely high, as is the responsibility," says Ioan Agavriloai, manager of Hosick's group. "Any error could have serious consequences for reliability."

Surprisingly, Hosick says her time studying celestial objects left her well prepared for her current role.

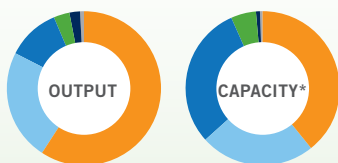
"My work in astronomy was mainly running simulations of galaxy mergers, which use a lot of the same numerical methods we use at the IESO," she says. "So the transition from astronomy made a lot of sense for me."



- 3,000 MW

THE AMOUNT OF COAL GENERATING RESOURCES REMOVED FROM THE GRID IN 2013, MARKING THE CULMINATION OF AN ORDERLY AND RELIABLE PHASE-OUT OF COAL IN SOUTHERN ONTARIO.

ENERGY OUTPUT AND INSTALLED CAPACITY BY FUEL TYPE 2013



● Nuclear	91.1 TWh	12,947 MW
● Hydro	36.1	7,939
● Gas/Oil	17.1	9,920
● Wind	5.2	1,725
● Coal	3.2	306
● Other	1.3	124

*As of December 31, 2013

The new dispatch tool for all grid-connected variable resources gives operators the ability to quickly adjust hundreds of megawatts of power to deal with rapidly changing system conditions.

The dispatch tool has become indispensable in helping to manage surplus situations. It has even been used to follow demand as it fluctuates throughout the day.

More importantly, it has helped the IESO meet its critical grid management responsibilities. Dispatch helped when an overloaded circuit in Virginia resulted in unexpected cuts to Ontario exports, resulting in a sudden surplus. Similarly, when a 500-kilovolt line in Southwestern Ontario was forced from service unexpectedly, operators dispatched both wind and nuclear resources to meet interconnection responsibilities in re-preparing the grid.

Without wind dispatch, large generating resources such as nuclear units would be shut down more frequently, taking more generation offline than is needed to solve short-term surpluses, resulting in a complicated and costly process.

New energy modelling software that became operational in 2013 will capture a broader spectrum of transmission constraints and characteristics of resources that allows for hourly evaluations of system adequacy, enhancing the IESO's planning processes.

Better, more comprehensive information is another key to understanding and adjusting to changes in Ontario's electricity infrastructure and supply mix. In this environment, enhanced knowledge translates into planning flexibility, which in turn creates grid resiliency.

Tapping Unused Flexibility

The IESO took another step forward in 2013 by entering into agreements and integrating emerging alternative technologies into Ontario's electricity regulation market. Following a competitive procurement process, three proponents were selected to provide a total of 10 MW from alternative sources of regulation, specifically from aggregated load, battery storage and flywheels.

One of these proponents is working to harness pre-existing flexibility by allowing companies with automated heating and cooling systems and other processes to offer that flexibility to the market. Those companies will respond to IESO signals by momentarily increasing or reducing their usage – without affecting their own processes.

All of these changes, representing a relatively small investment, are the product of extensive consultation with sector partners, including market participants, as well as the hard work of IESO staff, who have shown a great degree of flexibility in adapting to its new operational realities.

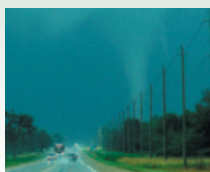
System Performance

The results of all these changes are notable, and play out every day in real time. Despite a high degree of complexity and change, Ontario's bulk electricity system performed well in 2013.

AUGUST 14, 2003: THE DAY THE GRID WENT DOWN



The province's electricity system has changed a lot since the blackout of 2003. Ten years on, it's more complex and diverse, with 8,000 MW of new and 4,100 MW of refurbished generation brought into service. The IESO also has a clearer picture of activity in neighbouring jurisdictions. And the entire North American grid is now held to higher, mandatory reliability requirements. Regulatory standards are more specific about the roles and responsibilities of system and transmission operators and are monitored and enforced through sanctions. Despite these new measures, ask Chief Operating Officer Kim Warren if a major blackout like 2003 could ever happen again and he'll say: "It is much less likely, but we never say never."



12

AVERAGE NUMBER OF TORNADOES ONTARIO GETS EVERY YEAR. IN ANTICIPATION OF TORNADOES AND OTHER EXTREME WEATHER EVENTS, IESO OPERATORS REPOSTURE THE GRID TO LIMIT THE IMPACT ON EQUIPMENT AND RELIABILITY.

LONG GONE ARE THE DAYS OF PREDICTABLE FLOWS, PATTERNS AND USEFUL HISTORICAL TRENDS.



The IESO and its market participants were able to effectively manage the high degree of intraday fluctuations in supply and demand and address the challenges posed by extreme weather events. Demand response played an increasingly prominent role in helping to balance the system, providing a combined 1,200 MW of demand reduction on the hottest days of the year.

The province's interconnections continued to act as a large shock absorber, allowing interconnected jurisdictions experiencing tight supplies to import power, while allowing others in oversupply to export. The province effectively exported electricity throughout 2013 and did not depend on imports to maintain reliability at any point during the year.

A Subtle Shift

Ontario has made great strides in its supply outlook by adding new renewable generation, natural gas infrastructure and new transmission to the market, in addition to increased demand response and new technologies such as storage. However, it has also lost considerable amounts of flexible generation. A full 3,000 MW of coal generation was retired in 2013 alone.

Both the addition and elimination of resources were done in an orderly, controlled process, with no impact on reliability. Nevertheless, a shift continues to take place.

During the next several years, large swathes of nuclear generation will cycle out of service for refurbishment. Ontario is transitioning from a period of ample supply to a period of adequate supply. Despite that fact, surplus baseload generation events will continue.

The IESO continues to aggressively pursue efficient solutions to new challenges. Recent investments will soon yield new demand forecasting capabilities, outage management protocols and operator training simulations to help the organization with these tasks.

Other solutions are further out on the horizon. System operators require an even broader view of system conditions in other interconnected jurisdictions to reduce the likelihood that incidents occurring hundreds of kilometres away will impact the Ontario power system.

In 2013, increased complexity and constant change were the prevailing themes at the IESO. Ontario's increasingly complex, interwoven system will continue to require creative solutions in 2014 and beyond. 🌐

BEHIND THE SCENES AT THE IESO



JENNIFER CUI

Just as it is for an emergency room physician, being on call is part of Jennifer Cui's job. But her operations are performed on complicated computer systems. And her scalpel is a laptop.

Cui, an electrical engineer, works on a range of software that helps the system run – software that contains all the bids and offers, for example, or that signals alarms when the system is approaching its operating limits.

"We work closely with our vendors and other teams within the business," she says. "If there's a situation with an application – if the flow calculations aren't converging, for example – we work with people in the Operations group as well as our vendors to pinpoint the root cause."

One week in five Cui is on call, ready to tackle complex problems at any time of day – or night.

"You always have to have your phone by your side," she says.



MEGAN DONER

University graduates with business degrees are in for tough competition in the job market. So Megan Doner, an assistant engineer/technical officer at the IESO, put herself at an advantage by earning a second concurrent degree in computer science.

At the IESO, Doner is putting both degrees to good use in her work for the Market Settlements group where, in addition to other tasks, she ensures the accuracy of billing for the IESO market.

Her business background helps give her an in-depth understanding of the market. Computer science gives her the tools to transform "a substantial amount of raw data into meaningful information."



+160% in 5 years

APPROXIMATE PERCENTAGE INCREASE IN GAS GENERATOR CAPACITY BETWEEN 2008 AND 2013, HIGHLIGHTING THE RELATIVELY YOUNG AGE OF ONTARIO'S GAS GENERATION FLEET. GENERATING CAPACITY ROSE BY 4,800 MW OVER THAT TIME, AS EIGHT NEW STATIONS WERE ADDED.

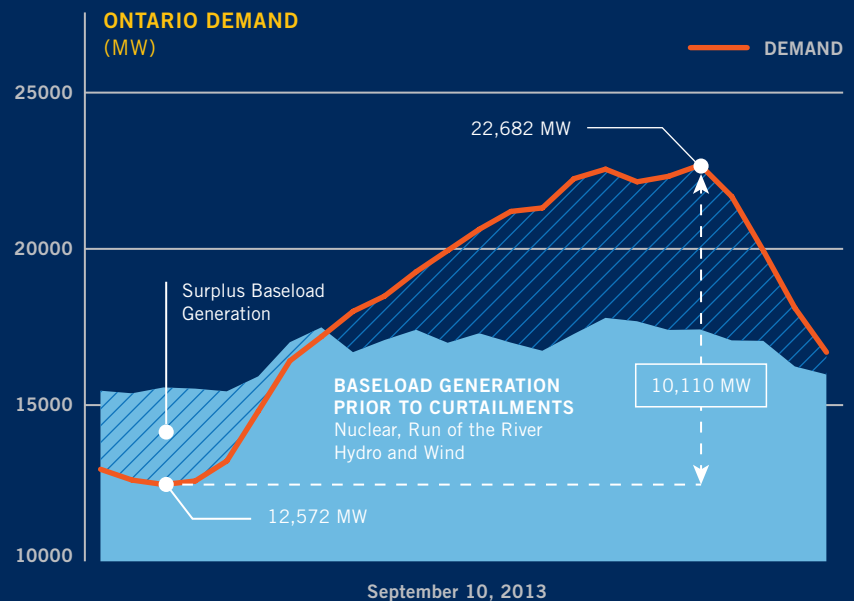
BEFORE & AFTER UNLEASHING THE FLEXIBILITY OF WIND

Wind generation has taken on a whole new role in the Ontario electricity system – moving from a passive resource to one that is actively used to balance supply against demand. The dispatch of wind has become an effective tool to manage surplus baseload generation.

BEFORE SEPTEMBER 10, 2013

On the day before implementation of wind dispatch, system conditions were a precursor of what will become an increasingly common occurrence – shortfalls and surpluses on the same day – with demand increasing more than 10,000 MW over the course of the day. And while large shifts in demand on the same day have happened before, surplus baseload generation had never been part of the mix.

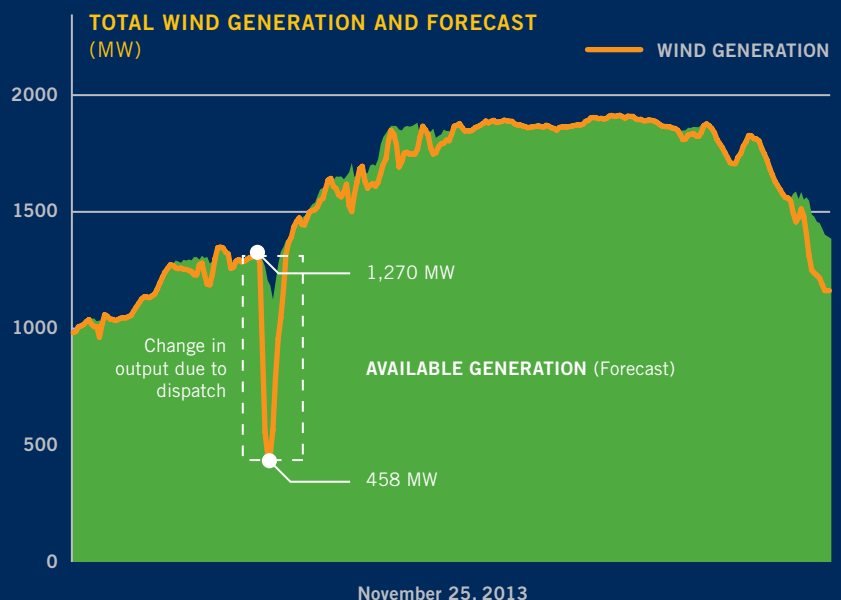
At first, the IESO control room managed the surplus through exports and reducing nuclear output, which is a cumbersome and inefficient process. As temperatures and demand rose, system operators shifted from managing surpluses to ensuring there was enough supply to meet afternoon peaks.



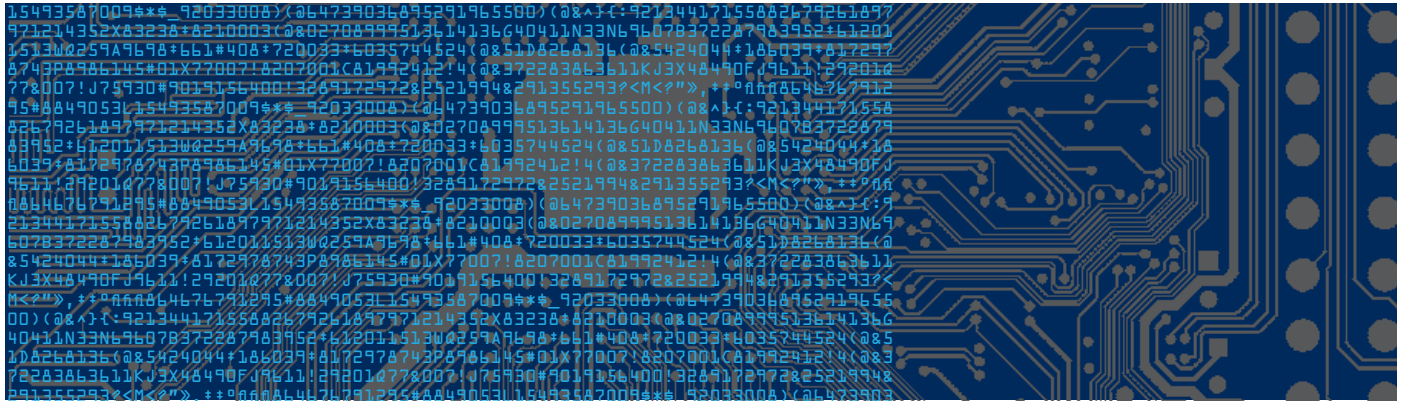
AFTER NOVEMBER 25, 2013

Once wind dispatch came into effect, the IESO was able to use the inherent flexibility of wind generation to help balance demand. When the wind is blowing, wind generators have proven to be highly flexible, with the potential of changing their output at a rate seven times that of gas facilities.

On November 25, wind generators played an important role in managing surpluses. At one point, wind output was reduced by more than 800 MW within 15 minutes, then increased by the same amount. Throughout the day, wind generation provided valuable 'load following' responding to the changing needs of the system and market.



Emerging Challenges: Cybersecurity



National Geographic's *American Blackout*, a dramatic portrayal of a large-scale power outage broadcast in 2013, is a reminder of the emerging risk posed by cybersecurity threats.

In this fictional national power outage, store shelves are empty and fuel supplies have evaporated. Increasingly desperate citizens roam the streets, looking for food, fresh water and anything else that may help them survive.

And all of it is caused by a cyberattack that could have been staged with a couple of thousand dollars in computer equipment.

The production's worst-case scenario premise may be extreme, but the fact remains that cyberattacks are posing new challenges to businesses in an array of sectors. Over the past decade, computer-generated attacks have increased in number, complexity and consequences.

As an organization with responsibility for critical infrastructure, the IESO takes cybersecurity very seriously, actively working to secure the grid against cyberattacks, and monitoring threats and vulnerabilities on a continuous basis.

To do this, the IESO employs a specialized team of cybersecurity experts who are all Certified Information System Security Professional (CISSP) trained

and compliant. The IESO also complies with a variety of North American Electric Reliability Corporation (NERC) standards governing the protection of critical infrastructure.

Through its extensive emergency planning experience, the IESO has developed mitigation plans for critical situations, including cyberattacks, physical attacks and extreme weather events.

In November 2013, the IESO participated in GridEx II, a continent-wide exercise that simulated a coordinated physical and cyberattack. The IESO took the Ontario exercise one step further than other jurisdictions by involving security and other agencies not directly involved in the electricity sector. The exercise gave IESO staff an important opportunity to practise real-time crisis response.

However, the IESO's efforts alone cannot eliminate risks to Ontario's power grid, which connects with hundreds of transmitters, distributors, generators and large consumers. Cybersecurity is a shared responsibility.

Recognizing this, the IESO has taken steps to promote better information-sharing among industry participants. Those efforts include, most recently, the establishment of the Cybersecurity Forum in late 2013. The Forum aims to increase awareness of cybersecurity initiatives, develop and collaborate on best practices and review current information about incidents.

"A big part of our efforts involves staying current," says Ben Blakely, team lead with the IESO's Security group and Chair of the Cybersecurity Forum. "We identify threats and solutions to those threats by collaborating and sharing information with industry members, as well as agencies such as NERC and the Canadian Cyber Incident Response Centre."

Always important, information-sharing has been given additional impetus after security experts remarked that perpetrators of cyberattacks use many of the same resources – servers and programming code, for example – in successive attacks.

In this context, information-sharing can be critical in protecting against future attacks. 🌐

THE CASE FOR DEMAND RESPONSE

Managing the power grid has traditionally been a matter of controlling supply output to meet changes in demand. Today, consumers can do the opposite by changing their consumption in response to prices that reflect system needs. This is called demand response.

Opportunities for demand response are growing. New technologies will allow consumers to have more control over their electricity use, manage their costs and contribute to system reliability.

THE ONTARIO EXPERIENCE



Ontario's system needs are constantly changing. Consumers can provide valuable flexibility through demand response.



There are 4.8 million smart meters allowing consumers to respond to time-of-use rates by shifting demand.



Ontario has a robust high-tech sector developing new products and services to help manage energy needs.



In managing the grid, the IESO schedules the lowest-cost generation to meet demand. If consumers offer reduced consumption into the market, more expensive generation may not be needed.



Demand response provides a valuable resource to Ontario. Over the hot summer days of 2013, it helped reduce peak demand by an average of 1,200 megawatts. This came from large industrial customers reducing their energy use during the five peak days of the year, the DR3 program, large consumers bidding for energy in the market (also known as dispatchable load) and time-of-use rates.



The province's Long-Term Energy Plan sets a target of using demand response to meet 10 per cent of peak demand by 2025.



THE EVOLUTION OF DEMAND RESPONSE

In the Long-Term Energy Plan, the Ontario government tasked the IESO with evolving current programs and working with consumers to develop new initiatives for demand response.



Current Demand Response

Program-based demand response such as peaksaverPlus and DR3 are activated when the grid is under strain, usually during hot summer days.

Current demand response programs are mostly focused on managing demand peaks. Ontario has built a solid foundation from which to expand for more products and services.

Future Demand Response

Already, some large consumers are participating in the market, responding to wholesale prices. By expanding its role in the market, DR can actively participate on a level playing field with generators and energy traders to provide services like managing local or regional conditions or minute-to-minute balancing.

The IESO is taking a lead on investigating market-based opportunities to expand the role of demand-side resources.

A new stakeholder working group has been established to support this effort.
www.ieso.ca/drwg.

HIGHLY FLEXIBLE



Demand response takes advantage of existing infrastructure to provide services that in some cases have previously only been offered by generators, adding a highly flexible resource to support system reliability.

The IESO has recently launched a pilot program allowing institutional, commercial and industrial consumers to provide aggregated regulation service. In this way, demand response helps the grid maintain second-to-second balance, by responding to small and frequent changes in energy demand and generation.

LEARN MORE ONLINE

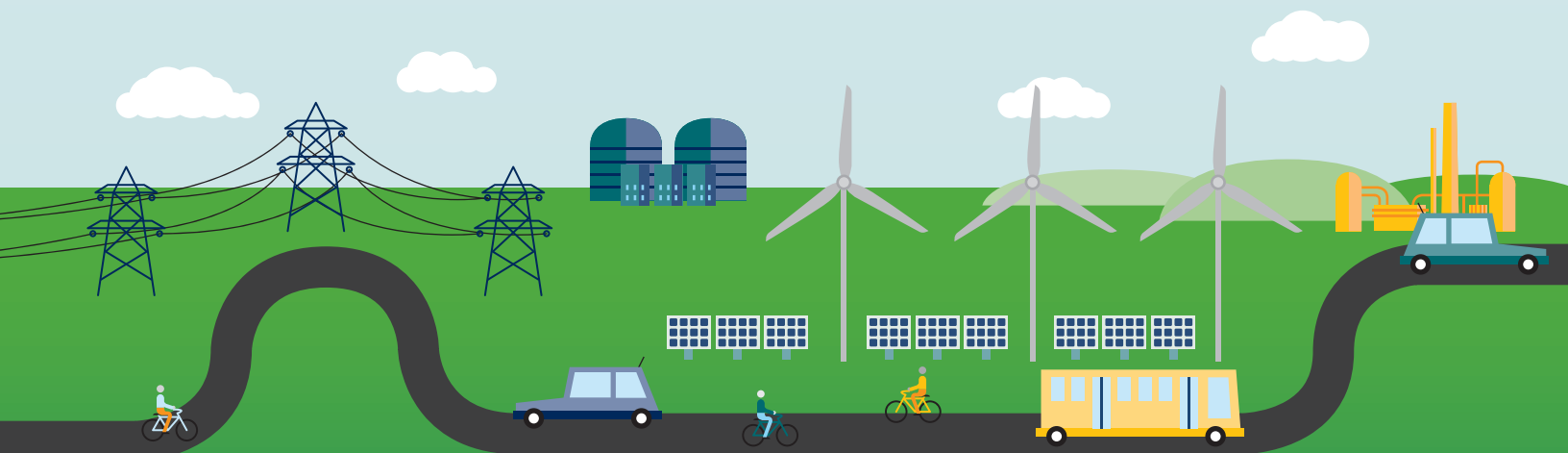


The Ontario Smart Grid is an interactive website that helps educate consumers on how their response to price and system signals can help grid reliability.

Visit www.ieso.ca/ontariosmartgrid to learn more.

Learn more about where we are now and the future of demand response by visiting the IESO website:

www.ieso.ca/demand.response





LOOKING AHEAD - FLEXIBILITY THROUGH MARKETS

HOW CAN ONTARIO'S ELECTRICITY SYSTEM BECOME MORE RESPONSIVE, MORE EFFICIENT AND TAKE ADVANTAGE OF NEW OPPORTUNITIES – PROVIDING NEW-FOUND FLEXIBILITY TO HELP KEEP THE LIGHTS ON?

Today's Ontario electricity system is vastly different from what it was just 10 years ago. Wind is now a mainstream resource; solar panels in communities are displacing demand from the high-voltage grid; large industrial users are shaving summer peaks; and coal has virtually disappeared from the provincial energy landscape.

And more change is on the way. Increasing variable generation, the renewal of the provincial nuclear fleet and the emergence of game-changing technologies mean that change is continuous. The IESO and other stakeholders are looking at how to evolve current structures to become more flexible and better able to take advantage of evolving opportunities.

Organizations that have complex operational responsibilities are often driven by a singular value. As is the case at the IESO, when it comes to reliability, change must be carefully managed and controlled. These organizations analyze, assess and consult, taking the necessary time to design rules and structures that will ensure continuity and consistency.

As technology, entrepreneurship and consumer needs continue to evolve at breakneck speed, questions emerge: Can institutions change fast enough or are they destined to become roadblocks? Can they adapt existing structures to facilitate and foster change?

“For the IESO, our goal is not just to ensure that change doesn't impact reliability,” says Bruce Campbell, President and CEO of the IESO. “We want to ensure that we can harness change to enhance reliability. And that means adapting the way we've structured the system so that it can attract innovation and new efficiencies that will make the entire system work better.”

The Transformation Continues

Ontario's power grid has now reached the point where all the investments in new and refurbished supply have assured adequacy of the electricity supply.

BRUCE CAMPBELL, PRESIDENT AND CEO OF THE IESO:
“WE WANT TO ENSURE THAT WE CAN HARNESS
CHANGE TO ENHANCE RELIABILITY.”



In 2013, Ontario had more nuclear units available for service and operating than at any other time since market opening. Wind generation has at times provided as much as 13 per cent of the province's energy needs. With the 2013 introduction of wind dispatch, this zero-carbon resource has evolved to provide valuable flexibility, augmenting the supply flexibility provided by Ontario's new gas generators. These advances in supply have been accompanied by new opportunities for electricity consumers to manage their electricity use.

This ambitious program has been implemented through contracting investment in new generation, new transmission, amendments to market rules and the deployment of new technologies – all facilitated by a significant commitment to stakeholder engagement. In short, the sector acted decisively to put many key changes in place.

Yet looking forward, can the industry rely on the same tools to absorb continued change? Kim Warren, the IESO's Chief Operating Officer, views change as a constant, and one which requires a more fundamental response.

“Certainty in operations will be a rarity. We need practical and efficient means to manage the volatility we see within a day's or week's operations. Our current approaches may not be the answer to our problems as they have in the past.”

While contracts and regulated rates for new and refurbished generation have been important tools in replacing Ontario's coal facilities and supporting investment in renewable energy, they can be difficult to adapt to rapidly changing circumstances. That's why the industry is exploring the evolution of market mechanisms – building on the inherent responsiveness of markets to address changing conditions in ways that both protect reliability and drive greater efficiencies.

The Future Ain't What it Used to Be

In 1989, Ontario Hydro forecast that primary energy demand in Ontario would near 200 terawatt hours by 2014. This forecast was based on sound planning methodologies, historical patterns and projections of how the population and economy would grow. The reality, howev-

er, is that total Ontario demand reached just 141 terawatt hours in 2013 and will likely remain at the same level in 2014.

The lesson here is not that the forecasts missed the mark, but that circumstances have changed so significantly that long-term plans can no longer be set in stone – they must be constantly adjusted and revised. The province's new Long-Term Energy Plan recognizes this reality, and will be assessed on an ongoing basis in the light of systematic energy statistical reports made available to the public to support broader, well-informed discussion.

Even in day-to-day operations, the level of predictability that system operators used to count on has dissipated, along with the value of historical trends and tested methodologies. They can be irrelevant – or worse, misleading – to the current day's operation. Grid operations are becoming more volatile and complex, with incidents increasing in scope and depth. And while the dispatch of wind generation and variable generation forecasting represent important tools for system operators, greater flexibility is still needed.

The Changes Ahead

The next few years will likely prove again that constant change has become a core feature of the province's electricity system. For example:

- Increasing amounts of both nuclear and renewable energy contributed to surplus baseload generation throughout 2013, and will continue to do so over the next few years. At the same time, daily variability will become more pronounced. By 2019, transmission-connected wind generation is expected to surpass 4,900 MW. This additional capacity will have the potential to both add to, and help manage, surplus baseload generation.
- Embedded solar and wind generation – output located within local distribution service areas – is expected to exceed 2,700 MW by 2019, adding increased variability to grid operations, with associated issues such as voltage control.
- A new round of nuclear refurbishments is slated to begin in 2016, representing more than 8,000 MW of generation, and 3,000 MW of generation at Pickering will be retired by 2020. As a result, the system will need to be regularly reconfigured to adapt to changing power flows as the refurbishment schedule unfolds. Other resources, such as natural gas generation, demand response and interconnections, will have to assume a greater role, once again changing the dynamics of balancing the grid.

Flexibility Through Markets

Since 2002, the wholesale electricity market has worked to balance supply and demand within the province through the price signal, which has brought generators, traders and large consumers together to determine the most efficient way to meet the province's supply needs on a five-minute basis. A great deal of experience has been gained over those years.

The cold weather throughout January 2014 showed just how flexible the market can be – and how the price signal can efficiently balance the market. With rising demand, market prices effectively attracted supply when and where it was needed most; and when there was surplus supply in Ontario, it provided generators with the opportunity to sell

BEHIND THE SCENES AT THE IESO



ANDY
HE

Andy He, an economist with a PhD from Carleton University, has a unique perspective on the operation of Ontario's wholesale electricity market.

He has spent the bulk of his 11-year IESO career monitoring market operations, assessing market participant behaviour and identifying defects in market design.

In 2013, he switched jobs, moving from the Market Assessment and Compliance Division to Markets and Finance where, as a senior economist, he is now helping model and assess potential changes to Ontario's bulk electricity market. Among the issues he has looked at is the application of storage in other markets.

"It's very interesting," He says about the change in perspective. "I've moved to the other end. I'm providing input to market and program initiatives in order to increase efficiency and avoid adverse consequences in the first place."



RHONDA
WRIGHT HILBIG

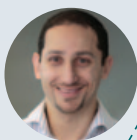
As a long-time leader at the IESO, Rhonda Wright Hilbig has played a role in its transformation into a customer-focused organization.

A mechanical engineer, Wright Hilbig began her career working at a coal generation plant in Southwestern Ontario. She was hired by the IESO at its inception and spent her early days in customer service, helping grid-connected customers integrate into the market. At the time, the IESO was an operations-focused organization.

Over time, that focus has shifted. "Now, it's customers first," she says.

Wright Hilbig recently took on the role of manager of market change initiatives, where she is responsible for spearheading the business and customer aspects of a market systems refresh and integrating demand response into the market.

She sees her latest role as a return to her roots. "I get to re-engage with consumers through programs that allow them to participate in the market," she says.



MOHAMED
EL-MADHOUN

The opportunity to work directly with electricity sector partners is just one of the benefits of Mohamed El-Madhoun's job at the IESO.

El-Madhoun, a senior engineer/technical officer with the organization's Meter Data Management group, leads a team responsible for registering and auditing revenue meters in the IESO market.

Large producers and consumers of electricity use the revenue meters to measure all energy transactions into and out of the grid.

The registration process, which holds market participants to strict standards, takes a month or two.

"There's a lot of interaction with market participants," says El-Madhoun, who holds a B.Sc. in engineering. "You have to be a really good listener. You need to know exactly what their concerns are."



CAPACITY MARKETS ALSO OFFER THE FLEXIBILITY TO INTEGRATE INNOVATIONS SUCH AS ENERGY STORAGE AND OTHER EMERGING TECHNOLOGIES.

this surplus in export markets, bringing in revenues that offset capacity investments. During this period, the capacity payments that generators would have received through the Global Adjustment were significantly reduced, as wholesale prices worked to cover a greater share of the investment costs.

A Market-Based Approach

Given the flexibility that markets can provide, the IESO is examining ways to leverage markets further to build greater flexibility into the system – whether in day-to-day operations or in helping to meet some of the nearer-term capacity needs.

Demand response – consumers responding to system needs – provides the perfect argument for why markets need to adapt. Markets can tap into existing infrastructure created for other purposes in order to generate more

flexibility from the demand side of the market. This can come in the form of peak shaving, load following or even second-to-second response.

Ontario already has experience with large consumers participating directly in the market. And now, with new technologies enabling consumers at all levels to take greater control of their energy use – whether on their own or through aggregators – the industry is seeking to capture the value that consumers can provide and developing ways to compensate them for that value. The aim is to put consumers, who want to better manage their electricity costs, on a level playing field with suppliers such as generators and energy traders.

Opening the market to broader participation is supported by efforts to increase the role of demand response in Ontario. The Long-Term Energy Plan sets a demand response target of 10 per cent of peak demand by 2025. In addition, it has called on the IESO to work with large

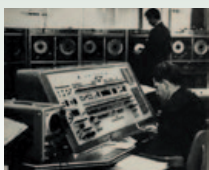
electricity consumers on new initiatives that can put demand response efforts on par with other generation options in Ontario's electricity markets.

One of the ways in which the IESO could integrate greater levels of demand response is by developing capacity markets. Capacity markets can complement existing contracts and other procurement options by ensuring adequate supply without locking in that supply for a long period of time.

As the province faces the potential uncertainties associated with refurbishing the nuclear fleet, markets may allow system planners to more easily adjust for the ebb and flow of system needs at lower costs than long-term commitments made through contracts. A properly designed capacity market could deliver near-term flexibility to dynamically adjust to revised or unforeseen changes in demand and supply conditions.

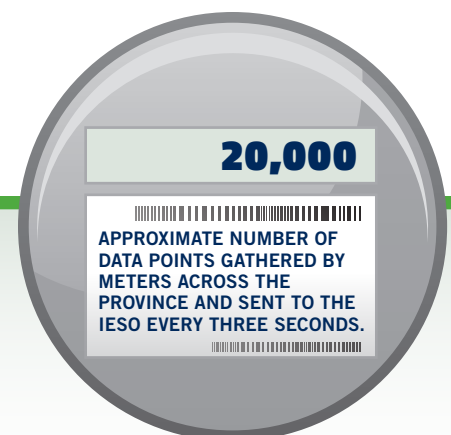
Ted Leonard, the IESO's Vice President – Markets and Chief Financial Officer, is keen to bring to Ontario some of the lessons about capacity markets learned from neighbouring jurisdictions. "At a time when we are under significant cost pressures, I want to know: How have other markets drawn out further efficiencies? How have those markets put downward pressure on capacity prices? It's our responsibility to explore these developments to determine where the opportunities are."

The IESO is looking at the experiences of system operators in New York and New England, and also at PJM, which serves the Central East United States, to help determine if capacity markets can provide cost savings and increased levels of flexibility.



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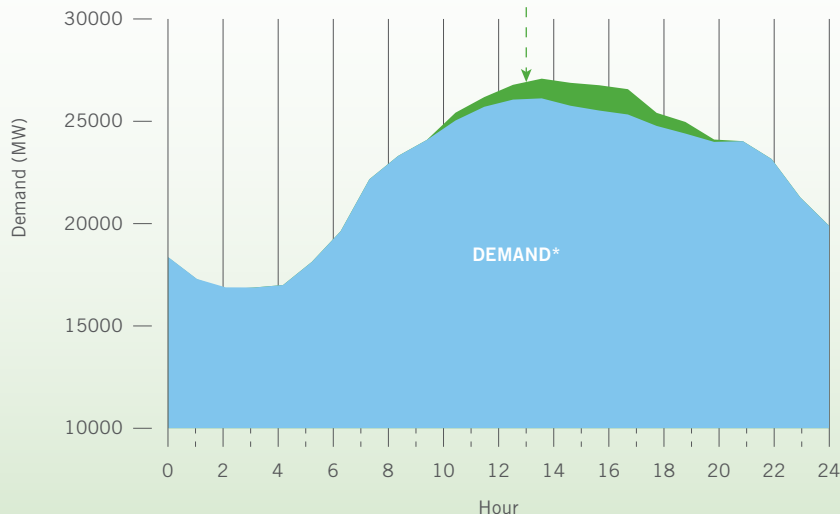
THE YEAR THE HYDRO-ELECTRIC POWER COMMISSION OF ONTARIO, THE FORERUNNER TO ONTARIO HYDRO, FIRST USED A DIGITAL COMPUTER (UNIVAC II) TO EXPERIMENT WITH OPTIMIZING ITS ENERGY SCHEDULING.



IMPACT OF DEMAND RESPONSE

DEMAND REDUCTION

Demand reduced as a result of price measures and demand response programs. Over several hot summer days in 2013, demand response helped reduce peak demand by an average of 1,200 MW.



* Ontario demand as supplied from the grid as well as estimate of demand supplied by embedded generation.

Capacity markets are flexible enough to allow for the full range of services that demand response providers can offer, which are largely dependent on how they operate their facilities, what kind of machinery they use and their overall energy needs. A one-size-fits-all approach to demand response would limit the amount of demand response that can ultimately be made available.

Jurisdictions that have introduced capacity markets report noteworthy results, such as lower all-in costs, more predictable prices and significant increases in demand response participation. Capacity markets also offer the flexibility to integrate innovations such as energy storage and other emerging technologies. While the costs for some of these technologies may not currently be competitive, this is changing quickly due to the pace of technological advances.

Throughout 2014, the IESO will be working to develop a capacity market and consulting with stakeholders on a “made in Ontario” approach that reflects the sector’s unique circumstances.

Bruce Campbell reinforces the need to adapt for the future: “Over the past few years, the grid has capably handled the demands made of it. But we can’t continue to do things in the same way we always have. Nuclear refurbishments, new technologies and consumer needs won’t wait for a time that’s convenient for us and, one way or another, they will all affect our business. Exactly how may not yet be clear, but for some of us this potential new world will be a made-to-order opportunity. At the IESO, we want to manage these changes, and not have them manage us.” 🌐



2,300 MW

NEW FLEXIBILITY FROM ONTARIO’S NUCLEAR UNITS

THE EIGHT UNITS AT THE BRUCE GENERATING STATION, FOR EXAMPLE, CAN CHANGE OUTPUT BY MORE THAN 2,300 MW, PROVIDING A REMARKABLE AMOUNT OF FLEXIBILITY FOR A BASELOAD RESOURCE.

BEHIND THE SCENES AT THE IESO



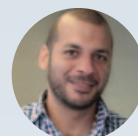
**EDWARD
ARLITT**

A 14-year veteran of the IESO, senior strategic analyst Edward Arlitt witnessed – and worked on – the initial implementation and ongoing evolution of Ontario’s wholesale electricity market.

Arlitt, who graduated with an M.Sc. in information systems from the London School of Economics, initially worked on the development of Market Rules. Other projects followed, including the implementation of the IESO’s Day-Ahead Commitment process and later, the IESO’s Smart Metering System Implementation Program.

Today he is involved in the IESO’s corporate strategy development, helping integrate new demand response initiatives into the market, and serves as the IESO’s representative on various smart grid-related forums.

“I enjoy my current role,” he says. “It allows me to stay abreast of the latest trends in technology and electricity.”



**HANY
HABIB**

Reducing the time it takes to perform a business process from seven days to two days is impressive.

Multiplied 2,200 times over three months, this one improvement becomes a real boon to business efficiency.

That is the story behind the IESO’s automated registration process for market participants.

Hany Habib, a software engineer with the IESO’s Business Solutions group, served as the lead developer on the process.

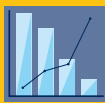
“There are so many benefits to automation,” says Habib, who graduated with a B.Sc. in computer engineering from Ain Shams University in his native Egypt. “Efficiency, fewer human errors, and of course it frees up staff to do other work.”

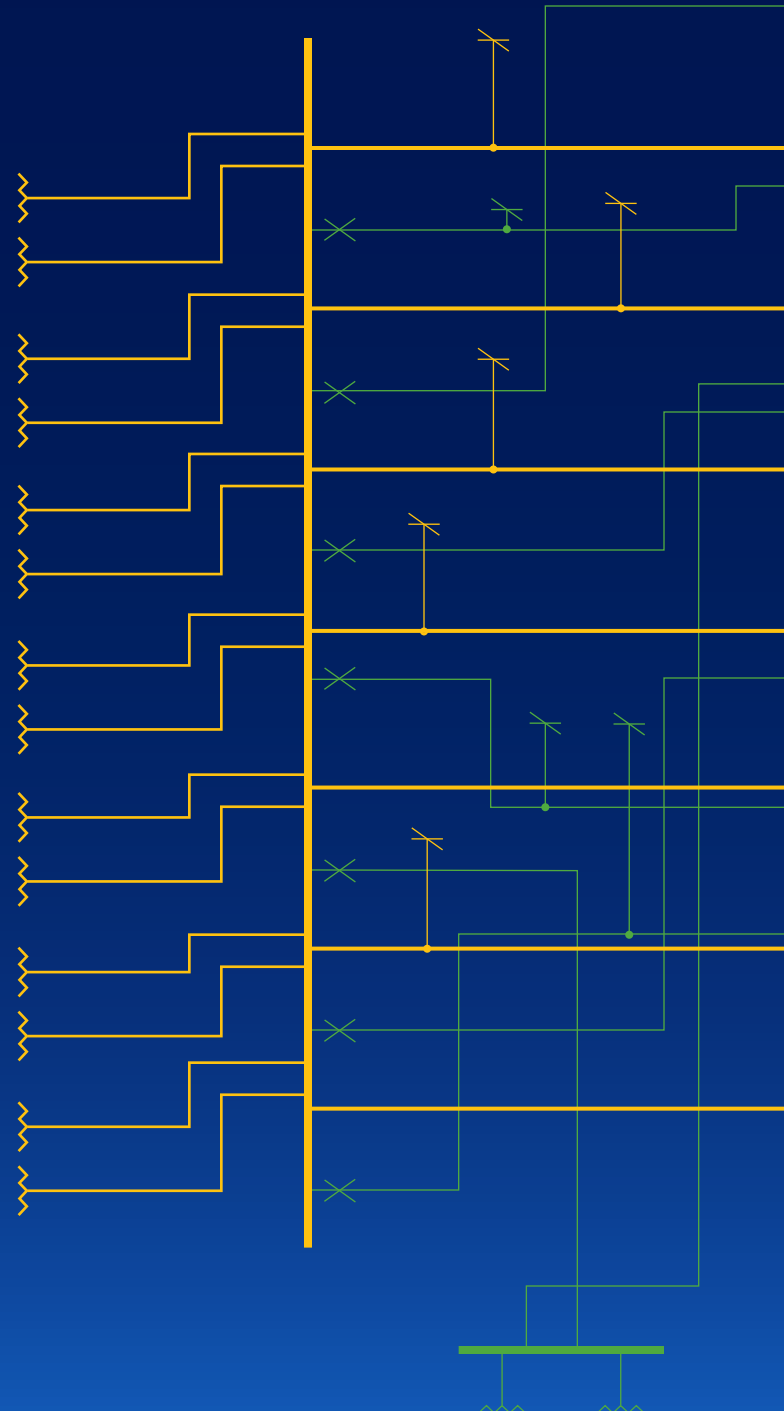
EVOLVING TO A MORE EFFICIENT ELECTRICITY MARKETPLACE

The IESO is looking to stakeholders to provide advice and input on how best to integrate significant changes in the management of the power system.

Here are some of the crucial questions facing the industry today, and the types of criteria used to evaluate options, and ultimately an approach to evolve the market.

THE DISCUSSION:

How can the system leverage the growing contribution of renewables?	
How should Ontario explore the potential of microgrids and nanogrids?	
How do we best integrate energy storage into the system?	
How can demand response better address system needs?	
What are the benefits of having a capacity market in Ontario?	
What market or pricing signals will consumers use to change their consumption?	
How does Ontario ensure new technologies compete on a level playing field?	



CRITERIA

Reliability

Customer value

Cost efficiency

Market-based

Flexibility

Adaptability

Operability

Market efficiency

CONSULTATION

Stakeholder Advisory Committee

"Involving stakeholders helps to ensure balanced electricity policy."

Working Groups / Standing Committees

"It's time to collectively develop solutions and act on them."

Stakeholder Engagements

"There's a need for the big picture or vision for electricity market development in Ontario."

Technical Panel

AN APPROACH TO MOVING THE MARKET FORWARD

Ontario's Smart Grid – Five Years On



Technology moves fast in the digital world. In 2008, the iPhone was just starting to revolutionize the cellphone market. Netflix had just opened its doors to give subscribers unlimited access to streaming video. And the Ontario Smart Grid Forum – whose members represent utilities, associations, public agencies and universities – started its work to achieve the vision of a smart grid for Ontario.

Since it was founded, the Forum, with the support of the Corporate Partners Committee, has explored a myriad of smart grid-related issues, advocating for a coordinated approach to smart grid development. While these groups act as independent bodies, the IESO supports the Forum's ongoing efforts – with IESO President and CEO Bruce Campbell acting as its current Chair.

Ontario has placed itself well ahead of most other jurisdictions around the world in terms of smart grid development. With more than 4.8 million smart meters installed in homes and businesses and almost all low-volume consumers on time-of-use rates, the province has created the basis for a smart grid. But as the Ontario Smart Grid Forum noted in its five-year assessment, this leading position might not last long.

According to some estimates, the number of Internet-connected devices exceeded

the number of people on Earth sometime in the year 2008 – the very year the Smart Grid Forum was founded. Using current estimates, that number could grow to more than 25 billion by as early as 2015.

A smart grid is just one part of a growing trend toward the 'Internet of things' that will provide greater connectivity, control and capacity for automation and responsiveness – perhaps at an astonishingly fast rate of growth. The Smart Grid Forum has been anticipating this development for some time now – though the greatest challenges may lie just ahead.

The United States, South Korea, Japan, Brazil and various members of the European Union have all made smart grid development a priority. Open standards, investment in research and development, and consumer demand are leading the way to a proliferation of new approaches to managing electricity use. Depending on how one counts smart

grid-related spending, estimates of the size of the global market for smart grid-related products and services range from \$73 billion to \$400 billion by 2020. It is no wonder that countries are looking to develop smart grid technologies to add value to their export portfolios.

Indeed, smart metering only scratches the surface of the potential for smart grids. New industry clusters for energy storage, demand response, home energy networks, smart appliances and distributed generation are emerging in Ontario and elsewhere. These capabilities may drive efficiencies across the electricity system, but they also generate high-value jobs that strengthen the province's economy.

As competition picks up, Ontario will need to become even more focused on demonstrating its capabilities to the world. Local distribution companies are implementing smart grid projects to accommodate small-scale generation and changing customer demands. Established technology companies, startups and Ontario's research institutions are strengthening the entire innovation chain. For its part, the IESO is examining its rules and processes in order to create opportunities for all types of services and technologies to compete to provide for the province's needs.

In the coming months, the Forum and the Corporate Partners Committee will discuss the emerging implications of connecting smart electrical grids and other energy systems such as thermal storage, combined heat and power and natural gas. They will continue to advocate for ways that Ontario can extend its lead in the fast-paced smart grid world. 🌐

Learn more about various smart grid technologies and the work of the Smart Grid Forum on the IESO website at www.ieso.ca.



A 360° VIEW: STAKEHOLDER PERSPECTIVES

Q1. What do you think has been the most significant change to take place in the market over the last few years? What were the benefits of this change? What lessons can be learned from it?

ROB COULBECK

VICE PRESIDENT ENERGY MANAGEMENT
GOREWAY STATION PARTNERSHIP

“The most significant change in the IESO wholesale market has been the renewed emphasis on stakeholder initiatives as a result of the Electricity Market Forum. The IESO and market participants have already seen the positive impact through the implementation of rules to address surplus baseload generation.

Ongoing stakeholdering will further enhance and evolve the market by evaluating all aspects of the current market and undertaking new initiatives to unearth potential efficiencies. Whether the changes are minor modifications, clarification of existing rules, overhaul of the unconstrained market price or new products (capacity market and day-ahead market, for example), we look forward to building on the cooperative efforts of the IESO, OPA and market participants, which will lead to more efficient operation of the market.”



JATIN NATHWANI

PROFESSOR AND ONTARIO RESEARCH CHAIR IN PUBLIC
POLICY FOR SUSTAINABLE ENERGY
EXECUTIVE DIRECTOR, WATERLOO INSTITUTE FOR
SUSTAINABLE ENERGY (WISE)
FACULTY OF ENGINEERING AND FACULTY OF ENVIRONMENT,
UNIVERSITY OF WATERLOO

“Ontario can take pride – and some solace – in the fact that we have put the crisis of inadequate energy supply behind us. Coupled to this stable generation environment is the achievement of the near-herculean task of closing the coal plants and putting Ontario’s electricity sector on a low-carbon trajectory for generations to come. This will, over the long term, prove to be the envy of jurisdictions around the world, and more so, those U.S. states that surround Ontario.

The emerging challenge to Ontario’s economic prosperity is the underlying threat embedded in the contracts of some high cost variable generation that will put upward pressure on cost to consumers. The enablement of a smart grid – another important Ontario achievement – has the promise and the potential to become a powerful tool in the hands of consumers to help mitigate the impacts of upward cost pressures.

The magic we have achieved is this: Ontario’s low-carbon electricity sector has transformed itself into a driving force to embolden Ontario to become a modern energy economy based on electrified mobility and smart urbanization.”



Q2. What emerging opportunities are there for the industry to ensure that the system becomes more sustainable, efficient and responsive to consumer needs? How can it best prepare to take advantage of these opportunities?

ED SEAWARD

MANAGER, MARKET DEVELOPMENT, UNION GAS

“Ontario is widening its definition of smart grid to smart energy network – a grid that uses advanced communications technology to monitor and measure energy use not just for electricity but for natural gas and other sectors. This inclusive smart energy network can improve the flexibility and resiliency of the power grid. For example, natural gas and electricity are linked in terms of generation. In a world of smart energy networks, those same connections could be expanded on the consumer side. There are opportunities for commercial and residential customers to help manage peak demand with technologies such as Combined Heat and Power (CHP), micro CHP, gas heat pumps or natural gas cooling.

For smart energy networks to happen, working together is key. In Ontario, energy policy tends to largely be focused on electricity policy, with less attention on natural gas policy. Both systems have robust energy delivery infrastructure – transmission and distribution for electricity, and transportation and distribution for natural gas. To fully utilize this infrastructure, we must look at connecting the two systems beyond the large generation level, moving to foster downstream consumer applications.”



BARRY CHUDDY

CHIEF EXECUTIVE OFFICER, GUELPH HYDRO INC.

“The system we have is pretty good but could be adapted to be a better fit for sustainability, efficiency and a reduction in harmful emissions as communities are accepting their obligations to reduce our carbon footprint. In order to be more sustainable and efficient, the rules on dispatch could be modified to recognize that CHP plants have some unique attributes and benefits, and as a system we want more of them, not the large gas-fired combined cycle plants that have predominated the market. Also, I think the economic dispatch of generation needs to consider its greenhouse gas effects and ‘price this in’. The location of generation and its dispatch needs to reflect the fact that we do want more generation closer to the load, and avoid transmission losses.”



WAYNE SMITH

SENIOR VICE PRESIDENT, GRID OPERATIONS
HYDRO ONE INC.

“Our customers need to see the value. Our supply of electricity and the markets that support it must make sense to them and be trusted. In the industry today, much of the complexity and competing dialogue can lead to quite the opposite. We need to embrace emerging ideas like automation, microgrids, renewable generation and social media in a way that improves and simplifies the experience for the customer. Accepting that the priorities differ for different customers, our customers need to be part of driving the investments we make. We also need to ensure this core infrastructure remains secure and reliable. Innovating with the vendors of the equipment that makes up our power systems and as an industry is key to maintaining or improving reliability and security. If we don’t innovate, both will degrade.”

Q3. What fundamental shifts are needed to prepare the system for changes over the medium and longer terms?



ERSILIA SERAFINI
PRESIDENT, SUMMERHILL

"I believe that building a Culture of Conservation and 'Conservation First' must be integrated into all energy-related decisions including system planning and infrastructure investment. We need to accept that conservation benefits consumers and society. We need to move to a state where conservation efforts are no longer confined to silos, compartments or channels but rather are a fully integrated approach in our system. Finally, we need greater coordination from all stakeholders understanding that the same fundamental approach applies whether it is electricity, natural gas, oil or water conservation."



RON DIZY
PRESIDENT AND CEO, ENBALA POWER NETWORKS

"Today's power system requires flexibility – it is no longer sufficient to think of the grid's needs in terms of energy and capacity. As the current power system continues to evolve and new forms of generation are brought online, procuring this flexibility is becoming a real challenge. In order to manage intermittent renewable energy, fluctuating demand and other evolving grid management issues, grid operators need to be aggressively working with and piloting alternative sources of flexibility – including demand-side management-based solutions and energy storage technologies. At the same time, we must explore and begin shifting to different mechanisms to effectively compensate energy resources for the value they bring to grid operations."



RON DEMBO
FOUNDER AND CEO, ZEROFOOTPRINT SOFTWARE INC.

"Looking at other industries around us, empowering the consumer has become the focus of many corporations – and this type of thinking is creeping into the electricity industry. Consumers want to be empowered to do things like better manage their electricity use to reduce their cost and consumption.

This fundamental change in thinking can all come together in a world of 'big data' and 'open data'. Harnessing the possibilities of data and smart consumer products will help improve efficiencies not just in energy, but in a variety of sectors. Consumers want their electricity meter at home, their water meter and even meters that track personal health to give them information not just for curiosity's sake but to use it for a purpose. Open data, especially at the IESO, which is at the nexus of smart meter energy data, will allow developers to design phone apps for consumers to get paid for managing energy with the touch of a finger."

1. REACH OUT TO THE STAKEHOLDER ADVISORY COMMITTEE (SAC)

Stakeholder Advisory Committee representatives provide advice and recommendations on market development and planning decisions directly to the Independent Electricity System Operator (IESO). Members representing electricity service providers, generators, conveyors and electricity consumers reach out to their constituents to gather input to help develop their recommendations. Upcoming meetings are listed at www.ieso.ca/sac.

2. JOIN A STAKEHOLDER GROUP OR ATTEND A MEETING

The IESO consults with stakeholders affected by a particular change initiative so they can provide input before a decision is made. Consultation channels include active consultations, working groups, standing committees and the Technical Panel. For more information, visit www.ieso.ca/se.

3. ATTEND THE ANNUAL STAKEHOLDER SUMMIT

The IESO Stakeholder Summit gathers speakers and panelists from across the Ontario energy industry and beyond to discuss key topics to further the development of the electricity market. Watch for the 2015 Summit announcement and read the 2014 Summit report at www.ieso.ca/summit.

5 WAYS TO ENGAGE WITH THE IESO

4. TALK TO US

IESO Customer Relations representatives are available from 8 a.m. to 5 p.m., Monday to Friday, to answer your questions. Subscribe to the weekly Info Bulletin to stay informed about news, notices, updates and events. Email customer.relations@ieso.ca or call 905.403.6900/1.888.448.7777.

5. FOLLOW THE IESO ON SOCIAL MEDIA

Get an inside look at how the IESO and electricity market are run. The IESO posts company and industry news, and answers questions from stakeholders and the general public.

Facebook:
www.facebook.com/OntarioIESO

Twitter:
www.twitter.com/IESO_Tweets

The IESO is responsible for delivering maximum value to ratepayers, and has built a culture of fiscal restraint and prudent spending. To access a copy of the IESO 2013 Financial Statements, visit www.ieso.ca/annual.report

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Financial Statements



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Management Report

Management's Responsibility for Financial Reporting

The accompanying financial statements of the Independent Electricity System Operator are the responsibility of management and have been prepared in accordance with Canadian public sector accounting standards. The significant accounting policies followed by the Independent Electricity System Operator are described in the Summary of Significant Accounting Policies contained in Note 2 in the financial statements. The preparation of financial statements necessarily involves the use of estimates based on management's judgement, particularly when transactions affecting the current accounting period cannot be finalized with certainty until future periods. The financial statements have been prepared within reasonable limits of materiality and in light of information available up to February 13, 2014.

Management maintained a system of internal controls designed to provide reasonable assurance that the assets were safeguarded and that reliable information was available on a timely basis. The system included formal policies and procedures and an organizational structure that provided for the appropriate delegation of authority and segregation of responsibilities.

These financial statements have been examined by KPMG LLP, a firm of independent external auditors appointed by the Board of Directors. The external auditors' responsibility is to express their opinion on whether the financial statements are fairly presented in accordance with generally accepted accounting principles in Canada. The Auditors' Report, which follows, outlines the scope of their examination and their opinion.

INDEPENDENT ELECTRICITY SYSTEM OPERATOR

On behalf of management,



Bruce Campbell
President and Chief Executive Officer
Toronto, Canada
February 13, 2014



Ted Leonard
Vice President, Markets
Chief Financial Officer and Treasurer
Toronto, Canada
February 13, 2014

Independent Auditors' Report

To the Board of Directors of the Independent Electricity System Operator (IESO)

We have audited the accompanying financial statements of IESO, which comprise the statement of financial position as at December 31, 2013, the statements of operations and accumulated deficit, remeasurement gains and losses, change in net debt and cash flows for the year then ended, and notes, comprising a summary of significant accounting policies and other explanatory information.

Management's Responsibility for the Financial Statements

Management is responsible for the preparation and fair presentation of these financial statements in accordance with Canadian public sector accounting standards, and for such internal control as management determines is necessary to enable the preparation of financial statements that are free from material misstatement, whether due to fraud or error.

Auditors' Responsibility

Our responsibility is to express an opinion on these financial statements based on our audit. We conducted our audit in accordance with Canadian generally accepted auditing standards. Those standards require that we comply with ethical requirements and plan and perform the audit to obtain reasonable assurance about whether the financial statements are free from material misstatement.

An audit involves performing procedures to obtain audit evidence about the amounts and disclosures in the financial statements. The procedures selected depend on our judgment, including the assessment of the risks of material misstatement of the financial statements, whether due to fraud or error. In making those risk assessments, we consider internal control relevant to the entity's preparation and fair presentation of the financial statements in order to design audit procedures that are appropriate in the circumstances, but not for the purpose of expressing an opinion on the effectiveness of the entity's internal control. An audit also includes evaluating the appropriateness of accounting policies used and the reasonableness of accounting estimates made by management, as well as evaluating the overall presentation of the financial statements.

We believe that the audit evidence we have obtained is sufficient and appropriate to provide a basis for our audit opinion.

Opinion

In our opinion, the financial statements present fairly, in all material respects, the financial position of IESO as at December 31, 2013, and its results of operations and the changes in its net debt and its cash flows for the year then ended in accordance with Canadian public sector accounting standards.



Chartered Professional Accountants, Licensed Public Accountants

February 13, 2014

Waterloo, Canada

Statement of Financial Position

As at (in thousands of Canadian dollars)

December 31, 2013 December 31, 2012

	\$	\$
FINANCIAL ASSETS		
Cash and cash equivalents	9,569	6,863
Accounts receivable	17,592	16,833
Long-term investments (Note 3)	31,801	27,721
TOTAL FINANCIAL ASSETS	58,962	51,417
LIABILITIES		
Accounts payable and accrued liabilities (Note 4)	24,178	21,308
Accrued interest on debt	266	346
Rebates due to market participants (Note 5)	25,755	13,107
Debt (Note 6)	124,200	133,200
Accrued pension liability (Note 7)	35,139	41,600
Accrued liability for employee future benefits other than pension (Note 7)	74,069	69,255
TOTAL LIABILITIES	283,607	278,816
NET DEBT	(224,645)	(227,399)
NON-FINANCIAL ASSETS		
Net tangible capital assets (Note 8)	91,636	87,607
Prepaid expenses	4,455	3,688
TOTAL NON-FINANCIAL ASSETS	96,091	91,295
ACCUMULATED SURPLUS/(DEFICIT)		
Accumulated deficit from operations (Note 5)	(132,698)	(137,651)
Accumulated remeasurement gains	4,144	1,547
ACCUMULATED DEFICIT	(128,554)	(136,104)

On behalf of the Board:



Tim O'Neill
Chair
Toronto, Canada



William Museler
Director
Toronto, Canada

Statement of Operations and Accumulated Deficit

For the year ended December 31 (in thousands of Canadian dollars)	2013	2013	2012
	Budget \$	Actual \$	Actual \$
WHOLESALE MARKET OPERATIONS			
System fees	123,914	115,683	116,257
Other revenue (Note 9)	3,919	3,143	3,958
Interest and investment income	938	1,601	350
Wholesale market operation revenues	128,771	120,427	120,565
Wholesale market operation expenses (Note 10)	(125,078)	(118,422)	(116,727)
Wholesale market operations annual surplus	3,693	2,005	3,838
MARKET SANCTIONS AND PAYMENT ADJUSTMENTS			
Market sanctions and payment adjustments	–	3,191	1,087
Customer education and market enforcement expenses (Note 10)	(307)	(3,856)	(670)
Market sanctions and payment adjustments annual surplus/(deficit)	(307)	(665)	417
SMART METERING ENTITY			
Smart metering charge	30,138	30,144	–
Smart metering expenses (Note 10)	(31,591)	(26,531)	(23,734)
Smart metering entity annual surplus/(deficit)	(1,453)	3,613	(23,734)
ANNUAL SURPLUS/(DEFICIT)	1,933	4,953	(19,479)
ACCUMULATED DEFICIT FROM OPERATIONS, BEGINNING OF PERIOD	(137,651)	(137,651)	(118,172)
ACCUMULATED DEFICIT FROM OPERATIONS, END OF PERIOD	(135,718)	(132,698)	(137,651)

Statement of Remeasurement Gains and Losses

For the year ended December 31 (in thousands of Canadian dollars)	2013	2012
	Actual \$	Actual \$
ACCUMULATED REMEASUREMENT LOSSES, BEGINNING OF PERIOD	1,547	(374)
UNREALIZED GAINS ATTRIBUTABLE TO:		
Foreign exchange – derivatives	–	–
Foreign exchange – other	178	35
Portfolio investments (Note 3)	2,454	1,025
AMOUNTS RECLASSIFIED TO THE STATEMENT OF OPERATIONS:		
Foreign exchange – derivatives	–	(2)
Foreign exchange – other	(35)	(46)
Portfolio investments	–	909
NET REMEASUREMENT GAINS FOR THE PERIOD	2,597	1,921
ACCUMULATED REMEASUREMENT GAINS, END OF PERIOD	4,144	1,547

Statement of Change in Net Debt

For the year ended December 31 (in thousands of Canadian dollars)	2013	2013	2012
	Budget \$	Actual \$	Actual \$
ANNUAL SURPLUS/(DEFICIT)	1,933	4,953	(19,479)
CHANGE IN NON-FINANCIAL ASSETS			
Acquisition of tangible capital assets	(23,559)	(22,196)	(16,244)
Amortization of tangible capital assets	18,431	18,167	16,539
Change in prepaid expenses	177	(767)	(585)
TOTAL CHANGE IN NON-FINANCIAL ASSETS	(4,951)	(4,796)	(290)
NET REMEASUREMENT GAINS FOR THE PERIOD	908	2,597	1,921
CHANGE IN NET DEBT	(2,110)	2,754	(17,848)
NET DEBT, BEGINNING OF PERIOD	(227,399)	(227,399)	(209,551)
NET DEBT, END OF PERIOD	(229,509)	(224,645)	(227,399)

Statement of Cash Flows

For the year ended December 31 (in thousands of Canadian dollars)

2013

2012

	\$	\$
OPERATING TRANSACTIONS		
Annual Surplus/(Deficit)	4,953	(19,479)
Changes in non-cash items:		
Amortization	18,167	16,539
Pension expense	10,800	11,985
Other employee future benefits expense	6,907	6,482
Change in fair value of long-term investments	–	876
	35,874	35,882
Changes in non-cash balances related to operations:		
Change in accounts payable and accrued liabilities	(2,146)	1,138
Change in accounts receivable	(759)	(2,698)
Change in rebates due to market participants	12,648	9,590
Change in prepaid expenses	(767)	(585)
	8,976	7,445
Other:		
Contribution to pension fund	(17,261)	(25,313)
Payment of employee future benefits	(2,093)	(1,768)
	(19,354)	(27,081)
Cash provided by (applied to) operating transactions	30,449	(3,233)
CAPITAL TRANSACTIONS		
Acquisition of tangible capital assets	(22,196)	(16,244)
Change in accounts payable & accrued liabilities	4,936	47
Cash applied to capital transactions	(17,260)	(16,197)
INVESTING TRANSACTIONS		
Purchase of long-term investments	(1,626)	(2,322)
Cash applied to investing transactions	(1,626)	(2,322)
FINANCING TRANSACTIONS		
Change in debt	(9,000)	23,000
Cash provided by (applied to) financing transactions	(9,000)	23,000
INCREASE IN CASH AND CASH EQUIVALENTS	2,563	1,248
CASH AND CASH EQUIVALENTS – BEGINNING OF PERIOD	6,863	5,626
Change in unrealized foreign exchange – other for the period	143	(11)
CASH AND CASH EQUIVALENTS – END OF PERIOD	9,569	6,863

Notes to Financial Statements

1. NATURE OF OPERATIONS

Independent Electricity System Operator (IESO) is a not-for-profit, non-taxable corporation, created by statute effective on April 1, 1999 pursuant to Part II of the *Electricity Act, 1998*. As set out in the *Electricity Act, 1998*, the IESO operates pursuant to a licence granted by the Ontario Energy Board (OEB). The objects of the IESO as contained in the *Electricity Act, 1998* and amended, in the *Electricity Restructuring Act, 2004* and Ontario Regulation 452/06, are as follows:

- to exercise the powers and perform the duties assigned to the IESO under the *Electricity Restructuring Act, 2004*, the market rules and its licence;
- to enter into agreements with transmitters giving the IESO the authority to direct the operation of their transmission systems;
- to direct the operation and maintain the reliability of the IESO-controlled grid to promote the purposes of the *Electricity Restructuring Act, 2004*;
- to participate in the development, by any standards authority, of standards and criteria relating to the reliability of the transmission systems;
- to work with the responsible authorities outside Ontario to co-ordinate the IESO's activities with their activities;
- to collect and provide information to the Ontario Power Authority (OPA) and the public relating to the current and short-term electricity needs of Ontario and the adequacy and reliability of the integrated power system to meet those needs;
- to operate the IESO-administered markets to promote the purposes of the *Electricity Restructuring Act, 2004*;
- to plan, manage and implement the smart metering initiative or any aspect of the initiative;
- to oversee, administer and deliver the smart metering initiative or any aspect of the initiative; and
- to establish and enforce standards and criteria relating to the reliability of transmission systems.

The IESO was designated the Smart Metering Entity by Ontario Regulation 393/07 under the *Electricity Act, 1998* on March 28, 2007. The regulation came into effect on July 26, 2007.

The objects of the Smart Metering Entity (SME), as contained in the *Electricity Act, 1998*, are as follows:

- to plan and implement and, on an ongoing basis, oversee, administer and deliver any part of the smart metering initiative as required by regulation under this or any Act or directive made pursuant to sections 28.3 or 28.4 of the *Ontario Energy Board Act, 1998*, and, if so authorized, to have the exclusive authority to conduct these activities;
- to collect and manage and to facilitate the collection and management of information and data and to store the information and data related to the metering of consumers' consumption or use of electricity in Ontario, including data collected from distributors and, if so authorized, to have the exclusive authority to collect, manage and store the data;
- to establish, to own or lease and to operate one or more databases to facilitate collecting, managing, storing and retrieving smart metering data;

- to provide and promote non-discriminatory access, on appropriate terms and subject to any conditions in its licence relating to the protection of privacy, by distributors, retailers, the OPA and other persons,
 - i. to the information and data referred to above, and
 - ii. to the telecommunication system that permits the Smart Metering Entity to transfer data about the consumption or use of electricity to and from its databases, including access to its telecommunication equipment, systems and technology and associated equipment, systems and technologies
- to own or to lease and to operate equipment, systems and technology, including telecommunication equipment, systems and technology that permit the Smart Metering Entity to transfer data about the consumption or use of electricity to and from its databases, including owning, leasing or operating such equipment, systems and technology and associated equipment, systems and technologies, directly or indirectly, including through one or more subsidiaries, if the Smart Metering Entity is a corporation;
- to engage in such competitive procurement activities as are necessary to fulfill its objects or business activities;
- to procure, as and when necessary, meters, metering equipment, systems and technology and any associated equipment, systems and technologies on behalf of distributors, as an agent or otherwise, directly or indirectly, including through one or more subsidiaries, if the Smart Metering Entity is a corporation;
- to recover, through just and reasonable rates, the costs and an appropriate return approved by the Ontario Energy Board associated with the conduct of its activities; and
- to undertake any other objects that are prescribed by associated regulation.

The IESO is required to submit its proposed expenditures, revenue requirements, and fees for the coming year to the OEB for review and approval. The submission may be made only with the approval or deemed approval of the IESO business plan by the Minister of Energy (Minister).

2. SUMMARY OF SIGNIFICANT ACCOUNTING POLICIES

a) Basis of financial statement preparation

The accompanying financial statements have been prepared on a going concern basis and in accordance with Canadian public sector accounting standards and reflect the following significant accounting policies.

b) Revenue recognition

System fees earned by the IESO are based on approved rates for each megawatt of electricity withdrawn from the IESO-controlled grid, including exports. System fees are recognized as revenue at the time the electricity is withdrawn. Rebates are recognized in the year in which the approved regulatory deferral account, before such rebates, exceeds regulated limits.

These financial statements do not include the financial transactions of market participants within the IESO-administered markets.

Other revenue represents amounts that accrue to the IESO relating to services the IESO performs and charges on a cost recovery basis, investment income on funds passing through market settlement accounts, as well as application fees. Such revenue is recognized as is earned.

Interest and investment income represents realized interest income and investment gains or losses on cash, cash equivalents, short-term investments and long-term investments.

Market sanctions represent funds received and payments disbursed related to penalties, damages, fines and payment adjustments arising from resolved settlement disputes.

c) Financial instruments

The IESO records cash and cash equivalents, investment portfolio, and foreign currency exchange forward contracts at fair value. The cumulative change in fair value of these financial instruments is recorded in accumulated surplus as remeasurement gains and losses and is included in the value of the respective financial instrument shown in the statement of financial position and the statement of remeasurement gains and losses. Upon disposition of the financial instruments, the cumulative remeasurement gains and losses are reclassified to the statement of operations and all other gains and losses associated with the disposition of the financial instrument are recorded in the statement of operations. Transaction costs are charged to operations as incurred.

Cash and cash equivalents comprise cash, term deposits and other short-term, highly-rated investments with original maturity dates of less than 90 days.

The IESO records accounts receivable, accounts payable and debt at amortized cost.

d) Tangible capital assets

Tangible capital assets are recorded at cost which includes all amounts directly attributable to the acquisition, construction, development or betterment of the asset. The IESO capitalizes applicable interest as part of the cost of tangible capital assets.

e) Assets under construction

Assets under construction generally relates to the costs of physical facilities, hardware and software, and includes costs paid to vendors, internal and external labour, consultants and interest related to funds borrowed to finance the project. Costs relating to assets under construction are transferred to tangible capital assets when the asset under construction is deemed to be ready for use.

f) Amortization

The capital cost of tangible capital assets in service is amortized on a straight-line basis over their estimated service lives.

The estimated service lives in years, from the date the assets were acquired, are:

Class	Estimated Average Service Life 2013	Estimated Average Service Life 2012
Facilities	38	38
Market systems and applications	4 to 10	4 to 11
Infrastructure and other assets	4 to 7	4 to 7
Meter data management/repository	10	10

Gains and losses on sales or premature retirements of tangible capital assets are charged to operations.

The estimated service lives of tangible capital assets are subject to periodic review. The effects of changes in the estimated lives are amortized on a prospective basis. The most recent review was completed in fiscal 2012.

g) Pension, other post-employment benefits and compensated absences

The IESO's post-employment benefit programs include pension, group life insurance, health care, long-term disability and workers compensation benefits.

The IESO accrues obligations under pension and other post-employment benefit (OPEB) plans and the related costs, net of plan assets. Pension and OPEB expenses and obligations are determined annually by independent actuaries using the projected benefit method and management's best estimate of expected return on plan assets, salary escalation, retirement ages of employees, mortality and expected health-care costs. The discount rate used to value liabilities is based on the expected rate of return on plan assets as at the measurement date of September 30.

The expected return on plan assets is based on management's long-term best estimate using a market-related value of plan assets. The market-related value of plan assets is determined using the average value of assets over three years (2012 – five years) as at the measurement date of September 30.

Pension and OPEB expenses are recorded during the year in which employees render services. Pension and OPEB expenses consist of current service costs, interest expense on liabilities, expected return on plan assets and the cost of plan amendments in the period. Actuarial gains/(losses) arise from, among other things, the difference between the actual rate of return on plan assets for a period and the expected long-term rate of return on plan assets for that period or from changes in actuarial assumptions used to determine the accrued benefit obligations. Actuarial gains/(losses) are amortized over the expected average remaining service life of the employees covered by the plan.

The expected average remaining service life of employees covered by the pension plans is 13 years (2012 – 13 years) and OPEB plans is 14 years (2012 – 14 years).

The IESO sick pay benefits accumulate but do not vest. The IESO accrues sick pay benefits based on the expectation of future utilization, and records the accrual within accounts payable and accrued liabilities.

h) Foreign currency exchange

Transactions denominated in foreign currencies are translated into Canadian dollars at the rate of exchange prevailing on the date of the transaction. Items on the statement of financial position denominated in foreign currency are translated to Canadian dollars at the rate of exchange as of the financial statements date. The cumulative unrealized foreign currency exchange gains and losses of items continuing to be recognized on the statement of financial position are recorded in accumulated deficit as remeasurement gains and losses and shown in the statement of financial position and the statement of remeasurement gains and losses. Upon settlement of the item denominated in a foreign currency, the cumulative remeasurement gains and losses are reclassified to the statement of operations and all other gains and losses associated with the disposition of the financial instrument are recorded in the statement of operations.

i) Use of estimates

The preparation of the financial statements in conformity with Canadian public sector accounting standards requires management to make estimates and assumptions that affect the reported amounts of revenues, expenses, assets and liabilities and the disclosure of contingent assets and liabilities as at the date of the financial statements. The IESO's accounts which involve a greater degree of uncertainty include the carrying values of tangible capital assets, rebates to market participants, accrued pension liability, and accrual for employee future benefits other than pensions. Actual results could differ from those estimates.

3. LONG-TERM INVESTMENTS

Long-term investments in a balanced portfolio of pooled funds are valued by the pooled funds manager based on published price quotations and amount to \$31,683 thousand (2012 – \$27,721 thousand). As at December 31, the market value allocation of these long-term investments was 65.0% equity securities and 35.0% debt securities (2012 – 60.5% and 39.5% respectively).

Balanced portfolio of pooled funds

As at December 31 (in thousands of Canadian dollars)	2013	2012
	\$	\$
Opening balance	27,721	24,341
Purchase of investments	1,508	2,322
Change in fair value	2,454	1,058
Closing balance	31,683	27,721

In addition to the balanced portfolio of pooled funds, the IESO has a long-term deposit with Canada Revenue Agency in the amount of \$118 thousand pertaining to the Retirement Compensation Arrangements Trust (Note 6).

4. ACCOUNTS PAYABLE AND ACCRUED LIABILITIES

As at December 31 (in thousands of Canadian dollars)	2013	2012
	\$	\$
Relating to operations	17,020	19,086
Relating to tangible capital assets	7,158	2,222
	24,178	21,308

5. REBATES DUE TO MARKET PARTICIPANTS AND ACCUMULATED DEFICIT

In 2013, the IESO recognized \$12,648 thousand in rebates due to market participants of system fees (2012 – \$9,590 thousand), due to net operating surplus in 2013. As at December 31, 2013 rebates due to market participants were \$25,755 thousand (2012 – \$13,107 thousand). The IESO's approved regulatory deferral account balance is maintained at a maximum of \$5.0 million.

As at December 31, the components of the accumulated deficit were as follows:

Accumulated Deficit

As at December 31 (in thousands of Canadian dollars)	2013	2012
	\$	\$
Regulatory deferral account (a)	5,000	5,000
Accumulated market sanctions and payment adjustments (b)	706	1,371
Smart metering entity – accumulated deficit (c)	(78,745)	(82,358)
PSAB transition items (d)	(55,515)	(60,117)
Accumulated deficit – end of year	(128,554)	(136,104)

a) Approved Regulatory Deferral Account

As at December 31 (in thousands of Canadian dollars)	2013	2012
	\$	\$
Accumulated surplus – beginning of year	5,000	5,000
Revenues (before rebates due to market participants)	133,075	130,155
Rebates due to market participants	(12,648)	(9,590)
Wholesale market operation expenses	(118,422)	(116,727)
Change in accumulated remeasurement gains	2,597	1,921
Recovery of PSAB transition items	(4,602)	(5,759)
Accumulated surplus – end of year	5,000	5,000

b) Accumulated Market Sanctions and Payment Adjustments

As at December 31 (in thousands of Canadian dollars)	2013	2012
	\$	\$
Accumulated surplus – beginning of year	1,371	954
Market sanctions and payment adjustments	3,191	1,087
Customer education and market enforcement expenses	(3,856)	(670)
Accumulated surplus – end of year	706	1,371

c) Smart Metering Entity – Accumulated Deficit

As at December 31 (in thousands of Canadian dollars)	2013	2012
	\$	\$
Accumulated deficit – beginning of year	(82,358)	(58,624)
Smart metering charge	30,144	–
Smart metering expenses	(26,531)	(23,734)
Accumulated deficit – end of year	(78,745)	(82,358)

d) PSAB Transition Item – Accumulated Deficit

As at December 31 (in thousands of Canadian dollars)	2013	2012
	\$	\$
Accumulated deficit – beginning of year	(60,117)	(65,876)
Recovery of PSAB transition items	4,602	5,759
Accumulated deficit – end of year	(55,515)	(60,117)

Effective January 1, 2011, the IESO adopted Canadian public sector accounting standards (PSAB) with a transition date of January 1, 2010. The adoption of PSAB was accounted for by retroactive application with restatement of prior periods subject to the requirements in Section PS 2125, *First-time Adoption by Government Organizations*. The corresponding change to pension and other-post employment benefits resulted in previously unrecognized actuarial losses and past service costs of \$80,617 thousand at the date of transition being charged to the accumulated deficit.

The IESO includes a portion of the accumulated deficit resulting from the PSAB transition items in the annual proposed expenditures to the OEB for recovery through system fees.

6. DEBT

Note payable to Ontario Electricity Finance Corporation (OEFC)

In May 2013, the IESO entered into a one-year note payable with the OEFC. The note payable is unsecured, bears interest at a fixed rate of 1.62% per annum and is repayable in full on April 30, 2014. Interest accrues daily and is payable in arrears semi-annually in April and November of each year. As at December 31, 2013, the note payable to the OEFC was \$78.2 million (December 31, 2012 – \$78.2 million).

For the year ended December 31, 2013, the interest expense on the note payable was \$1,430 thousand (2012 – \$1,756 thousand).

Credit facility

The IESO has an unsecured credit facility agreement with the OEFC, which will make available to the IESO an amount up to \$110.0 million. Advances are payable at a variable interest rate equal to the Province of Ontario's cost of borrowing for a 30 day term plus 0.50% per annum, with draws, repayments and interest payments due monthly. The credit facility expires April 30, 2014. As at December 31, 2013, \$46.0 million was drawn on the credit facility (December 31, 2012 – \$55.0 million).

For the year ended December 31, 2013, the interest expense on the credit facility was \$790 thousand (2012 – \$505 thousand).

As of February 13, 2014, the IESO is in the process of refinancing its debt with the OEFC and is confident this will be in place for May 1, 2014.

Retirement Compensation Arrangements Trust

In July 2013, the IESO established a Retirement Compensation Arrangements Trust (RCA) to provide security for the IESO's obligations under the terms of the supplemental employee retirement plan for its employees. As at December 31, 2013, the IESO has provided the RCA trustee with a bank letter of credit of \$26,831,000 the trustee can draw on if the IESO is in default under the terms of this plan.

7. POST-EMPLOYMENT BENEFIT PLANS

The IESO provides pension and other employee post-employment benefits, comprising group life insurance, long-term disability and group medical and dental plans, for the benefit of current and retired employees.

Pension plans

The IESO provides a contributory defined benefit, indexed, registered pension plan. In addition to the funded, registered, pension plan, the IESO provides certain non-registered defined benefit pensions through an unfunded, indexed, non-registered plan.

Other employee future benefits

The group life insurance, long-term disability and group medical and dental benefits are provided through unfunded, non-registered defined benefit plans.

Summary of accrued benefit obligations and plan assets

(in thousands of Canadian dollars)	2013 Pension Benefits	2012 Pension Benefits	2013 Other Benefits	2012 Other Benefits
	\$	\$	\$	\$
Accrued benefit obligation	443,562	405,323	82,848	71,715
Fair value of plan assets	390,934	360,017	–	–
Funded status as of measurement date	(52,628)	(45,306)	(82,848)	(71,715)
Employer contribution/other benefits payments after measurement date	4,647	4,314	570	480
Unrecognized actuarial (gain)/loss	12,842	(608)	8,209	1,980
Accrued liability recognized in the statement of financial position	(35,139)	(41,600)	(74,069)	(69,255)

Registered pension plan assets

As at the measurement date of September 30, the proportion of the fair value of registered pension plan assets held in each asset class was as follows:

	2013	2012
Canadian equity securities	20.0%	19.3%
Foreign equity securities	44.0%	38.9%
Canadian debt securities	35.1%	40.5%
Cash equivalents	0.7%	1.0%
Forward foreign exchange contracts	0.2%	0.3%
	100.0%	100.0%

Principal assumptions used to calculate benefit obligations at the end of the year are determined at that time and are as follows:

	2013 Pension Benefits	2012 Pension Benefits	2013 Other Benefits	2012 Other Benefits
Discount rate at the end of the period	6.25%	6.50%	6.25%	6.50%
Rate of compensation increase	3.75%	4.00%	3.75%	4.00%
Rate of indexing	2.25%	2.50%	2.25%	2.50%

The assumed hospital and drug cost increase was 10.0% for 2013 grading down 0.5% per year to 4.75% in 2024. Dental costs are assumed to increase by 4.25% per year.

Benefit costs and plan contributions for pension and other plans are summarized as follows:

(in thousands of Canadian dollars)	2013 Pension Benefits	2012 Pension Benefits	2013 Other Benefits	2012 Other Benefits
	\$	\$	\$	\$
Current service cost (employer)	6,750	6,279	2,053	1,923
Interest cost	26,383	25,317	4,713	4,410
Expected return on plan assets	(22,911)	(20,402)	—	—
Amortization of net actuarial loss	578	791	141	149
Benefit cost	10,800	11,985	6,907	6,482

(in thousands of Canadian dollars)	2013 Pension Benefits	2012 Pension Benefits	2013 Other Benefits	2012 Other Benefits
	\$	\$	\$	\$
Employer contribution/other benefit payments	17,261	25,313	2,093	1,768
Plan participants' contributions	3,476	3,525	—	—
Benefits paid	21,109	18,300	2,093	1,768

The most recent actuarial valuation of the registered pension plan for funding purposes was at January 1, 2011, and the date of the next required valuation is January 1, 2014.

Principal assumptions used to calculate benefit costs for the year are determined at the beginning of the period and are as follows:

	2013 Pension Benefits	2012 Pension Benefits	2013 Other Benefits	2012 Other Benefits
Discount rate at the beginning of the period	6.50%	6.50%	6.50%	6.50%
Rate of compensation increase	4.00%	4.00%	4.00%	4.00%
Rate of indexing	2.50%	2.50%	2.50%	2.50%

8. TANGIBLE CAPITAL ASSETS

Net tangible capital assets consist of the following:

Tangible Capital Assets

(in thousands of Canadian dollars)	As at December 31, 2012	Additions	Disposals	As at December 31, 2013
	\$	\$	\$	\$
Facilities	50,315	288	—	50,603
Market systems and applications	240,967	9,131	—	250,098
Infrastructure and other assets	52,814	4,595	—	57,409
Meter data management/repository	31,215	1,393	—	32,608
Total cost	375,311	15,407	—	390,718

Accumulated Amortization

(in thousands of Canadian dollars)	As at December 31, 2012	Amortization Expense	Disposals	As at December 31, 2013
	\$	\$	\$	\$
Facilities	(17,279)	(1,285)	—	(18,564)
Market systems and applications	(214,574)	(10,267)	—	(224,841)
Infrastructure and other assets	(47,107)	(2,779)	—	(49,886)
Meter data management/repository	(13,425)	(3,836)	—	(17,261)
Total accumulated amortization	(292,385)	(18,167)	—	(310,552)

Net Book Value

(in thousands of Canadian dollars)	As at December 31, 2012	As at December 31, 2013
	\$	\$
Facilities	33,036	32,039
Market systems and applications	26,393	25,257
Infrastructure and other assets	5,707	7,523
Meter data management/repository	17,790	15,347
Total net book value	82,926	80,166
Assets under construction	4,681	11,470
Net tangible capital assets	87,607	91,636

In 2013, there were no adjustments to management's estimates of remaining asset service lives and hence there was no impact on amortization expense in the year (2012 – \$381 thousand decrease)

Interest capitalized to assets under construction during 2013 was \$44 thousand (2012 – \$4 thousand).

9. OTHER REVENUE

In its administration of the IESO-administered markets, the IESO directs the investment of market funds in highly-rated short-term investments throughout the settlement cycle. The IESO is entitled to receive the investment interest and investment gains, net of investment losses earned on funds passing through the real-time market settlement accounts. The IESO is not entitled to the principal on real-time market investments.

The IESO recognized investment income earned in the market settlement accounts of \$1,386 thousand in 2013 (2012 – \$1,269 thousand).

The IESO recognizes revenue as it is earned relating to services the IESO performs and charges on a cost recovery basis. Cost recovery revenue in 2013 was \$1,742 thousand (2012 – \$2,676 thousand).

10. SEGMENT DISCLOSURES

Expenses by object for 2013 are comprised of the following:

(in thousands of Canadian dollars)	Wholesale market operations 2013	Customer education and market enforcement 2013	Smart metering entity 2013	Total 2013
	\$	\$	\$	\$
Labour	76,165	2,591	2,634	81,390
Computer services, support and equipment	9,194	–	810	10,004
Contract services and consultants	7,309	1,244	17,650	26,203
Telecommunications	3,237	3	7	3,247
Other costs	7,274	18	33	7,325
Amortization	14,331	–	3,836	18,167
Interest expense and financing charges	912	–	1,561	2,473
Total expenses	118,422	3,856	26,531	148,809

Expenses by object for 2012 are comprised of the following:

(in thousands of Canadian dollars)	Wholesale market operations 2012	Customer education and market enforcement 2012	Smart metering entity 2012	Total 2012
	\$	\$	\$	\$
Labour	77,075	357	2,608	80,040
Computer services, support and equipment	8,686	–	719	9,405
Contract services and consultants	7,061	312	15,303	22,676
Telecommunications	3,033	1	3	3,037
Other costs	7,036	–	3	7,039
Amortization	12,981	–	3,558	16,539
Interest expense and financing charges	855	–	1,540	2,395
Total expenses	116,727	670	23,734	141,131

11. CAPITAL DISCLOSURES

The IESO's primary objectives are to maintain and enhance the reliability of Ontario's power system, administer the wholesale electricity market, and serve the needs of market participants and stakeholders. In order to fulfill its mandate, the IESO receives fees from market participants (Note 1). The IESO has limited ability to accumulate a surplus from these fees.

The IESO submitted its proposed 2014 expenditures, revenue requirements, and fees to the OEB for review on November 4, 2013 after approval by the Minister. The Minister provided formal approval of the IESO's 2014 – 2016 Business Plan on October 22, 2013. As of February 13, 2014, the OEB has not approved the IESO's proposed expenditures, revenue requirements, and fees for 2014.

The IESO is also the SME and expects to fund its SME operating costs and capital investment in the meter data management/repository through fees from users of smart meters in Ontario. On March 28, 2013 the OEB approved that the Smart Metering Entity charge of \$0.788 per month be levied and collected by the Smart Metering Entity from all distributors for each of their residential and general service less than 50 kilowatt customers. This charge is intended to cover the costs of developing and operating the MDM/R to date and until October 31, 2018. The rate was effective May 1, 2013.

12. RELATED PARTY TRANSACTIONS

The Province of Ontario is a related party as it is the controlling entity of the IESO. The OEFC, OPA, OEB, Hydro One and Ontario Power Generation Inc. (OPG) are related parties of the IESO, through the common control of the Province of Ontario. Transactions between these parties and the IESO were as follows:

The IESO holds a note payable and an unsecured credit facility agreement with the OEFC (Note 6). Interest payments made by the IESO in 2013 for the note payable was \$1,511 thousand (2012 – \$1,756 thousand) and for the credit facility was \$789 thousand (2012 – \$485 thousand). As of December 31, 2013 the IESO had an accrued interest payable balance with the OEFC of \$266 thousand (2012 – \$346 thousand).

The IESO performs system studies for the OPA in support of their Power System Planning requirements. In addition, the IESO also provides support to the OPA's Demand Response program. In 2013, the IESO invoiced the OPA \$137 thousand (2012 – \$276 thousand) for services associated with these programs. In 2013, the OPA has provided a secondment resource for market enforcement activities and the IESO incurred costs of \$117 thousand (2012 – \$13 thousand) for these services. As of December 31, 2013 the IESO had a net payable balance with the OPA due to invoice adjustments of \$42 thousand (2012 – net payable balance of \$58 thousand).

Under the *Ontario Energy Board Act, 1998*, the IESO incurs registration and licence fees. The total of the transactions with the OEB were \$612 thousand in 2013 (2012 – \$514 thousand).

The IESO performed connection assessments and approvals and technical feasibility studies for Hydro One in 2013. In 2013, the IESO invoiced Hydro One \$504 thousand (2012 – \$696 thousand). The IESO procures short circuit studies as part of connection assessments and approvals and meter services on IESO owned interconnected revenue meters from Hydro One. In 2013, the IESO incurred costs of \$522 thousand (2012 – \$130 thousand) for these services. As of December 31, 2013 the IESO had a net receivable balance with Hydro One of \$296 thousand (2012 – net receivable balance of \$279 thousand).

In 2013, the IESO performed connection assessment and approvals for OPG; administered telecommunication services to market participants to connect to the real time market systems and performed technical feasibility studies. In 2013, OPG was invoiced \$102 thousand (2012 – \$144 thousand). As of December 31, 2013 the IESO had a net receivable balance with OPG of \$96 thousand (2012 – \$6 thousand).

13. FINANCIAL RISK MANAGEMENT

The IESO is exposed to financial risks in the normal course of its business operations, including market risks resulting from volatilities in equity, debt, and foreign currency exchange markets, as well as credit risk and liquidity risk. The nature of the financial risks and the IESO's strategy for managing these risks has not changed significantly from the prior year.

a) Market Risk

Market risk refers to the risk that the fair value or future cash flows of a financial instrument will fluctuate to cause changes in market prices. The IESO is exposed to three types of market risk: currency risk, interest rate risk and equity risk. The IESO monitors its exposure to market risk fluctuations and may use financial instruments to manage these risks as it considers appropriate. The IESO does not use derivative instruments for trading or speculative purposes.

i) Currency Risk

The IESO conducts certain transactions in US dollars, primarily related to vendors' payments, and maintains a US dollar denominated bank account. From time to time, the IESO may utilize forward purchase contracts to purchase US dollars for delivery at a specified date in the future at a fixed exchange rate. In addition, the IESO utilizes US dollar spot rate purchases in order to satisfy any current accounts. As at December 31, 2013, the IESO did not have any outstanding forward purchase contracts.

ii) Interest Rate Risk

The IESO is exposed to movements or changes in interest rates primarily through its short-term variable rate credit facility, cash equivalents' securities, and long-term investments. Long-term investments include investments in a pooled Canadian bond fund. The potential impact to the securities' value had the prevailing interest rates changed by 25 basis points, assuming a parallel shift in the yield curve, with all other variables held constant is estimated at \$0.4 million as at December 31, 2013 (2012 – \$0.4 million).

iii) Equity Risk

The IESO is exposed to changes in equity prices through its long-term investments. Long-term investments include investments in pooled equity funds. A 30% change in the valuation of equities as at December 31, 2013 would have resulted in a change for the year (before the impact of adjustments to the approved regulatory deferral account (Note 5) of approximately \$6.2 million (2012 – \$5.0 million). The fair values of all financial instruments measured at fair value are derived from quoted prices (unadjusted) in active markets for identical assets.

b) Credit Risk

Credit risk refers to the risk that one party to a financial instrument may cause a financial loss for the other party by failing to meet its obligations under the terms of the financial instrument. The IESO is exposed directly to credit risk related to cash equivalents' securities and accounts receivable, and indirectly through its exposure to the long-term investments in a Canadian bond pooled fund. The IESO manages credit risk associated with cash equivalents' securities through an approved management policy which limits investments to investment grade investments with counterparty-specific limits. The accounts receivable balance as at December 31, 2013 included no material items past due and substantially all of the balance was collected within 30 days from December 31, 2013. The long-term Canadian bond pooled fund is comprised of primarily investment grade securities.

c) Liquidity Risk

Liquidity risk refers to the risk that the IESO will encounter financial difficulty in meeting obligations associated with its financial liabilities when due. The IESO manages liquidity risk by forecasting cash flows to identify cash flows and financing requirements. Cash flows from operations, short-term investments, long-term investments, and maintaining appropriate credit facilities help to reduce liquidity risk. The IESO's long-term investments are normally able to be redeemed within three business days however; the investment manager of the pooled funds has the authority to require a redemption in-kind rather than cash and has the ability to suspend redemptions if deemed necessary.

14. COMMITMENTS AND CONTINGENCIES

Operating commitments

The obligations of the IESO with respect to non-cancellable operating leases over the next five years are as follows:

As at December 31 (thousands of Canadian dollars)

	\$
2014	2,277
2015	2,126
2016	1,813
2017	1,822
2018	1,622

Contingencies

The IESO is subject to various claims, legal actions, and investigations that arise in the normal course of business. While the final outcome of such matters cannot be predicted with certainty, management believes that the resolution of such claims, actions and investigations will not have a material impact on the IESO's financial position or results of operations.

EXECUTIVE COMPENSATION AT THE IESO

Current pay restraint legislation imposes a number of constraints upon compensation awards for designated executives (CEOs, Vice-Presidents and General Counsel) with respect to fixed compensation adjustments and individual variable payments.

For designated executives, a general freeze applies to salary, variable pay, benefits and perquisites subject to very limited exceptions. The legislation also imposes a freeze on the compensation structure for designated executives.

There is also a cap on the total variable pay that applies to all non-represented employees, and not just designated executives impacted by the wage freeze. The cap limits the performance pay envelope (i.e. variable pay earnings) during the restraint period to the total variable pay earned in 2011. The cap on variable pay has been adjusted in 2013 due to the transition of variable pay to fixed compensation resulting from the implementation of a new compensation plan for the non-executives. More details about the new plan can be found on page 30.

Program Objectives

The IESO compensation program for executives was designed to attract, retain and motivate the calibre of senior staff required to support the achievement of the IESO's statutory mandate, business objectives and corporate vision. Accordingly, the compensation philosophy and programs were built on the following objectives:

- To focus executives on meeting the IESO's business objectives
- To attract qualified and talented staff needed to carry out the IESO's mandate
- To be able to retain valued staff
- To have the flexibility to reward results and demonstrated competencies, and
- To have compensation levels which are responsible and defensible to stakeholders and customers.

The philosophy underlying these objectives is that total compensation for executives should be sufficient, but not overly sufficient, to attract and retain the skills and competencies necessary to carry out the IESO's mandate.

Program Governance

The IESO Board establishes the compensation objectives for the following year's program. They delegate the responsibility to thoroughly review the compensation objectives, policies and programs to the Human Resources and Governance Committee of the Board (HRGC) which make recommendations to the full Board for approval.

The Board is composed of 10 independent, external Directors, appointed by the Minister of Energy, with broad experience in both industry and public sector organizations, plus the Chief Executive Officer. Their experience includes many years of dealing with Human Resource matters including the setting and implementation of compensation policies. Information on individual Board members and their backgrounds can be found on the IESO web site at http://www.ieso.ca/imoweb/governance/board_of_directors.asp.

In carrying out their mandate the Board members have access to the Management's analysis and recommendations as well as those of expert consultants in the compensation field. These programs are reviewed annually with regard to business needs, program objectives and design, industry compensation trends, internal compensation relativities, and external market relativities.

The Board also assesses risks associated with the establishment and implementation of compensation policies and programs. Annually the Board presides over and approves the IESO's Business Plan. An important component of this process is consideration of, and the implementation of mitigating actions, associated with Enterprise Risk Management. This latter overarching process includes the assessment of all significant risks to the IESO, including risks associated with its compensation policies and programs.

In addition to the formal governance and oversight structure in place for compensation matters, the IESO discloses compensation levels annually for staff earning \$100,000 or more as part of its public sector salary disclosure. For the IESO, a further level of public review and assurance is provided through a statutorily required annual review of the IESO's expenditures, revenue requirements and fees. The IESO's usage fee has not changed since it was last set on January 1, 2012 by an Interim Fee Order issued by the Ontario Energy Board. Information related to compensation matters, including Management compensation and market relativities, is subject to the Ontario Energy Board review. A range of small and large consumers, assisted by their legal and professional advisors, are represented in these public proceedings. The IESO is also responsive to various requests by the Ministry of Energy in relation to compensation enquiries such as the Agency Review Panel (ARP) in 2007 which conducted an exhaustive review of senior management compensation for the various agencies in the Ontario electricity sector.

Market Comparisons

The IESO regularly benchmarks compensation to similar positions in Canadian industry. The objective of this initiative is to determine how IESO Management compensation levels compare to those in the marketplace particularly in relation to the median of the market.

The IESO undertook in 2011 a major review of the compensation competitiveness of its management group. For this review two peer groups were used, a peer group of 46 organizations applied to senior management positions and 40 organizations applied to other management positions. These comparator groups were each comprised of equally weighted samples of government sector and non-government sector organizations. The samples included small and mid-sized organizations where the complexity of operations was judged to be similar to those found at the IESO.

Job matching was independently conducted by Towers Watson and 17 IESO senior management positions were matched to the market and an additional 22 other IESO management positions were matched to their peers in the market. Market data was gathered for various components of compensation including fixed compensation and total cash compensation with emphasis on total remuneration, including the sum of fixed and variable compensation, benefits and pension.

The following organizations were used as senior management comparators within the analysis:

Government Comparators	Non-Government Comparators
Alberta Electric System Operator	Accenture
Atomic Energy of Canada Limited	Alliance Pipeline
BC Transmission	AMEX Canada Inc
British Columbia Railway Company	ARC Resources
Canadian Deposit Insurance Corp	Bruce Power
Canadian Blood Services	Capital Power
Columbia Power	Compton Petroleum
Electrical Safety Authority	Convergys Corp
Energy Resources Conservation Board	Emera
ENMAX	Fort Chicago Energy Partners
EPCOR Utilities	FortisAlberta
Hydro Ottawa Holdings Inc.	Hunt Oil Company of Canada
Manitoba Hydro Electric	Laurentian Bank of Canada
New Brunswick System Operator	Niko Resources
Ont. Lottery and Gaming Commission	Nova Scotia Power
Ontario Power Authority	Open Text Corp
Port Metro Vancouver	Pacific Northern Gas
Powerex	Paramount Energy Trust
SaskEnergy	Pengrowth
SaskPower	Sanmina
SGI Canada	Terasen Gas
Toronto Hydro Electric Systems	The Equitable Trust
Via Rail Canada	Total E & P Canada

The results of the Towers Watson analysis indicated that management compensation in 2011 at the IESO was slightly below the median of the market for cash compensation (fixed plus variable compensation) paid to its management staff – in the range of 3% to 6% below the market median. For total remuneration (cash compensation plus benefits and pension) the analysis showed the IESO to be at the median of the market – in the 0% to 3% of median range.

The IESO monitors annually the competitiveness of its executive compensation programs. The decision was made in 2013 to conduct an external benchmarking analysis in alternating years starting in 2014.

Program Description

The IESO program includes fixed and variable compensation, core and flex benefit plans, and pension provisions. IESO Human Resources staff participates in and reviews results from various compensation surveys and monitors economic trends such as gross domestic product trends, inflation and unemployment rates which impact on compensation, as well as monitoring internal compensation relativities. Based on this data and the IESO business priorities, Human Resources staff develops recommendations on compensation programs for all Management staff. External specialized compensation, benefit and pension consultants are utilized to ensure accurate, representative market compensation data is obtained, that current industry compensation trends are being utilized, as well as to provide insight and recommended adjustments to current programs.

Under the government's *Strong Action for Ontario Act (Budget Measures), 2012*, a freeze on fixed compensation, variable compensation, benefits and pension programs at the level in effect on March 24, 2010, is to continue until the end of the restraint period.

Program Description – Fixed Compensation

Within the IESO broad salary ranges, individuals are assessed as developmental, mature or expert in their position relative to an established competency model. This model consists of behavioural competencies, such as customer focus, drive for results, teamwork, leadership, effective communication and strategic business sense. Assessments are based upon demonstrated competency. Each individual is awarded a fixed compensation level within their band based upon their assessed competency.

Program Description – Variable Compensation

In order to promote a results orientation in the senior team, the variable pay plan is a significant component of the total compensation of executives. The IESO Board annually establishes a robust set of performance measures which are evaluated each year and these results carry a 70% weight within each executive's variable compensation award. The remaining 30% results from the assessment of predetermined measures/targets established for each individual executive.

The IESO Board assesses the corporate performance results and the CEO's individual performance results. Under the plan, having assessed the results against target, the Board does have the ability to use some discretion in determining the final performance rating – however in the past apart from one occasion the Board has relied upon the directly assessed results to award variable compensation.

The variable compensation awards for the CEO and Vice-Presidents for achieving the targets are respectively at 65% and 50% of fixed compensation for 2013. The plan provides for awards above or below these target amounts depending on the performance results achieved. To address retention, 50% of the earned variable compensation is deferred and paid out over the subsequent two year period, with accrued but unpaid amounts forfeited in the event of termination with cause or voluntary resignation.

Program Description – Group Benefits

The group benefit plan provides a core level of health & dental benefits, life insurance, disability coverage and vacation which can be adjusted by individual executives through a flexible component within the plan. The flexible element provides executives the option of adjusting their benefits to meet their individual/family needs including vacation above core amounts, levels of life insurance, health coverage and other components.

Program Description – Pension Plan

A defined benefit pension plan provides annual retirement income calculated as 2% of fixed compensation and one-half of variable compensation paid during the highest paid 36 consecutive months of service multiplied by years of service, to a maximum of thirty-five years. The pension formula is integrated with the Canada Pension Plan (CPP) to provide a level income stream before and after age 65, when the IESO pension is reduced to reflect benefits from CPP. The Plan also has early retirement provisions as well as commuted value, pension deferral and reciprocal transfer options.

The plan provides a maximum benefit of 70% of highest paid, pre-retirement earnings. As the Canadian Revenue Agency limits the amount of pension payable from a registered plan, the IESO has an unfunded supplemental employee retirement plan (SERP) to provide required pension income to meet the commitments of the Plan above that payable from the registered plan. On July 1, 2013, the SERP has been secured by a Retirement Compensation Arrangement (RCA) trust utilizing a letter of credit. Pension funding is provided through a combination of employer and employee contributions.

The plan also provides several options including member's life only or joint and survivor pensions, as well as pre-retirement death benefits to provide benefits to surviving spouses or beneficiaries.

Performance Measures & Impact on Compensation

The IESO annually establishes corporate performance measures relating to its business priorities during the business planning process. These are approved, monitored and assessed by the IESO Board of Directors each year. Individual performance measures supporting one or more corporate performance measures are also developed for each executive.

As outlined above the corporate results achieved each year impact on each executive's variable pay. The following chart highlights each of the business perspectives where performance measures are established and provides a brief description of the performance objectives which were approved by the IESO Board for 2013. For each of these performance objectives specific measures and targets are defined.

Business Perspective	Performance Objectives
Reliability (30% Weight)	The IESO-controlled grid provides reliable electricity service. (10%)
	The IESO's actions support reliable operation of the IESO-controlled grid. (10%)
	The IESO-controlled grid is equipped to provide reliable electricity service going forward (10%)
Customers & Stakeholders (25% Weight)	Suppliers and consumers are responsive to the price of electricity. (10%)
	Market Participants are satisfied with the IESO's administration of the electricity market. (5%)
	The IESO administered market enables incorporation of the investments being made as a result of the Green Energy and Green Economy Act (GEA). (10%)
Operational Effectiveness (20% Weight)	The IESO's infrastructure is capable of meeting the needs of customers in the future. (5%)
	The IESO's human resources are capable of meeting the needs of customers in the future. (5%)
	IESO resources are used effectively and efficiently to meet the needs of customers and achieve stakeholder satisfaction. (10%)
Reputation & Relationships (25% Weight)	The IESO is perceived as a leader in the electricity sector. (10%)
	The IESO is able to influence important policy decisions that impact the IESO. (15%)

A rating scale ranging from partially meeting expectations to exceeding expectations is used to assess the results for both corporate and individual performance objectives as well as calculate the associated variable pay amount. According to this scale corporate results and individual results may be rated from zero to 1.5 times the target variable amount (the table below outlines the ratings in detail). A payout factor is then determined and applied to the target variable pay amount for each executive.

Type of Performance	Corporate Rating	Individual Rating
exceeding expectations	1.3 – 1.5	1.2 – 1.5
meeting expectations	0.8 – 1.2	0.8 – 1.1
partially meeting expectations	0.0 – 0.7	0.0 – 0.7

For 2013 the IESO Board assessed the corporate results as meeting expectations with a rating of 1.04, unchanged from the previous year's rating. This was based on the corporate performance perspectives of reliability, customers and stakeholders, operational effectiveness and reputation and relationships each assessed as meeting expectations. In addition to the corporate measures each executive also had an individual set of measures and targets for the year which aligned with the corporate performance objectives and IESO's business priorities and these were similarly assessed. The Board assessed the results of the CEO's performance and the CEO assessed the performance of the Vice Presidents which were also reviewed with the Board.

Other Considerations

Compensation decisions may at times be impacted by market factors – such as the recruitment of an executive with specialized skills/competencies or possessing unique talents within the industry. To this end individual incumbent arrangements are sometimes established relating to terms of employment and the possibility of future termination. On May 1, 2013, Mr. Campbell was promoted from Vice-President to CEO following Mr. Murphy's retirement. His employment agreement outlines terms and conditions for a twenty eight months period of employment ending on August 31, 2015 with a potential renewal at least six months prior to the end of the term. Mr. Campbell's agreement for accelerated pension provisions terminated as of April 30, 2013. Some Vice-Presidents also have provisions which provide 24 months or less of severance for termination without cause. Mr Limbrick has an agreement to provide accelerated pension provision such that, at age 65, he would have twenty-five years of credited service. Finally Mr. Limbrick has decided to retire on February 28, 2014 and Mr. Thomas was appointed as Vice-President, Information and Technology Services and Chief Information Officer effective March 1, 2014.

Executive Compensation and Pension Statements

The first table below details the annual compensation for the year ended December 31, 2013 for the executives listed. The information provided in the Summary Compensation Table differs from the information published under the *Public Sector Salary Disclosure Act* (Ontario) for the indicated period due to the timing of payment of variable pay. Disclosures under the *Public Sector Salary Disclosure Act* are limited to amounts listed on T4 taxation forms for each year (i.e. includes variable pay paid out in 2013) whereas information in the summary compensation table is based on the year for which the variable pay was earned. Variable pay is determined early in the year following the year assessed. Under the IESO plan 50% of that amount is then paid early in the year following the assessed year and 50% is deferred for payment in future years.

The second table below outlines pension plan participation and benefits for each of the Executive Officers listed. Specifically detailed are:

- total years of credited service in the pension plan
- the increase in the compensatory value of the pension (due to increased service and pensionable earnings, if applicable) during 2013
- the increase in the non-compensatory value of pension (due to a decrease in the pension discount rate) during 2013
- the estimated annual pension payable at age 65 based upon the executive's service and pensionable earnings as of December 31, 2013
- the estimated annual pension with service credits projected to age 65 using actual pensionable earnings as of December 31, 2013.

Various factors have an impact on the pension calculations displayed in Table 2. Should interest or discount rates vary significantly from one year to the next, there will be volatility in year over year pension amounts reported.

Use of Consultants

During 2013 the services of AON Hewitt were used for the development of pension data and updates on disclosure requirement. AON Hewitt also provided pension and benefit actuarial support to the IESO during 2013 as well as pension, benefit, compensation consulting services. These services were obtained through competitive bidding processes.

Implementation of a revised Management Compensation Program

The IESO Board regularly considers compensation matters, including the structure of the Management Compensation Program, within the framework established by relevant public sector compensation legislation. In considering these matters as early as 2011, the conclusion was that the structure of the IESO's management compensation program should be brought more in line with that in the public sector by reducing the management variable pay levels and reducing the number of management staff eligible for variable pay. As the legislative framework evolved through 2012, the IESO was able to introduce plan revisions to achieve both of these goals, other than for Designated Executives.

The revisions reflected a number of considerations including:

- The mix of fixed and variable pay to be more reflective of the public sector;
- Simplification of the program through the elimination, over time, of the deferred payout arrangements associated with variable pay;
- Facilitating the harmonization of the IESO's management compensation program with management compensation at the Ontario Power Authority in the event of a merger between the two entities; and
- Alignment of the IESO's compensation program with changing public expectations.

The revised structure of the IESO Management Compensation Program was implemented on January 1, 2013 and eliminated variable pay for non-represented staff at the manager level and below and resulted in the reduction of variable pay for directors to 20% from 40% of base salary. There was no increase in individual earnings as a result of the revisions to the non-executive management compensation program; and consistent with the legislative requirements, no change to the compensation structure for Designated Executives.

The guiding principles for transitioning staff to the revised compensation program were that it should be cost neutral to the IESO in terms of total cash compensation and pension benefits, and that individuals' compensation should not be reduced in terms of total target cash compensation (salaries and variable pay) and earned pension benefits at time of transition. Overall, with the elimination of variable pay that was previously subject to a 0-150% multiplier, the IESO's annual non-executive management compensation costs will be reduced.

However, the figures reported as 2013 remuneration in the 2013 Public Sector Salary Disclosure for the non-executive management staff will be higher than actual 2013 salaries, as the reported figures will include both the 2013 salary under the revised program (with no variable pay) plus the payout of variable pay amounts owing from prior years. By 2016, all deferred earnings will have been paid out.

Other principles such as definition of the comparator groups, and market positioning at the median of the market comparator groups, are unchanged.

2013 Summary Compensation Table

Name & Position	Salary	Variable Pay ¹		Other Annual Compensation ²	Total Cash Compensation	Amounts Reported Under Public Sector Salary Disclosure
		Paid	Deferred			
Paul Murphy³ President & CEO	\$116,624	\$ 81,340	–	\$ 6,544	\$204,508	\$412,364
Bruce Campbell⁴ President & CEO	\$321,688	\$106,357	\$106,357	\$ 709	\$535,111	\$468,431
Ted Leonard VP Markets, CFO & Treasurer	\$205,744	\$ 54,420	\$ 54,420	\$ 6,341	\$320,925	\$291,068
Bill Limbrick VP IT Services & CIO	\$242,735	\$128,407	–	\$ 2,649	\$373,791	\$399,495
Kim Warren VP Operations & COO	\$225,879	\$ 59,746	\$ 59,746	\$11,043	\$356,414	\$325,531
Terry Young VP Corporate & Employee Relations	\$216,571	\$ 58,095	\$ 58,095	\$10,934	\$343,695	\$312,873

1. Reflects variable pay earned in 2013 and subsequently paid out to each executive in early 2014 (50%) with deferred amounts (50%) to be paid over the subsequent 2 years with interest.

2. Includes residual payout from IESO's flex benefit plan.

3. Mr. Murphy retired on April 30, 2013

4. Mr. Campbell was promoted to CEO on May 1, 2013.

2013 Pension Benefits Table

Name & Position	Number of Years Credited Service	Increased Pension Value During 2013		Annual Benefits Payable Upon Retirement	
		Compensatory Amount During Year	Non Compensatory Amount During Year	At Year-End (2013) ¹	At Age 65 ²
		\$	\$	\$	\$
Paul Murphy ³ President & CEO	35.000	\$ 53,000	\$443,000	\$315,000	\$315,000
Bruce Campbell ⁴ President & CEO	26.491	\$152,000	\$ 44,000	\$187,000	\$187,000 ⁵
Ted Leonard VP Markets, CFO & Treasurer	17.750	\$130,000	\$137,000	\$ 80,000	\$157,000
Bill Limbrick ⁶ VP IT Services & CIO	23.093	\$198,000	\$272,000	\$154,000	\$163,000
Kim Warren VP Operations & COO	35.000	\$ 71,000	\$312,000	\$167,000	\$167,000
Terry Young VP Corporate & Employee Relations	30.667	\$ 95,000	\$217,000	\$148,000	\$169,000

1. Payable at age 65 assuming no increase in pensionable earnings & service beyond year-end 2013.

2. Payable at age 65 assuming no increase in pensionable earnings beyond year-end 2013 and credited service continues until age 65.

3. Mr. Murphy retired on April 30, 2013

4. Mr. Campbell was promoted to CEO on May 1, 2013.

5. Mr. Campbell's accrued pension payable at the valuation date is shown, as he is over age 65.

6. Mr. Limbrick's credited service has been prorated to reflect his part-time (80%) work arrangement effective July 1, 2013.

Independent Electricity System Operator

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