

Fair Hydro Plan Financing Program Servicing Review

November 14, 2017

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Clean Energy Adjustment Collection Process - OPG

Independent Electricity System Operator

Section 1

Where did We Come From?

Hydro-Electric Power Commission of Ontario



Ontario Hydro



ONTARIO POWER
GENERATION

hydro
one

 Electrical
Safety
Authority

OEFC
ONTARIO ELECTRICITY FINANCIAL CORPORATION

 **ieso**

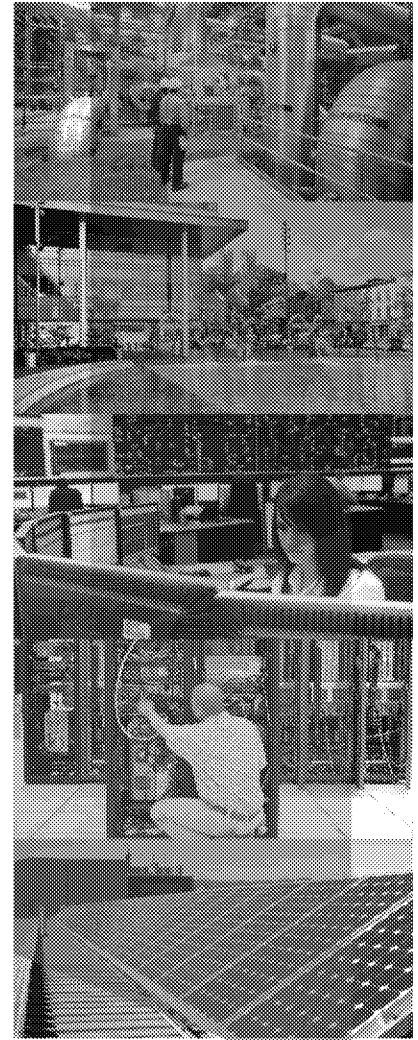
Independent Electricity System Operator

- Not-for-profit corporation established in 1998 by the Electricity Act of Ontario and merged with the Ontario Power Authority in 2015
- What we do is defined by legislation
- Fee (revenue requirement) regulated by the Ontario Energy Board (annual hearing with intervenors)

What We Do

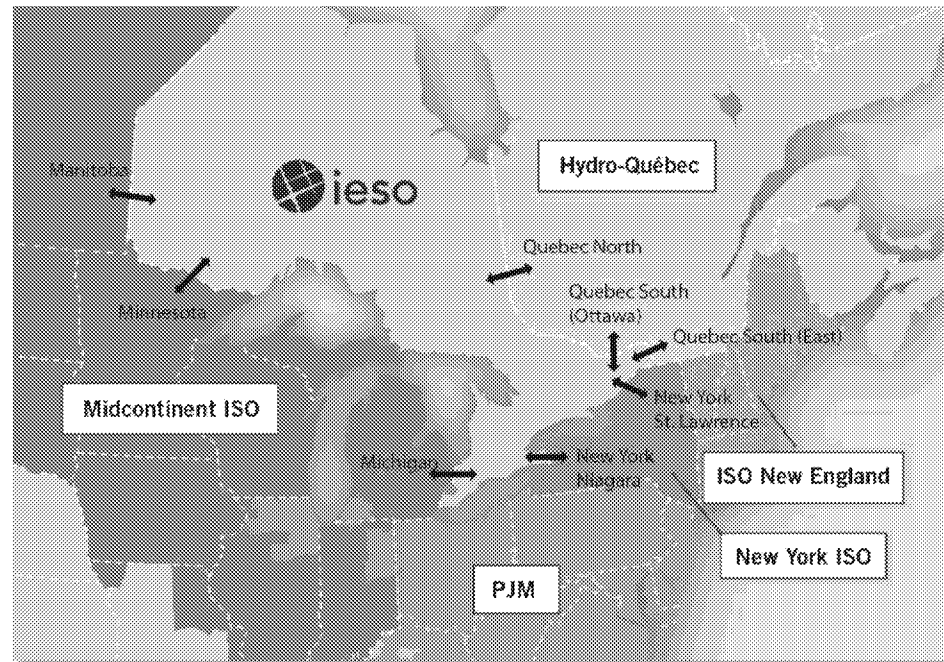
The Independent Electricity System Operator (IESO) works at the heart of Ontario's power system – ensuring there is enough power to meet the province's energy needs in real time while also planning and securing energy for the future. It does this by:

- Planning
- Enabling Conservation
- Ensuring Supply
- Operating the Grid
- Engaging Stakeholders and Communities



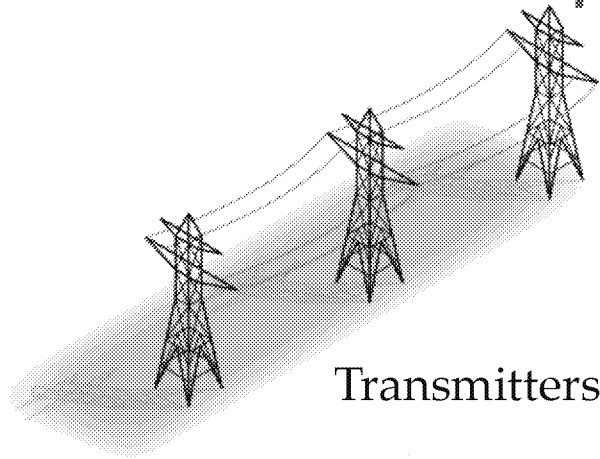
Ontario at a Glance

Installed Capacity	36,853 MW (Sept 2017)
Record Summer Peak	27,005 MW (August 1, 2006)
Record Winter Peak	24,979 MW (December 20, 2004)
Total Annual Energy Consumed	137 TWh (2016)
Energy Savings Through Conservation (2016)	1.2 terrawatt-hours (TWh)
Customers	4.9 million
Ontario Import Capability	6,500 MW
Transmission Lines	30,000 km
Interconnections	New York, Quebec, Manitoba, Michigan, Minnesota

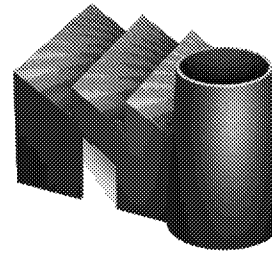


The IESO is the reliability coordinator for Ontario and works closely with other jurisdictions to ensure energy adequacy across North America.

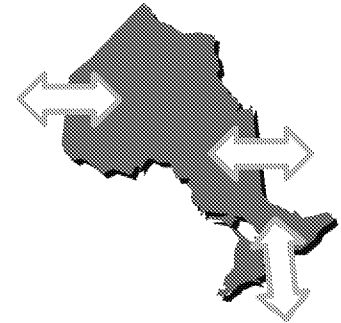
Market Participants



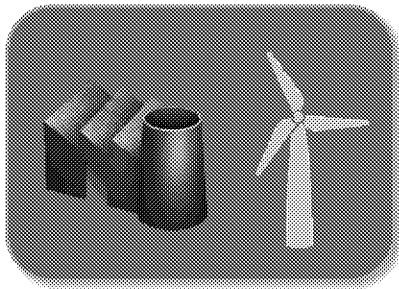
Transmitters



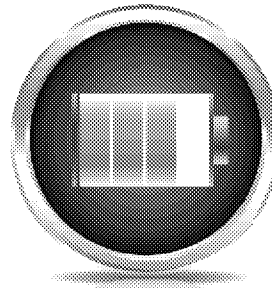
Directly Connected
Large Consumers



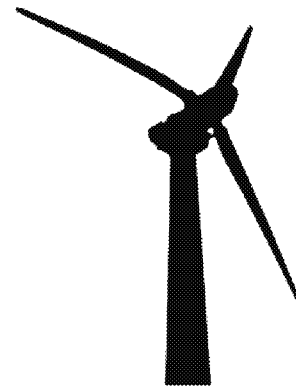
Electricity Traders



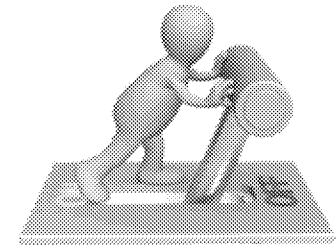
Local
Distribution
Companies (**65
Registered**)



Storage



Directly Connected
Generators



Demand
Response
Aggregator

IESO Business Overview

- Approved 2017 operating budget is \$191.4M
- IESO operates in a unionized environment
- Currently approved staffing level is 712
- Third party services are used for specialized expertise as required – professional & consulting services comprise \$17.8 million or approximately 9% of IESO's operating budget

Review and Update of Strategic Priorities Underway by New CEO

Themes What we do	Providing public value		Respecting and valuing our communities, customers and stakeholders	Building corporate resilience
Goals What we want to achieve in the next five years	Deliver superior reliability performance in a changing environment	Drive to a more efficient and sustainable marketplace	Be recognized as a trusted advisor, informed by engagement	Invest in our people and processes to meet the needs of the sector
Strategic Objectives How we will achieve our goals	- Plan and manage the power system so Ontarians have power when and where they need it. - Enhance reliability and efficiency through coordination of IESO- and LDC-controlled resources. - Promote robust cybersecurity practices across the sector.	- Evolve the IESO markets to increase market efficiency and value for consumers. - Foster an open and competitive electricity marketplace with broad participation.	- Enhance public confidence in the IESO and the sector to facilitate informed customer choice. - Work effectively with government to support policy development and IESO's excellence in implementation. - Seek out and respond to input from communities, customers and stakeholders to inform IESO decisions.	- Strengthen the development and engagement of our employees. - Attract and retain the best talent. - Be a focused and flexible organization positioned to support the ongoing transformation of our industry.

IESO Control Framework

- The workplace environment reflects the mindset, awareness and actions of the IESO's Board of Directors, management and other stakeholders concerning the importance of internal controls. As evidenced by the focus on control in the company's policies, procedures, methods and organizational structure
- The Executive Leadership Team, which includes the President and CEO, meets regularly to discuss all areas of IESO's business
- This team is responsible for establishing corporate policies and procedures and for creating and maintaining a control conscious environment

IESO Risk Assessment

- IESO Executive Leadership Team with the oversight of the Board of Directors has established and implemented a process to manage risks effectively and efficiently across the IESO
- IESO's Enterprise Risk Management (ERM) process supports corporate governance responsibilities in providing a structured approach to identifying, assessing, managing and monitoring potential events that may affect the achievement of its organizational objectives

IESO Staffing

- Recruiting, developing and retaining highly skilled staff is an ongoing priority
- Low annual rate of voluntary turnover at 2.4% in 2016 and turnover in 2017 is trending below 1%
- IESO provides competitive salary, benefits and defined benefit pension
- Actively and materially supports continuous learning, career development, health and safety, work/life balance, and a professional, respectful work environment
- The IESO does not use offshore resources

LDC Onboarding and Administration

Section 2

LDC Onboarding

- There are currently 65 LDCs registered to participate in the IESO Administered Markets
- OEB lists 78 active distributors – difference represents embedded distributors that are managed within the 65 LDCs
- New LDC introduction at the IESO level is unlikely
- Recent experience has been amalgamation
 - 2017 Alectra Utilities Corporation created from Horizon Utilities Corporation, PowerStream Inc, Enersource Hydro Mississauga Inc, and Hydro One Brampton Networks Inc

LDC Activity in IESO Administered Markets

- LDCs, like any other Market Participant, are required to adhere to the IESO's Market Rules which dictates how errors, mistakes and disputes are to be adjudicated
- IESO relies on market rules, statutes and regulations that direct LDCs to supply information in the form and timing requested
- OFHPA is outside of the IESO's electricity market structure and would not be governed by market rules but existing Settlement processes and tools will be leveraged

LDC Activity in IESO Administered Markets

- Most LDC settlements are automated and results from computer interrogated revenue meters measurement
- While IESO is not obligated to conduct / perform actions to detect or prevent LDCs' errors/fraud/mistakes, the IESO has business processes and controls which analyze LDCs' info/data
- For example, there are business rules inherent in forms for data submission that will detect significant changes month over month – they will ask the inputter if the entry is correct

LDC Oversight

- LDCs are regulated by the OEB and are required to adhere to various key OEB codes:
 - Standard Supply Service Code:
https://www.oeb.ca/oeb/Documents/Regulatory/Standard_Supply_Service_Code.pdf
 - Retail Settlement Code
 - https://www.oeb.ca/sites/default/files/Retail_Settlement_Code_RSC.pdf
 - Distribution System Code
 - https://www.oeb.ca/oeb/Documents/Regulatory/Distribution_System_Code.pdf
 - Electronic Business Transactions Standards for Retail Settlement
 - https://www.oeb.ca/oeb/Documents/Regulatory/Ontario_EBT_Standards_v4.pdf
- The OEB has regulatory authority to audit

LDC – IESO Treasury Administration

- LDCs are required to adhere to specific market rules on payments, collateral, and margin calls
- All market participants and LDCs are required to pay (even if a dispute is noticed) their IESO invoice by the 12th business day each month, and any margin calls within 2 business days
- IESO conducts daily monitoring of all market participants' electricity market financial exposures including LDCs
 - Collateral calls may be issued based on actual exposures and/or collaterals' expiries;
 - Margin calls may be issued based on actual estimated exposures;
 - All market participants have login-access to monitor their IESO's financial exposures on a daily basis;

LDC – IESO Treasury Administration

- IESO does not rank LDCs based on a “risk” profile;
- The OEB provides annual reports / scorecards to compare LDCs’ performance, various metrics, and bad debt expenses;
 - <https://www.oeb.ca/utility-performance-and-monitoring/what-are-electricity-utility-scorecards/electricity-utility>;
 - <https://www.oeb.ca/sites/default/files/2016-consolidated-scorecard.pdf>;
 - https://www.oeb.ca/oeb/Documents/Press%20Releases/OEB_RRR_2.1.8_Arrears_PaymentAgreements_WriteOffs.pdf;
 - https://www.oeb.ca/oeb/Documents/RRR/2016_Yearbook_of_Electricity_Distributors.pdf;

LDC – IESO Treasury Administration

- IESO Market Rules recognize that LDCs have a lower credit risk profile than non-LDCs (e.g. mines, auto companies, steel companies etc.), and therefore the collateral requirements are materially lower than non-LDCs;
- About 15 (out of 65) LDCs have external credit ratings – e.g. Toronto Hydro, Waterloo North Hydro. Waterloo North is about 1/16 the size (via invoice \$) of Toronto Hydro. Rated LDCs comprise about 75% of total IESO LDCs billings/invoices
- LDCs that do not have external credit ratings are not necessarily less credit worthy – many do not need or rely on credit ratings for their business structure / operations. Some non-rated LDCs have good financial ratios (e.g. Newmarket-Tay current ratio 2.74, leverage ratio 0.67, and Kitchener-Wilmot current ratio 1.96, leverage ratio 0.57,)

LDCs' Payment Defaults

In general, the IESO experiences the following three types (or severities) of payment defaults:

- defaults that are administrative in nature and are cured quickly within a few days;
- defaults that involve significant delays in payment and require IESO action(s)/effort(s) to resolve but are ultimately cured without drawing upon the collateral;
- defaults that involve non-payment from the MP, resulting in a draw on the MP's collateral by the IESO, which may include issuance of a default levy if all collateral is exhausted;
 - Within IESO history no LDC has been in this 3rd type;
 - IESO has had non-LDCs in this 3rd type;

LDCs' Payment Defaults

- Most LDCs' payment defaults are administrative in nature, and are cured by a full payment within a day or two
- LDCs are required to pay each IESO's invoice or margin call in full as due even if an alleged error or dispute is noticed in the invoice/margin call
- Disputes are handled by separate IESO processes

IESO Cash Management Procedures and Controls

- The IESO electricity market's settlements controls processes and procedures are reviewed by an external accounting firm every two years – CSAE 3416 Type II SOC 1 and SOC 2 Type II (recent Aug 2017 – unqualified opinion)
- The Market Rules specify various cash management requirements (e.g. bank accounts, settlement dates, IESO EFT only, etc.) and issuance of settlement statements and invoices
- LDCs have daily access to monitor their own specific financial exposures, margin calls, and invoices online via an IESO portal;
- IESO utilizes Treasura (Wallstreet) for treasury management system and Lawson for accounting/ledger systems

IESO Cash Management Procedures and Controls Continued

- IESO settled \$17.5 billion in 2017 settlements/cash management
- The Treasury system automatically downloads bank balances and transaction details daily for all accounts
- Treasury personnel reconcile bank transactions and balances on a daily basis and investigate any unreconciled items
- Accounting personnel conduct separate minimum monthly bank reconciliations for bank vs. ledger transactions

IESO Cash Management Procedures and Controls Continued

- There are segregation of duties between the Treasury, Accounting, and Settlements groups to ensure best practices and good controls
- The IESO Board is provided with regular separate reports regarding Treasury and cash management operations in addition to Accounting and any Settlement matters

IESO's Role in the Fair Hydro Program – Creation of the Regulatory Asset

Section 3

Regulatory Asset Accounting

- The IESO is rate regulated by the OEB
- Rate regulated entities can establish regulatory assets and liabilities
- Regulatory assets represent the right to recover costs in the future
- Regulatory assets can be transferred/acquired
- For the OFHP regulatory asset, the IESO will maintain as required by the OFHP Act an internal record of the variance account balance that is determinative at the time of recording

Creation of Regulatory Asset

- LDCs submit monthly to the IESO all OFHP bill reduction amounts for specified consumers which are reflected as reduction to monthly IESO invoices
- The Fair Hydro Trust will submit carrying costs monthly for reimbursement during the four year moratorium period (prior to the Clean Energy Adjustment coming in effect in 2021)
- IESO will receive the reduced amount (RPP and Non-RPP's global adjustment modifier) from the LDCs when they pay their IESO invoices

Creation of the Regulatory Asset

- IESO will pay the generators and the Fair Hydro Trust the amount owed on a monthly basis
- LDC shortfall and Fair Hydro Trust carrying costs will be funded by IESO in the interim via a \$2 billion debt facility provided by Ontario Financing Authority (facility term 2022)– this facility is solely for the Fair Hydro Program
- Any borrowings or interest incurred thereon from the IESO Fair Hydro Program debt facility will be recorded in the variance account as part of the regulatory asset
- Fair Hydro Trust may purchase all or part of the regulatory asset as outlined in the MTSA - this will transfer the risks and rewards associated with the regulatory asset from the IESO to the Fair Hydro Trust
- Cash received through purchases made by the Fair Hydro Trust will clear borrowing of the Fair Hydro Program debt facility

Before Clean Energy Adjustment Begins in 2021

- IESO and Fair Hydro Trust to develop an implementation plan to ensure all obligations of the OFHP legislation and regulation are addressed
- Additional FTE requirements will be determined as part of the implementation plan – this will not be a budget issue as the MTSA permits recovery of incremental OFHP costs

To Be Addressed in Implementation Plan for Clean Energy Adjustment Amounts

- How LDCs will establish and certify segregated account into which CEA collections from Specified Consumers are to be deposited as required by Regulation
- Guidance with respect to the establishment of procedures for the invoicing amounts in respect of the CEA, the identification, deposit and segregation of CEA collections, the remittance of CEA collections and reporting will be provided

To Be Addressed in Implementation Plan for Clean Energy Adjustment Amounts

- **Invoicing requirements:** CEA amounts are outside of the IESO's electricity market structure as such the CEA will not appear on the IESO Market invoice so another mechanism will be determined
- **Information requirements:** LDCs will submit information of CEA billed to Specified Consumers in line with current submission requirements within 12 business days of the end of each billing period

To Be Addressed in Implementation Plan for Clean Energy Adjustment Amounts

- **Review the information and resolve applicable issues when:**
 - material manifest discrepancies exist, including any discrepancy between the collections reported and the amount received by LDCs
 - LDCs do not deliver information in respect Specified Consumers
 - No CEA collections are received
 - An LDC has not certified annually the segregated account for CEA deposits

Clean Energy Adjustment Amounts Received

- Receive CEA collections from LDCs
- Held in trust in a segregated account for the benefit of the Issuer
- Provide notice of collection at least 10 days before remittance
- Transfer any cash to the Issuer

Demand Forecasting

Section 4

Three types of forecasts used at the IESO

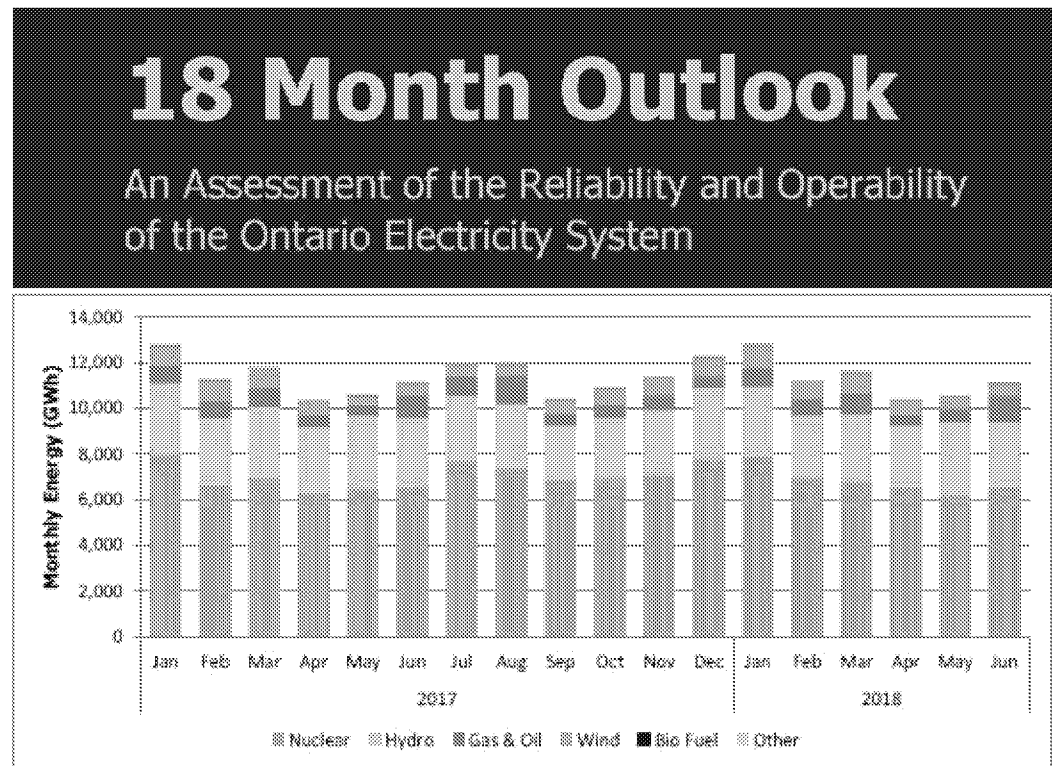
Short-term: looks ahead 5 minutes to 10 days; review forecast variances monthly

Mid-term: looks ahead 18 months, econometric approach; review of forecast variance month and quarterly

Long-term: looks ahead 20+ years, end-use approach, scenario-oriented; review forecast variance, 1- 3 years

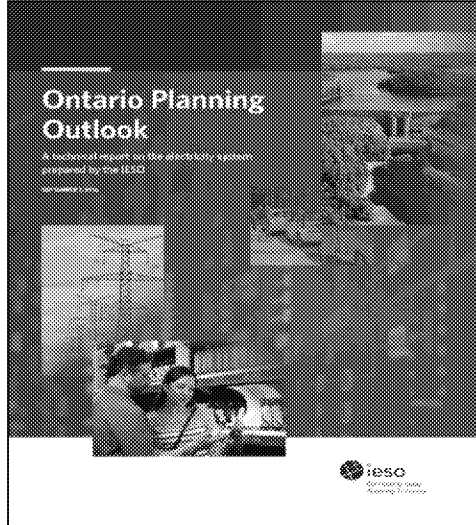
Example of Forecasting Ontario's Future Electricity Needs in Mid-Term

- The IESO plans and prepares for Ontario's future electricity needs by conducting forecasts and assessments of Ontario's current and short-term electricity requirements, as well as the adequacy and reliability of the integrated power system
- Decisions made over the past decade mean that Ontario demand supply picture will remain positive for the foreseeable future



- ☐ Adequate supply from a diverse supply mix
- ☐ Demand expected to remain flat for the long term
- ☐ Growth to be offset by conservation savings

Example of Forecasting in Long-term



The IESO's Ontario Planning Outlook:

- Provides a 10-year review (2005-2015) and a 20-year outlook (2016-2035) for Ontario's electricity system
- Responds to a June 10, 2016 request from the Minister of Energy for a technical report on the adequacy and reliability of Ontario's electricity resources
- Provides insights and considerations for the operational needs associated with implementing low-carbon resources, electrification and the growth of distributed energy resources
- Serves as a key input to the government's Long-Term Energy Plan

Forecast Error

- IESO does not have a current role in assessing forecasts to actuals of specified consumers – no comparative data available
- OEB previously managed forecast error through semi-annual adjustments to the RPP rates
- IESO has experience in minimizing forecast error
- For example, the IESO monitors forecast error of short-term forecasts for Ontario demand - consistently meets Corporate Performance Measurement target of no greater than 2.2% error

Specified Consumers Forecast

- The IESO's role to date has been providing annual TWh demand to the OEB for their use in setting RRP rates (Tiered and TOU)
- Monthly and annually the IESO provides information to the OEB based on actuals for rate updates and forecast analysis
- Specified consumers go beyond the RPP eligible and the OEB has developed a bill reduction rate modifier for consumers OFHP eligible but not receiving RPP rates

Specified Consumers Forecast

- The IESO is collecting monthly data on specified consumers as part of the GA deferral recognition:
 - Tier 1/ Tier 2 (conventional meters) kWhs, number of consumers and bill reduction amount \$
 - On-peak, Mid-peak, Off-peak (smart meters) KWhs, number of consumers, and bill reduction amount \$
 - Non – RPP using modifier KWhs, number of consumers, bill reduction amount \$
- There will be four years of data upon which to develop forecasting models to set CEA rates

Example of the Monthly OEB RPP Variance Account Report

Month & Year	RPP Load Submitted by LDC's	Total Market AQEW	RPP vs. Total Market AQEW	"Gross" Accumulated IESO Variance Account ⁴	"Net" IESO Variance Balance (IESO VA less OPG Rebate) ⁴	Cumulative "Net" Interest	"Net" IESO Variance Balance (IESO VA less OPG Rebate) ⁴ including interest
	kWh Total	kWh	%	\$	\$	\$	\$
Oct-16	4,529,048,317	10,321,447,273	44.16%	\$676,854,013.85	\$73,058,109	-\$6,563,177.52	\$66,494,931
Nov-16	4,371,745,587	10,492,527,220	44.18%	\$70,224,836.60	\$70,224,837	\$11,022.06	\$70,235,859
Dec-16	4,713,221,033	11,689,726,329	44.10%	-\$27,637,063.96	-\$27,637,064	\$51,431.79	-\$27,585,632
Jan-17	5,335,304,962	11,828,819,703	44.36%	-\$6,002,338.17	-\$6,002,338	\$101,065.18	-\$5,901,273
Feb-17	4,979,491,689	10,417,870,348	44.43%	-\$29,244,185.66	-\$29,244,186	\$79,819.65	-\$29,164,366
Mar-17	5,198,153,131	11,408,408,037	44.18%	-\$66,756,693.44	-\$66,756,693	\$69,434.54	-\$66,687,259
Apr-17	4,435,407,154	9,695,799,202	44.15%	-\$18,568,705.33	-\$18,568,705	\$61,273.68	-\$18,507,432
May-17	4,401,035,843	10,013,011,756	44.22%	\$114,034,880.00	\$114,034,880	\$9,224.92	\$114,044,105
Jun-17	4,316,533,813	10,477,034,607	44.29%	\$136,510,260.51	\$136,510,261	-\$2,833.07	\$136,507,427
Jul-17	4,810,997,307	11,355,300,033	44.37%	\$139,258,989.16	\$139,258,989	\$72,109.96	\$139,331,099
Aug-17	4,997,167,274	11,139,446,944	44.24%	\$194,389,126.61	\$194,389,127	\$209,413.08	\$194,598,540
Sep-17	4,661,892,190	10,497,819,588	43.88%	\$181,526,277.37	\$181,526,277	\$338,578.91	\$181,864,856
12 month Total	56,749,998,299	129,337,211,040	43.88%	\$1,364,589,398	\$760,793,493	-\$5,562,637	\$755,230,856

Example of RPP Actual Data Provided Annually to OEB

Month & Year	RPP Load Submitted by LDC's					
	kWh					
	Tier 1	Tier 2	Off-Peak	Mid-Peak	On-Peak	Total
Jan-16	637,976,003	464,204,706	2,636,399,973	657,938,514	710,262,746	5,106,781,942
Feb-16	595,724,594	525,880,527	2,699,953,177	687,596,504	752,207,397	5,261,362,199
Mar-16	597,533,357	480,748,952	2,854,666,780	699,022,293	760,033,065	5,392,004,447
Apr-16	550,093,929	394,249,578	2,444,294,636	649,011,891	692,002,948	4,729,652,983
May-16	536,991,396	361,830,793	2,271,112,686	631,127,296	642,343,305	4,443,405,475
Jun-16	459,807,948	453,145,981	2,245,584,988	627,783,522	626,357,836	4,412,680,275
Jul-16	505,538,987	504,035,509	2,610,264,925	721,816,971	756,455,872	5,098,112,263
Aug-16	524,532,869	592,724,382	2,978,511,701	854,694,883	955,019,790	5,905,483,625
Sep-16	445,790,365	485,187,893	2,681,804,343	778,185,207	886,297,264	5,277,265,073
Oct-16	473,630,840	381,853,178	2,300,875,221	668,235,067	704,454,012	4,529,048,317
Nov-16	507,879,719	382,854,290	2,222,797,673	633,096,983	625,116,921	4,371,745,587
Dec-16	656,156,035	343,293,598	2,342,419,219	649,809,799	721,542,383	4,713,221,033
12 month Total	6,491,656,041	5,370,009,387	30,288,685,321	8,258,318,930	8,832,093,539	59,240,763,218

IESO Information Technology Environment

Section 5

IESO Information Technology Environment

- IT executes the delivery of products and services through IESO personnel based on documented roles, responsibilities and performance standards or via contracts with external suppliers
- Core Business Areas:
 - Information Technology consists of three core IT units:
 - Business Solutions
 - Technology Services
 - IT Operations
 - Organizational Governance Support

IESO Information Technology Environment

- Business Solutions Department is responsible for development, maintenance of all business solutions:
 - Maintain, support and develop requirements for enhancements to Power System, Electricity Market and Corporate business solutions
 - Plan replacement and major upgrades of application systems
 - Manage contracts for vendors who provide support for Power System, Electricity Market and Corporate business solutions
 - Provide second and third tier (external vendors) support to all application systems
 - Develop web solutions for Power System, Electricity Market and Corporate business solutions
 - Business Analysis Services
 - Develop business processes for internal IESO business processes
 - Provide integration services for business solutions acquired or developed

IESO Information Technology Environment

- The Technology Services Department is responsible for the delivery, administration, and maintenance of the technical infrastructure of the IESO including:
 - All server hardware/software (Unix, Linux, Windows)
 - Database management system
 - Desktop and laptops definition and deployment infrastructure
 - Mass storage and backup infrastructure
 - Local and Wide Area Networks
 - Telephony and communications
 - All electronic wallboard displays
 - Common corporate tools such as Exchange Mail and Aspen file server

IESO Information Technology Environment

- The IT Operations Department is responsible for the 24x7 operation of the production environment and the IESO data centers with specific responsibilities for:
 - 7x24 Shift Operations
 - 7x24 IT Service Desk Support (Tier 1 support)
 - 7x24 Data Integrity
 - 7x24 IT Security Support (Monitor the virus alerts, monitor for NERC advisories and Alerts)
 - Incident Management
 - High Level reporting on Service Desk Management

IESO Information Technology Environment

- Organizational Governance Support provides the governance framework for the delivery and support of IT systems and support:
 - Overall security policies and IT security oversight including development and coordination to implement the IT security framework (policies, standards, guidelines, procedures)
 - Change, release, baseline, records and information management as well as, advising, tracking, reporting and providing metrics for each process
 - Support of the IESO's business continuity management program
 - Establishing and promoting project governance and project management standards and methodologies across the IESO

IESO Backup and Recovery

- The IESO operates redundant backup servers, one each at the primary site and the backup operations center site
- All critical data is replicated in real-time from the primary site to the backup site
- Requirements for the recovery of business functions following a contingency are established
- Business units establish and exercise plans to meet these requirements
- Redundancy for critical information systems is provided at a physically remote backup site
- Ability to operate those redundant systems is tested periodically

Incident Management

- The IESO has implemented a formal incident management (malfunctions) process based on the ITIL framework
- Processes provide the framework to prioritize service failures, assign and escalate to designated IT support, record investigation and resolution
- Processes also provide guidance on how IT personnel are required to create incidents based on IT issues detected from various systems monitored by the IT department
- Incident management process has been documented in policy and procedural documentation which are available on the IESO website

Disaster Recovery

- As an integral part of IESO's business continuity management program, the IESO disaster recovery plan describes the technology continuity management framework and strategies associated with the recovery of IESO critical systems and services
- The Disaster Recovery Plan (DRP) defines the key activities, resources and strategies required to effectively recover IESO systems and services consistent with critical business recovery time objectives in the support of critical business functions

Disaster Recovery

- The IESO conducts regular failover testing of information technology systems and services to provide assurance that our disaster recovery capabilities are robust and that the critical systems can be recovered in a timely manner in support of IESO business
- Recovery includes regaining access to applications, data, communications, work space and other IT services and functions
- Complete test of financial and critical systems September 2017 (financial systems tested once/yr. and critical systems twice/yr.)

Primary Applications Used With LDC Settlement

- Commercial Reconciliation System
- Lawson
- Treasura
- Notice of Disagreement Tool
- Market Participant Portal Access

Commercial Reconciliation System - (Replacement Project Underway)

- Collects data from other IESO systems
- Calculates the settlement amounts for the IESO-defined charge types
- Processes user-entered settlement adjustments (i.e. manual line items)
- Generates financial exposure information for Market Participants
- Generates settlement statements for IESO-administered markets

Lawson

- General Ledger, Accounts Payable and Accounts Receivable applications
- Applications handle the generation of invoices, as well as the maintenance of market accounts, and maintenance of Market Participant historical payment information
- Lawson also creates electronic transfer files for payments

Treasure

- Collects and records cash receipts from, and make payments to, Market Participants
- Used for the market cash management functions of the IESO and interfaces directly with Lawson and the IESO's bank
- Used to manage daily cash and create reports necessary to manage and report on the market-related cash management activities
- Treasure is hosted by a third party vendor, Wall Street Systems

Notice of Disagreements Tool

- Notice of Disagreement tool allows Market Participants to submit a Notice of Disagreement to the IESO
- Allows tracking of the submission through to completion
- Workflow application allows tracking of actions taken on identified incidents to ensure the disagreement is processed in accordance with the timelines required

Market Participant Portal Access

- Portal is the starting point to access IESO information and software applications
- Users can securely upload, share and revise data used in settlement calculations
- Web portal provides greater flexibility and security than a normal website and is currently used by Market Participants to submit and view settlement data
- This is an example of a tool expected to be used by LDCs for CEA information submission

Historic and Projected Energy Use

Appendix

Historic Electricity Demand

Some broad trends:

- 1940's – Mid 2000's: growth in absolute terms, but at a declining rate
- Mid 2000's – today: pronounced demand reduction (re: economy, conservation, pricing effects), now effectively flat
- Changing sectoral composition: commercial up, industrial down, residential in between

Historic Electricity Demand

Some broad trends continued:

- Declining intensity of electricity use in residential sector
- Since early 2000's, shift to a predominantly summer peaking system
- Peakier annual load shape

Projected Energy Usage

Electricity Demand by Sector (TWh)																			
	2017	2018	2019	2020	2021	2022	2023	2024	2025	2026	2027	2028	2029	2030	2031	2032	2033	2034	2035
Residential	52	52	52	51	51	50	50	50	50	49	49	49	49	50	50	50	50	50	51
Commercial	52	52	52	51	51	51	52	52	52	52	52	52	52	52	52	52	53	53	54
Industrial	34	35	34	35	35	35	34	34	34	34	34	33	34	34	34	34	34	34	35
Transportation ¹	0	0	0	0	1	1	1	2	2	3	3	4	4	5	6	7	7	8	9
Other ²	5	5	5	5	5	5	5	5	5	5	5	5	5	5	5	5	5	5	5

Notes:

¹ Transportation includes Electric Vehicles and Transit

² Other = Agriculture, Remote Communities, Generator Demand, Industrial Electricity Incentive, and Street Lighting

Electricity Demand by End-Use (TWh)			
Residential Net Energy Demand by End-Use (TWh)			
	2017	2025	2035
AC Central	3.0	3.0	3.0
AC Room	0.5	0.5	0.5
Clothes Dryers	2.5	2.5	2.2
Clothes Washers	0.3	0.3	0.3
Computers	1.1	1.3	1.4
Cooking	2.5	2.2	2.3
Dehumidifiers	0.5	0.5	0.4
Dishwashers	0.5	0.5	0.5
Domestic Hot Water	3.8	3.3	3.3
Elevators	0.2	0.2	0.2
Forced Air Central Heating	1.4	1.2	1.5
Freezers	1.7	1.7	1.8
Lighting	7.6	6.0	4.9
Miscellaneous	4.2	4.9	5.8
Baseboard Heating	6.7	5.9	5.7
Other Consumer Electronics	3.8	4.1	4.8
Refrigerators	4.4	4.4	4.6
Set Top Boxes	0.8	0.8	0.9
Space Heating Room	0.1	0.1	0.1
Swimming Pool Pumps	0.6	0.6	0.6
Televisions	2.5	2.9	3.5
Ventilation And Circulation	3.2	2.6	2.5

Electricity Demand by End-Use (TWh)			
Commercial Net Energy Demand by End-Use			
	2017	2025	2035
Space Heating	4.1	4.7	5.1
Computer Equipment	5.0	5.2	5.4
Cooking	0.8	0.8	0.8
Cooling Chillers	1.1	1.0	1.1
Cooling DX	3.6	3.6	3.8
Domestic Hot Water	0.7	0.4	0.4
Elevators	0.3	0.3	0.3
HVAC Fans Pumps	4.5	3.9	3.6
Lighting	19.0	19.0	19.6
Miscellaneous Equipment	5.1	5.7	6.6
Other Plug Loads	4.0	4.1	4.2
Refrigeration	3.8	3.0	2.7

Electricity Demand by End-Use (TWh)			
Industrial Net Energy Demand by Subsector			
	2017	2025	2035
Chemicals	3.4	3.5	4.0
Fabricated Metals	1.9	1.9	2.0
Food And Beverage	2.3	2.3	2.6
Mining	6.5	7.4	7.0
Transportation And Machinery	3.1	3.0	3.1
Miscellaneous Industrial	4.0	4.0	4.4
Non-Metallic Minerals	1.3	1.2	1.2
Paper Manufacturing	2.6	2.1	1.9
Petroleum Refineries	1.7	1.8	2.0
Plastic And Rubber	2.1	2.0	2.1
Primary Metals	4.5	3.9	3.7
Wood Products	1.0	0.9	1.0

Electric Vehicle (EV) Stock Forecast			
	2017	2025	2035
Thousands of EVs	15	450	2,401

	Households	Commercial SQFT
2017	5,581,089	3,305,815,503
2018	5,666,227	3,356,412,223
2019	5,749,669	3,406,188,634
2020	5,831,807	3,455,870,987
2021	5,910,039	3,504,894,508
2022	5,980,524	3,548,806,209
2023	6,046,212	3,590,932,451
2024	6,107,951	3,631,662,560
2025	6,166,993	3,670,932,197
2026	6,223,916	3,710,854,449
2027	6,279,658	3,754,051,817
2028	6,335,207	3,798,150,194
2029	6,390,108	3,840,274,838
2030	6,443,694	3,881,397,857
2031	6,498,305	3,922,332,509
2032	6,550,344	3,964,872,528
2033	6,600,290	4,007,469,324
2034	6,647,466	4,050,118,742
2035	6,691,553	4,092,547,558

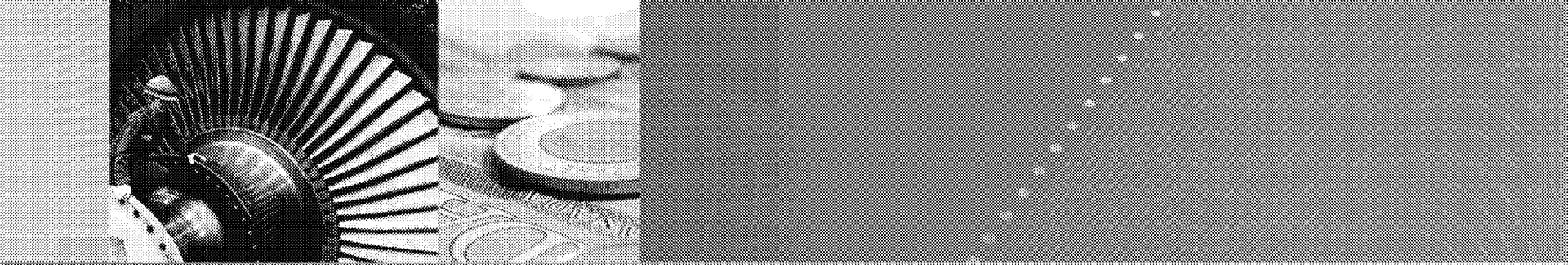
Growth and Economic Assumptions

Driver	2005-2015	2015-2025	2025-2035
Annual growth in number of residential households ^{1,2}	1.4%	1.3%	0.8%
Annual growth in commercial floor space ^{1,2}	1.9%	1.4%	1.1%
Annual growth in Ontario industrial GDP ¹	-2.0%	1.1%	1.4%

Notes:

¹ Drivers are from USDO and independent economic forecasts including CANSIM 2015, StatCan, Homeson May 2015, Informetrica Jan 2011, and IHS Nov 2015.

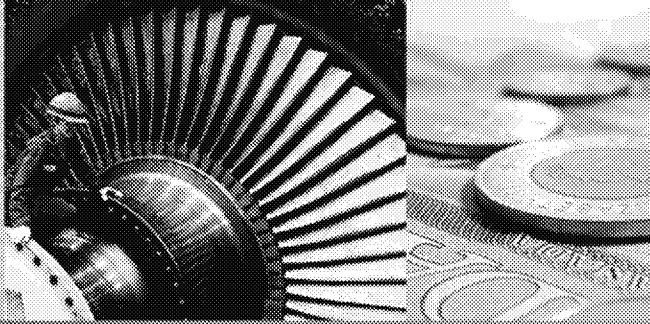
² Assumptions: annual residential floor space growth from 2015 to 2025, and 0.8% from 2025 to 2035. Commercial floor space cumulative growth: 15% from 2015 to 2025, and 11% from 2025 to 2035.



A TRUSTED BUSINESS PARTNER DRIVING VALUE

Fair Hydro Plan Financing Program Servicer Review Clean Energy Adjustment Collection Process

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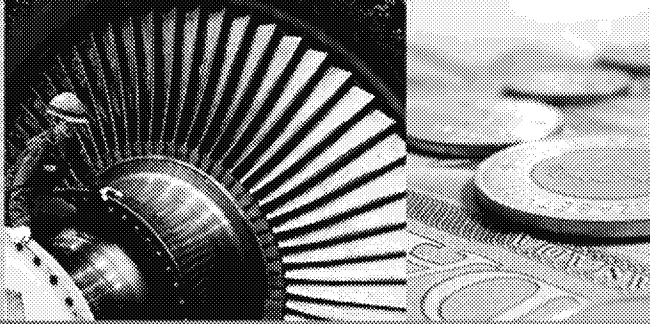
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Overview

- The OPG and IESO each have roles and responsibilities in regards to the CEA collections process
- IESO's role, as defined in the MTSA, is to:
 - Provide LDCs guidance in establishing procedures
 - Receive and review information provided by LDCs
 - Undertake to contact LDCs and resolve any applicable issues
- OPG's role, as defined in the Management Agreement, is to:
 - Take necessary action against any LDCs the IESO has identified as not fulfilling their CEA duties and obligations under the Fair Hydro Act and Regulations
 - These duties and obligations center around CEA invoicing, collection, receipt, remittance and reporting
- The involvement of both OPG and IESO will provide a robust and effective collection process

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Collaborative Process

- IESO and OPG will work together to further develop the CEA collection process
- This will be formalized in a dynamic Protocol Agreement
- A robust and effective collection process will be implemented