

ONTARIO
ENERGY
BOARD

Electricity Regulation in Ontario

Presentation to Brazilian Delegation

Monday May 7, 2018

Overview

- Ontario's Electricity Sector
- Electricity Regulation
- Grid Modernization & Distributed Energy Resources
- Smart Meters and Time-Of-Use Pricing

Ontario's Electricity Sector

Ontario Snapshot

Area: 1,076,395 km²

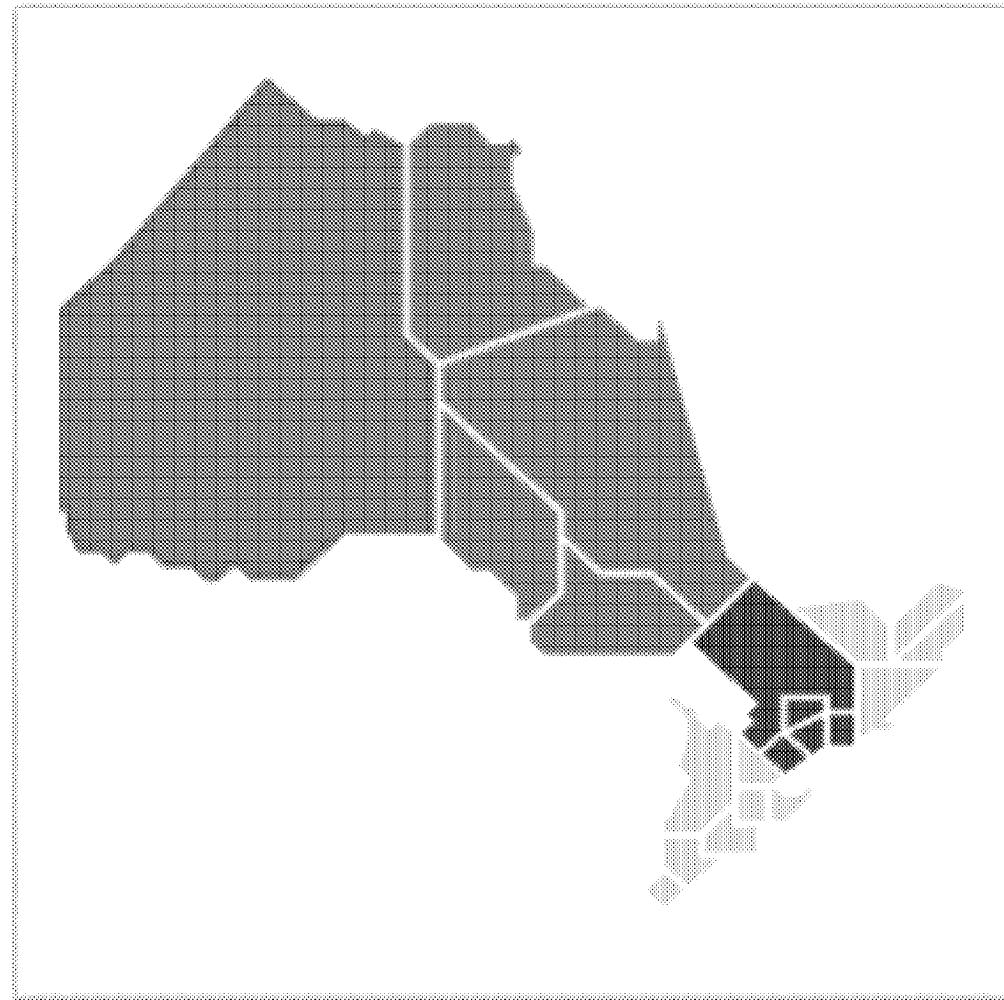
Population: ~14 million

GDP (2017): \$794.8 billion
(39% of Canada's GDP)

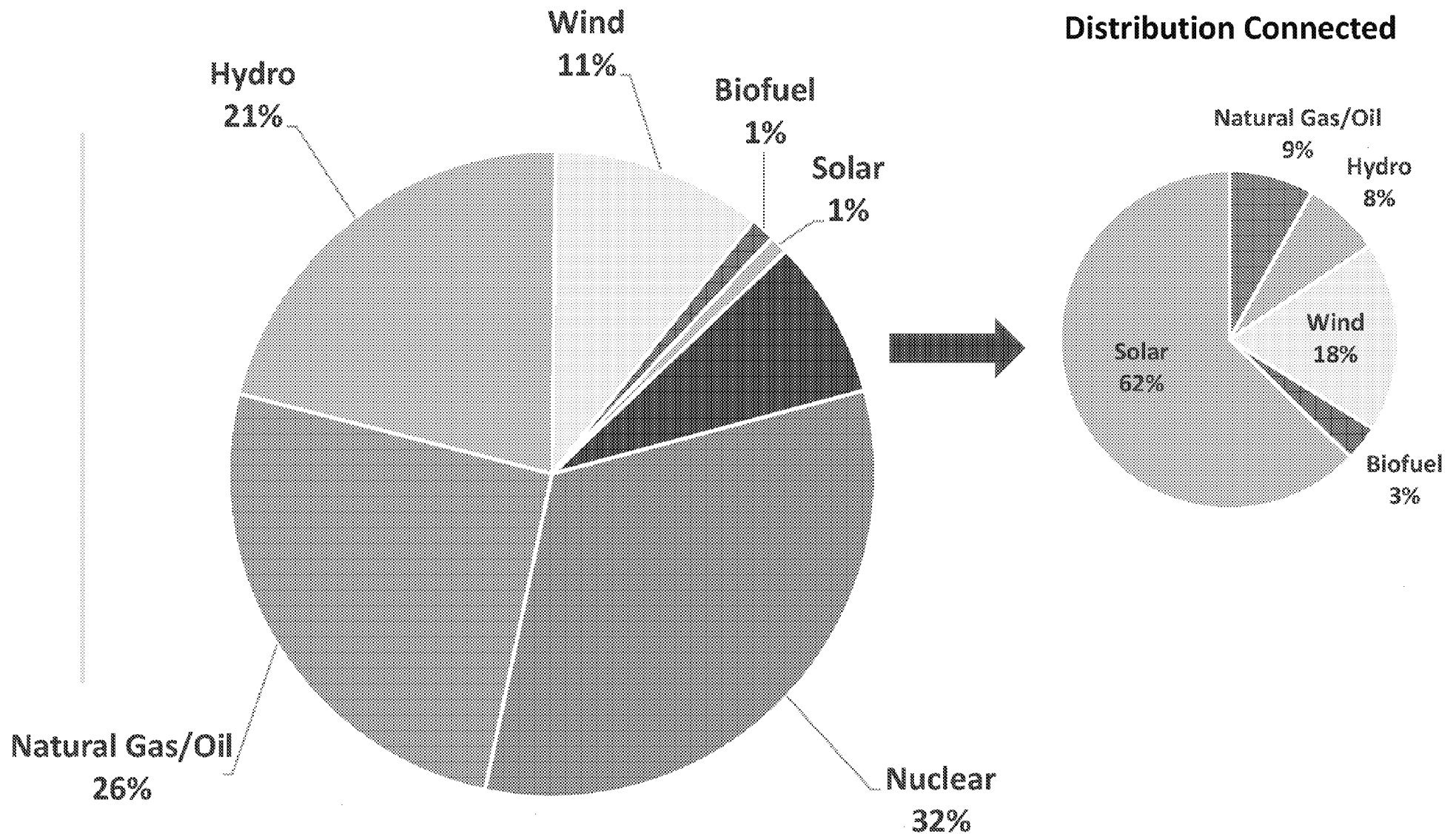
Electricity Customers: ~5 million

Total Demand (2017): 132 TWh

Peak Demand (2017): 21,786 MW
(on September 25, 2017)

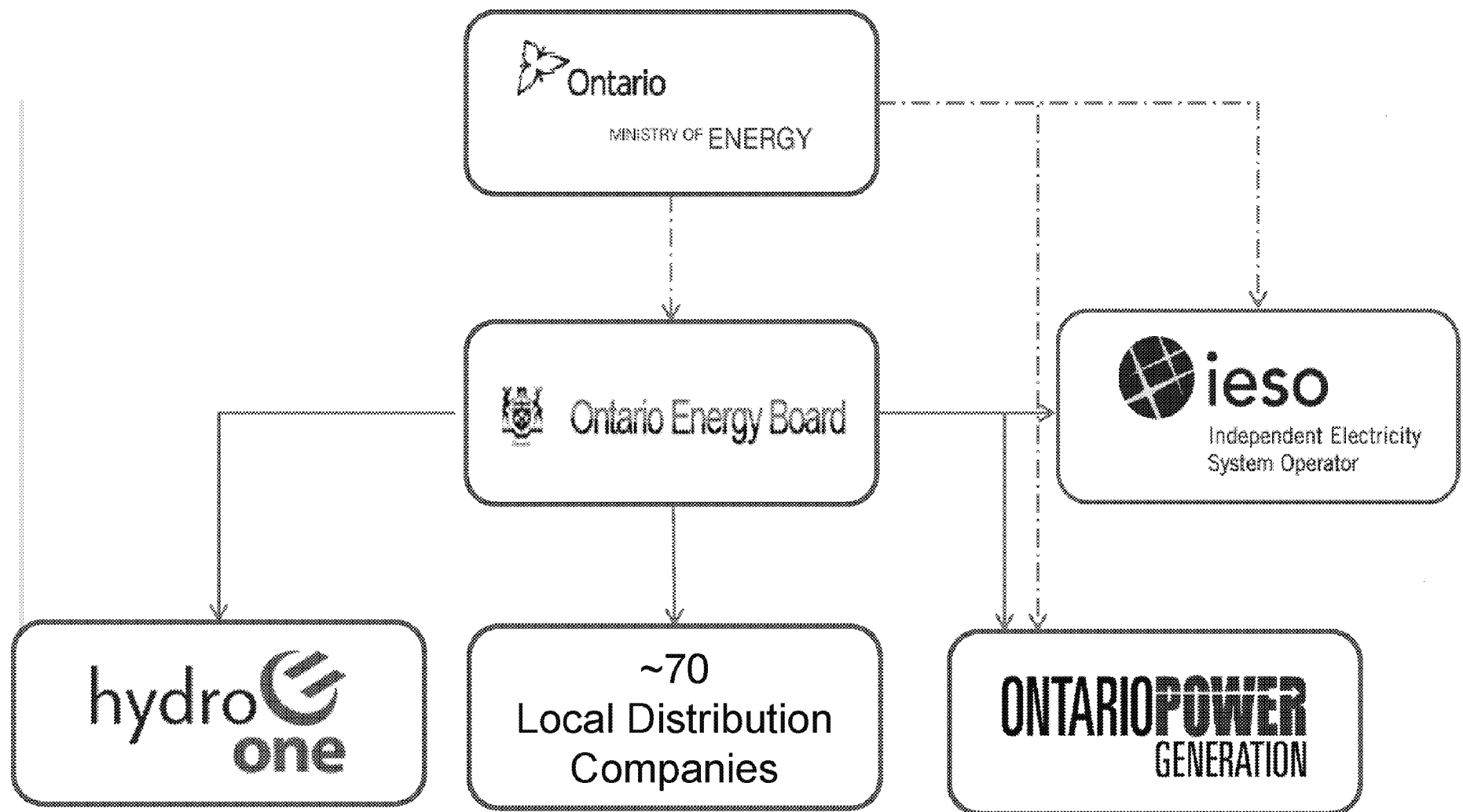


2017 Installed Capacity



Source: IESO

Key Players



History of the Electricity Sector

Pre-1999

- Ontario Hydro, a vertically integrated, government owned utility, served all of Ontario

1999-2004

- Electricity sector is restructured but the 'pure' competitive market is short-lived

Post-2004

- Often described as a 'hybrid' market, Ontario's electricity sector continues to evolve

Restructuring (1999-2004)

Phase 1:

- Until 1999, Ontario Hydro was responsible for planning, building, and operating the electricity system from generation to distribution
- In 1999, competitive generation and retail markets were established
- Ontario Hydro was broken up and new entities were formed:
 - Independent Electricity System Operator to administer supply market
 - Ontario Power Generation to hold Ontario Hydro's generation assets
 - Hydro One to hold Ontario Hydro's transmission and rural distribution assets
 - Over 300 local distribution companies, majority small and municipally owned, to hold remaining distribution assets
- In the absence of centralized planning, the IESO-administered market was intended to send price signals for investments in generation needed to serve province

Restructuring (1999-2004)

Phase 2:

- Market opening coincided with a hot summer; high demand and tight supply led to high prices
- Rates were frozen for a period and then further restructuring occurred:
 - Ontario Power Authority established to perform long term supply planning and serve as contracting entity to secure new supply
 - Regulated Price Plan introduced to provide more stable/predictable retail rates for low-volume customers
- Delivery remained regulated by the OEB:
 - Transmitters, with input from IESO, plan, build, and operate transmission system
 - Distributors plan, build, operate distribution systems
 - Transmitters and distributors are not responsible for procuring supply for their customers, they simply pass through the actual cost of electricity

Evolution of Hybrid Structure (2004-Present)

Phase 3:

- Over time, the Government took on increasing planning responsibilities and provided direction regarding supply:
 - Coal generation fully phased out by 2014
 - Green Energy and Green Economy Act to promote smart grid and renewable generation
 - Significant amount of supply is secured via long-term contracts; FIT and Micro FIT encouraged renewable generation
- Ontario Power Authority merged with the IESO, its long term planning role was reduced
- Instead, Ministry of Energy produces Long Term Energy Plans every 3 years
 - Conservation First policy central to planning
 - OEB and IESO must prepare Implementation Plans

Electricity Supply

- The IESO is the system planner assuring generation adequacy and reliability as well as the main procurement agent for the system
- Market-based approach for dispatching electricity
 - Generators bid to supply, IESO accepts lowest-cost supply
 - Market clearing price is set every 5 minutes; in each hour, average market clearing price is the “Hourly Ontario Energy Price” (HOEP)
- However, virtually all supply is under long term payment arrangement
 - Long term contracts with generators
 - Ontario Power Generation’s nuclear and hydro assets are subject to rate-regulation by the OEB
- A charge, known as the global adjustment, ensures that generators are compensated consistent with payment arrangements for any revenues not earned in the wholesale market

Electricity Commodity Prices

Option 1 – Regulated Price Plan: >95%	Option 2 – Retail Contract: <5%
• Default rate for low-volume consumers – all residential and small business under 50 kW • Unbundled: Covers only commodity cost • About 40% of annual Ontario consumption • A stable and predictable rate that recovers cost of market/contracted supply • Same prices prevail province wide • GA is blended into the RPP rate	• A guaranteed fixed rate offered by competitive electricity retailers • GA is added to the retailer's rate • Delivery and other charges apply; same as those applied to an RPP customer in same circumstances.

*Commercial & industrial customers pay the market price (HOEP + GA) unless they sign a contract with a retailer / wholesaler

Ontario's Unbundled Electricity Bill

OEB's Rate Setting Covers About ½ of the Total Bill

1. Electricity Commodity

- OEB sets the Regulated Price Plan (RPP) rate to recover actual costs but does not control all cost components within it; we only set rates for Ontario Power Generation (OPG)

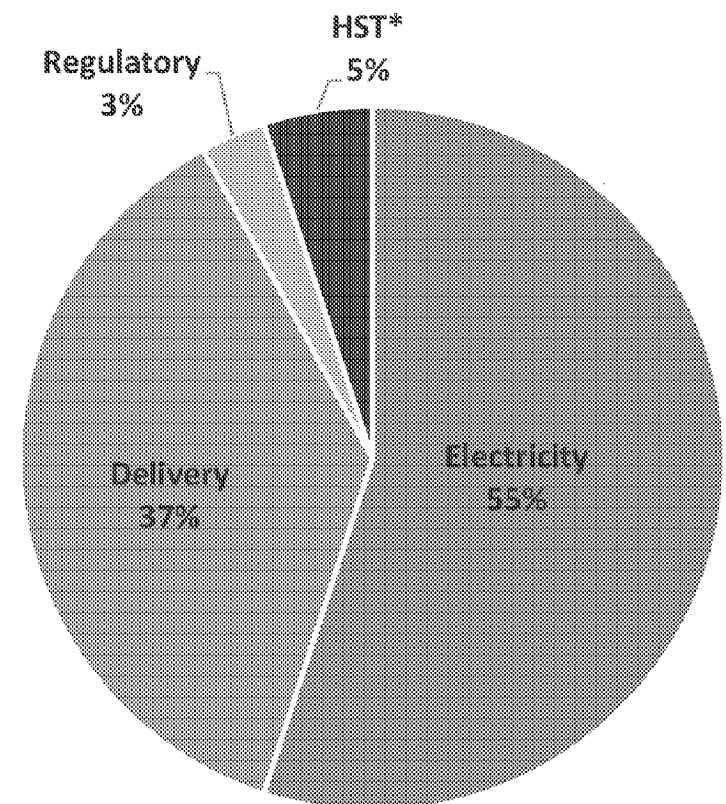
2. Delivery (fully regulated)

- Distribution – 26% - OEB sets rates for ~70 LDCs
- Transmission – 8% - OEB sets transmission rates
- Line Losses – 3% - difference between distributor electricity purchases and what it sells to customers

3. Regulatory Charges

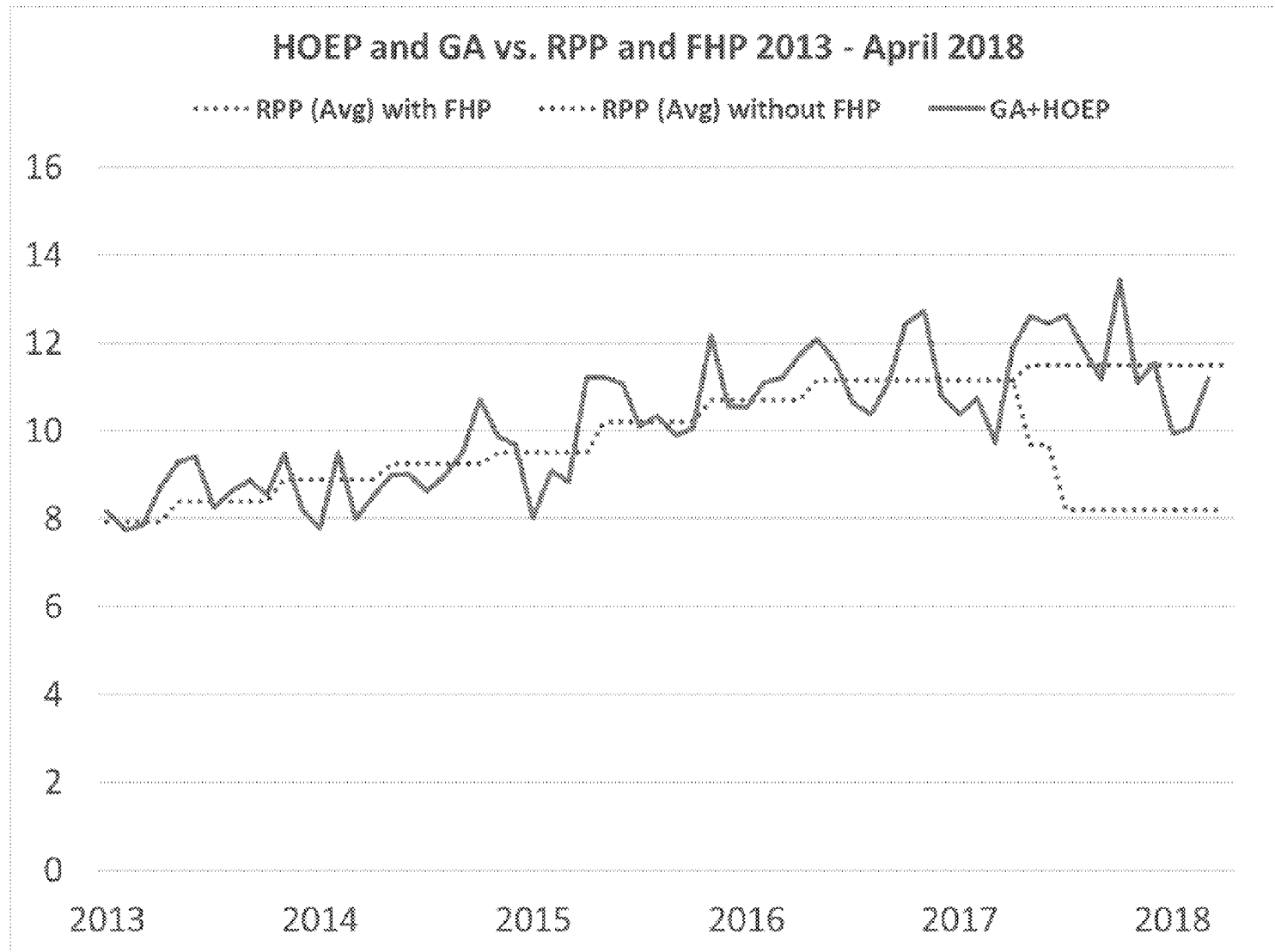
- Includes cost of operating the wholesale market, and cost of programs such as Rural and Remote Rate Protection plan
- Wholesale market costs are established in IESO market and passed through to customers

Bill Breakdown
Typical Residential Electricity Customer
about \$112 / month

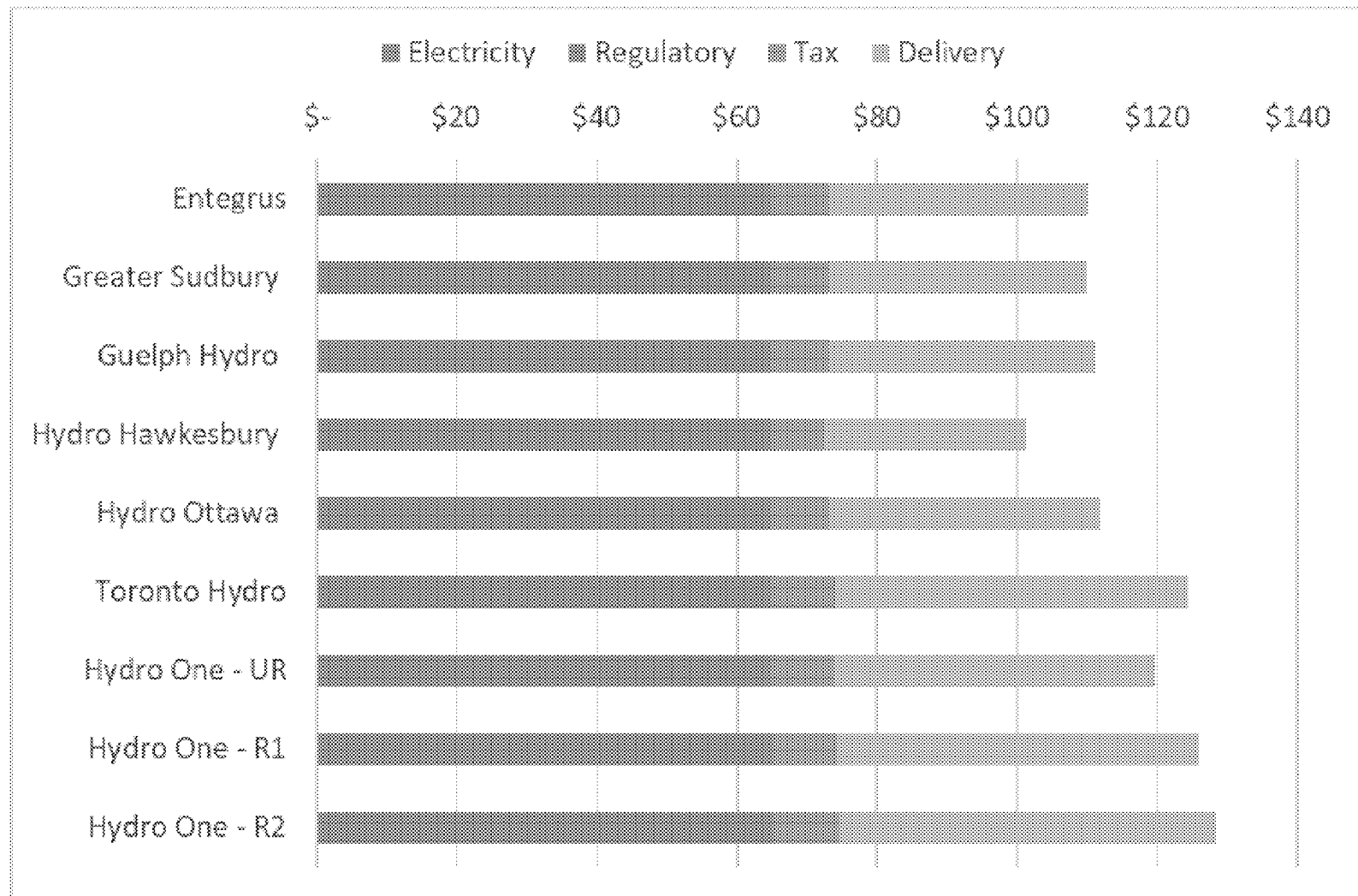


* Values based on typical customer consumption of 750 kWh/month

Regulated Price Plan



Residential Bills by Distributor





Electricity Regulation

OEB's Mandate and Objectives

Mandate:

- To regulate the electricity and natural gas sectors in the public interest

Legislated Objectives:

- Protect the interests of consumers with respect to price, reliability and quality of service
- Promote the education of consumers
- Facilitate the maintenance of financially viable electricity and natural gas industries
- In electricity we are also to promote renewable energy projects, including timely connection to distribution and transmission systems, promote conservation and facilitate implementation of smart grid
- In natural gas we are also to facilitate rational expansion of transmission and storage and facilitate competition in sale of gas

What We Do

The OEB is an Economic Regulator That:

- Licences participants
- Sets rates
- Approves construction of transmission facilities and pipelines
- Sets standards of service for utilities
- Sets and enforce rules for utilities, retailers, and unit sub-meter providers
- Oversees natural gas and electricity markets
- Informs and educate consumers about energy
- Implements government policy
- Provides advice to government upon request

How We Do It

Quasi-Judicial Hearings

- In response to applications for new rates or leave to construct
- Hearings may be oral or written
- Orders without a hearing permitted in some circumstances
- Alternative dispute resolution (settlement) is available
- Administrative law principles of natural justice and fairness apply, as well as procedural requirements

Policy Development

- To establish or amend codes, rules or guidelines; also to implement government policy or provide advice to government
- Public consultations
- Stakeholder conferences
- Research and policy options papers
- Policy matters may be addressed through generic hearings

Regulating Electricity

Set Rules and Enforce Them:

- System connection rules
- Customer service rules (security deposits, equal payment plans, arrears, disconnections etc.)
- Electricity retailer and unit sub-meter provider rules
- Reporting & Record Keeping Requirements

Sets Rates:

- Payments for OPG prescribed nuclear and hydro-electric assets
- Rates for transmission
- Rates for distribution
- IESO fees (administrative costs)
- Regulated Price Plan (RPP) commodity price for low volume consumers

Other Approvals:

- Licences for generators, transmitters, distributors, retailers, sub meter providers, wholesalers
- Leave to construct transmission lines larger than 2 km
- Mergers and acquisitions of transmitters and distributors

Monitors the Wholesale Electricity Market:

- *Market Surveillance Panel* provides reports on how the market is operating and issues that arise

Performance Based Rate Regulation

Utilities choose the rate-setting option best suited to their circumstances:

Price Cap IR	Annual IR Index	Custom IR
• Cost of service rebasing • 4 years of IRM adjustments • Stretch factor updated annually based on OEB-sponsored productivity study • 5-year Distribution System Plan • Traditional CoS/IRM approach with some additional mechanisms (ACM/IRM)	• Price Cap IR adjustment but using largest stretch factor • No requirement for cost of service rebasing • 5-year Distribution System Plan • Suited for utilities with little growth and stable/predictable costs	• Minimum 5-year customized plan • Incentive rate structure and form customized to applicant; must include explicit financial incentives for cost control and continuous improvement • 5-year Distribution System Plan • Intended for utilities with specific operational and investment needs

OEB's Performance Based Approach

Utilities are expected to achieve four outcomes:

- **Customer Focus** – customer engagement a fundamental part of business planning
- **Operational Effectiveness** – optimized asset planning and efficient operation
- **Public Policy Responsiveness** – effective implementation of government policies
- **Financial Performance** – able to attract capital and maintain reasonable rates

Distributor Scorecard

Performance Outcomes	Performance Categories	Measures	2011	2012	2013	2014	2015	Trend	Target	
									Industry	Distributor
Customer Focus The company provides the services that respond to identified customer performance.	Service Quality	New Residential/Small Business Services Connected on Time	99.40%	99.20%	99.30%	100.00%	100.00%	↻	90.00%	
		Scheduled Appointments Met On Time	99.96%	99.70%	99.50%	100.00%	91.70%	↻	90.00%	
		Telephone Calls Answered On Time	66.20%	88.10%	87.30%	83.00%	82.50%	↻	65.00%	
	Customer Satisfaction	First Contact Resolution				99.99%	99.99	↻		
		Billing Accuracy				100.00%	99.99%	↻	98.00%	
		Customer Satisfaction Survey Results				'A' Rating	A			
Operational Effectiveness Continuous improvement in productivity and cost performance is achieved, and distribution delivers safe, reliable and quality objectives.	Safety	Level of Public Awareness					85.00%			
		Level of Compliance with Ontario Regulation 22/04	C	C	C	C	C	↻		C
		Serious Electrical Incident Index	0	0	0	0	0	↻		0
	System Reliability	Number of General Public Incidents Rate per 10, 100, 1000 km of line	0.000	0.000	0.000	0.000	0.000	↻		0.000
		Average Number of Hours that Power to a Customer is Interrupted ³	0.70	1.00	2.67	0.64	1.08	↻		1.20
		Average Number of Times that Power to a Customer is Interrupted ²	1.30	1.43	2.35	1.33	1.36	↻		1.45
	Asset Management	Distribution System Plan Implementation Progress				Behind Plan	Behind Plan			
	Cost Control	Efficiency Assessment		3	3	3	3			
		Total Cost per Customer ³	\$571	\$593	\$624	\$634	\$646			
		Total Cost per Km of Line ³	\$26,301	\$27,417	\$28,714	\$29,241	\$29,524			
Public Policy Responsiveness Distributors deliver on obligations mandated by government (e.g., in legislation and in regulatory requirements imposed further to Ministerial Directives to the Board).	Conservation & Demand Management	Net Cumulative Energy Savings ⁴					18.16%			85.00 GWh
	Connection of Renewable Generation	Renewable Generation Connection Impact Assessments Completed On Time	100.00%	100.00%	100.00%	100.00%	100.00%			
		New Micro-embedded Generation Facilities Connected On Time			100.00%	100.00%	100.00%	↻	90.00%	
Financial Performance Financial viability is maintained, with savings from operational effectiveness and innovation.	Financial Ratios	Liquidity: Current Ratio (Current Assets/Current Liabilities)	2.08	3.00	2.32	0.76	2.10			
		Leverage: Total Debt (includes short-term and long-term debt) to Equity Ratio	0.62	0.59	0.57	0.51	1.10			
		Profitability: Regulatory Return on Equity	9.85%	9.85%	9.85%	9.36%	9.36%			
		Downside (included in rates) Achieved	9.57%	9.78%	7.60%	8.32%	10.00%			

1. Compliance with Ontario Regulation 22/04 assessed: Compliant (C); Needs Improvement (NI); or Non-Compliant (NC).

2. The trend's arrow direction is based on the comparison of the current 5-year rolling average to the fixed 5-year (2010 to 2014) average distributor-specific target on the right. An upward arrow indicates decreasing reliability while downward indicates improving reliability.

3. A benchmarking analysis determines the total cost figures from the distributor's reported information.

4. The CDM measure is based on the new 2015-2030 Conservation First Framework. This measure is under review and subject to change in the future.

Legend: 5-year trend
 ↻ up ↻ down ↻ flat
 Current year
 ● target met ● target not met

Distribution System Plans

- Every 5 years distributors must file an integrated Distribution System Plan that documents:
 - Asset management strategy
 - Capital investment plans
 - Investments should be paced, prioritized, and optimized
- The Plan should demonstrate how the distributor will serve demand and meet the reasonable expectations of its customers
- The Plan must contain sufficient information to allow the OEB to assess:
 - Whether and how a distributor has planned to deliver value to customers;
 - How the plan supports the effective management of the assets; and
 - How a distributor is seeking to control the costs and related rate impacts of proposed investments
- The Plan must reflect any investments arising from the Regional Planning process

Distribution System Plans

The DSP is expected to have the following characteristics:

- Includes all assets, both system assets and general plant
- Underpinned by an asset condition assessment
- Linked directly to the proposed budget included in the rate application
- Integrates considerations of conservation, smart grid, renewable generation connection, regional planning, and any relevant public policies
- Demonstrates how the utility has planned to deliver value to current and future customers
- Demonstrates how the plan supports the effective management of the assets
- Demonstrates how the plan is optimized (by considering alternatives, capital vs maintenance or operating solutions, the use of conservation to defer investments, the use of new technologies, etc.) and how projects are prioritized and paced to recognize potential rate impacts

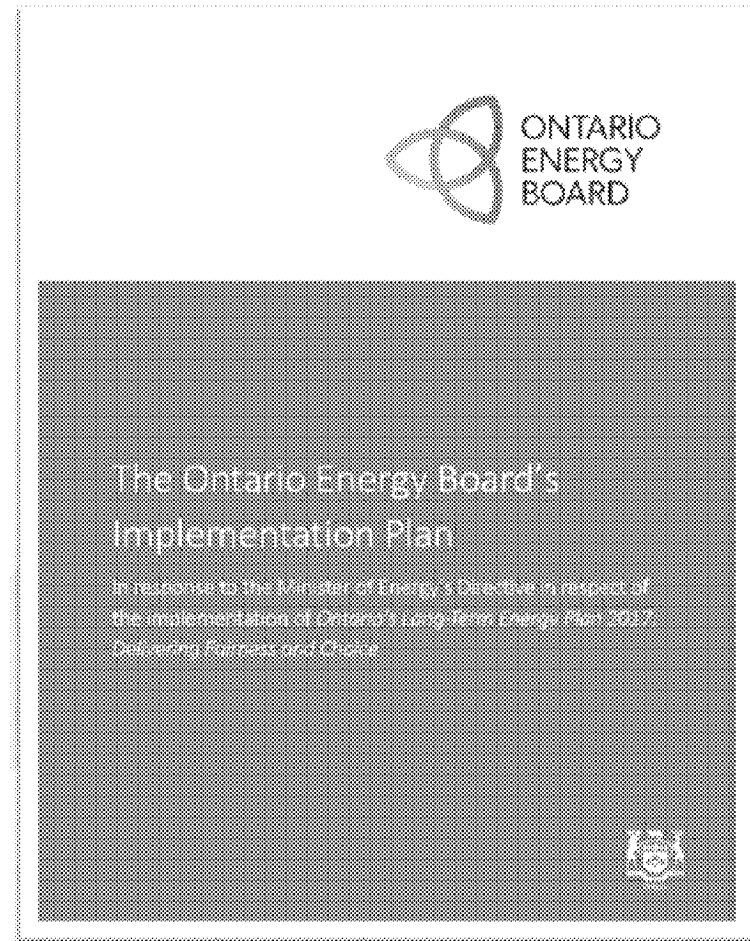
Distribution Rate Design

- Ontario's distributors are currently transitioning from volumetric to fully fixed distribution rates for residential customers
- The OEB is also developing new rate design for commercial and industrial customers
- New rate design will:
 - Remove any disincentive for utilities to promote conservation, net metering, and other behind-the-meter technologies in line with public policy
 - Provide greater revenue stability for distributors, position them for technological change, and help with their investment planning
 - Enable customers to leverage new technologies, manage costs through conservation, and better understand the value of distribution services
 - Recover costs of distribution service fairly and protect non-participants from cost shifting as a result of increased net-metering

Grid Modernization & Distributed Energy Resources

Long-Term Energy Plan – Implementation Plan

- On October 26, 2017, the Government released Ontario's Long-Term Energy Plan 2017: Delivering Fairness and Choice
- An Implementation Directive was issued by the Minister of Energy to the OEB on the same date
- In accordance with the Directive, the OEB submitted an Implementation Plan to the Minister on January 31, 2018
- The Plan was approved by the Minister of Energy on February 15, 2018





Grid Modernization

Smart Meter Implementation

- In April 2004, government announced an objective to transition all low-volume customers to smart meters and TOU pricing
 - By 2012, nearly all low-volume customers were paying TOU prices
- Government established technical specifications for smart meters to promote consistency among distributors
 - Initially 6 distributors procured and installed smart meters
 - Once the OEB reviewed and approved costs associated with the initial procurement other distributors largely used same vendors/meters
- Government established the Smart Metering Entity (IESO) to manage and validate all meter data for billing purposes

Grid Modernization

- The OEB has a legislated objective to facilitate the implementation of the smart grid
- 2010 Minister's Directive to the OEB established 24 specific policy objectives of smart grid
 - **Policy** - efficiency, customer value, co-ordination, interoperability, security, privacy, safety, economic development, environmental benefits and reliability
 - **Customer Control** - access, visibility, control, participation in renewable generation, customer choice and education
 - **Power System Flexibility** - distributed renewable generation, visibility, control and automation and quality
 - **Adaptive Infrastructure** - flexibility, forward compatibility, encourage innovation and maintain pulse on innovation

Grid Modernization

- OEB Policy in response to Minister's Directive:
 - For regulatory purposes, no distinction between “smart grid” investments and “traditional” investments
 - Meter is the demarcation point; distributors may not provide behind-the-meter services and technologies as part of their regulated business
 - Maintain separation between monopoly and competitive services
 - Distributors may continue to engage in behind-the-meter activities specifically exempted in legislation (e.g. conservation)
 - Specific findings / expectations regarding each of the 24 objectives

*For more details see *Report of the Board: A Renewed Regulatory Framework for Electricity; and Supplemental Report on Smart Grid*

Grid Modernization and LTEP IP

- The 2017 LTEP calls for clear and even investment in grid modernization
- The OEB is identifying regulatory reforms to advance cost-effective innovation and modernization of Ontario's electricity sector
- Focus of reforms on the ways utilities are remunerated to encourage utilities to pursue optimal, least-cost investment decisions, including those enabled by grid modernization. Other considerations will include:
 - Non-wires solutions; operational measures to defer capital
 - Active system management and customer participation
 - Energy efficiency measures on distribution systems
 - Tools that could support more shared services among distributors

Enabling Distributed Energy Resources & Innovation

Supporting Non-Traditional Investments

- Distributors may apply to the OEB for funding through distribution rates to pursue various programs:
 - CDM programs
 - Demand response programs
 - Energy storage programs
- Programs for reducing distribution losses for the purpose of deferring the capital investment for specific distribution infrastructure

Connecting Renewable Generation

- Distributors have been expanding and upgrading their networks to connect renewable generators
- In 2010 the OEB established a policy to allocate the costs of these investments based on where the benefits accrue:
 - Once the OEB has approved the costs associated with connecting renewable generation a calculation is used to determine the amounts to be recovered from:
 - the **distributor's customers** (collected through the distribution rate); and
 - all **provincial ratepayers** (collected by the IESO and remitted to the distributor)
 - Hydro One performed a detailed analysis to determine the benefits to a) their customers and b) the province; the OEB approved Hydro One's approach and allowed other utilities to use it (instead of performing their own analysis):
 - **Network Expansions** = 94% provincial recovery + 6% distributor customer recovery
 - **Renewable Enabling Improvements** = 83% provincial recovery + 17% distributor customer recovery

Net Metering

- Net metering policy is established by the Government
- To support government policy and prepare for expected increased customer interest in net metering, the OEB is examining:
 - The availability of information on net metering
 - 'Standardizing' net metering applications and agreements to improve process efficiency
 - Data reported to the OEB on net metering activity
 - The maximum cumulative generating capacity from net metered generators
 - Distributor administrative costs related to net metering

Example of Distributor Innovation

- Toronto Hydro deferring investment in conventional infrastructure:
 - Using storage to relieve capacity constraints in a congested part of the system
 - Using local demand response program to defer Cecil TS upgrade*
- Cost recovery for this type of storage investment is the same as any other distribution asset



*See EB-2014-0116

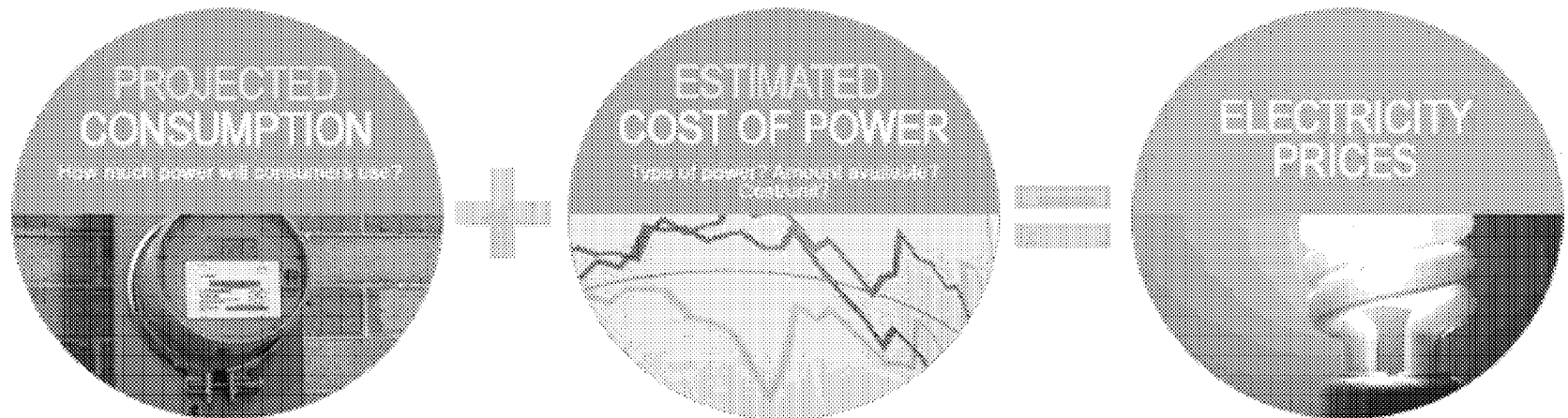
Distributed Energy Resources & LTEP IP

- LTEP emphasizes the need to accelerate modernization of Ontario's electricity system and DERs are identified as important vehicles for achieving this
- OEB examining ways to encourage the efficient placement and operation of DERs, particularly when they can supplant traditional investments, while ensuring long-term value
- Result will be a compensation framework that enables innovative investments to move forward when it is economic to do so.
- In developing these reforms, the OEB will also consider:
 - Frameworks for assessing and allocating the benefits and costs of DER investments
 - How to encourage DERs that can provide incremental value to consumers and the system
 - How diffuse benefits and multiple value streams can be appropriately recognized
 - Roles of distributors and others, including the potential for customer involvement

Smart Meters and Time of Use Pricing

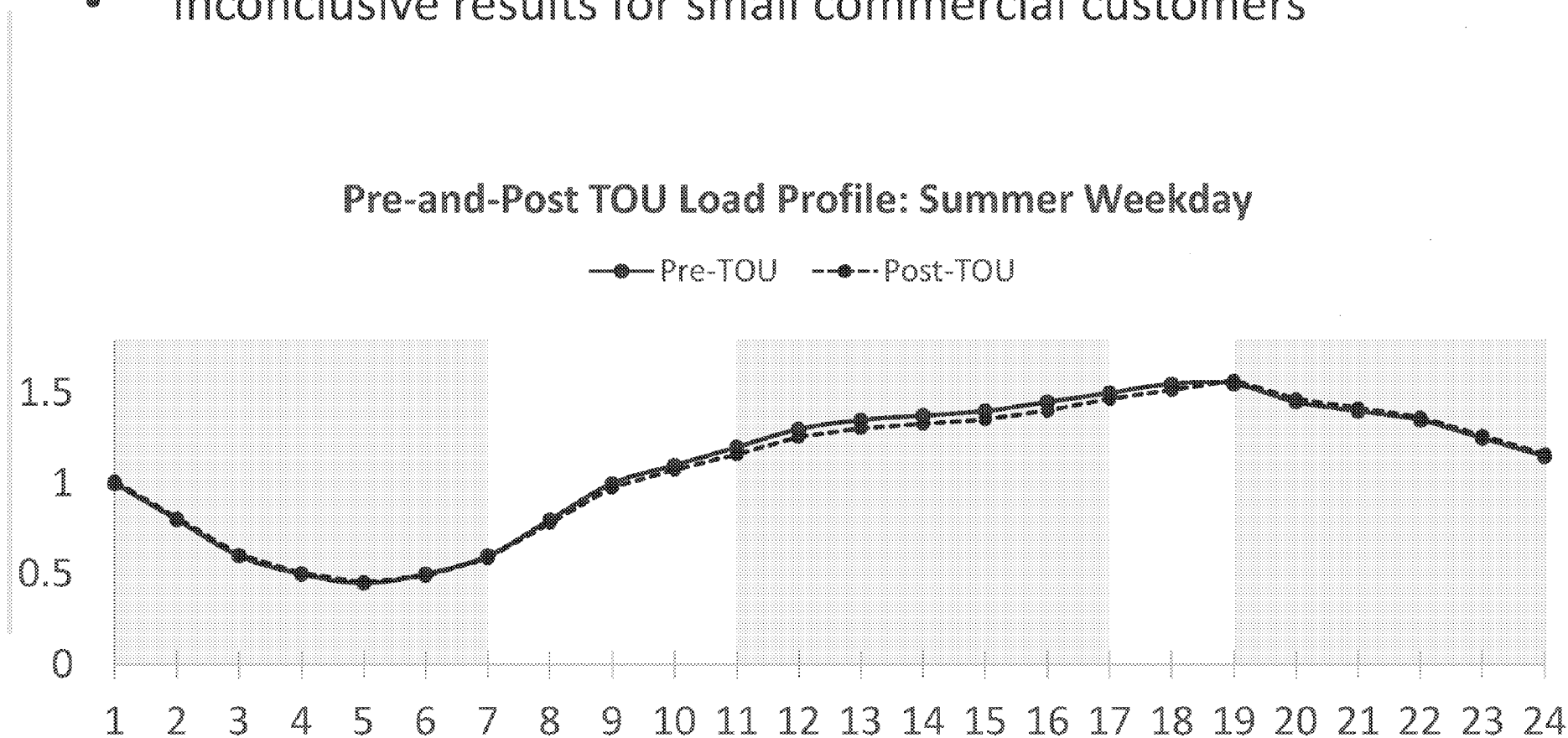
Regulated Price Plan for Supply

- The OEB administers the Regulated Price Plan for low-volume customers
- The OEB's authority and responsibility for setting RPP pricing is set out in legislation, regulation, and the OEB's own codes
- About 5 million residential and low-volume business consumers are eligible
- Prices are set on a forecast basis – using projections of costs and energy demand



Assessing the Effectiveness of TOU (1 of 2)

- 3.3% reduction in summer on-peak residential consumption
- Inconclusive results for small commercial customers



Source: Navigant Analysis

Assessing the Effectiveness of TOU (2 of 2)

- Lack of understanding about the electricity system in Ontario
- Consumers do not understand the charges on their electricity bills

Figure S4. Overview of Main Findings

Behavioural Intervention Points	Experimental Results
1. Unit of Price	Cents perform better on measures of clarity
2. Naming Schema	Price focused names = ↑ recall
3. TOU Visuals	Linear TOU visuals = ↑ recall & understanding
4. Peaksaver Plus offer	No significant difference
5. Price Clarity	Salient visuals + fix charges on the back = ↑ recall + comp
6. Pricing Extremes	5:1 ratio = ↑ control + recognition of peak consumption
7. Consumption: Visual	Vertical bars with salient comparisons = ↑ comprehension
8. Consumption: Benchmarks	Historical data, negative affect = ↑ Intent to conserve
9. Pledge	Multiple options, social pledges = ↑ intent to shift to off peak

Source: BEworks Analysis

RPP Pilots: Overview

- 5 projects in distinct territories across Ontario that will test 13 new price plans on approximately 20,000 customers
- Approved pilots to be in place between early & mid-2018, and run for a year
- Final results expected starting Q3 2019 but timing will depend on actual start dates
- Focus on price and non-price (feedback, automation) applications