ONTARIO ENERGY BOARD

Electricity Regulation in Ontario

Presentation to Chilean Delegation

Wednesday October 18, 2017

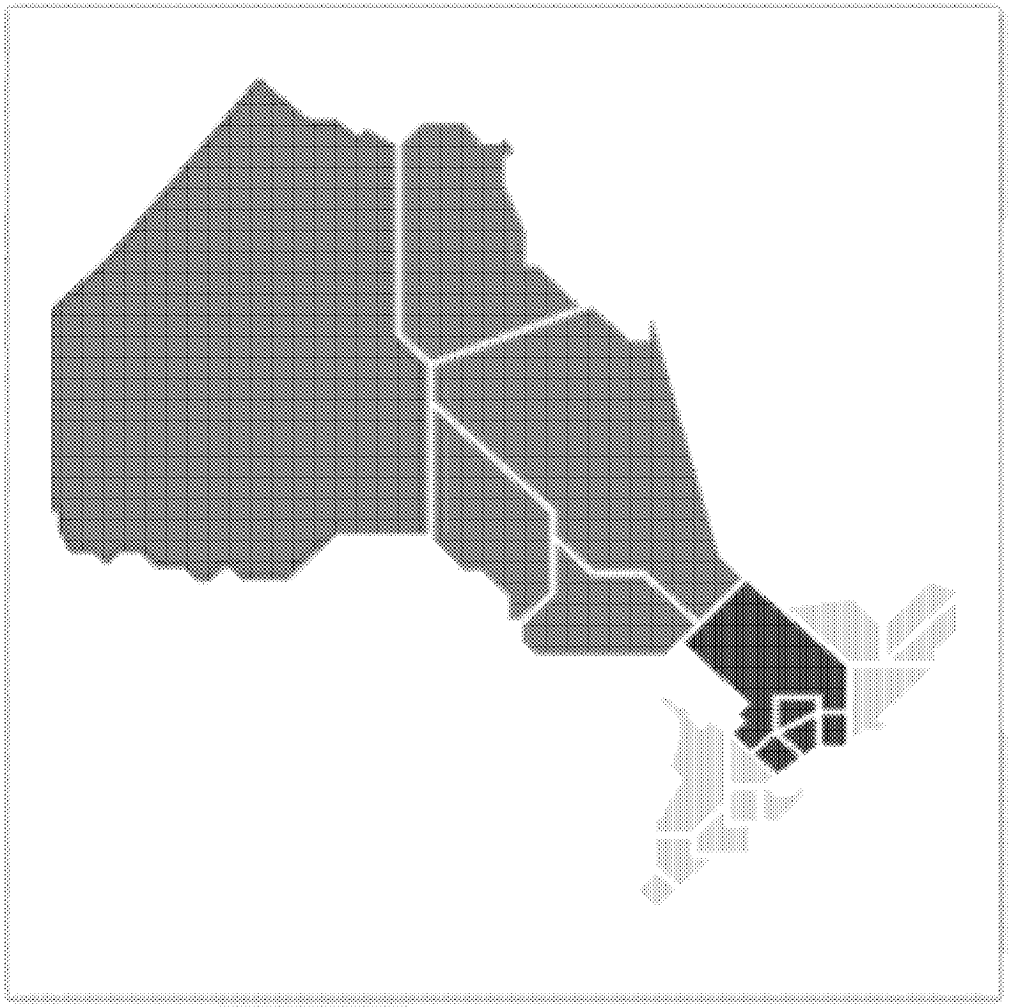
Overview

- Ontario's Electricity Sector
- Electricity Regulation
- Distribution Rates and Policies Regarding Distributed Energy Resources
- Smart Meters and Time of Use Pricing

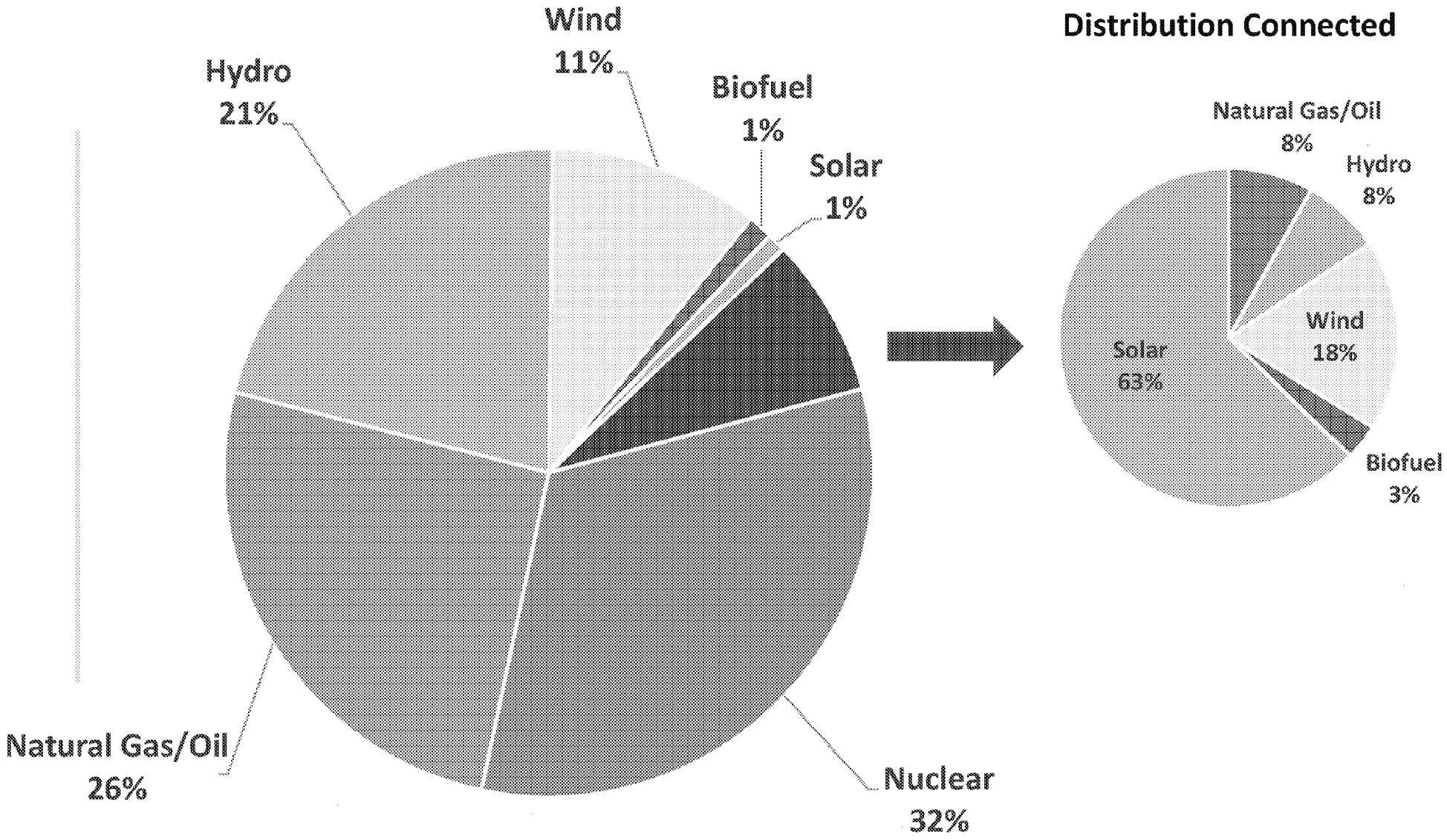
Ontario's Electricity Sector

Ontario Snapshot

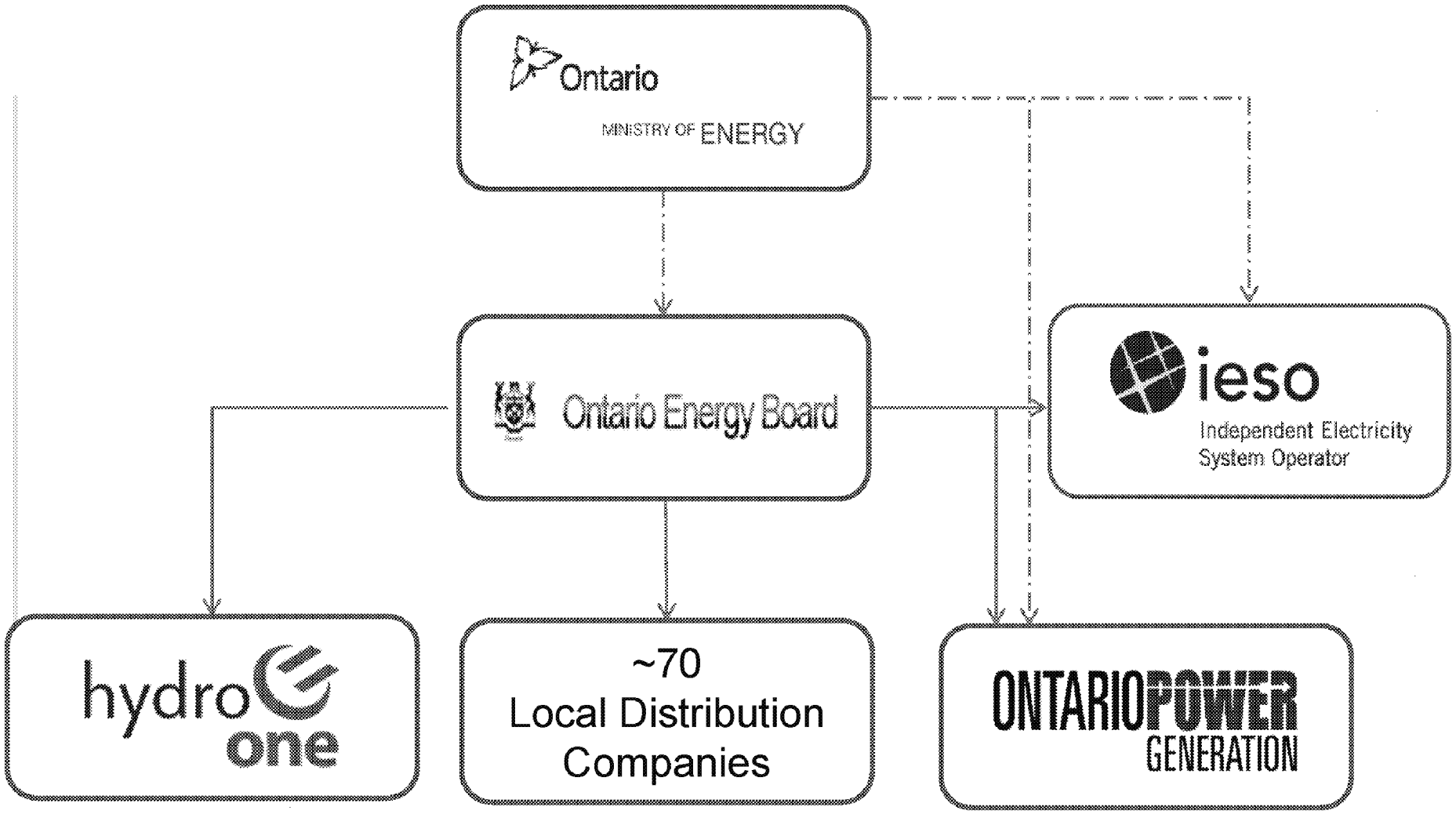
Area:	1,076,395 km²
Population:	~13.5 million
GDP (2016):	$763.2 billion (38% of Canada's GDP)
Electricity Customers:	~5 million
Total Demand (2016):	137 TWh
Peak Demand (2016):	23,213 MW (on September 7, 2016)



2017 Installed Capacity



Key Players


Ontario
MINISTRY OF ENERGY
Ontario Energy Board
ieso
Independent Electricity System Operator
hydro one
~70
Local Distribution Companies
ONTARIO POWER GENERATION

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

- 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 (~45% of Ontario's total installed capacity)
- 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
- 2016 weighted HOEP = **1.66** cents/kWh
- Estimated 2016 GA rate as of December 31, 2016 = **9.66** cents/kWh

Electricity Supply Rates

Declining Retail Market; Heavily Subscribed Regulated Price Plan

- ~4.9M low-volume consumers, mostly residential, are eligible for the RPP
- A little more than 40% of Ontario consumption subject to RPP prices
- Less than 1 in 10 RPP-eligible customers have signed a retail contract

Options for Low-Volume Consumers

Option 1 – Regulated Price Plan	Option 2 – Retail Contract
• Default rate for low-volume consumers* • A stable and predictable rate that recovers cost of market/contracted supply • GA is blended into the RPP rate	• A guaranteed fixed rate offered by competitive electricity retailers • GA is added to the retailer's rate

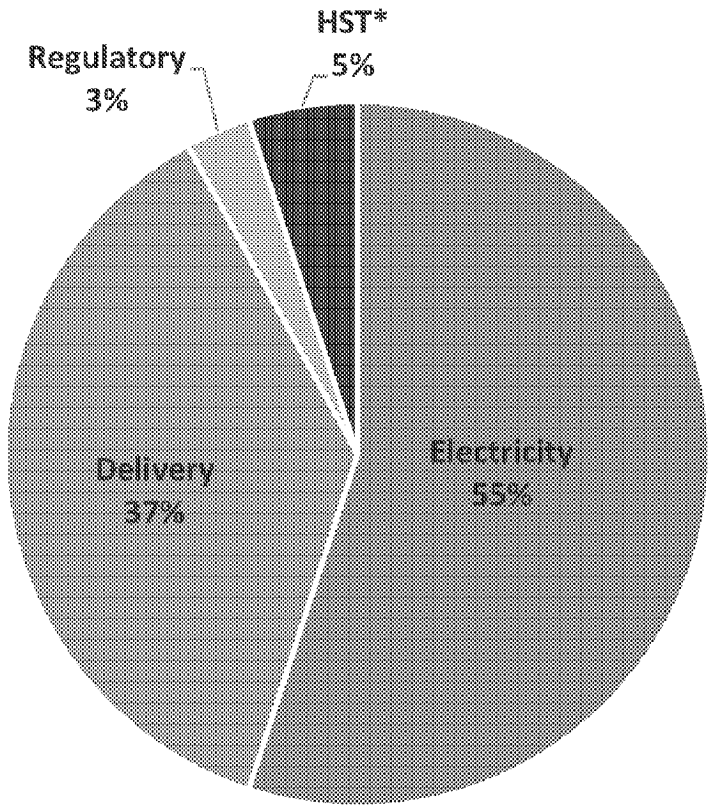
*Commercial & industrial customers pay the market price (HOEP + GA) unless they sign a contract with a retailer / wholesaler

Ontario's Unbundled Electricity Bill

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

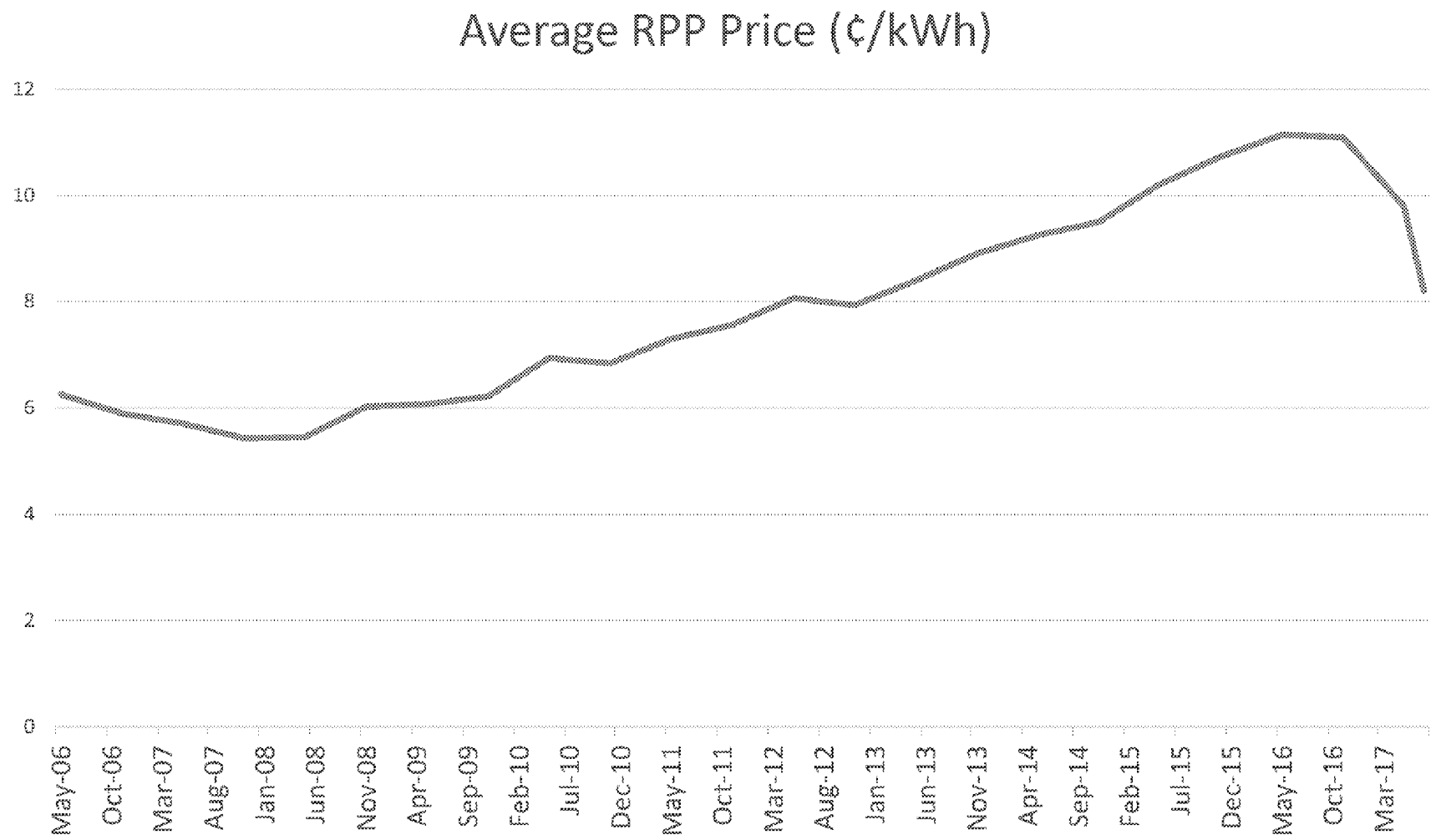
1. **Electricity Commodity**
   - OEB sets the Regulated Price Plan (RPP) rate to recover actual costs but does not control all cost components within it; we only set rates for Ontario Power Generation (OPG)
2. **Delivery (fully regulated)**
   - Distribution – 22% - OEB sets rates for ~70 LDCs
   - Transmission – 7% - 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 $110 / month



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

Historical Electricity Prices*

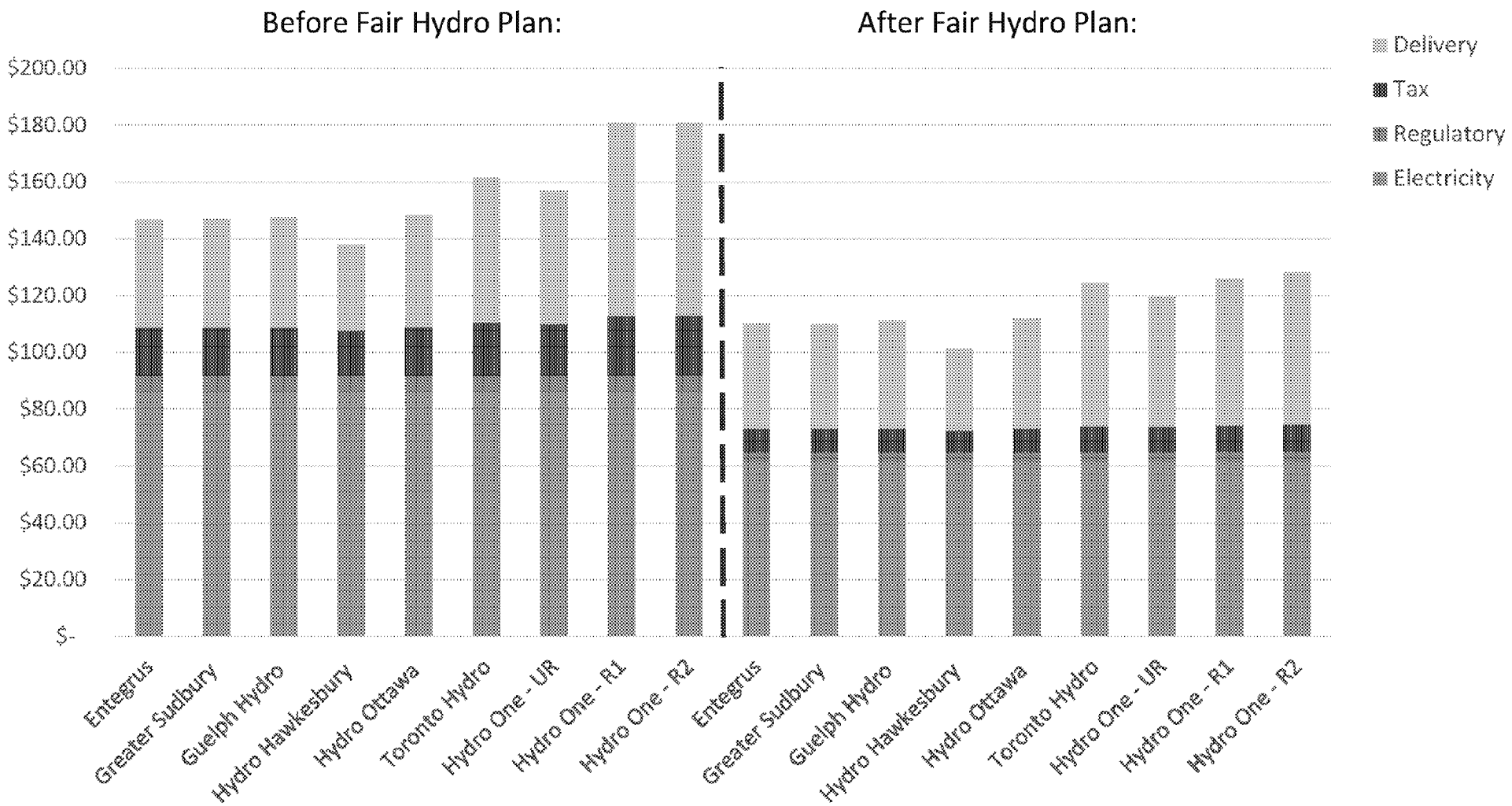


*For low-volume customers

Fair Hydro Plan

- The Government lowered electricity bills by 25 per cent for the typical residential customer and is holding rate increases to the rate of inflation for four years; small businesses and farms also benefit
- People with low incomes, those served by distributors with the highest distribution costs, and On-Reserve First Nation households receive greater reductions
- These measures came into effect July 1, 2017 and will cost the government up to $2.5 billion over the next three years
- Bill reductions are being provided by:
  - Spreading the cost of electricity investments over a longer period of time
  - Funding certain costs through taxes instead of electricity rates

Residential Bills by Distributor*



*Not all distributors shown

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

Distribution Rates and Policies Regarding Distributed Energy Resources

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	• 5-year customized plan • Generally combines CoS and IRM elements in multi-year plan • 5-year Distribution System Plan • Rate updating can be customized to reflect needs and plans of customer • 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	Target: Distributor
Customer Focus Services are provided in a manner that responds to identified customer preferences	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		99.90%	98.70%	99.50%	100.00%	91.70%	↓	90.00%	
		Telephone Calls Answered On Time		66.20%	68.10%	67.30%	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 distributors deliver on system reliability and quality objectives	Safety	Level of Public Awareness						85.00%			
		Level of Compliance with Ontario Regulation 22/04 [1]		C	C	C	C	C	→		C
		Serious Electrical Incident Index	Number of General Public Incidents	0	0	0	0	0	→		0
			Rate per 10, 100, 1000 km of line	0.000	0.000	0.000	0.000	0.000	→		0.000
	System Reliability	Average Number of Hours that Power to a Customer is Interrupted [3]		0.78	1.68	2.67	0.64	1.68	↑		1.29
		Average Number of Times that Power to a Customer is Interrupted [3]		1.39	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			
		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	$29,534			
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%			65.00 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 and sustainable cost performance is achieved	Financial Ratios	Liquidity: Current Ratio (Current Assets/Current Liabilities)		2.09	3.08	2.32	0.78	2.10			
		Leverage: Total Debt (includes short-term and long-term debt) to Equity Ratio		0.62	0.59	0.57	0.91	1.10			
		Profitability: Regulatory Return on Equity	Deemed (included in rates)	9.85%	9.85%	9.85%	9.36%	9.36%			
			Achieved	9.57%	9.76%	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 2015-2020 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.

Regional & Integrated Resource Planning

- There are 21 electricity regions across the province, divided based on electrical infrastructure boundaries
- At least every 5 years, the IESO, utilities, and stakeholders assess each region's needs
- When a need for new infrastructure is identified, a scoping assessment is performed to identify which planning approach is best:
  - Integrated Regional Resource Plan
    - Stakeholders work together with the IESO and utilities to develop the plan
    - Conservation, generation, transmission, distribution, and/or innovative resources are identified to meet the region's needs
  - Regional Infrastructure Plan
    - Affected transmitter and distributors develop the plan
    - Transmission and/or distribution solutions are identified to meet the region's needs

Allocating Costs to Support Regional Planning

- OEB is currently developing new rules for allocating costs of certain transmission investments
- The OEB's new policy is guided by the following principles:
  - Optimal Infrastructure Solution – proposed investments should meet regional needs at the lowest cost
  - Beneficiary Pays – all those who benefit from the asset(s) should pay, costs should be allocated based on customers' proportional use of the asset(s)
  - Open, Transparent and Inclusive – the process for assessing and allocating costs among beneficiaries should be transparent and include all affected parties
- Proposed investments would be assessed on a case by case basis to determine appropriate allocation of costs between the customer that 'triggered' the need for the investment, and all provincial ratepayers who benefit from it

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*

Connecting Renewable Generation

- Distributors have been expanding and upgrading their networks to connect renewable generators
- 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; recently, policy changes were introduced to allow customers with renewable generation *who also own storage systems* to participate in net-metering
- To support government policy and prepare for increased net-metering activity the OEB is developing new rules that will:
  - Improve the availability of information on net metering
  - Improve process efficiency by 'standardizing' net metering applications and agreements
  - Enhance data reported to the OEB on net metering activity
  - Change the maximum cumulative generating capacity from net metered generators
    - Currently, distributors must allow net-metering on a first come first serve basis until total net-metered capacity equals 1% of distributor's annual maximum peak load, after that, further net-metering arrangements are at the distributors' discretion
  - Manage and recover distributor administrative costs related to net metering

Electricity Storage

- In 2014, an OEB working group identified potential regulatory issues that might be encountered for the following storage scenarios:
  - Stand-alone (and non-Dx/Tx owned) with IESO contract to provide ancillary or non-ancillary services
  - Load customer-owned, behind-the-meter storage facility where storage energy is used for net-metering or load-displacement generation
  - Dx/Tx owned/operated/contracted storage, exclusively used as system asset; no participation in markets
  - Dx/Tx owned/operated/contracted storage, no rate-basing and not deemed system asset; recovery entirely through ancillary/non-ancillary services/merchant
  - Merchant storage facility (i.e. no contract with IESO), engages in price arbitrage and/or bilateral contract(s) with market participants
- Pursuant to Minister's Directive the IESO procured 50 MW of storage to provide ancillary services
  - In addition to spurring use of storage in Ontario, operational data is expected to inform whether and how the regulatory framework may be adjusted to accommodate storage

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

Integrated 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

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

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

Optimizing Investment Decisions

- The OEB is assessing the need for regulatory reforms which encourage optimal investment decisions and support the evolution of the sector including:
  - Pricing of network services;
  - Infrastructure planning;
  - Incentives for distributors and transmitters;
  - Incenting more efficient and effective investment by changing the way LDCs earn a return; and
  - Other features of the Renewed Regulatory Framework
- In the first phase of this project the OEB will develop a preliminary set of options and roadmap for any regulatory reforms needed to address the implications of technological innovation in the Ontario energy sector

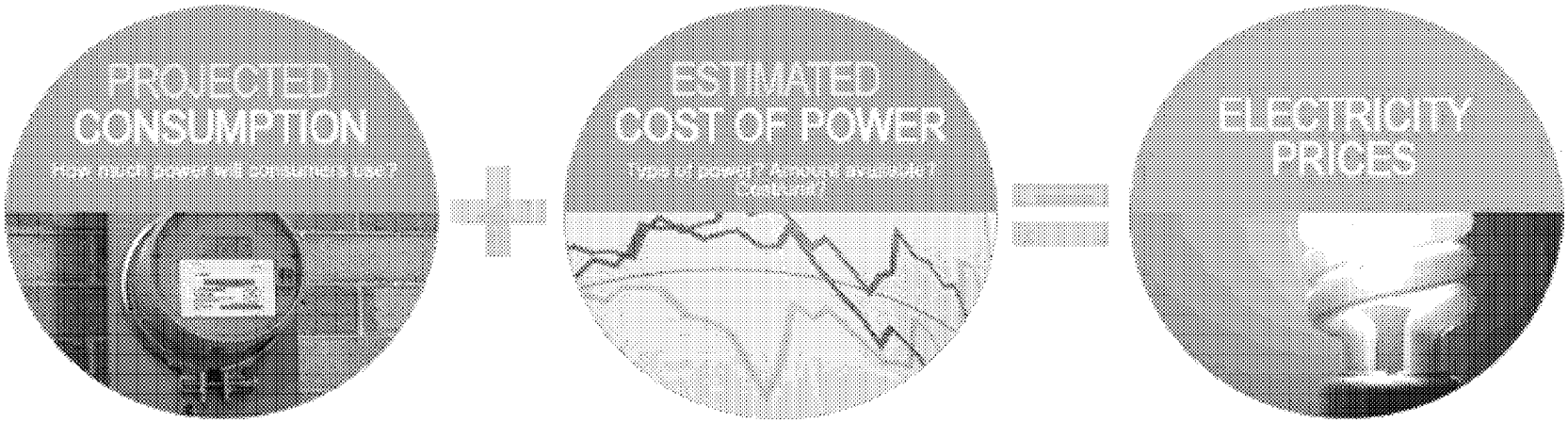
Smart Meters and Time of Use Pricing

Smart Meter Implementation

- 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

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 4.9 million residential and low-volume business consumers are eligible
- Prices are set on a forecast basis – using projections of costs and energy demand



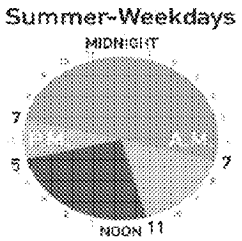
Impacts of TOU Pricing

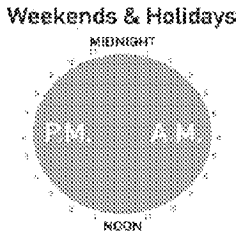
OEB commissioned studies to assess:

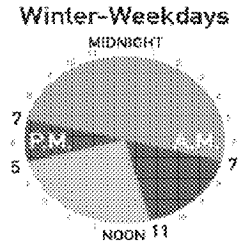
- The impact of TOU rates and how TOU could be improved through structural changes
- Consumer awareness and understanding of existing TOU and opportunities to improve consumer response to existing TOU

Key findings:

- TOU works but can be improved:
  - Residential customers are shifting consumption, but the magnitude of the shift diminishes over time
  - Commercial customers are shifting less but conserving more than residential customers; businesses mentioned most often that they cannot control their hours of operation to meet the TOU schedule
- We need to communicate it better:
  - Consumers displayed confusion and a lack of understanding about Ontario's electricity system and the charges on their bills
  - Awareness of TOU pricing is high but comprehension of the scheme is low







Testing New TOU Options

The OEB is partnering with utilities to test alternative TOU structures:

- Experimental pricing priorities include
  - Critical peak pricing (CPP) – high prices concurrent with high load system conditions
  - Enhanced TOU – greater price spreads
  - Seasonal Time of Use – flat rates in shoulder seasons
- Experimental non-pricing priorities include
  - Information provision and behavioural feedback
  - Automatic load control and information displays, especially in concert with CPP