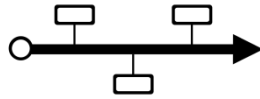




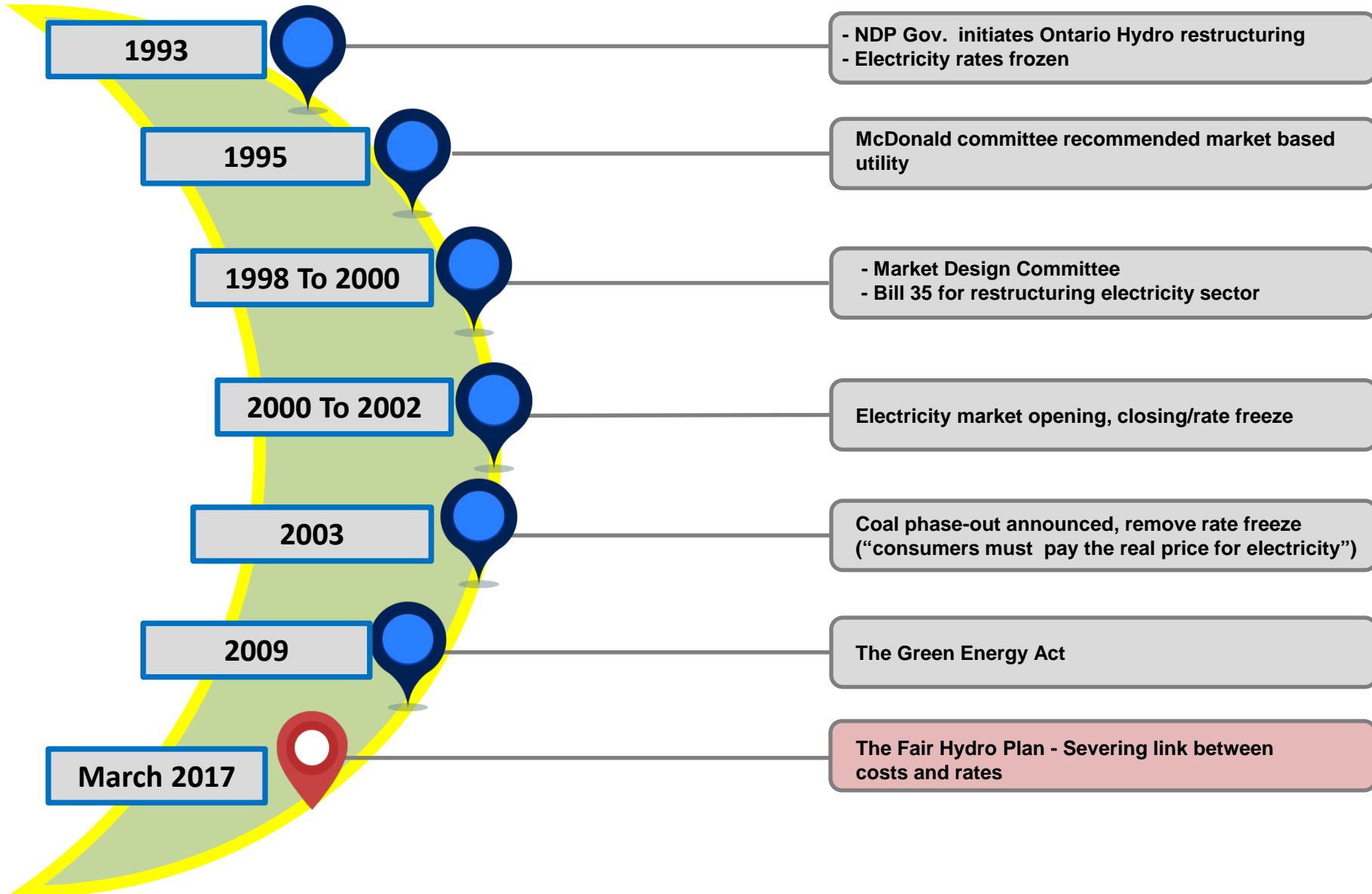
Dynamic Energy Pricing Pilots

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Ontario Electricity Market Background



- Time of Use pricing has been implemented across all residential and small business customers in Ontario since 2009.
- To date, Ontario has not experienced the amount of load shifting initially expected (59 MW vs. 308 MW of peak demand savings in 2014).^{1,2}
- The difference between Ontario’s on-peak and off-peak rates has increased over the years, but still does not provide enough financial incentive to motivate many customers to shift usage.

YEAR	On-Peak (¢/kWh)	Mid-Peak (¢/kWh)	Off-Peak (¢/kWh)	On/Off Peak Price Differential (¢/kWh)
2010	9.9	8.0	5.3	4.6
2012	11.7	10.0	6.5	5.2
2014	13.5	11.2	7.5	6.0
2016	18.0	13.2	8.7	9.3

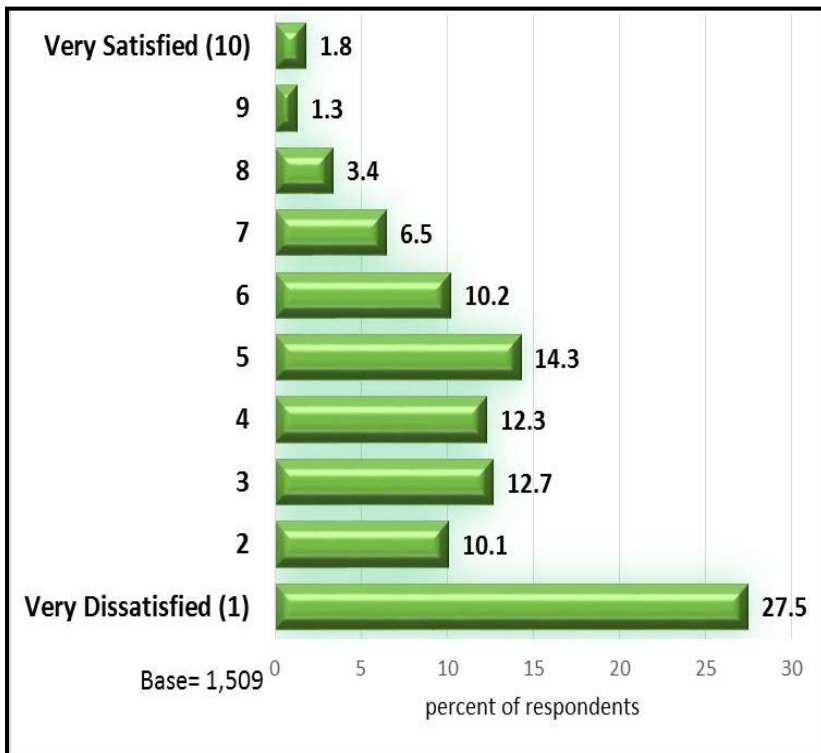
Table 1: Variations in Time-of-Use Rates (2010 – 2016)

1: 2011-2014 LDC-OPA Province-wide Programs: Portfolio Roll-up Forecast 1 Presentation to EDA CDM Caucus. April 27, 2010

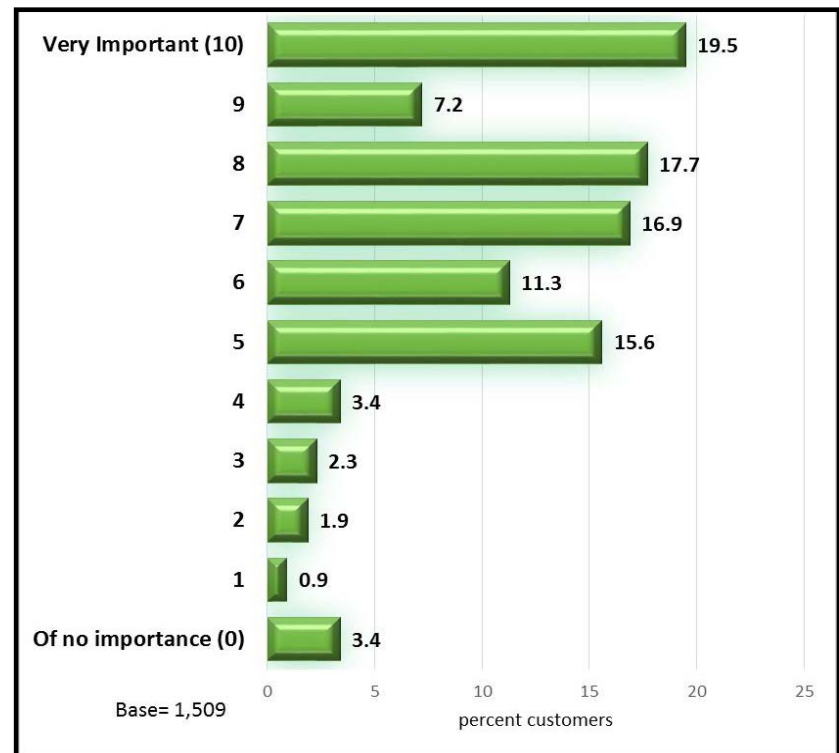
2 : IESO 2011-2014 Conservation Results Report

- Overall, electricity rates have been steadily rising and customers are looking to the utility to offer ways to lower their bill – including the ability to choose a rate plan that suits their lifestyle.
- In 2015, Hydro One partnered with leading energy economics experts at McMaster University to test how residential customers would respond to a variety of alternative rate structures and enabling technologies.
- Pre-pilot surveys (2015) show that customers are looking for options and control over their electricity charges.

Overall, how satisfied or dissatisfied are you with the pricing of electricity?



How important is it to your satisfaction with electricity to have different pricing plans available among which you can choose?

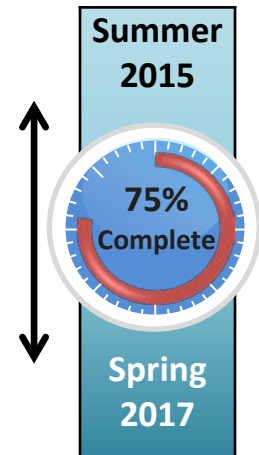




- Hydro One has launched 2 phases of the Pricing Pilots.

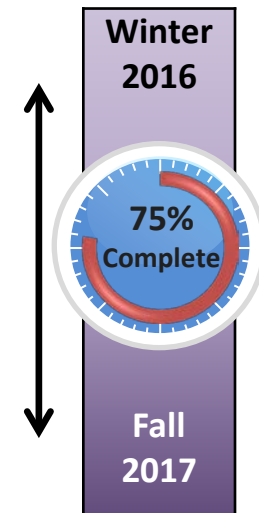
- Phase 1 (Dynamic Pricing with IHD)

- 1,100 customers
- Launched Summer 2015
- Information Technologies: IHD & Plotwatt Energy Disaggregation Portal
- Final Report: Spring 2017



- Phase 2 (Same as Phase 1 + Smart Thermostat)

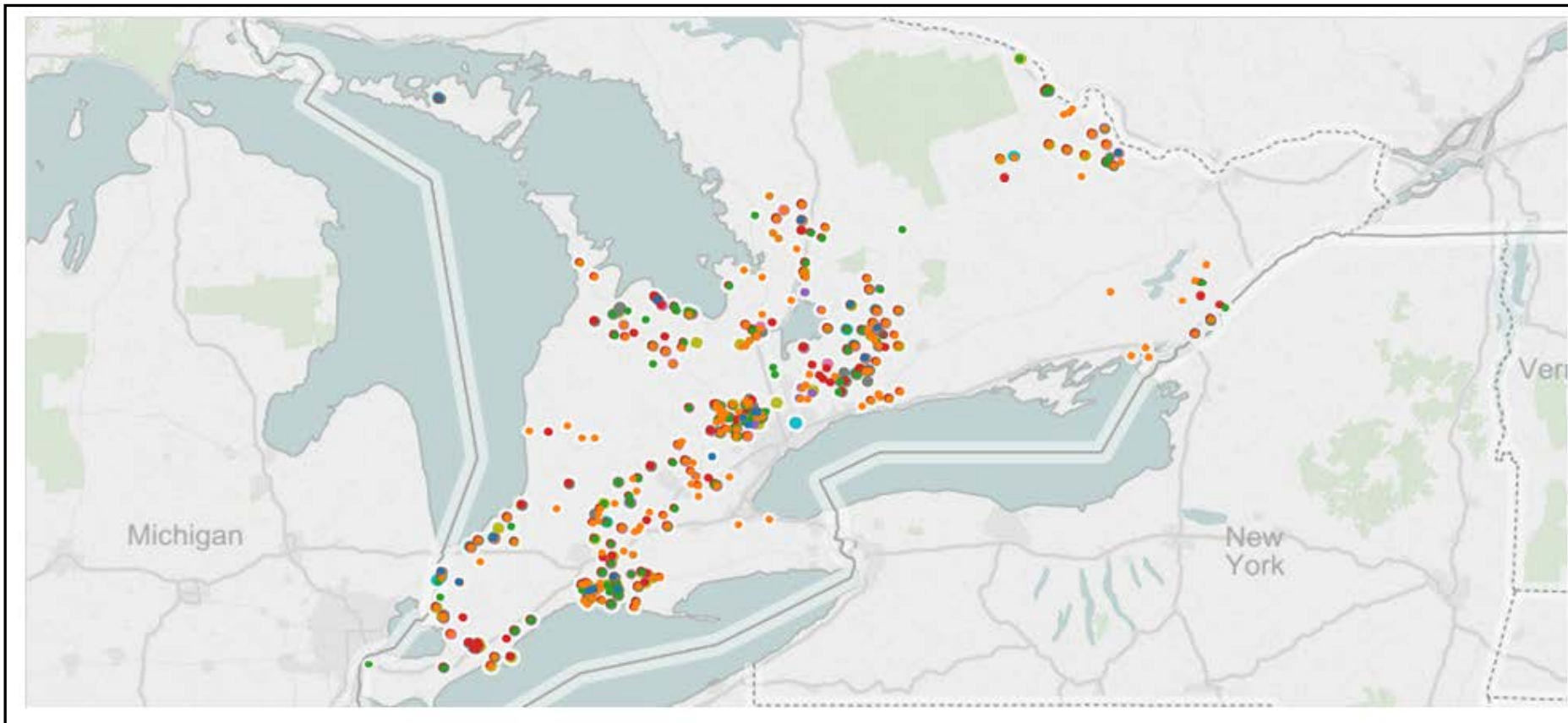
- 350 Customers
- Launched Winter 2016
- Information/Enabling Technologies: IHD, Plotwatt & Energate Wi-Fi Connected
- Thermostat
- Final Report: Fall 2017





Participant Map

- Pilot participants are spread across western, central and eastern Ontario in Hydro One's service territory





Assess consumer appetite for 4 alternative rate structures:

- **Time of Use (TOU) – 6 rates**
 - 2 and 3 bucket TOU rates
 - Price differential far greater than provincial TOU rate
- **Critical Peak Pricing (CPP) - 1 rate:**
 - Low all-in off-peak rate (15 ¢/kWh) and critical peak rate (~48 ¢/kWh)
 - Customer receives notice when CPP rate to be activated (max of 15-20 times per year for 4 hour weekday afternoon period)
- **Variable Peak Pricing (VPP) - 3 rates:**
 - Low all-in off-peak rate (15 ¢/kWh) and variable peak rate that can vary with system peak load (i.e., 48-81 ¢/kWh)
 - Preset maximum number of days (10-25) per year that each peak rate can be applied to
- **Real Time Pricing (RPP) – 2 rates:**
 - Rate changes in 4 hour blocks based on real-time Hourly Ontario Energy Price (HOEP)

-
- Some of the rate treatment groups (**CPP, VPP, RTP**) require providing customers with a notification to inform them when Critical or Real-Time prices will apply.
 - **1 CPP Group:** 10 critical days per year. E-mail notification sent at 4 PM the day before.
 - **3 VPP Groups:** 2 of the VPP rates will have 20 Critical/Super Critical days per year. E-mail notification sent at 4 PM the day before.
1 of the VPP rates will have 35 Critical/Super Critical days per year. Critical day e-mail notification sent by 7 AM the day of.
 - **2 RTP Groups:** Max of 10 days per year when RTP prices will be a “High Price Day” and prices may range between 10.6 ¢/kWh to 85 ¢/kWh. 1 group will receive notification of a High Price Day by 4 PM the day before, while the other group will receive notification by 7 AM the day of.



DEP Rate Details - TOU

Group	Time Period	AM										PM										Fixed Charge						
		12	1	2	3	4	5	6	7	8	9	10	11	12	1	2	3	4	5	6	7		8	9	10	11		
Current TOU Prices - Prices Below are for R1 Customers. UR prices are ~88% and R2 prices are ~113% as shown below																												
Current TOU 0	Summer Weekday	12.9¢/kWh					17.4¢/kWh					22.2¢/kWh					17.4¢/kWh					\$	35.63					
	Summer Weekend	12.9¢/kWh																							\$	35.63		
	Winter Weekday	12.9¢/kWh					22.2¢/kWh					17.4¢/kWh					22.2¢/kWh					\$	35.63					
	Winter Weekend	12.9¢/kWh																							\$	35.63		
TOU Prices - Prices Below are for R1 Customers. UR prices are ~88% and R2 prices are ~113% as shown below																												
TOU 1 R1	Summer Weekday	9.2¢/kWh					54.5¢/kWh																				\$	26.50
	Summer Weekend	9.2¢/kWh																							\$	26.50		
	Winter Weekday	9.2¢/kWh															54.5¢/kWh					\$	26.50					
	Winter Weekend	9.2¢/kWh																							\$	26.50		
TOU 2 R1	Summer Weekday	11.8¢/kWh					54.5¢/kWh																				\$	-
	Summer Weekend	11.8¢/kWh																							\$	-		
	Winter Weekday	11.8¢/kWh															54.5¢/kWh					\$	-					
	Winter Weekend	11.8¢/kWh																							\$	-		
TOU 3 R1	Summer Weekday	6.6¢/kWh					54.5¢/kWh																				\$	39.80
	Summer Weekend	6.6¢/kWh																							\$	39.80		
	Winter Weekday	6.6¢/kWh															54.5¢/kWh					\$	39.80					
	Winter Weekend	6.6¢/kWh																							\$	39.80		
TOU 4 R1	Summer Weekday	3.9¢/kWh					28.8¢/kWh					54.5¢/kWh					28.8¢/kWh					\$	26.50					
	Summer Weekend	3.9¢/kWh																							\$	26.50		
	Winter Weekday	3.9¢/kWh					54.5¢/kWh					28.8¢/kWh					54.5¢/kWh					\$	26.50					
	Winter Weekend	3.9¢/kWh																							\$	26.50		
TOU 5 R1	Summer Weekday	5.0¢/kWh					28.8¢/kWh					54.5¢/kWh					28.8¢/kWh					\$	-					
	Summer Weekend	5.0¢/kWh																							\$	-		
	Winter Weekday	5.0¢/kWh					54.5¢/kWh					28.8¢/kWh					54.5¢/kWh					\$	-					
	Winter Weekend	5.0¢/kWh																							\$	-		
TOU 6 R1	Summer Weekday	3.3¢/kWh					28.8¢/kWh					37.2¢/kWh					28.8¢/kWh					\$	39.80					
	Summer Weekend	3.3¢/kWh																							\$	39.80		
	Winter Weekday	3.3¢/kWh					37.2¢/kWh					28.8¢/kWh					37.2¢/kWh					\$	39.80					
	Winter Weekend	3.3¢/kWh																							\$	39.80		

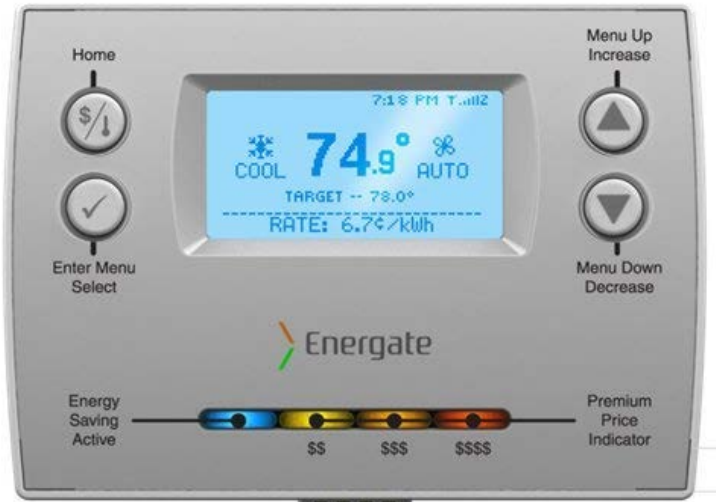


DEP Rate Details – CPP/VPP/RTP

Group	Time Period	AM											PM											Fixed Charge	
		12	1	2	3	4	5	6	7	8	9	10	11	12	1	2	3	4	5	6	7	8	9		10
Critical Peak Pricing (CPP) Prices - Prices Below are for R1 Customers. UR prices are ~88% and R2 prices are ~113% as shown below																									
CPP 7 R1 Max 10 days Critical	Summer Weekday	15.5¢/kWh											20.9¢/kWh					26.50							
	Summer Weekend	15.5¢/kWh																							26.50
	Winter Weekday	15.5¢/kWh											20.9¢/kWh					26.50							
	Winter Weekend	15.5¢/kWh																							26.50
	Summer Critical Day	15.5¢/kWh											48.0¢/kWh					26.50							
Variable Peak Pricing (VPP) Prices - Prices Below are for R1 Customers. UR prices are ~88% and R2 prices are ~113% as shown below																									
VPP 8 R1 Max 15 days Critical, 5 days Critical+	Summer Weekday	15.0¢/kWh											18.8¢/kWh					26.50							
	Summer Weekend	15.0¢/kWh																							26.50
	Winter Weekday	15.0¢/kWh											18.8¢/kWh					26.50							
	Winter Weekend	15.0¢/kWh																							26.50
	Summer Critical Day	15.0¢/kWh											60.7¢/kWh					26.50							
	Summer Critical+ Day	15.0¢/kWh											81.6¢/kWh					26.50							
VPP 9 R1 Max 15 days Critical, 5 days Critical+	Summer Weekday	15.0¢/kWh											18.9¢/kWh					26.50							
	Summer Weekend	15.0¢/kWh																							26.50
	Winter Weekday	15.0¢/kWh											18.9¢/kWh					26.50							
	Winter Weekend	15.0¢/kWh																							26.50
	Summer Critical Day	15.0¢/kWh											48.2¢/kWh					26.50							
	Summer Critical+ Day	15.0¢/kWh											65.0¢/kWh					26.50							
VPP 10 R1 Max 25 days Critical, 10 days Critical+	Summer Weekday	15.0¢/kWh											18.9¢/kWh					26.50							
	Summer Weekend	15.0¢/kWh																							26.50
	Winter Weekday	15.0¢/kWh											18.9¢/kWh					26.50							
	Winter Weekend	15.0¢/kWh																							26.50
	Summer Critical Day	15.0¢/kWh											48.2¢/kWh					26.50							
	Summer Critical+ Day	15.0¢/kWh											65.0¢/kWh					26.50							
Real Time Pricing (RTP) Prices -RTP 1 will receive same day notification, RTP 2 will receive day ahead notification																									
RTP 11 90% low price, 10% high price	Summer Low Price Day	15.3 - 22.5¢/kWh																							-
	Summer High Price Day	10.6 - 85.0¢/kWh																							-
	Winter All Days	23.7¢/kWh																							-
RTP 12 90% low price, 10% high price	Summer Low Price Day	15.3 - 22.5¢/kWh																							-
	Summer High Price Day	10.6 - 85.0¢/kWh																							-
	Winter All Days	23.7¢/kWh																							-



“Energate” Thermostat



Smart thermostat:

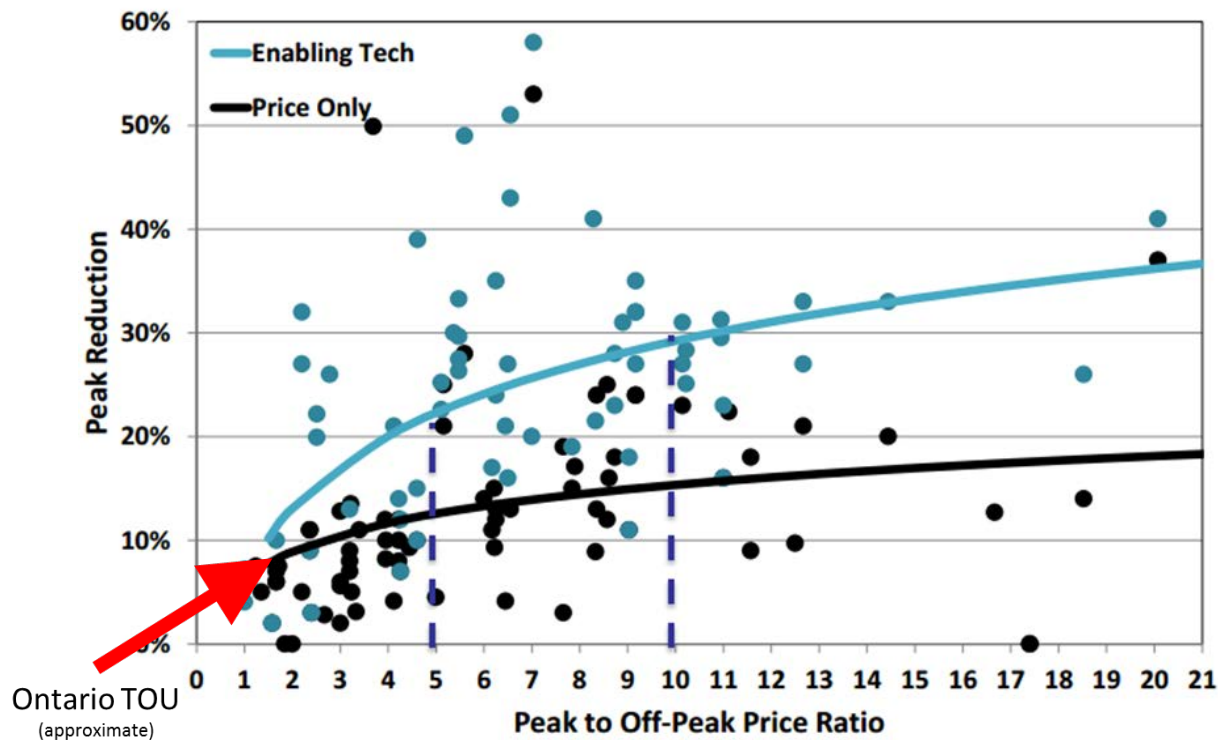
- Advanced user interface
- Load management & bill savings opportunities
- Saves energy by adjusting temperature set-point based on current price and user selected conservation settings

Mobile app:

- Customers have 5 options to adjust thermostat settings from “Maximum Comfort” to “Maximum Savings”.



- Dynamic Pricing plus smart technology = maximum savings
- Enabling technology doubles savings
- To maximize savings 5-10x off-peak to on-peak price ratio is needed
- Final results from Phase 2 (with “Energate” Thermostat) expected in Fall 2017

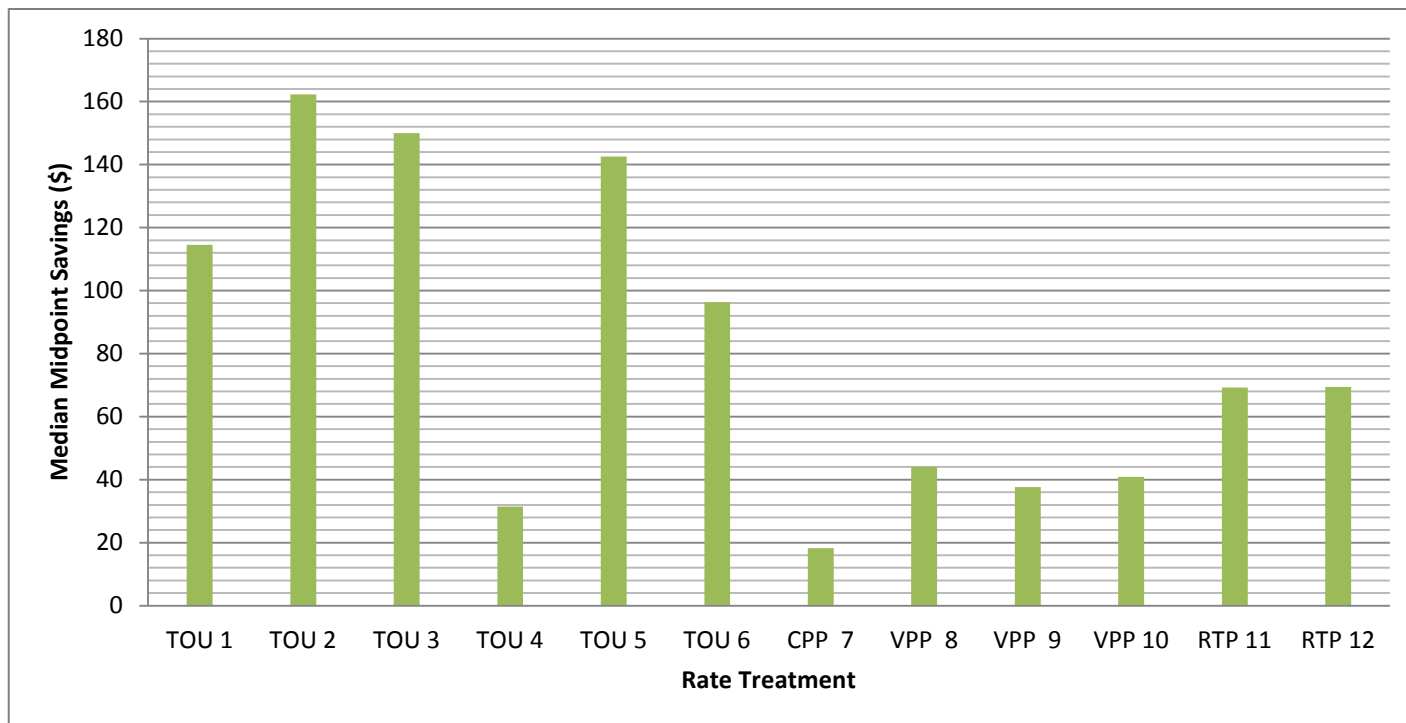


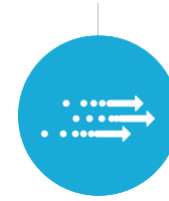
Overall Pilot Results Suggest that:

- About 92% of participants remained on pilots since signing up; first participants retained for 21 months
- Customers with web portals: most popular times of visits are on Mondays & Tuesdays; most common views related to general home usage information, followed by tracking electricity consumption by appliance
- Average bill savings is approximately 7%; average monthly is approximately \$11.00
- Excluding control group, projects have involved 13,700,000 kWh where 9,478,000 kWh have resulted in lower bills and 4,264,000 kWh in higher bills

Midpoint Results by Rate Treatment

- Preliminary results are available for the first 6 months (Aug-15 to Jan-16 and Jun-16 to Dec-16 respectively) of both Phase 1 and 2 participation.
- With 1 exception, TOU rates have provided the most bill savings followed by RTP, VPP and CPP.
- Still waiting for full year final results which will account for seasonality bias in rates, weather normalized comparison with control group and customer survey feedback.





HONI is currently planning a new pilot for late 2017 that will focus on:

- *Preferred Rates:* 4 dynamic rates with proven bill savings, customer satisfaction and system benefits plus one flat rate
- *Customer Choice:* Allow customers to choose from a menu of rate offering
- *Remove guaranteed rate protection;* introduce insurance
- *Technologies:* IHD, Data Disaggregation, Thermostats, Thermal Energy Storage (TES)

Thank you!