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Quick-Ramp, Customer Engagement

Price-Motivated Residential DR with 15 Minutes' Notice

Carlos Lopez and Peter Steele-Mosey

11:15 – Noon, 2019-11-05

London Hydro: A snapshot

London Hydro is a municipally-owned in Ontario's south-west.

Electricity Customers	160,000
Water Customers	113,000
Full-Time Staff	327
2018 Summer Peak Demand	690 MW
2018 Energy Distributed	3,300 GWh
Miles of Line	~2,000

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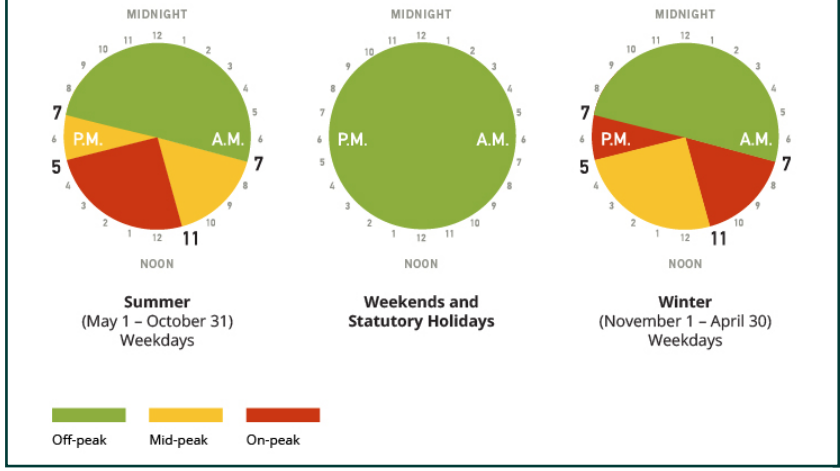
What is London Hydro's "RPP Pilot"?

Provincial Context.

London Hydro's Pilot is an experimental pilot funded by Ontario's provincial regulator, the Ontario Energy Board (OEB).



The Regulated Price Plan (RPP) is the provincial regulation that sets the commodity price of electricity for residential and small business consumers.

Since ~2010, RPP commodity costs have been collected using a mandatory time-of-use (TOU) rate structure.

In late 2015 the OEB released it's RPP Roadmap - a strategic push to evolving the RPP to improve system efficiency. As part of this strategy it commissioned experimental rate pilots from four Ontario electricity distribution utilities, including London Hydro

What is London Hydro's "RPP Pilot"?

Treatment Groups and Timing.

In 2017/2018, London Hydro recruited approximately 1,600 volunteers to participate in three treatment groups.

RT Only ~1,000 Customers	CPP Only ~300 customers	CPP/RT ~300 customers
Trickl app with real-time consumption information	Critical peak price with enabling technologies	Both treatments

The pilot period ran from May 1, 2018 through April 30, 2019.

What is London Hydro's "RPP Pilot"?

Treatment Groups Detail.

In 2017/2018, London Hydro recruited approximately 1,600 volunteers to participate in three treatment groups.

	Information	Rate	Technology
RT Only ~1,000 Customers	**Trickl APP:** real-time consumption data, peer comparison.	Status Quo (SQ) TOU	N/A
CPP Only ~300 customers	**Trickl APP**: critical price notifications only	SQ TOU with: • Discounted Off-Peak • 36 Critical Peak Events	• Panel-connected load switch • Smart plug • WiFi hub enabling control of switch/plug
CPP/RT ~300 customers	**Trickl APP**: functionality of RT and CPP group apps.		
Controls ~450 customers	Control customers were selected from applicants to the pilot – "recruit-and-deny" to enable a randomized control trial N/A	Status Quo TOU	N/A

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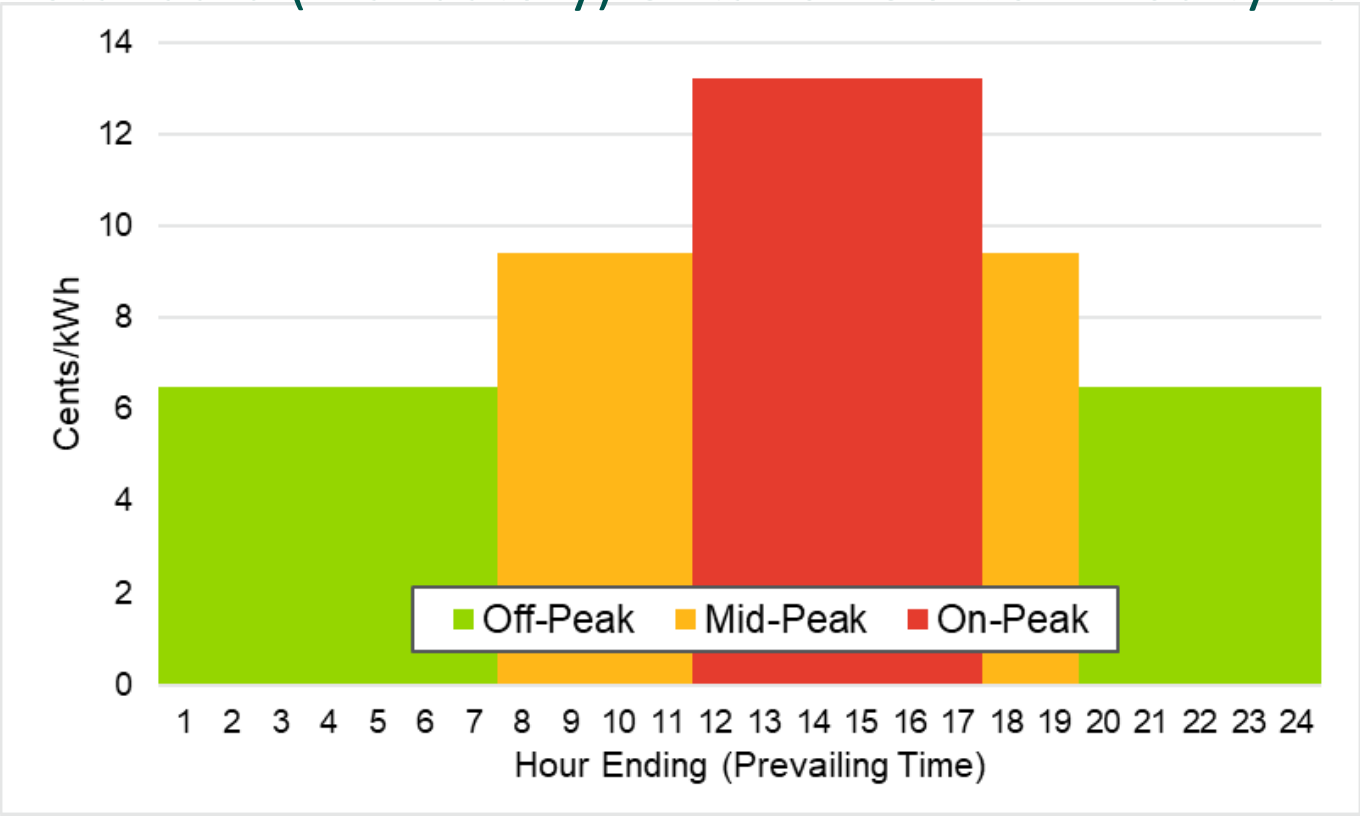
What is London Hydro's "RPP Pilot"?
Critical Peak Rate Treatment.

Standard (Mandatory) Ontario TOU Commodity Rate



Non-commodity variable costs: ~2.1 cents/kWh
Fixed monthly charge: ~$23/month

Pilot Price Treatment:

- 0.5 cent reduction of Off-Peak price.
- 18 CPP events (4pm – 8pm only) over the summer.
- CPP events 1 hour each.
- CPP cost: **59.5 cents/kWh**

Important Additional Information:

- *Fast Ramping.* Participants received only 15 minutes' notice of a CPP event.
- *Enabling Technology.* London Hydro dispatched a signal to participants' hubs at event start. This activates the panel load control switch and the smart plug.

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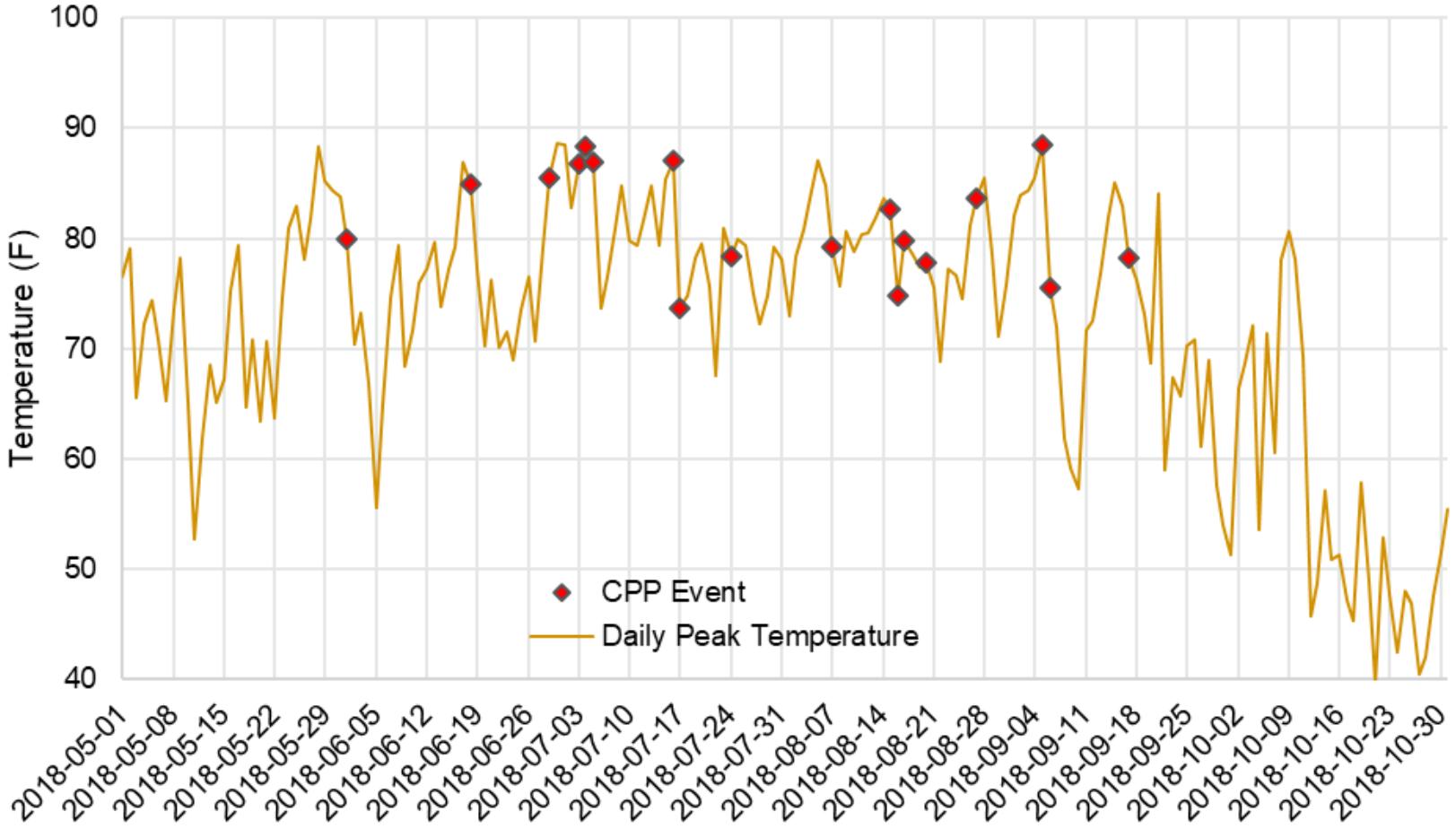
When Did Events Get Called?



Date	Event Start Time	Event Temperature
2018-06-01	6:00 PM	76
2018-06-18	5:00 PM	78
2018-06-29	6:00 PM	83
2018-07-03	5:00 PM	86
2018-07-04	6:00 PM	88
2018-07-05	6:00 PM	78
2018-07-16	5:00 PM	77
2018-07-17	5:00 PM	72
2018-07-24	5:00 PM	77
2018-08-07	5:00 PM	78
2018-08-15	6:00 PM	80
2018-08-16	5:00 PM	74
2018-08-17	5:00 PM	75
2018-08-20	5:00 PM	77
2018-08-27	5:00 PM	84
2018-09-05	5:00 PM	84
2018-09-06	5:00 PM	70
2018-09-17	5:00 PM	74

- 13 CPP events were called between 5pm and 6pm, five between 6pm and 7pm
- All events last one hour
- Average event temperature was 78 ^{o}F (26 ^{o}C)

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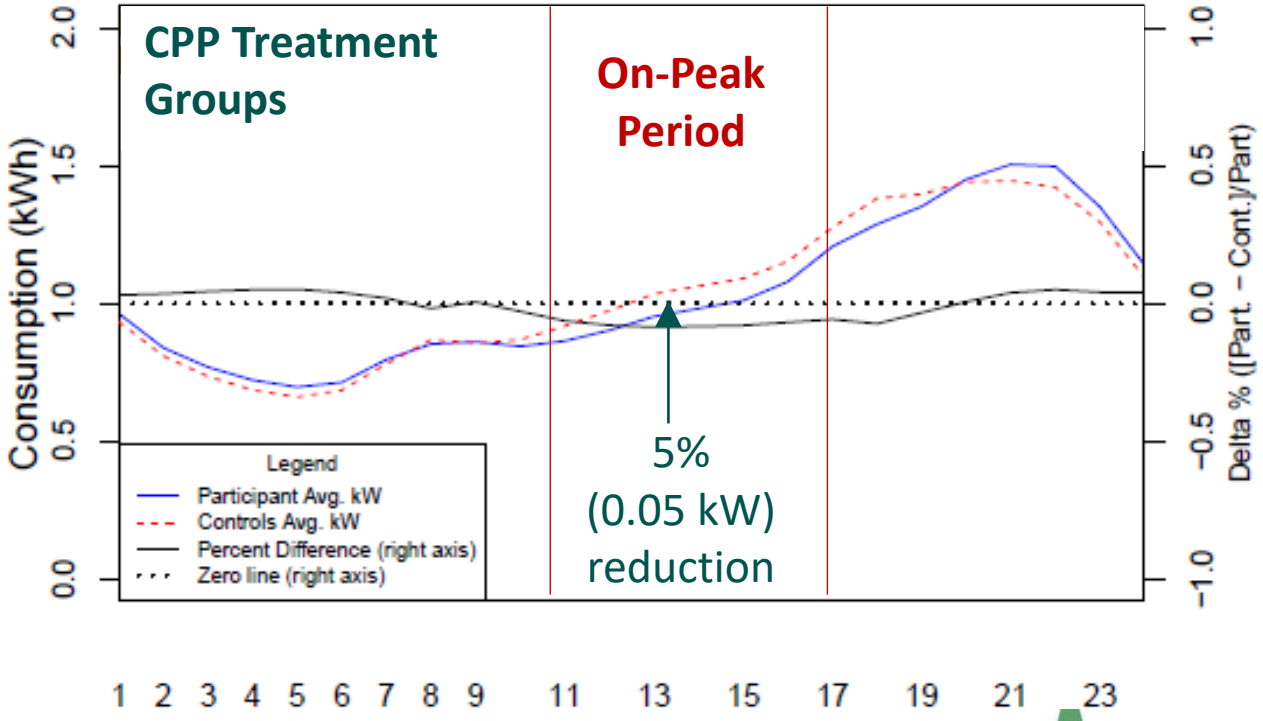
What was the impact of the pilot?

Navigant was tasked with evaluating two types of impact:

1. Energy impacts (on non-event days)
2. Demand impacts during CPP events

Energy Impacts

- On non-event days, there is no price signal encouraging energy savings.
- Navigant did not expect to find any energy savings.
- And yet, Navigant estimated statistically significant **5% reduction** in energy use during the TOU On-Peak period.
- The working hypothesis: absent a price signal at this time, it seems likely that impact is driven by London Hydro's customer engagement.



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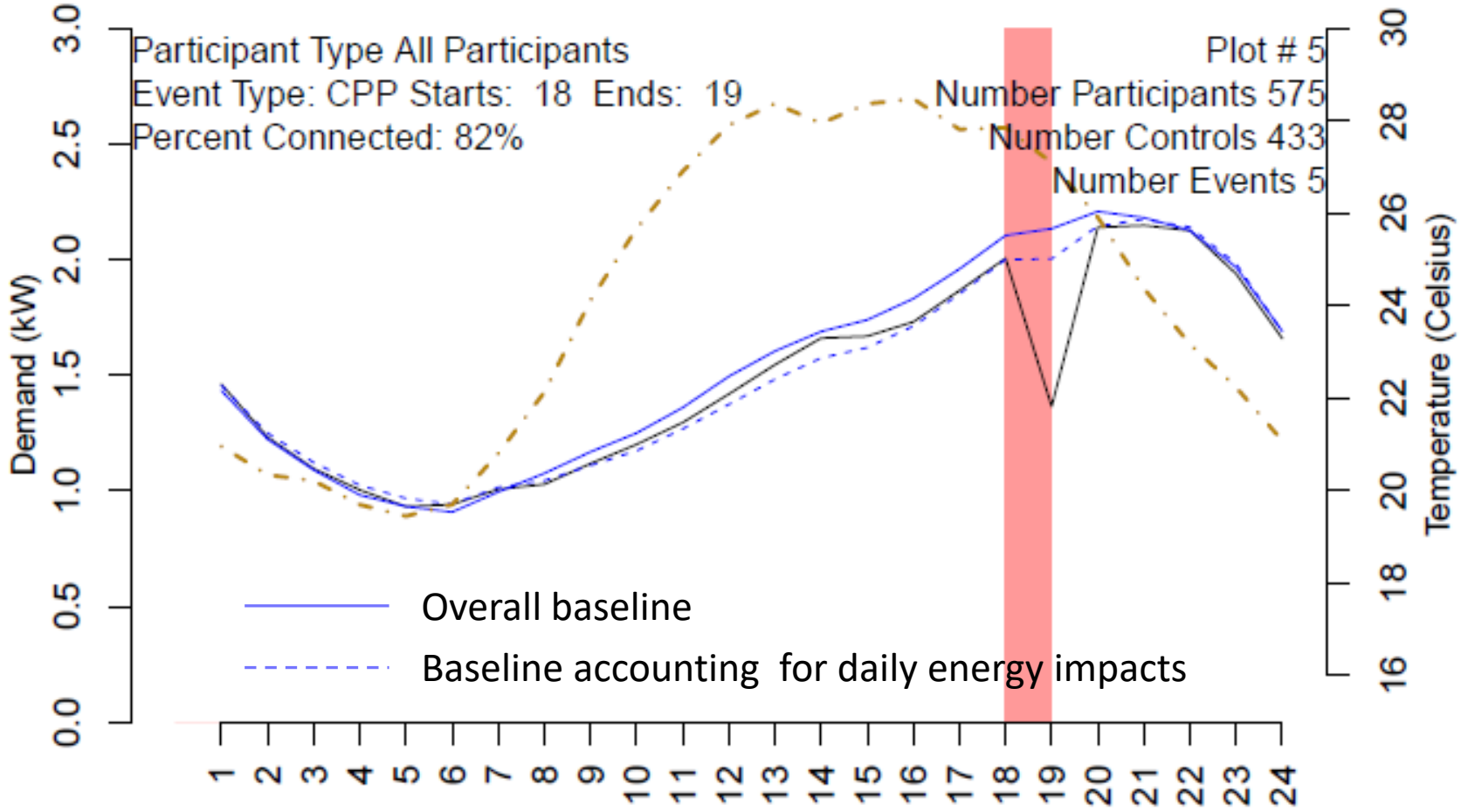
What was the impact?

Event Demand Impacts

- Impact on hottest (~87° F) event: **1 kW**
- Average impact across events: 0.67 kW.
- No incremental impacts from availability of real-time information.



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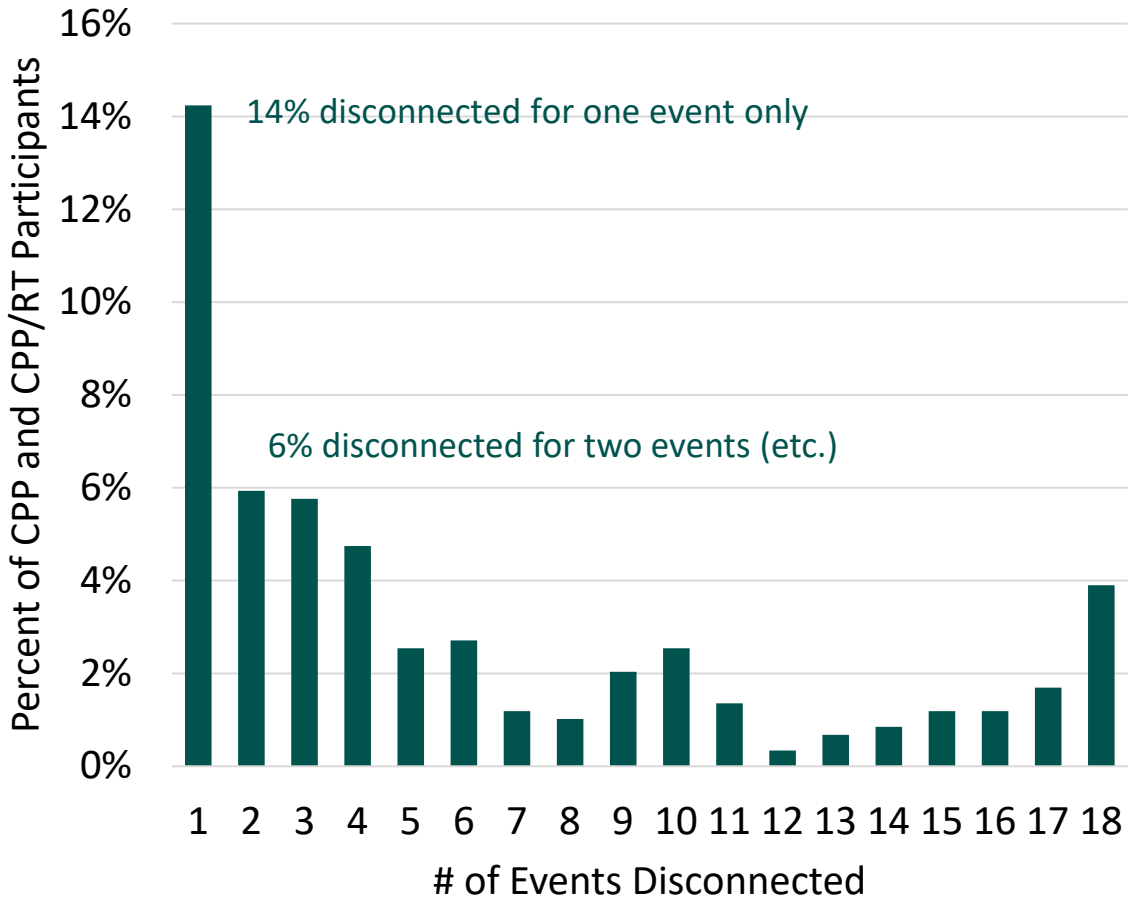
We know DR works – what's so special?

Load switch connectivity issues provide a natural experiment for assessing purely behavioural DR-like price response

- On any given event, approximately 20% of load switches were not connected and did not automatically curtail load.
- Half of participants were disconnected for at least one of the 18 events.
- Recall: participants receive only 15 minutes notice of an event taking place
- **Disconnections provide an ideal lab for testing fast-ramping behavioural DR**



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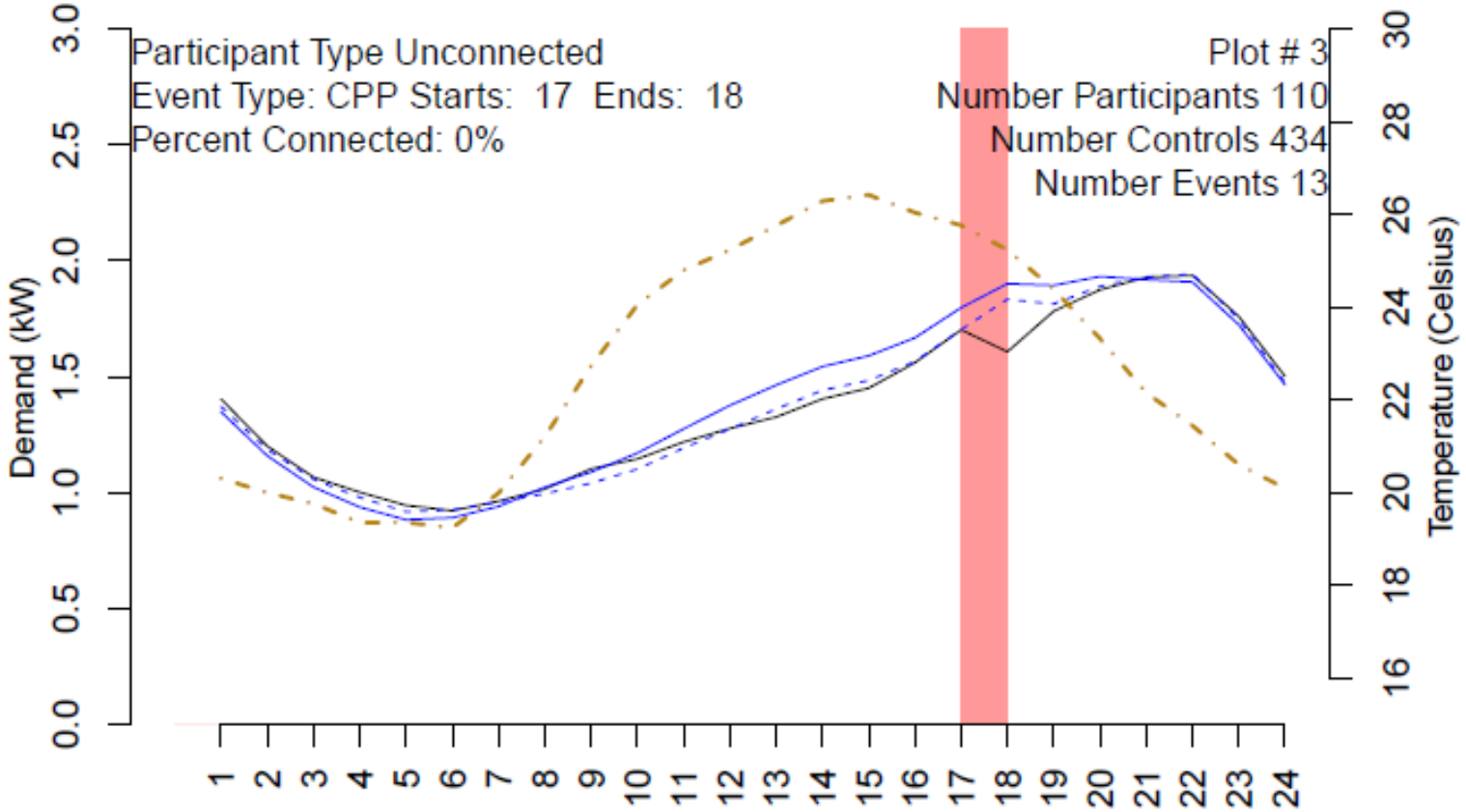
A significant amount of DR is being driven purely by customer behaviour.

On the hottest event (86° F), the 20% of disconnected customers delivered nearly 0.4 kW of DR.

- On average, across 18 events, disconnected participants delivered 0.3 kW of DR.
- These impacts were delivered without any functioning enabling technology beyond the event warning provided 15 minutes prior to event start.



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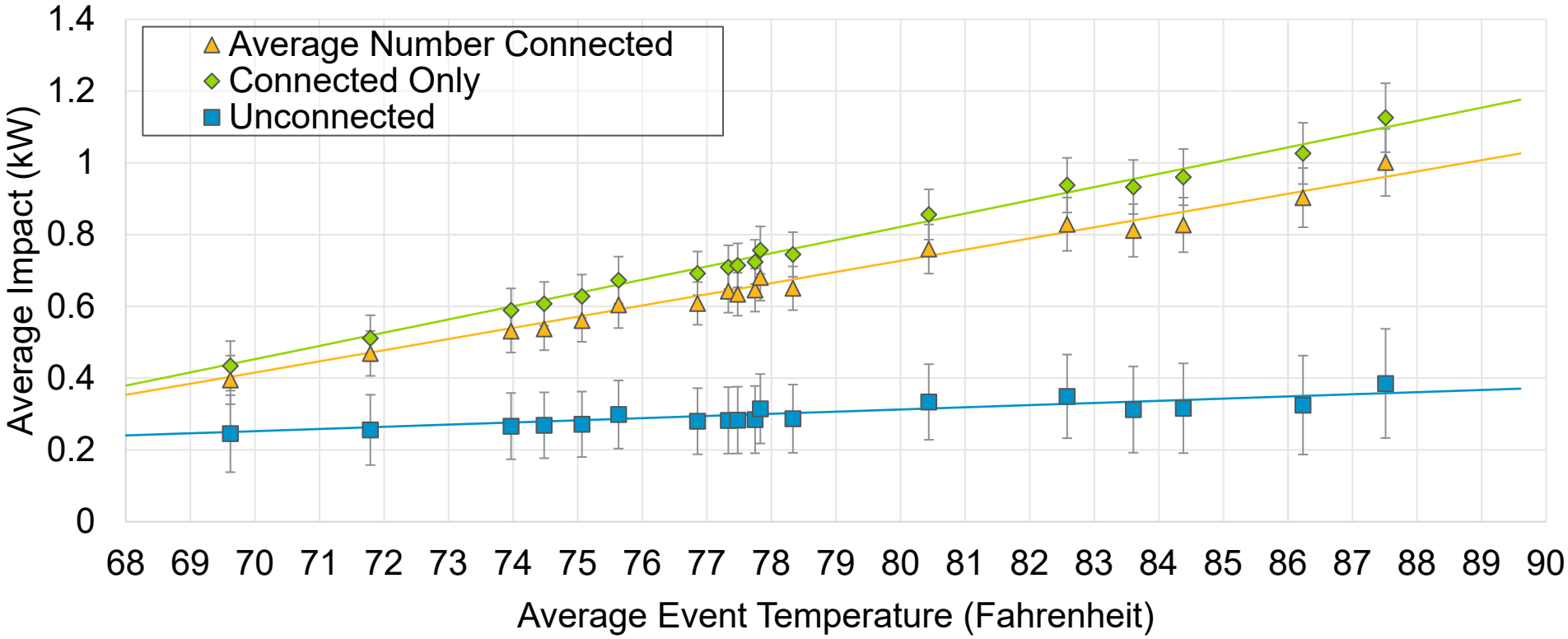
Behavioural response is not as strongly correlated with weather as technology-supported response.



- As temperatures approach 90 degrees, impacts per participant will reach – and exceed – 1 kW on average (yellow line).
- Purely behavioural response (blue line) is not as temperature sensitive as automated response, suggesting purely behavioural response is focused in non-space-cooling end-uses (e.g., lighting, appliances, etc.)

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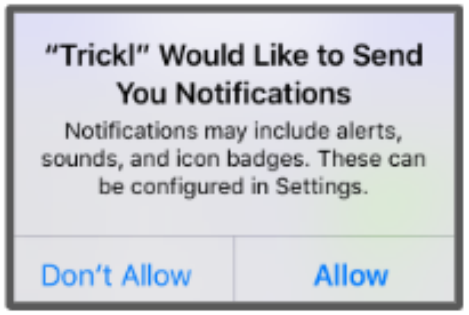
Customer engagement – Key elements

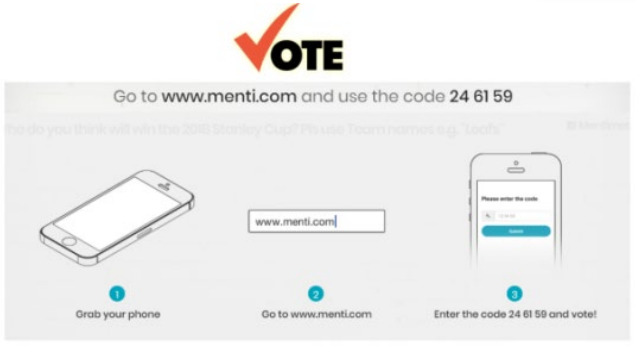
- Mobile first strategy – Trickl App
- Agile approach (*Live for 554 days / 34 releases = 1 release every 16 days*)
- Continuous education
  - Notifications engine (in-app, emails, SMS, IVR)
  - Door to Door & Call campaigns
  - Surveys and Online voting



trickl™

Take a swipe at real time energy control

London Hydro



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Customer engagement – Key elements

- The concept of *"Ambassador Customer"*
- Customer outreach events
  - Kick Off breakfasts, Focus groups, Open houses, Pizza at the park, End of Year touch point
- Support 24x7 (Support channels included phone, email and home visits).

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Customer engagement / Outreach events

Breakfast Kick -Off

Ambassadors Plan

Focus groups

Pizza in the Park

Open houses

Surveys

Door to door campaigns

RESULTS

Participants engaged

+500

Volunteers

+150

Ambassador input on features

Participants engaged

+200

Participants engaged

+100

- e.g. Open House Experience
- Trickl Features Survey
- Menti online voting tool

+40%

Proactive support / Participants engaged

+125

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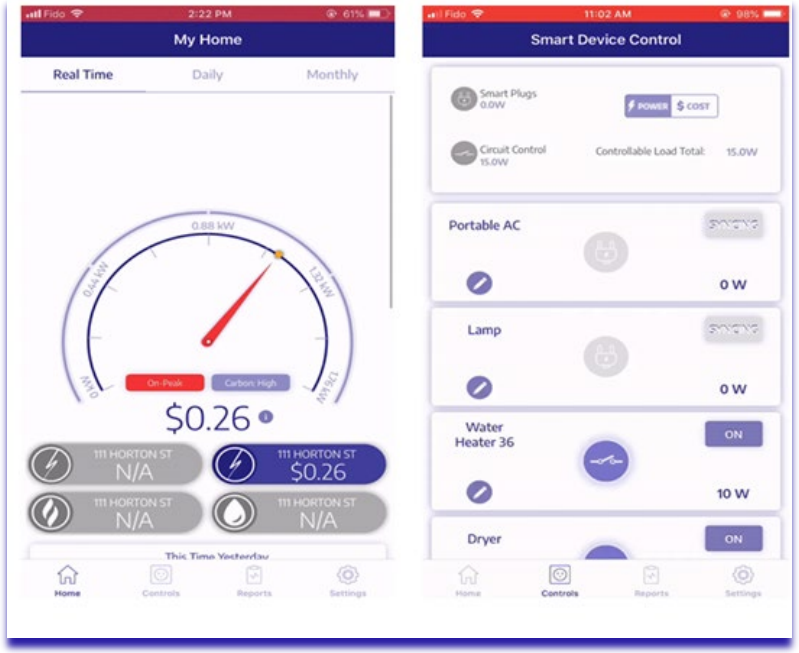
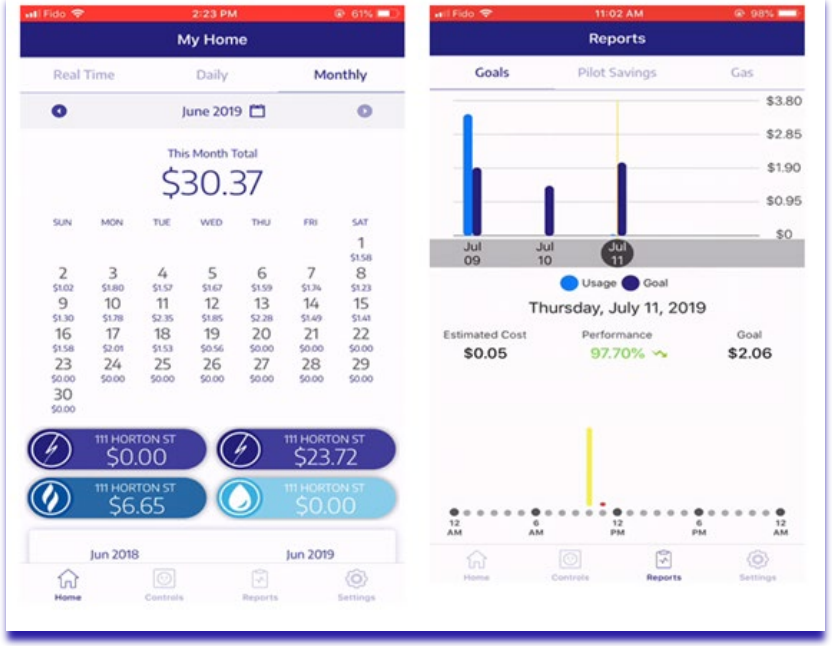
Trickl Mobile App

- Available for iOS and Android
- Easy to use/navigate
- Single Sign-On (same myLH account credentials)
- Open Standards / OpenADR
- Real Time Data
- Daily & Monthly views
- Water and Gas integration
- Hardware Control
- Devices disaggregation
- Personalized notifications
- Multichannel notifications



- What is my current hour usage/cost?
- What is my usage/cost per appliance?
- What are the days when I use more/less electricity? What was the cost for those days?
- Am I below or above my daily goal?
- I need to turn on/off some devices. I can do this using my mobile app



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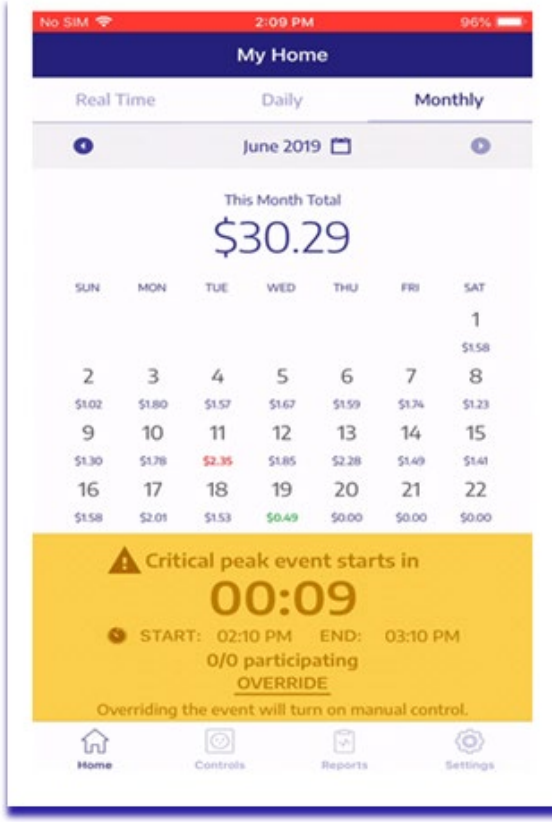
Trickl Mobile App

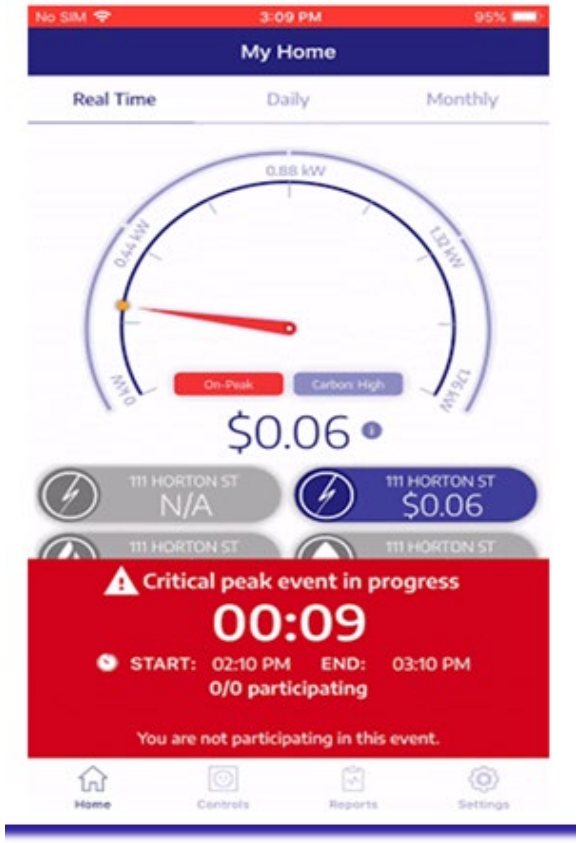
1

- Pre Event Notification
- Countdown
- Override option



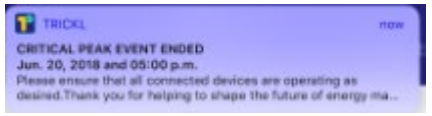
2

- During Event Notification
- Countdown
- Customers participating



3

- After Event Notification
- Pilot Savings Report



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Testimonials

Topic	Customer Testimonial
CPP	"I enjoyed the CPP events, I will miss them." ***Stephen Cummins***
CPP	"It's great to see how much power you are using overall, then you can cut and curb accordingly." ***Daniel O'Neill***
CPP	"Much more energy usage aware. Thank you." ***Angela Borchert***
RT	"Love being able to track real time usage, especially in the summer when costs are $$$$$." ***Jessica Kennedy***
RT	"Great information to have. Interesting to see how the different load will affect my electricity bill." - ***Graham Dykeman***
RT	"I think everyone should have this app to help reduce hydro use and costs." ***Gordon Rayner***
Trickl	"Very impressed with the new Trickl app." - ***Koyejo Oyerinde***
Trickl	"Love the new app! So helpful!"
Trickl	"I love the new look of the app, there are so many useful new features!"

Lessons learned

- Clear understanding and pilot expectations – **Educate, educate and educate !**
- Customer experience is our main priority – **Provide the right tools !**
- Use feedback to engage customer – **We listen !**
- Turn frustration into positive energy – **Create engagement !**
- Multichannel customer support - **We are here to help you 24x7 !**

Next Steps

- Continue Customer Engagement with pilot participants
- Leverage Ambassador Customer experience
- Release Trickl App to all London Hydro Customers
- Additional opportunities with OEB:
  - Extend pilot Phase 2
  - Scale solution in Ontario Province with other utilities

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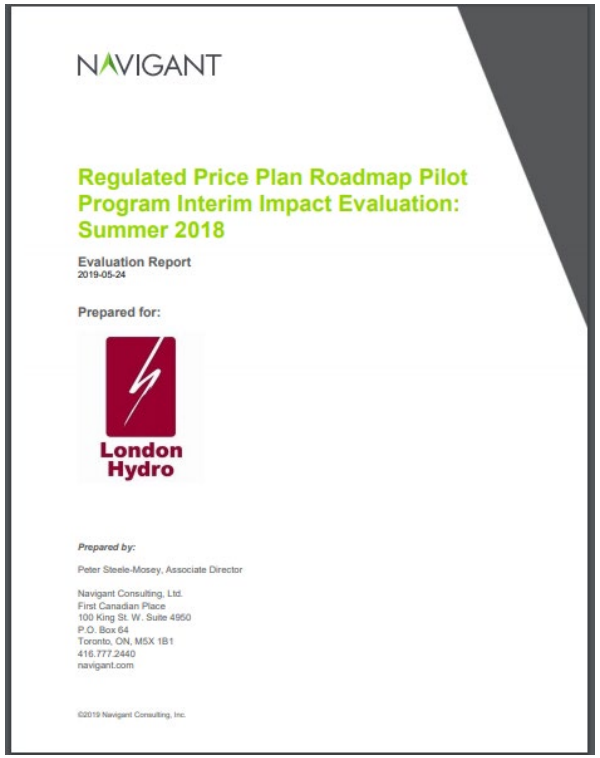
References, Appendix, and Contact Information

References and Links


NAVIGANT

Regulated Price Plan Roadmap Pilot Program Interim Impact Evaluation: Summer 2018

Evaluation Report
2019-05-24

Prepared for:

London Hydro

Prepared by:

Peter Steele-Mosey, Associate Director

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Interim evaluation report available on OEB web-site here:

https://www.oeb.ca/sites/default/files/rpp-roadmap-interim-results-londonhydro-20190524.pdf

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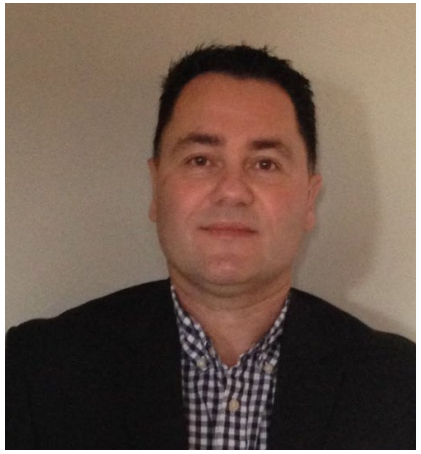

Carlos Lopez
London Hydro
Product Manager

Carlos is a seasoned IT professional who has been working for more than 15 years in Information Technology projects in several industries. Carlos is currently Product Manager at London Hydro. He is responsible for the development, expansion, enhancement, management and support of the portfolio of residential and commercial energy management systems such as Green Button (GB) applications and platform.
Carlos is a certified Project Management Professional (PMP), graduated as Computer Science Engineer in 1995 and obtained a Master Degree in Systems Management in 2000.

He started his career in 1996 as a Software Developer and then worked in different countries in South and North America in different IT roles such as IT Consulting Manager, Software Development Manager and IT Manager. Working in the Utilities sector, Carlos has gained a broad knowledge of the energy industry by supporting analytics applications for utilities, smart meters data collection platforms, integration between different AMI platforms and billing systems, Customer Engagement applications, behind the meter technology, IoT integration and innovation projects related to energy management systems.

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Peter Steele-Mosey
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Associate Director

Peter Steele-Mosey is an econometrician with over 11 years of experience evaluating time-differentiated electricity rates, demand response, and energy efficiency programs. He is also proficient in utility load forecasting and has supported load forecasting efforts for Toronto Hydro, FortisBC, and others.

When not up to his ears in computer code and algebra, Peter enjoys spending time with his wife and two children, whether sailing in Toronto harbour, skiing, or just building Lego at home.

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