The You in Time of Use

results from TOU+DR pilots with smart thermostats

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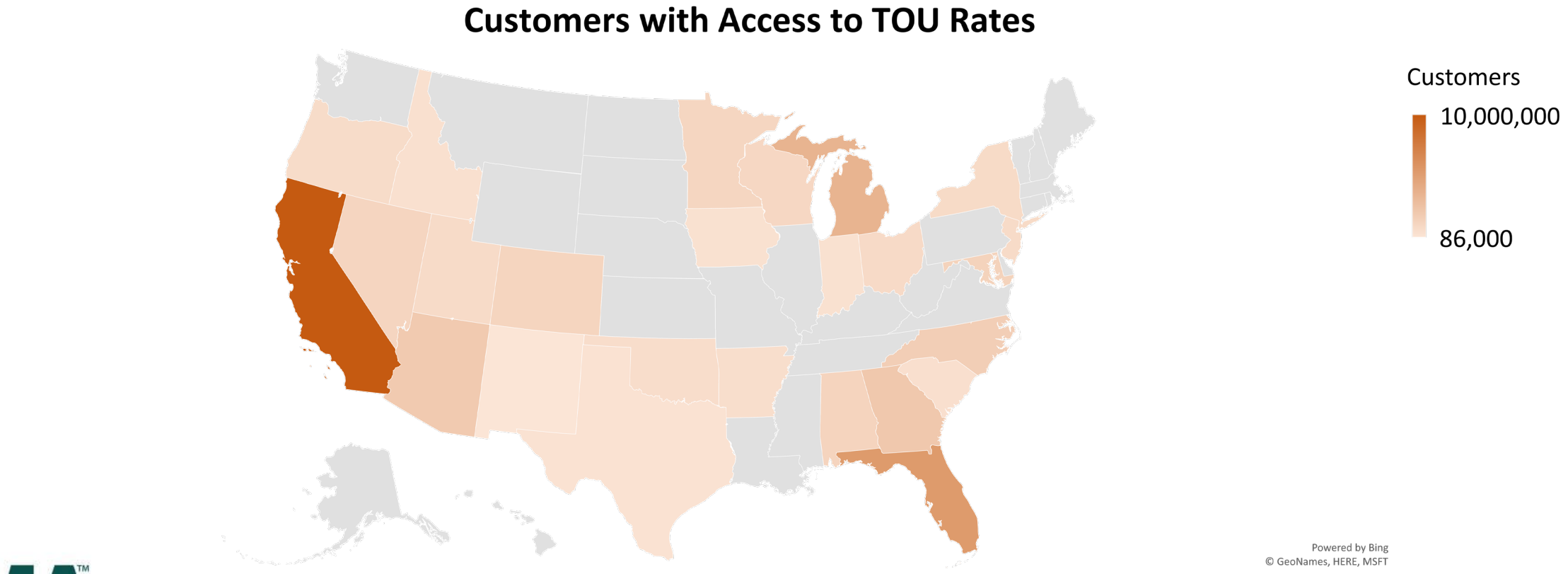
Overview

- TOU – Coming to an electric utility near you!
- TOU Challenges for Consumers & Utilities – The Fridge Magnet Problem
- Peak Relief to the Rescue!
- TOU Optimization – Impacts and Savings
- Consumers Insights
- The future of Peak Relief

Overview

By end of 2020, 18M customers will be on default TOU rates in Canada and the U.S



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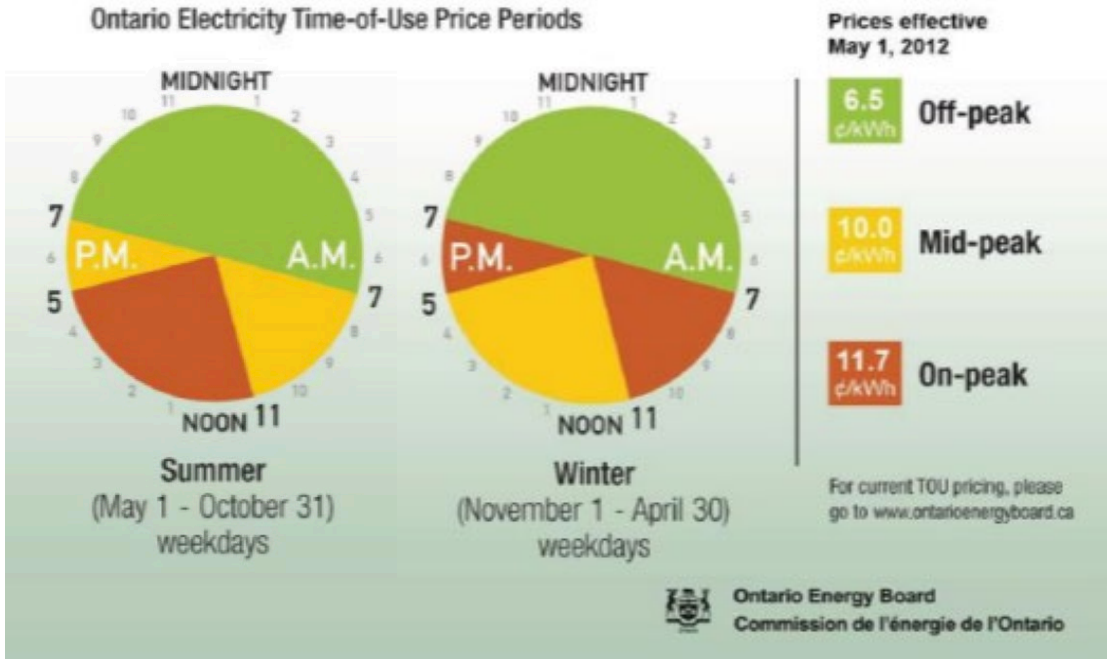
Fridge Magnets are Great – but are they enough?

- Pricing alone is often expected to drive significant behavioral change
- Ontario TOU rollout showed pricing alone stimulated just 0.7 - 2.1% peak reductions (Brattle, 2016)
- The Problems:
  - Regulators and utilities shy away from on-peak prices that are high enough to drive change
  - Customers have more important things to do



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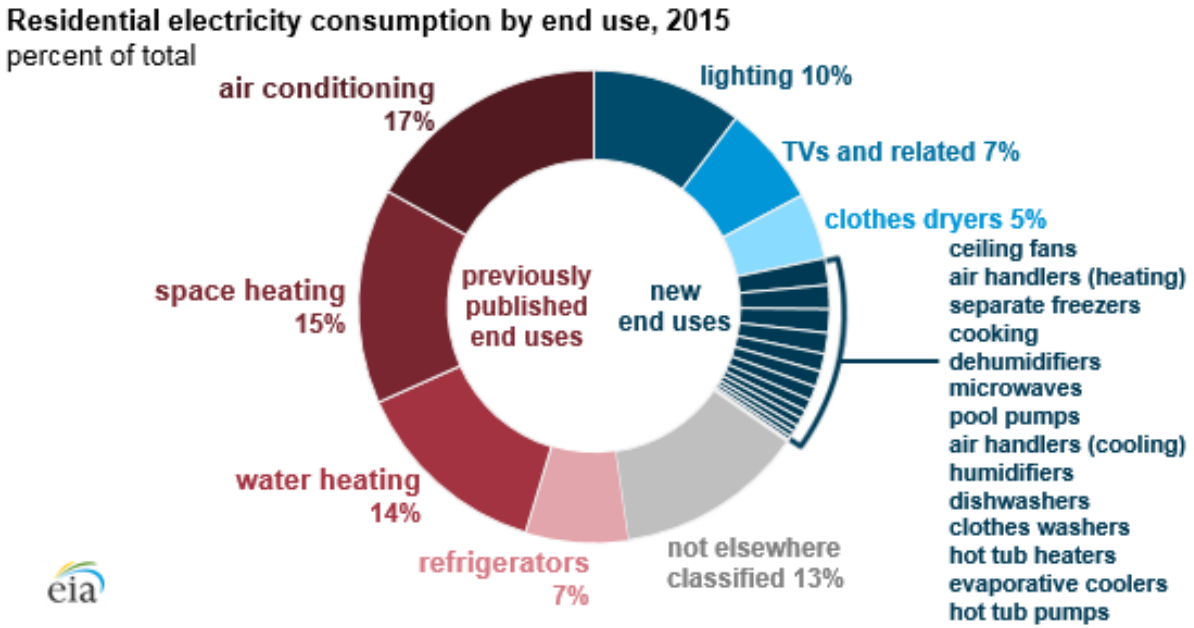
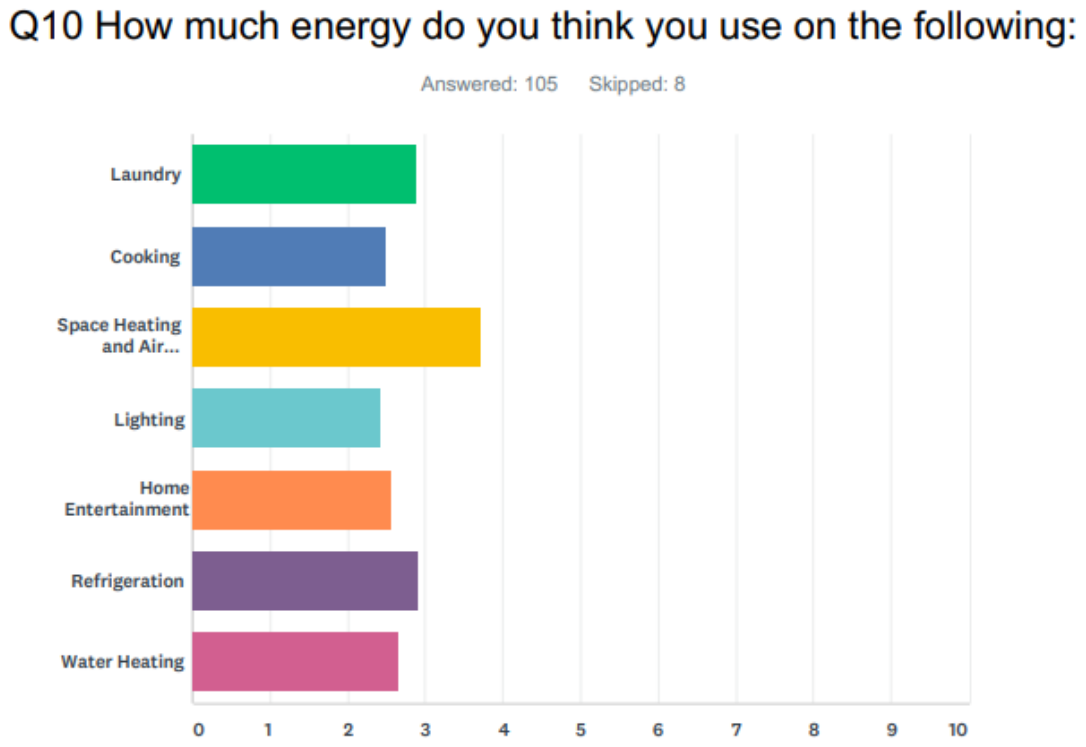
Consumers & Energy Use Awareness

Lack of knowledge of consumption of end use devices makes it difficult for consumers to make choices related to their energy consumption





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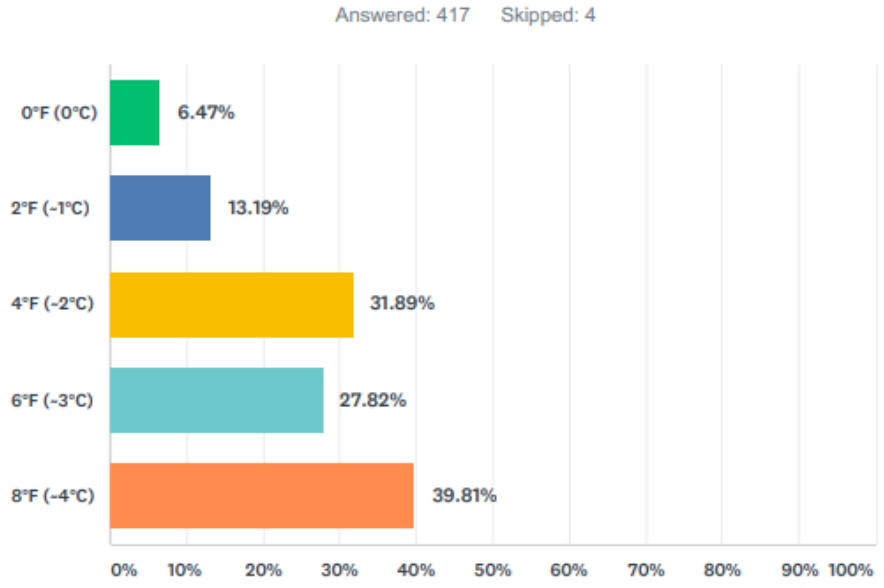
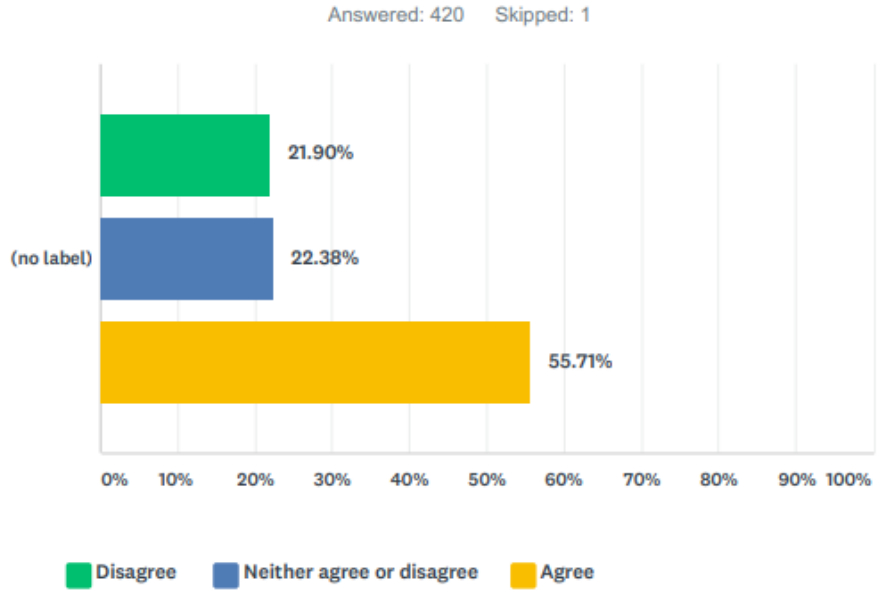
Comfort – A range not a setpoint

Consumers told us they are willing to have ecobee modify their setpoints to save them money

Q31 By how many degrees would you allow ecobee to adjust your home's temperature when you're not home?



Q32 When I am home, I would be willing to allow my ecobee to make temperature adjustments, both up and down, within 2 degrees F (1 degree C) to create additional energy savings.



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Peak Relief – Putting the You in Time of Use

Solution: Let smart technology do it for you!

Peak Relief Overview

- Custom thermal modeling for each home
- Personalized DR and TOU optimization routines based on customer-chosen savings and comfort preferences
- Streamlined in-app program enrollment and over-the-air software upgrades
- TOU and DR specific user experience

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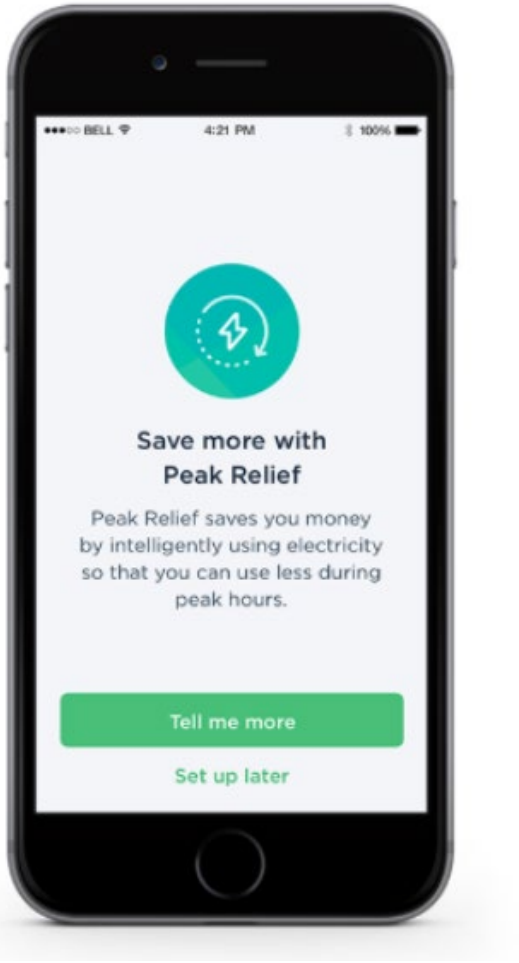
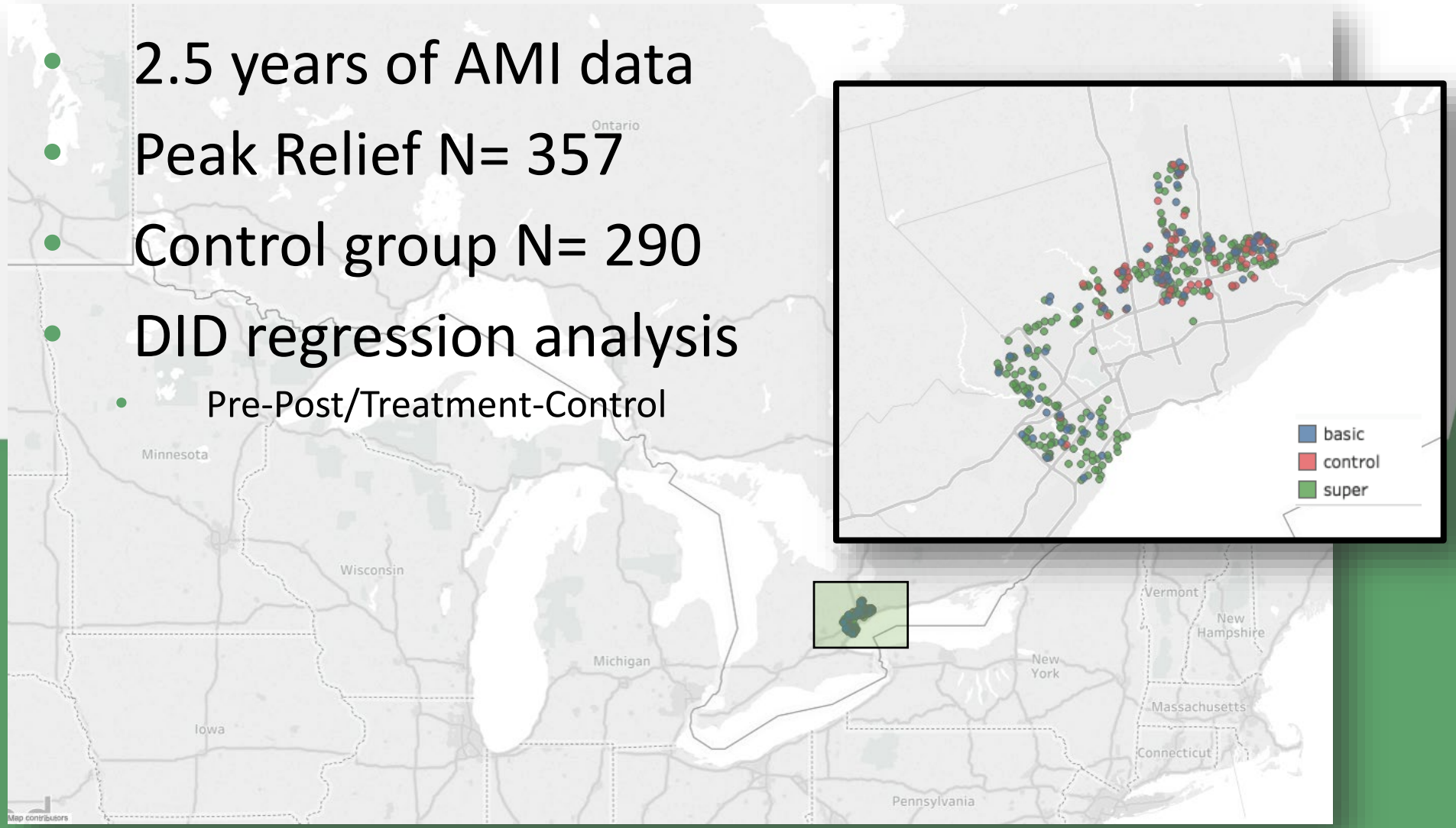
Peak Relief Pilot



- **Goals**
  - Assess user acceptance of a non-incented TOU+DR feature and experience
  - Test the optimization engines
  - Assess the kWh and kW impacts
- **Locations**
  - Ontario – Alectra, Toronto Hydro, Hydro Ottawa, Hydro One
  - California – SoCal Edison, Pacific Gas & Electric
  - Arizona – Salt River Project, Arizona Public Service
- **Participants**
  - 3,000 total customers
  - Ontario – 40% of invited customers enrolled in just 3 weeks
- **Optimizations**
  - TOU – daily optimizations
  - DR Events – 3 test events per market

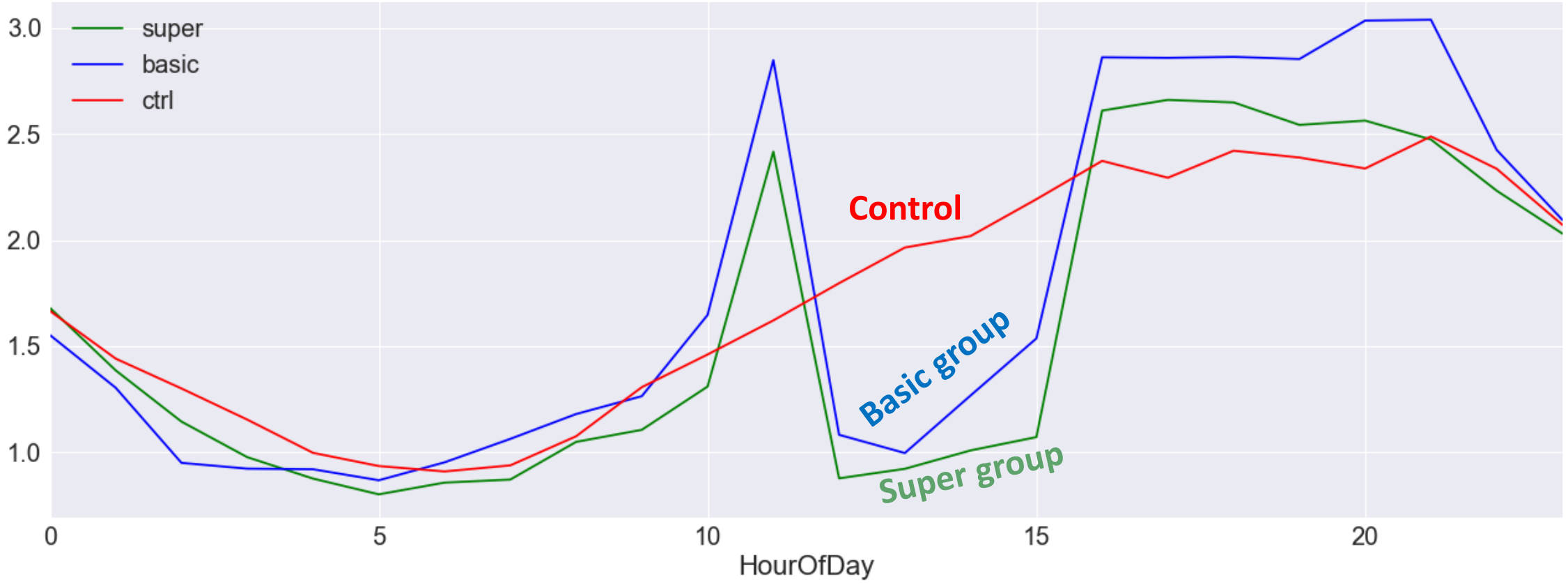
Ontario Results

- 2.5 years of AMI data
- Peak Relief N= 357
- Control group N= 290
- DID regression analysis
  - Pre-Post/Treatment-Control



Event Day Loads (kW)

August 15, 2018 - High temp: 89°F



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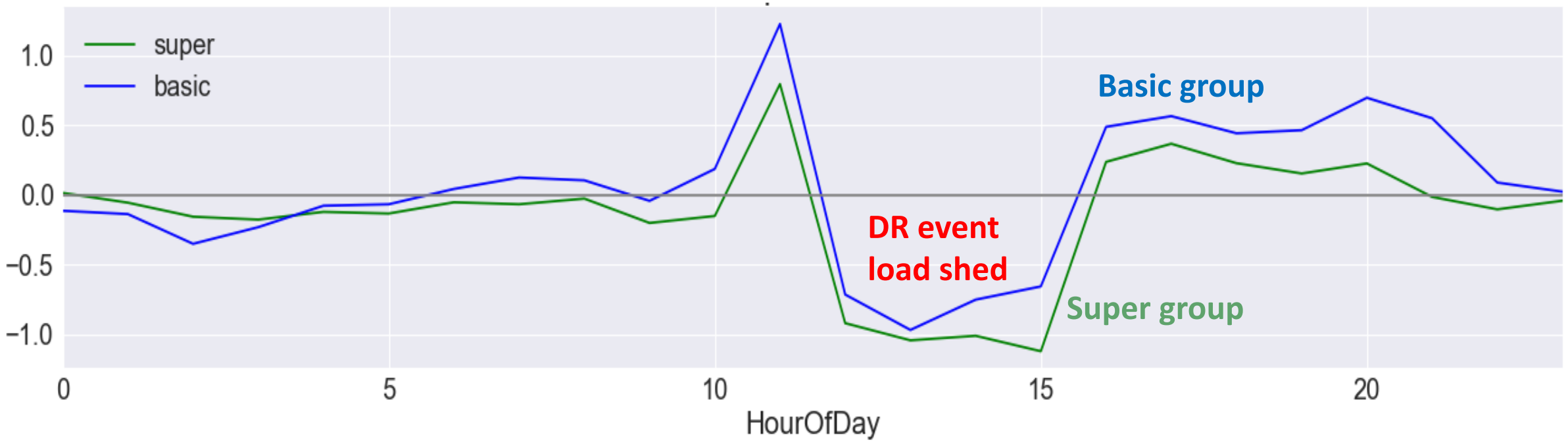
Event Day DR Impacts (kW)

August 15, 2018 - High temp: 89˚F

Average **DR event** savings:
1.0 kW (50%)



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Daily TOU Peak Impacts (kW)

High temp: 92˚F

Average **non-event** peak savings:
0.52 kW (20%)

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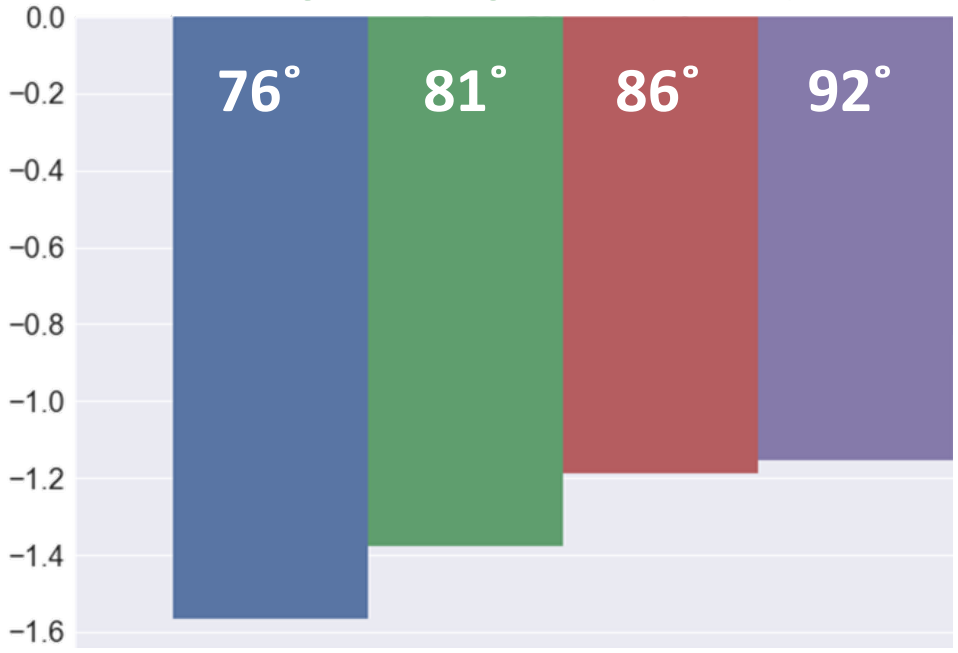
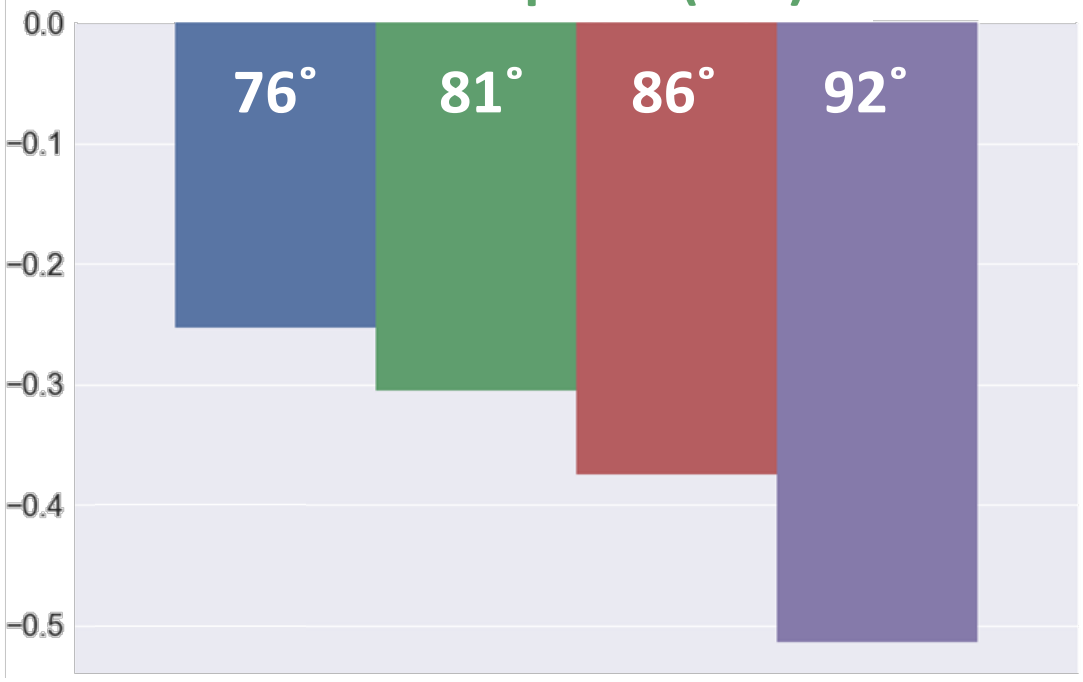
Non-event Day Impacts – EE and TOU

at different High Temperatures (˚F)

Daily EE impacts (kWh)



Peak TOU impacts (kW)



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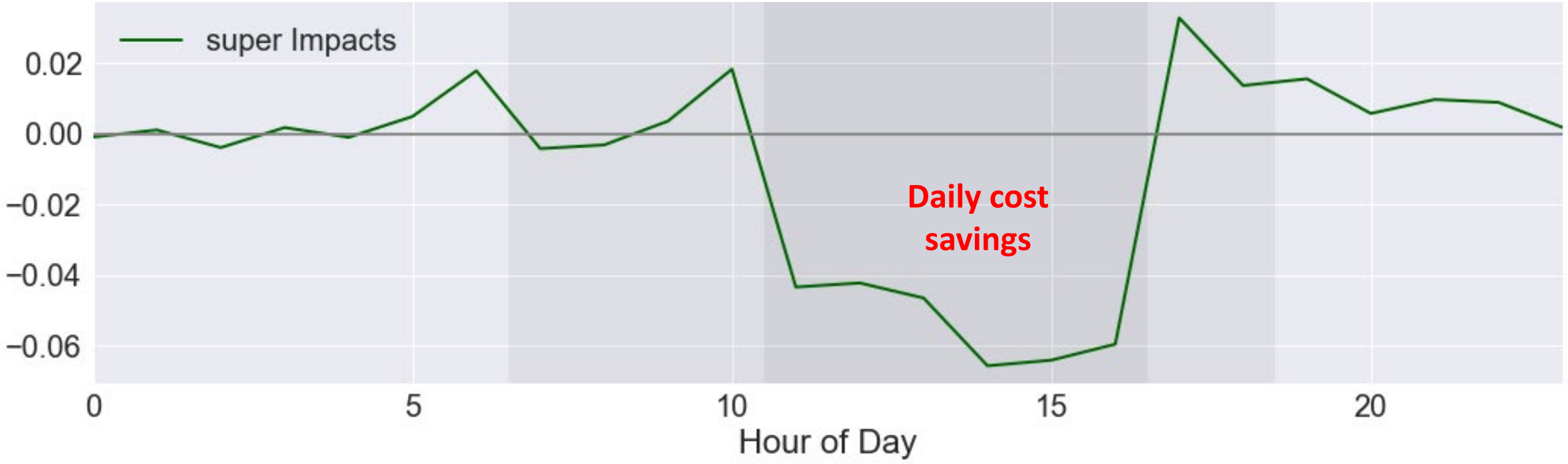
Customer TOU Cost Impacts ($)

average daily high temp: 92 °F

Average Customer Savings:
$15 (6.7%) per season



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Savings Insights

- Rates with the largest peak to off-peak price differentials showed the highest peak energy savings and customer bill savings
- As expected, Super Savers showed higher EE, TOU, and DR savings
- Savings depend on temperature
  - EE savings higher on cooler days
  - TOU savings higher on hotter days
- TOU and DR baselines
  - Peak savings on event days: 50% TOU, 50% DR
  - DR events doubled the daily TOU response
  - Peak relief provides a half-size DR event every day
  - Reduced DR “potential” by half – but firm service level is not changed

Consumer Insights

- Enrollment Experience – “Very easy”
  - Insight – a streamlined mobile experience can lead to high program enrolment rates
- Enrollment Challenges – “Help me find my rate”
  - Challenge: Most frequent customer service inquiry was related to customers identifying their rate
  - Solution: Provide more obvious tool tips and more self-service points beyond bill image
- Customer Value - “I want to see it to believe it”
  - Insight - Customers needed to be shown savings to trust that Peak Relief is working
- Savings Preferences - 80% Super Saver
  - Insight – Many customers say Peak Relief as a cost savings feature hence wanted to maximize savings and trusted ecobee to appropriately balance comfort and savings
- TOU Pricing Can Effect Consumer Smart Thermostat Programming
  - Many Arizona consumers programmed a setback by default; not the case in Ontario
  - DR savings available vs. baseline for consumers who pre-program thermostats is reduced

Have we put the “You” in Time of Use?

- Pairing smart thermostat technology with machine learning has proven successful in helping customers manage their energy costs and consumption where there are TOU rates
- A streamlined enrollment flow with simple inputs for personalization is key in gaining consumer uptake and maintaining high customer satisfaction to reduce feature opt-outs
- Being able to adapt to regional contexts is an important consideration in delivering a phenomenal customer experience while optimizing energy savings

Questions and Discussion

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