

# Preliminary Results from Portland General Electric's Employee Smart Water Heater Pilot

***2016 ACEEE Hot Water Forum***

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Session 7C

Presenter: Josh Keeling



# Background

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- Portland General Electric is committed to demand response as part of a least-cost, reliable, and sustainable resource portfolio
- PGE believes DR can and should:
  - Benefit all customers
  - Be responsive to systems needs
  - Fit customers' lifestyles
  - Realize multiple value streams
  - Be reliable and low cost
- Connected devices and the growing adoption of smart technologies provides an opportunity to provide a new form of cost-effective DR
- Smart water heaters provide the opportunity to cost-effectively meet all of these needs with minimal impact to customers

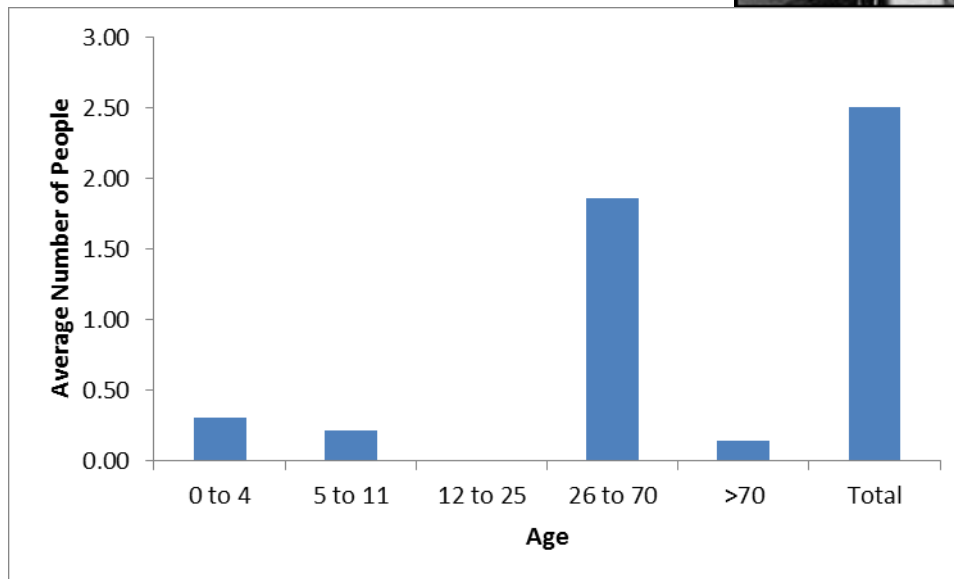
# Employee Smart WH Pilot

- Started in September 2015
  - Fully enrolled by November
- Provided complimentary water heaters contingent in participation
- 14 units installed:
  - 10 AO Smith PXNT-50
  - 4 Whirlpool Energy Smart
  - Thirteen 50-gallon units
  - One 80-gallon unit
- Called events for ~60 days:

	Is Event Day	
	0	1
Sunday	9	7
Monday	5	12
Tuesday	7	8
Wednesday	7	8
Thursday	8	8
Friday	7	8
Saturday	8	8

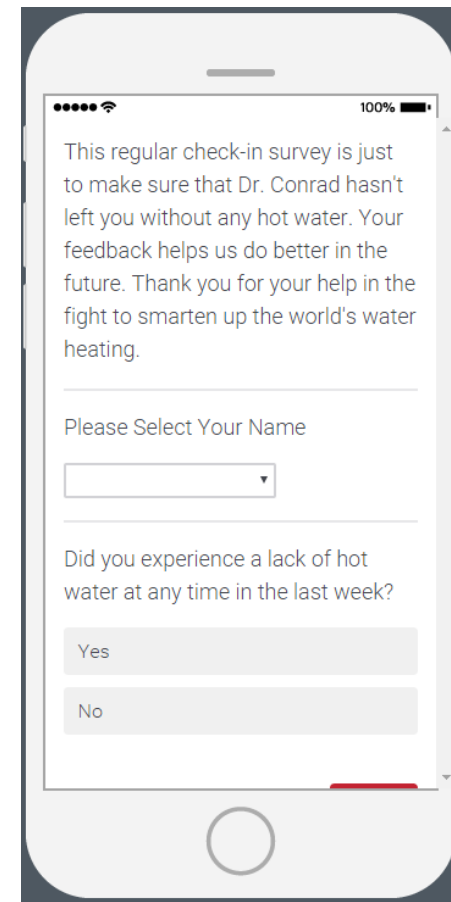
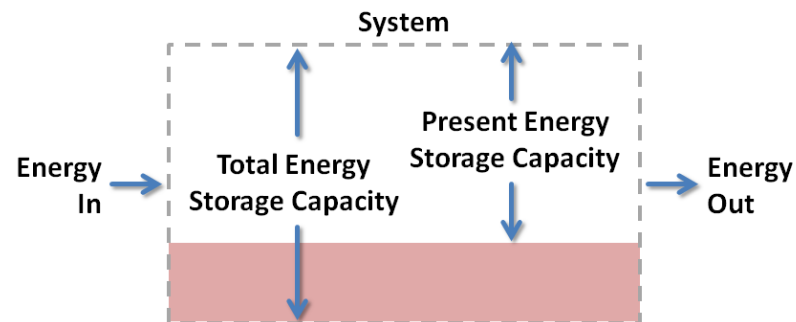
# Sample Composition

- 14 participants
- 36% have children in the home
- 1.7 showers per day
- 0.2 baths per day
- 1 person with Jacuzzi



# Data Collected

- Baseline survey data on household size and typical usage
- Ongoing weekly survey on occurrence, timing, and probable cause of loss of hot water
- Logger data
  - W
  - Present Wh
  - Total Wh
- Message data
- Configuration update logs
- Error logs







# Example Data

- Extracted, transformed, and loaded into relational database



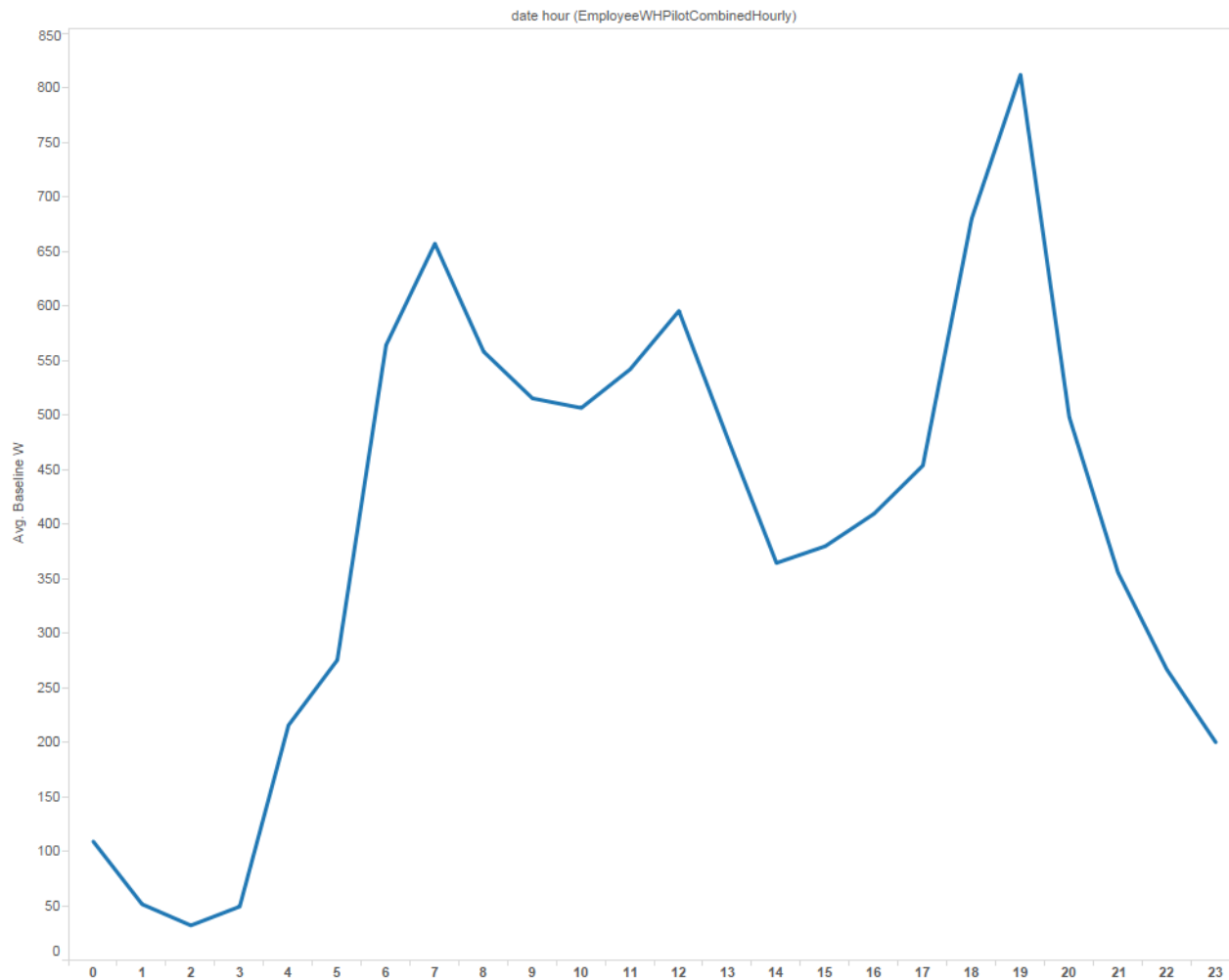
# Impact Methodology

- Baselines were constructed for each employee based on the average of comparable non-event days
  - Matched by day of week, hour, and minute
    - Also excluded hours where an event had occurred less than six hours prior (in cases where late night events were called)
- Top X of Y methods not used because events were not called based on load conditions
- Weather effects were not significant in most cases and were therefore omitted
- Impacts for curtailment events were then simply calculated as:
  - $\text{Impact} = \text{Observed Usage} - \text{Baseline Usage}$



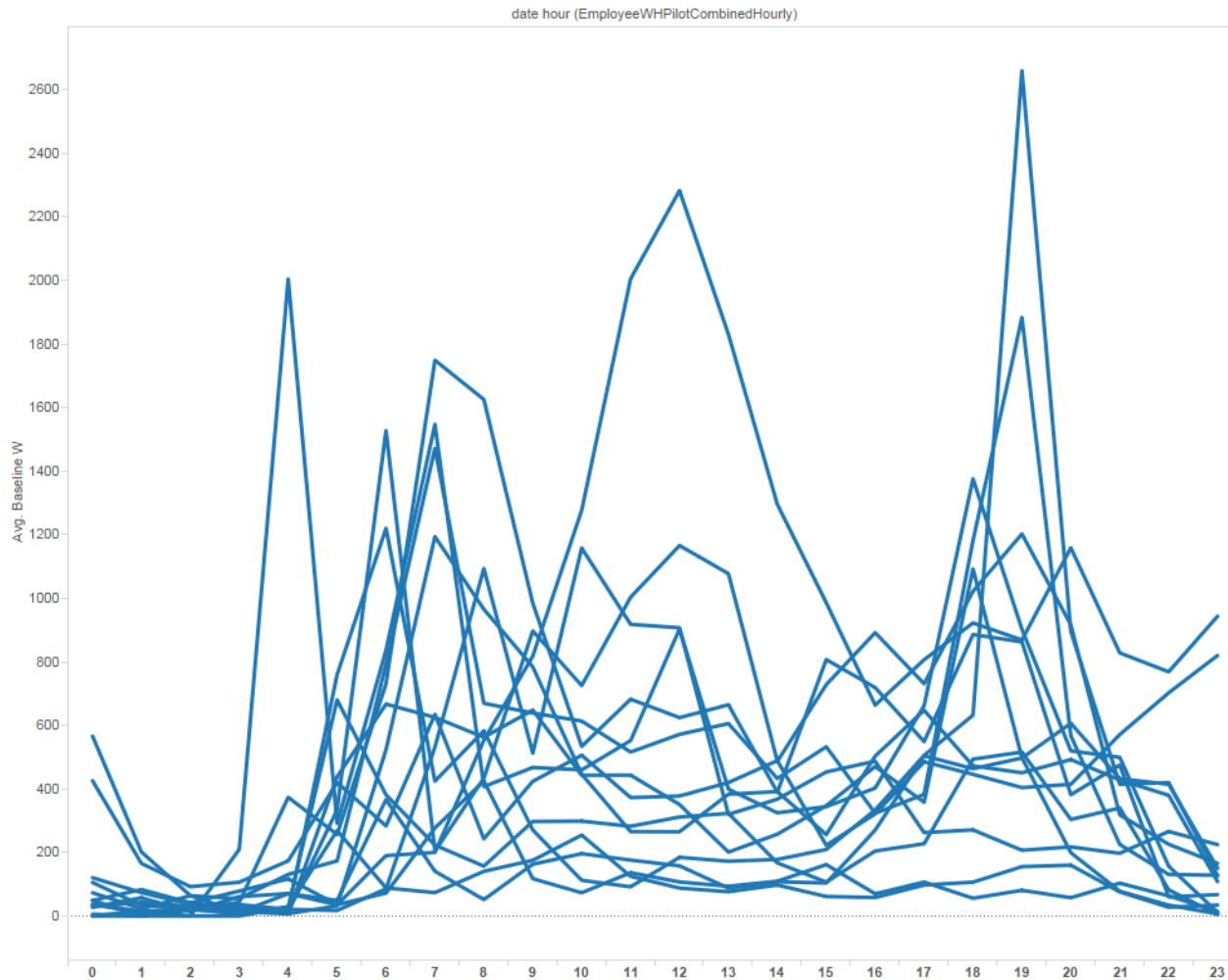
# A Note About Water Heaters Usage...

- Average baseline usage in the sample



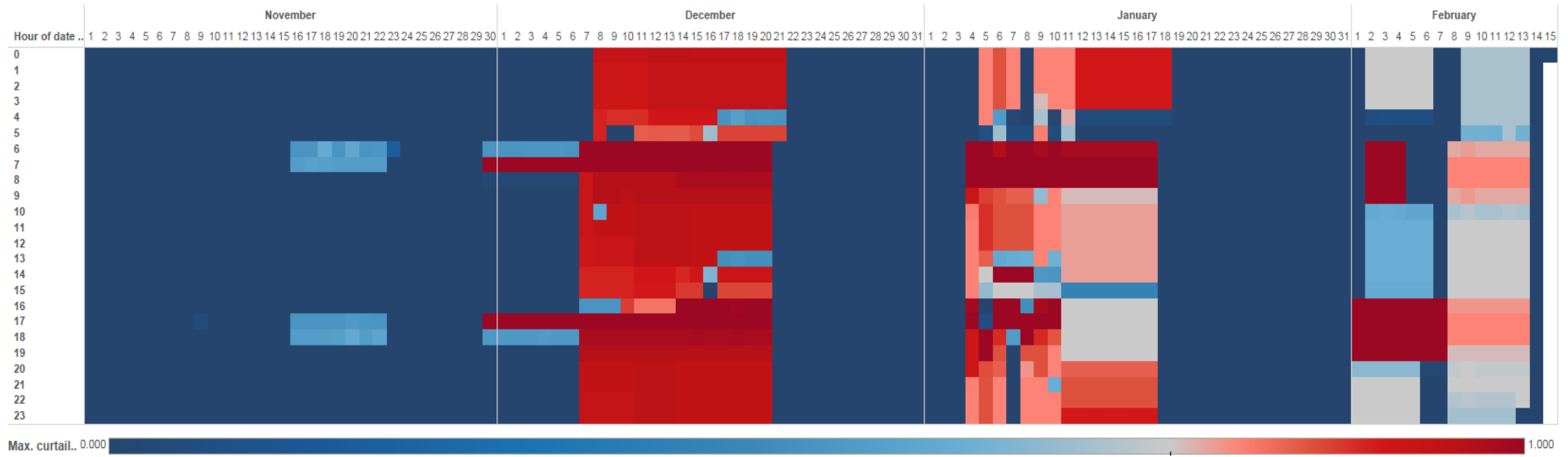
...there is a huge difference in how we use hot water.

- Average baseline usage by employee

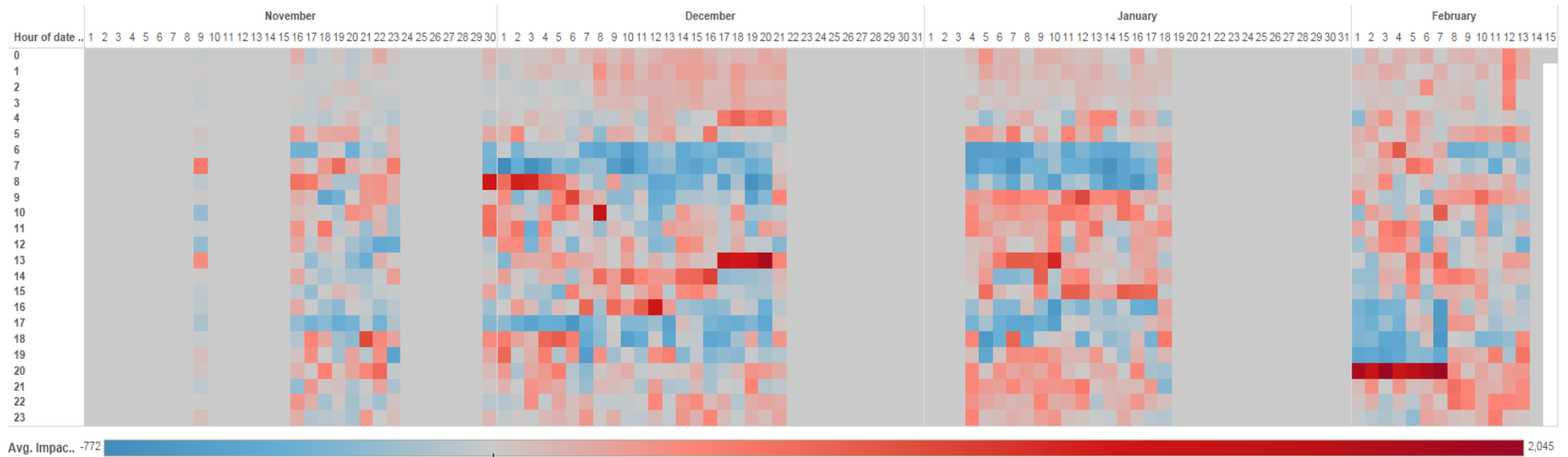


# Event Campaign

## All Curtailments



## All Impacts



# Example Day: Simple Shed

- Friday December 4, 2015

- Two events:

- One-hour 50% curtailment + one-hour shed command
- No reported loss of service

