

# Hidden in the Basement: Customer Learnings from a DR Study

Emerging technologies are the mechanism by which utilities create customer engagement, ensure savings, and future proof their portfolios. ILLUME found valuable learnings about the customer experience in our evaluation of a pilot to assess the magnitude of demand impacts and energy savings from water heater-based demand response (DR).



# The Challenge

Heat pump water heaters (HPWHs) use less than half the energy of standard electric storage water heaters and have the potential to save the average household, thousands of dollars over the unit's lifetime. Relegated to our garages and basements, HPWHs are a low-priority investment for consumers searching for more relevant technologies or offerings that can deliver immediate value.

In a crowded market of new and more efficient appliances, utilities must carefully evaluate new technologies to ensure they are both cost-effective and can deliver savings. And though consumers probably think of smart technologies like smart thermostats, electric vehicles, and battery storage first, utilities have an opportunity to turn to heat pump water heaters (HPWHs) in search of deeper savings and expanded opportunities to leverage demand response (DR) to support the grid during peak usage.

Vetting new offerings is a perennial challenge. To test this new technology, the utility turned to “friendly” customers (employees) who volunteered to participate in a pilot that installed 70 HPWH and 30 electric resistance water heaters.



# The Results

**The WHDR pilot achieved an average demand reduction of 0.20 kW per household during winter events and an average of 0.11 kW per household during summer events.** The pilot achieved greater impacts among water heaters that were pre-heated. Connectivity issues reduced impacts by approximately 40% during the winter and 20% during the summer.

**Neither advance notice of the DR events nor preheating the water heaters affected the customer experience with the DR events.** Providing participants with notification of events, or preheating, did not have a positive or negative effect on the customer experience. Respondents that received the advance notice of events did not opt-out of any DR events prior to the event start.

**Engaging customers in new offerings could open up avenues for future engagement.** Nearly three quarters of respondents said they would participate in a future water heater DR program. Participation could open other possibilities for engagement as well as elicit new ideas for incentives. When asked what type of incentive they would like to receive for participating in a future program, the respondents most frequently suggested a bill credit or rate reduction, followed by other suggestions, like being invited to participate in other utility programs like those involving solar credits, or other smart technologies for their homes; or simply receiving gift cards to the utility marketplace.

**Technology must be responsive to customers who choose to opt-out.** During summer DR events three customers opted out of events. Of these, one customer remained in load shed active status for almost the entirety of the event, while another customer who opted out remained in load shed active status for almost 60% of the event. When customers opt-out, they will expect their devices to return to normal temperatures quickly.

**Is WHDR a better on ramp for demand response?** When introducing utility customers to demand response programs, should utilities start with water heaters? WHDR events did not cause concern among participants and led to few disruptions to routines, negative effects, or issues with hot water in either season. The majority (89%) of post-event survey respondents were not bothered by the utility adjusting their water heater setpoint during DR events. Few respondents reported issues with their hot water, disruptions to routines, or negative effects due to the DR events. *There may be value comparing these types of demand response (DR) events to other types of DR, like smart thermostat DR, which may result in more obvious and perceptible changes like room temperature shifts that negatively impact the customer experience.*

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## RESULTS BY THE NUMBERS

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of pilot participants  
were very satisfied with  
their new water heater



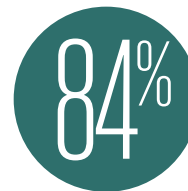
of pilot participants said their  
experience signing up for the  
program and scheduling the  
installation ranged from  
'somewhat easy' to 'easy'



of pilot participants were  
very satisfied with their  
installation experience



Average demand reduction  
per household during winter  
and summer events



Customer satisfaction with  
their utility never dropped  
below 84% across nine  
DR events during a period  
of six months



# How We Did It

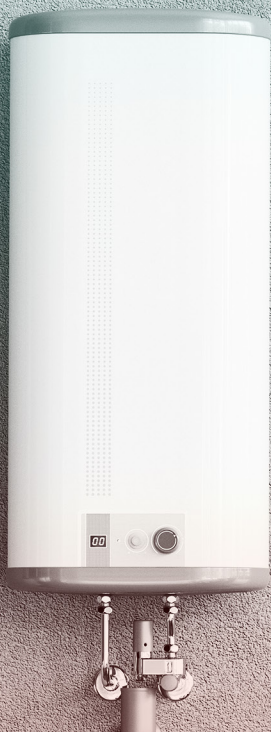
In addition to understanding the extent energy impacts and demand vary by the types of water heater installed, our team's methodology included questions to understand the customer experience from motivations, to the installation process, to the nuances of DR events.

- **Staff Interviews:** Our research team met with the utility on a weekly basis throughout the duration of pilot. During these meetings, the ILLUME team gathered insight into the history of the pilot, recruitment efforts, pilot goals and objectives, and barriers for meeting those goals.
- **Impact Analysis:** The ILLUME team estimated demand reduction and energy savings achieved during the DR events by using hourly AMI data for participating homes, an estimate of double-counted savings (through an examination of pilot participant involvement in other of our utility client's energy efficiency programs), and an analysis of device-level event participation using manufacturer water heater data.
- **Participant Surveys:** Our research team used three types of online surveys to understand the customer experience. These included:

**Post-installation survey.** We used a short survey to gather initial feedback on the water heater, program enrollment and installation experience. Our team sent participants email invitations to complete the survey within two weeks of their water heater installation.

**In-depth customer experience survey.** This survey assessed motivations for participation, user experience with the pilot, customer satisfaction, and demographics. The team sent email invitations for the customer experience survey to all 100 unique participant emails.

**Short follow-up surveys.** The team used a shorter follow up survey to provide a longitudinal perspective on the customer experience with DR events. Once a participant completed the customer experience survey, the team invited them to take this shorter follow-up survey after every remaining DR event.



## Is your utility or program gearing up to evaluate a new concept or considering a pilot?

Here are some important considerations that emerged from this evaluation.

### **Don't underestimate the importance of the installation process.**

Your customers' experiences of the installation process are just as important as how the technology performs or the types of savings it can deliver.

### **In today's digital environment smart devices are ubiquitous, but that doesn't mean they're integrated.**

Though less than one in five respondents had questions or concerns about upcoming DR events once their water heater was installed, comments like, *"I linked the water heater to my nest thermostat. Do I need to do this or does it create an issue if Nest is managing my 'response' rather than [my utility]?"* are important reminders that customers participating in DR or other energy efficiency programs will want to integrate smart home apps. If not done properly, this could undermine utility DR objectives.

### **DR events can be a good opportunity to gauge customer satisfaction of the utility.**

When asked to take into consideration all aspects of their utility service experience and rate their utility, most customers (ranging from 93 to 100%) were either completely or moderately satisfied with their utility after each event. A finding that carried across nine separate DR events.

### **Recruiting pilot participants from within the company has the dual benefit of phasing out inefficient equipment and providing employees an opportunity to experience and learn about utility offerings.**

In addition to the offer of a free electric resistance or HPWH for participating in the pilot, the utility engaged employees to participate by inviting them to help the utility gauge customer satisfaction with the water heater and DR event, test the amount of demand shift possible with water heaters, and assess the energy efficiency aspect of the heat pump water heaters.

## The Takeaway

Electrifying heat and cooking appliances in the U.S. is essential to limiting global warming. But to electrify 121 million American households before 2050 means we need to switch close to 80 million appliances across 50 million households over the next decade. As customers demonstrate increased interest to fight climate change, utilities can put this amenability into action by offering incentives to not only spur fuel transition but put in place demand response programs to lower electricity levels across the grid.

Combining customer surveys and staff interviews with impact analyses can unearth rich findings to help utility DR programs understand customer control—a key component for program retention. Moreover, customer research provides utilities with pilot participant testimonials to highlight how some programs have relatively low impact, and that when issues arise, customers have the ability to override an event.



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