
Customer centric recommendations for the design of residential direct load control (DLC) demand response (DR) utility Programs



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Problem in a nutshell

"From 2013 to 2015 the top 1% most expensive hours accounted for about 8% of Massachusetts ratepayers' annual spend on electricity."

Oversizing the infrastructure to meet peak demand and provide the necessary energy resources is expensive.

- Residential demand response (DR) could help address (summer) peaks.
 - Customers could reduce their electricity consumption at times of peak energy demand to reduce long-term infrastructure costs or system reliability risks (DOER, 2017).
 - With connected devices, residential DR wouldn't rely on active customer involvement and could become a firm local resource to help manage demand peak.
 - A volatile , highly fragmented resource, typically dependent on matters of individual choice and could become a firm resource.
 - If enrolling a significant fraction of potential customers

- This indicates the need to deeply understand the underlying beliefs impeding customer participation to facilitate program success.

Case study: National Grid's Connected Solutions ADR Program

- We teamed up with National Grid to investigate the reasons why customers weren't enrolling in the ADR program as quickly as expected.
 - By September 2016, TSTAT enrollments were at 30% of target.
- **Focus Groups:** Participants were encouraged to openly discuss concerns and beliefs about ADR without ever experiencing ADR.
 - Willingness to modify some routines and practices to participate in DR programs.
 - Acceptance of and reactions to email-based program recruitment by utility companies

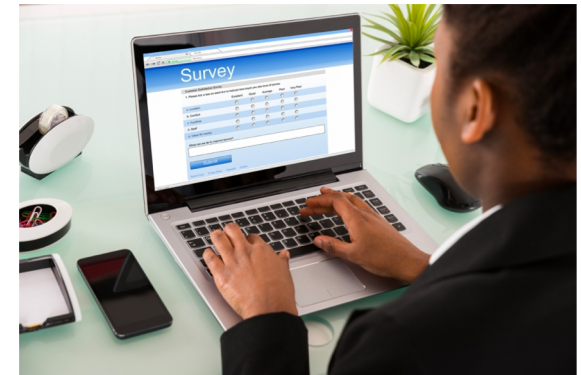
*Proportion of smart thermostats enrolled in National Grid's Residential ADR Program (Sep,30, 2016)



*Unstandardized by market size

Recruitment

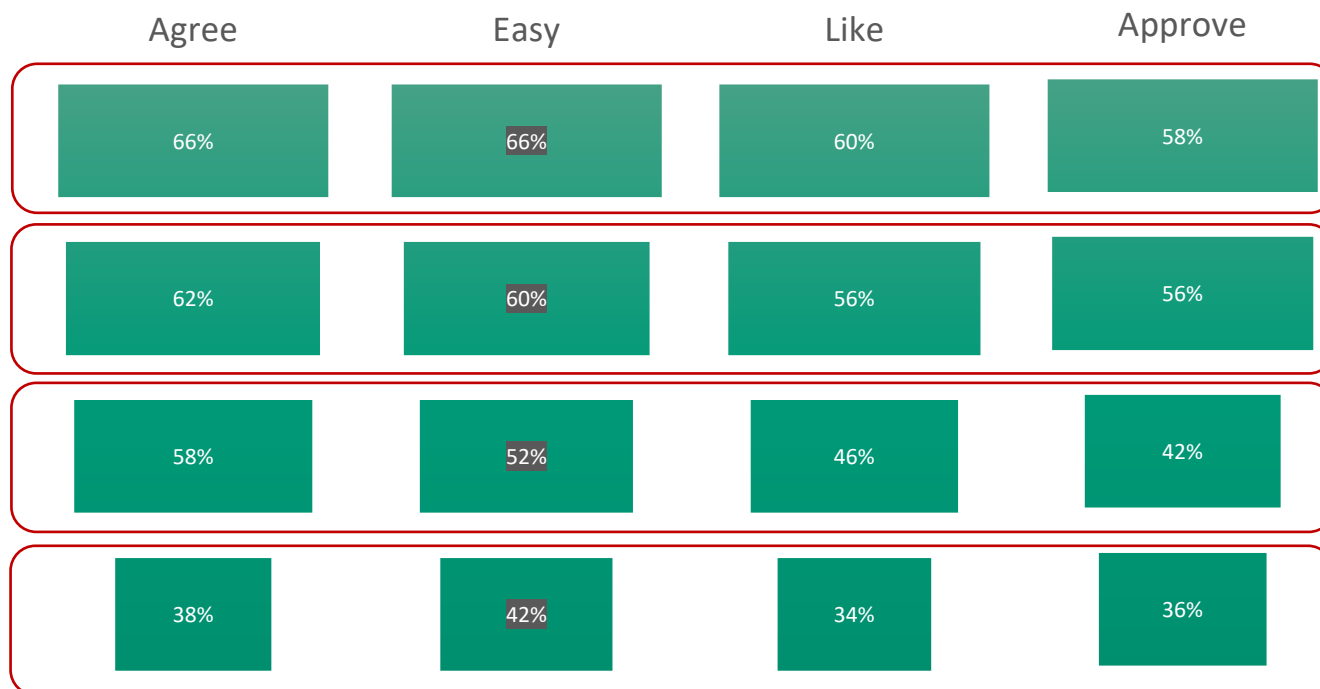
- Online recruitment via an ad on craigslist and reddit
 - \$40 for 90 minutes to discuss household routines
 - 188 applicants filled an online survey
 - Eligibility criteria: have AC and pay for utility bills
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- 3 focus groups
 - #1: 6 p. average age above 45, #2: 5 p. under the age of forty and #3: 3 p. national grid customers
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- Semi structured focus groups: discussion with worksheet completion followed by discussion



Focus group insights: delaying activities relevant to DR programs



- Ice breaker: introduces participants to one another by inviting them to discuss everyday routines in the summer.
- Participants were invited to discuss energy dependent habits, of interest for DR programs w/ connected devices.



Focus group insights



Delay dishwashing

Somewhat flexible. On average, the participants were willing to delay dishwashing by 1.7 hours (SD = 2.6). No appreciable differences between groups.



Delay laundry

Time of performing activity depends on other activities. Hygienic concerns: “letting laundry pile up” or “not having enough clothes”. Willing to delay activity by 2 days (SD = 1.8).

Older group was more willing to postpone laundry (younger populations may have to change clothes multiple times a day, or family with kids tend to accumulate laundry)



Increase indoor temperature

Could increase temperature for an average of four hours.



Change the time of the shower

Routine. It is associated with notions of wellbeing, cleanliness, start of the day

Shifting: 1.5 hours.

Focus group insights: Email outreach

Take better control

Overall concern: legitimacy of the email

What comes to mind... “distrust”

Stood out: “Savings, incentives but....”
“Why would the utility be interested in their savings?”

When asked to describe the email by their own words:

- Monetary Savings
- New technology
- Energy Savings
- “big brother effect”

Enroll now, get paid, and save energy!

Honeywell | Home

Overall opinion: legitimate email. Reputable company

What comes to mind... “want to know more”
Concerns of third party control

Email is about ...

- Saving money and energy
- Introducing new thermostat feature or technology

Connected Solutions program

Utility Peak Energy Events

WHY	High electricity demand occurs on extremely hot, humid summer days when everyone switches on their air conditioners
WHAT	<ul style="list-style-type: none">• Be paid \$25 for enrolling the WiFi thermostat.• The program will adjust the temperature of your enrolled WiFi thermostat by 2°F, for 4 hours.• Home is precooled before the event.• Maximum number of events: 40.• Utility pays \$25 if you participate in 75% of the events.• Customer is notified before the event.• Opt-out by adjusting the temperature on the thermostat or online.
BENEFITS	The program keeps you comfortable while reducing overall energy use, during peak times, and saving you money.

Reduce the burden on the electric grid, save money, and maintain comfort.

Focus group insights: program design

	Average age: > 40 #6	Average age: < 40 #5	National Grid #3
<i>What first comes to mind when thinking about participating in the program?</i>	Saving money and energy =5 Comfort? =1 Will rates increase later? =1	Lack of detail. Doesn't make sense =1	Saving money and using energy more efficiently.
<i>Enrollment process</i> (web) HEA	User friendly and natural	Issues of privacy	
<i>What would make it hard for you to enroll?</i>	Skepticism that money would be saved in the long run Lack of choice, Hidden costs, comfort Requiring landlord approval and not being home for installation		
<i>What would you do if it was too hot during an event, and you were home</i>	Override thermostat settings = 12 Turn on alternative cooling devices (fan) = 2		
<i>What would be the benefits of participation?</i>	Saving money = 7 Favorable environmental impact = 2 Being paid = 2		

Trust worksheet

Subscale	Statement	All Groups		
		N	Ave	SD
Trust	My electric company treats people like me fairly and justly	14	4.0	0.8
	I feel confident about my electric company's skills	14	3.9	1.0
	I believe that my electric company can be relied on to keep its promises.	14	3.7	1.0
	My electric company has the ability to accomplish what it says it will.	14	3.5	1.0
	Whenever my electric company makes an important decision, I know it will be concerned with people like me.	14	3.3	1.2
	I believe that my electric company takes the opinions of people like me into account when making decisions	14	3.0	1.2
	Total Trust	14	3.6	1.1
Control Mutuality	In dealing with people around, (Reverse score) (2.2 <rating <3.8)	13	3.2	1.0
	My electric company listens to what people like me have to say.	13	3.1	1.2
	My electric company really listens to what people like me have to say.	13	3.0	1.1
	My electric company believes the opinions of people like me are legitimate.	13	3.0	1.3
	The management of my electric company gives people like me enough say in the decision-making process	13	2.7	1.1
	Total Control Mutuality	13	3.0	1.1
Satisfaction	Generally speaking, I am pleased with the relationship my electric company has established with people like me.	13	3.5	1.0
	Most people enjoy dealing with my electric company.	13	3.2	1.0
	I am happy with my electric company.	13	3.2	0.7
	Most people like me are happy in their interactions with my electric company.	13	3.2	1.2
	Both my electric company and people like me benefit from the relationship.	13	3.2	1.1
	Total Satisfaction	13	3.3	1.0

Summary of concerns

- Reluctance of participation, with CT, especially in hot and humid summer days
- Participants viewed delaying the use of dishwashers and laundry machines for a few hours as a minor issue, mainly because they were typically not used daily
 - which suggests that consumers may be more receptive to DR programs that curtail electricity for these appliances (as well as electric water heaters) than for CTs.
- Legitimacy of the offer that their electric utility presented to them
- Lack of control would have a significant negative influence on their comfort and trust for the program overall
- Only a few participants were willing to cede control for the sake of the incentive and for environmental concerns

Comfort

Flexibility

Trust

Control

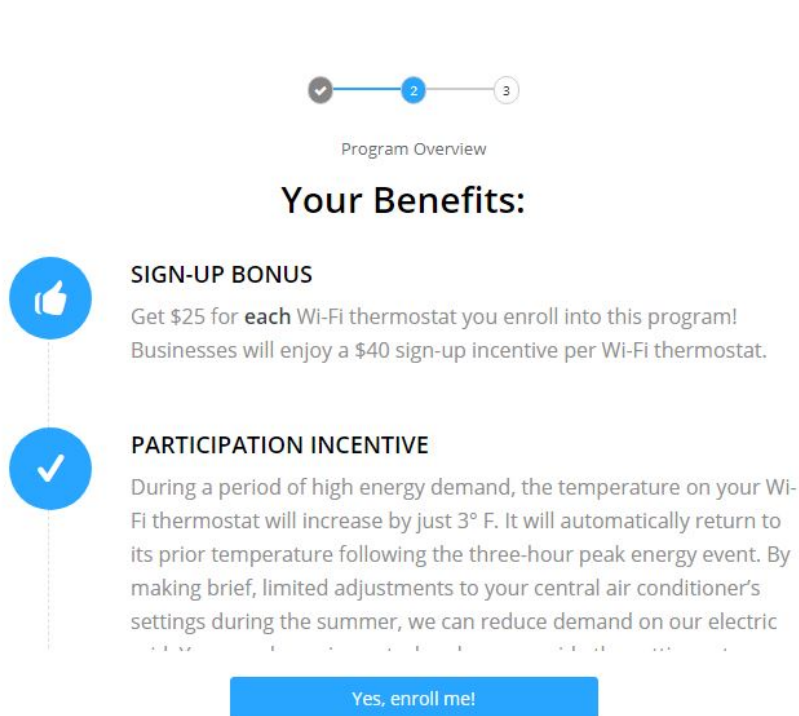
Recommendations

1. **Customer testimonials** in to increase the credibility and likelihood of participation. **Referral incentive.**
2. To further help with awareness and familiarity, we recommend some level of **dissemination of the program on mass media.**
3. We recommend **wording marketing materials to use fewer terms implying savings** since savings are not a target of the DR program, to build transparency and trust. Add more conditions related to ease of participation and compensation **while ensuring customer control and comfort.**
4. Higher receptiveness to emails received from a communicating thermostat vendor. Consequently, we recommend **pursuing marketing efforts paired with device manufacturers to increase enrollment.**

Example of changes made to program

Focus on customer benefits, other than monetary savings, instead of the benefits for the electric grid

Introduce customer testimonials



WHISKERLABS
CONNECTED
SAVINGS

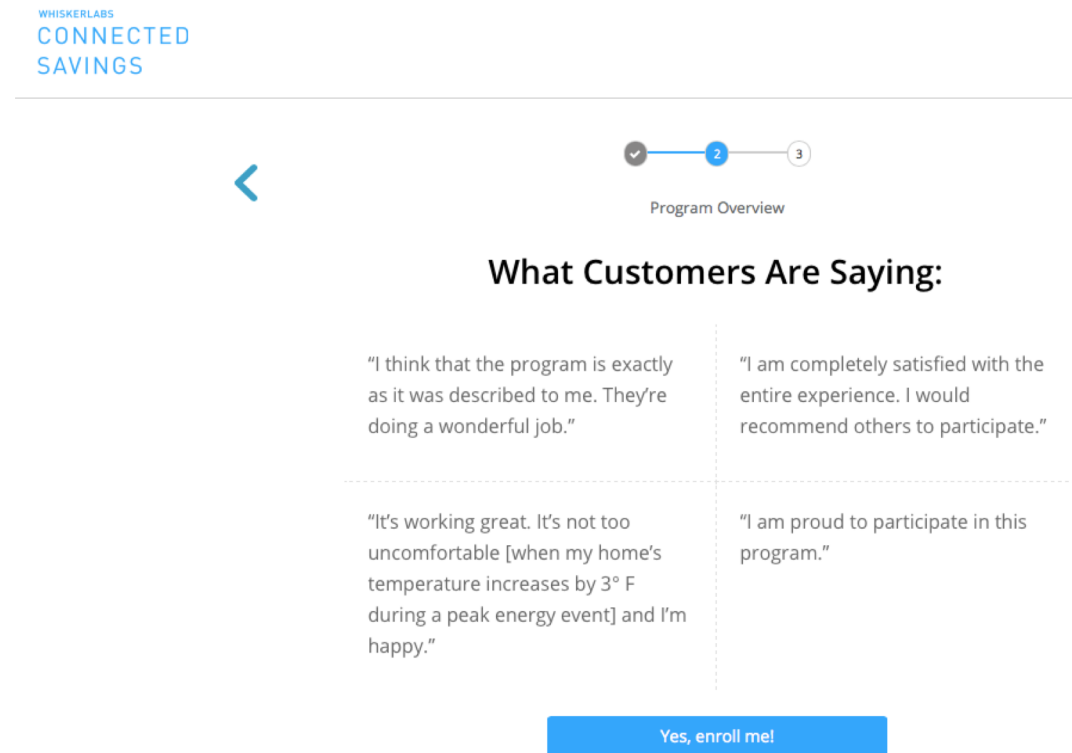
Program Overview

Your Benefits:

SIGN-UP BONUS
Get \$25 for **each** Wi-Fi thermostat you enroll into this program!
Businesses will enjoy a \$40 sign-up incentive per Wi-Fi thermostat.

PARTICIPATION INCENTIVE
During a period of high energy demand, the temperature on your Wi-Fi thermostat will increase by just 3° F. It will automatically return to its prior temperature following the three-hour peak energy event. By making brief, limited adjustments to your central air conditioner's settings during the summer, we can reduce demand on our electric

Yes, enroll me!



WHISKERLABS
CONNECTED
SAVINGS

Program Overview

What Customers Are Saying:

"I think that the program is exactly as it was described to me. They're doing a wonderful job."

"I am completely satisfied with the entire experience. I would recommend others to participate."

"It's working great. It's not too uncomfortable [when my home's temperature increases by 3° F during a peak energy event] and I'm happy."

"I am proud to participate in this program."

Yes, enroll me!

Changes made to the portal included customer insights and were responsible for an increase of 168% in enrollment rate (Navigant, 2018)

Any Questions?

Thank you!

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Department of Energy Resources. (2017). Demand response and load management. Retrieved from <http://www.mass.gov/eea/energy-utilities-clean-tech/energy-efficiency/ee-for-business-institutions/demand-response-and-load-management.html>.

Navigant Consulting, Inc. (2018). 2017 Demand Response Programs Impact Evaluation Results. Prepared for National GRID