## Utility Perspective on Grid Interactive Water Heating

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### **Today's Outline**

- Grid interactive water heaters versus heat pump water heaters: our perspective
- Lessons learned from utility emerging technology programs
- Lessons learned from PG&E's residential hot water strategy
- Lessons learned from VEIC's water heating leasing program
- Customer perspective: results of our Residential Utility
  Customer Survey
- Bridging the gap between DR and ancillary services
- The future of this technology: batteries and thermal storage going hand in hand

## Grid Interactive Water Heaters Versus Heat Pump Water Heaters: Our Perspective



#### **Different Strokes for Different Folks**

- We've seen opposition to the use of GIWHs due to the inefficiencies of electric resistance heat
- GIWHs are not an energy efficiency technology; they're an energy storage technology
- The greatest societal benefit will likely come from the use of energy efficiency technologies in some locations and energy storage technologies in other locations
- There haven't been any studies comparing the societal value of these two technologies

#### **The Best of Both Worlds**

What if...

- The electrical resistance element of a HPWH was controlled for frequency regulation when needed, and the heat pump was used at other times?
- Variable speed compressors were used for the heat pump and their capacity was ramped up or down to provide regulation?

## Lessons Learned from Utility Emerging Technology Programs



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#### SMUD's Technology Assessment Scorecard



Source: Sacramento Municipal Utility District

#### SMUD's Four-stage Emerging Technology Development Process



read to overcome market barriers just yet"

- David Bisbee, Project Manager for SMUD's Customer Advanced Technologies Program



#### **Market-Viability Analysis At Nicor Gas**



"The market information is the grease that will lubricate the skids all the way to the contractor."

- Gary Cushman, Program Manager for Emerging Technologies for the Nicor Gas Energy-Efficiency Program

### Market Information is Transferred Throughout Nicor Gas' Emerging Technology Process



Source: Nicor Gas

## If the Technology Works, That's Great, But...

- Make sure you can address the market barriers!!!
- If you can't, don't fret, there's help

"Price and 'what's on the truck' are referenced as the primary barriers to improving the market penetration for Energy Star® Water Heaters."

- Delaina Wilhelm, Senior Product Manager - Appliances & Water Heaters, PG&E

## Lessons Learned From PG&E's Residential Water Heater Strategy



#### **Get the Customer Engaged**

- Traditional approach focused on the installers, but installers aren't salesman/woman
- Started with the retailers, customers would see the incentives and request them from contractors
- Water heater upgrades not about efficiency or ROI, they're about comfort, maintenance, and functionality
- Blitz campaign do everything, all at once

# The Water Heater as the Heart of the Home



## Lessons Learned From Vermont Energy Investment Corporation's Water Heater Leasing Program



#### **96% Customer Satisfaction**





#### **Customer Expectations**

Expectations	Customer Deemed "Very Important"
1. Never leaks drainwater	81%
2. Is as energy efficient as possible	73%
3. Has lower operating costs than the original	73%
4. Provides hot water on demand	62%
5. Is covered by the manufacturer's warranty	46%
6. Never runs out of hot water	42%
7. Is covered by the installers warranty	31%
8. Has a low installation cost	27%
9. Operates quietly (No sound in the living area)	19%
10. Dehumidifies the space where it is located	12%
11. Is manufactured by a recognizable name brand	12%
12. Is installed without interrupting power	8%

Source: Shawn Enterline, formerly of VEIC

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#### The Future of Equipment Leasing

- Best business model is an upstream (distributor) rebate
  - Generally only about a dozen distributors in each state
- Joint rebate and lease program utility gets DSM credit, customer get's equipment purchase with no money down
- If purchasing from big-box retail
  - Walk in, sign up, walk out
- If purchasing from a contractor
  - Distributor can pay commission to the contractor and have electronic lease signup for customer

## The Customer's Perspective: Results From the E Source Residential Utility Customer Survey



#### Do you rent or own your water heater?



### Have you ever considered replacing your water heater with a more efficient model before it fails or needs replacing?





If it means that you would never have to service your water heater on your own, would you be interested in renting your water heater from your utility?



## How much would you be willing to pay for this service each month?



## Demand Response and Frequency Regulation Hand-in-Hand



#### **Like Oil and Vinegar**

Speaking to Tim Roughan, Director of Distributed Resources for National Grid...

Is it feasible for one commodity to provide both DR and ancillary services?

No, FERC standards of conduct say that the retail arm can't know what the generation arm is doing, so that you can't manipulate the market

Would you bid ancillary services into the wholesale market without DR?

No, because we're regulated, and we can't earn too much. Unless we're not meeting our revenue goals, then we could

### The Future of GIWH Technology



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#### **Thermal Storage and Batteries Hand in Hand**

- With very high penetrations of renewables (>60%)...
  - Load shedding from shutting off thermal storage devices (water heaters, etc.) is not enough to balance the grid
  - Use thermal storage for thermal needs (heat and hot water)
  - Use batteries for plugload needs

#### **For More Information**

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#### References

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- PG&E's 2013 2014 Residential Water Heater Strategy, Delaina Wilhelm, Pacific Gas & Electric Company (2013)
- Program Design for the Equipment Lease
  <u>Distribution Channel</u>, Shawn Enterline, Vermont
  Energy Investment Corporation (2013)