Utility Perspective on Grid Interactive Water Heating

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E Source

Peak Load Management Alliance Grid-Interactive Water Heating Interest Group Workshop
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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
SMUD’s Technology Assessment Scorecard

Emerging Technology Score Card
Version: 2013 V1

Name of Technology:

Please enter the requested responses in the blue cells

I. Technical Savings Potential (35 points maximum) Points
   a) Does this technology reduce SMUD’s peak demand? (Y or N) - N/A
   b) How much is the potential peak demand savings? (Enter the percentage as a whole number) - 0.0
   c) Does this technology save energy? (Y or N) - N/A
   d) How much is the potential energy savings? (Enter the percentage as a whole number) - 0.0
   e) Does this technology shift demand to SMUD’s off-peak hours? (Y or N) - N/A

Total: 0

II. Market Potential (40 points maximum)

Enter Y or N Points

a) Target market (Choose only one)
   - Residential HVAC
     - Central air conditioning with gas heat
     - Central heat pump
     - Central electric resistance heat
     - Residential lighting
     - Residential water heating (electric)
     - Residential plug loads
     - Residential swimming pools
   - Commercial HVAC
     - Rooftop package units < 5 tons
     - Rooftop package units 5.5-11.25 tons
     - Rooftop package units 11.25 to 20 tons
     - Chillers 50 to 150 tons
     - Chillers > 150 tons
   - Commercial lighting
     - Internal lighting

III. Market Readiness (15 points maximum)

Enter Y or N Points

a) Stage of Development (choose only one)
   - Preliminary design (shop drawings)
   - Prototype phase (lab tested)
   - Beta testing phase (field testing - one to two systems)
   - Pre-production phase (UL, ETL approved)
   - Commercially available, reliability unknown
   - Commercially available, proven reliability
b) Is the target market sector a priority for SMUD this year? (choose only one)
   - Low priority
   - Medium priority
   - High priority
c) Has the technology been field tested by a respected third party? (Y or N)
   - If so, do available test results confirm the manufacturer’s claims? (choose only one)
   - Results strongly support manufacturer’s claims
   - Results somewhat support manufacturer’s claims
   - Results do not support manufacturer’s claims
   - Results refute manufacturer’s claims
d) How will product be incorporated (choose only one)
   - Need to develop new program
   - Modify existing EE rebate program
   - Fit into existing EE rebate program
ex) Warranty coverage? (choose only one)
   - 1 year
   - 1 to 3 years
   - Over 3 years

IV. Strength of Manufacturer (10 points maximum)

Enter Y or N Points

a) Years in business? (choose only one)
   - 1 year
   - 2 to 5 years
   - Over 5 years

Source: Sacramento Municipal Utility District
SMUD’s Four-stage Emerging Technology Development Process

“…We know it’s going to die a painful death if we try to put it directly into programs because it’s not ready 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

Satisfied, 15%

Unsatisfied, 4%

Very satisfied, 81%

Source: Shawn Enterline, formerly of VEIC
## Customer Expectations

<table>
<thead>
<tr>
<th>Expectations</th>
<th>Customer Deemed “Very Important”</th>
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<tbody>
<tr>
<td>1. Never leaks drainwater</td>
<td>81%</td>
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<td>2. Is as energy efficient as possible</td>
<td>73%</td>
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<td>3. Has lower operating costs than the original</td>
<td>73%</td>
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<td>4. Provides hot water on demand</td>
<td>62%</td>
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<td>5. Is covered by the manufacturer’s warranty</td>
<td>46%</td>
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<tr>
<td>6. Never runs out of hot water</td>
<td>42%</td>
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<tr>
<td>7. Is covered by the installers warranty</td>
<td>31%</td>
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<td>8. Has a low installation cost</td>
<td>27%</td>
</tr>
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<td>9. Operates quietly (No sound in the living area)</td>
<td>19%</td>
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<td>10. Dehumidifies the space where it is located</td>
<td>12%</td>
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<td>11. Is manufactured by a recognizable name brand</td>
<td>12%</td>
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<tr>
<td>12. Is installed without interrupting power</td>
<td>8%</td>
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Source: Shawn Enterline, formerly of VEIC
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?

- Rent, 21%
- Own, 75%
- Don't Know, 4%
Have you ever considered replacing your water heater with a more efficient model before it fails or needs replacing?

Yes, 37%
No, 63%
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?

Yes, 34%

No, 66%
How much would you be willing to pay for this service each month?

- $5-$10, 47%
- $11-$15, 29%
- $16-$20, 21%
- Other, 3%
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
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

- **Innovative Techniques for Taking Emerging Technologies from Discovery to Implementation**, Jay Stein, E Source (2013)