LESSONS LEARNED THROUGH IMPLEMENTING NH’S THERMAL RPS for GEOTHERMAL

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Lessons Learned:
Independent Monitor Perspective

1. **Need buy-in from installers**
   - Installers need to see benefit and be provided with tools to make process easy.

2. **NH Metering methods seem appropriate**
   - Heat pump specifications and metered runtimes for small systems.
   - Heat meter for large systems.

3. **Make process more efficient:**
   - Streamline application process
   - Work to get ‘meter’ data (on/off, EWT, LWT) from onboard systems like WaterFurnace Symphony
Lessons Learned:
Independent Monitor Perspective

Need buy-in from installers

1. Plan for installation prior to construction
   - Wiring and internet connections
   - Large systems need sufficient pipe runs and location to meet heat meter requirements.

2. Make metering systems agnostic to system performance.
   - Goal is to meter heat from ground
   - Data may not represent system efficiency accurately, so avoid presenting data as COP – especially with small systems.
Lessons Learned: 
Independent Monitor Perspective

Metering methods seem appropriate (perhaps adjust small-to-large threshold upward)

1. Small systems meter runtimes (heating)
   - Heat pumps need AHRI certifications
   - Sensors should be clamp-on and installed in heat pump (not electrical panel)

2. Large systems require Heat Meter
   - “Class 3K” temperature sensors, ground loop ΔT should be greater than 5.4°F (3°C).
   - Examples: Onicon Systems 10 and 40 (smaller)
IM Lessons: Metering (small)

“Metered” with calibrated temperature sensors and flow meter

<table>
<thead>
<tr>
<th>Degree Days</th>
<th>2,172</th>
</tr>
</thead>
<tbody>
<tr>
<td>Geoexchange</td>
<td>9,583,417</td>
</tr>
<tr>
<td>Total kWh</td>
<td>1,094</td>
</tr>
<tr>
<td>System Operating Cost</td>
<td>$219</td>
</tr>
</tbody>
</table>

“Metered” with AHRI Performance Data and measured Runtimes

<table>
<thead>
<tr>
<th>Current Conditions</th>
<th>Runtimes</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>91 days starting January 01, 2016</td>
</tr>
<tr>
<td>EWT</td>
<td>LWT</td>
</tr>
<tr>
<td>Heat Pump 1</td>
<td>60.26° F</td>
</tr>
</tbody>
</table>

HC=22,000 Btu/h
COP = 4.8

Q = \( \frac{HC \times (COP - 1) \times t}{COP} \) = 9,579,167
0.04% error

USE WITH CAUTION: need to look at data from more sites!!
Lessons Learned:
Independent Monitor Perspective

Make process more efficient

1. Streamline application process
   - Standardized process with one-way flow of documents and approvals.
   - Use web-based method that allows for uploading documents and digital signatures.

2. Capitalize on existing sensors (small systems)
   - Work with manufacturers to have essential data (heat pump on/off, EWT, LWT) ‘pushed’ to Independent Monitor.
Application Process: Current

- Paper based
- Non-linear
- Inefficient
- Requires input from 6 entities
Application Process: Recommended

- Linear process
- Installer initiates standardized process
- Electronic, cloud-based, append documents
- Standardize initial contract
- Electronic notary options?
Contact info

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