Promoting the Use of GSHPs to Reduce Peak Demand and Improve Electric System Utilization

October 15, 2014

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Manager, Residential Efficiency Programs
Overview

- PSEG – Company Information
- New York State and Long Island Associations
- The Electric Utility
- Renewable Technologies - Utility Perspective
  - Solar
  - Geothermal Cooling and Heating
- PSEG Long Island
  - Utility 2.0
  - Incentives and Rebates for GSHP Installations
Public Service Enterprise Group (PSEG) owns and operates New Jersey’s oldest and largest electric and gas utility (PSE&G).

PSE&G is a 106-year old energy company with a commitment to and track record of providing the most reliable electricity and gas service to its 2.2 million customers in New Jersey.

PSEG Overall
$29B in assets; almost 10,000 employees; 13,000 MW of electric generation; renewable energy subsidiaries
PSEG Corporate Structure
PSEG Long Island

• On January 1, 2014, PSEG Long Island became the electric utility for the 1.1 million customers on Long Island and the Rockaways.

• PSEGLI has the authority for:
  – Day-to-day operations
  – Budgeting
  – System maintenance and Operation
  – Storm preparedness and response
  – Infrastructure improvements
  – Energy Efficiency and Renewable programs ....including rebates and incentives for geothermal projects
What’s Going on in New York?

Long Island Geothermal Energy Organization (LI-GEO)

- First meeting: June of 2012
  - John Franceschina P.E. (PSEG Long Island) – President
  - Zach Fink (ZBF Geothermal) – Vice President

Milestones

- Authored the Suffolk County Geothermal Code
- Conference and Press Event: November 13th

www.li-geo.org
What’s Going on in New York?

The New York Geothermal Energy Organization (NY-GEO)
• First meeting: June of 2014
  • John Franceschina, P.E. (PSEG Long Island) – President
  • Bill Nowak, Executive Director
  • Jens Ponikau (Buffalo Geothermal) – Vice President

Milestones
• Hired Executive Director
• Completed Several Albany Meetings
• Working on NYS Tech Manual (TRM)
• Renewable Energy World

How One Utility Enlisted Geothermal Cooling to Reduce Peak Electric Demand and Improve System Utilization

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The Good Old Electric Utility...

- Highly Reliable
- Conservative Mentality
- Very Slow to Adopt Changes
- Prefer Central Plants....Not Distributed Resources
- Rate Tariffs Not Conducive to Non-Traditional Billing
- Buy a Transformer.....Get an Attractive ROI
Peak Electric Utility Load

Sample Daily Load Shape
PSEG Long Island Territory

7/18/2013 Peak Day: 5757 MW
Sample Shoulder Day: 4/17/2014: 2533 MW
GSHPs vs. Solar PV *(Electric Utility Perspective)*

Distributed Solar PV Advantages

- Mainstream
- Renewable
- CO₂ Reduction
- Green Technology
- Solid Contractor Base
- Understood by Inspectors (Electrical, Buildings, etc.)
- Limited Number of Customers (Greenies/Upper Middle Class)
- Happy Customers
Geothermal vs. Solar PV *(Electric Utility Perspective)*

Distributed Solar PV Disadvantages

- Reduces Revenue for Utility (less kWh)
- Cost
  - Increases Cost on a Per kWh Basis
  - Same Infrastructure Required
- Customers that Install PV are Paying Less for the same Electric Service
- Inability to Collect Fair Service and Demand Charges
- Transitioning from a Niche Market to a Main Stream Market
- Existing Tariff may Penalize Poorer Customers
- Creates a Sharper Load Profile (Duck Curve)
If it Looks Like a Duck...

Califonia's electrical grid throughout the day

2012
2013
2014 proj.
2015
2020

The net load on March 31 of each year

Source: CalISO

The California Duck Curve
GSHP Advantages *(Electric Utility Perspective)*

- **Reduce Peak Demand**
  - For Decades Utilities Were Incentivized to Increase Demand ($$$)
  - Today Regulators are Requiring Utilities to Reduce Peak Demand
- **Sell More kWh (Off-Peak)**
- **Lower My Carbon Footprint**
  - The Dirtiest (High Carbon Units) Run During Peak
- **Potential to Own the Loop Fields** – New Business Opportunity

*Win-Win-Win*

- Utility (Makes Regulators and Customers Happy)
- Geothermal Customer (Lowers Energy Cost)
- All Customers (Lower Bill - Fixed Costs Spread Over More kWh)
GSHP Disadvantages *(Utility Perspective)*

• I Can’t Think of Any......
## PSEG Long Island Utility 2.0 Long Range Plan
### 2015 - 2018

<table>
<thead>
<tr>
<th>Program</th>
<th>Description</th>
<th>Annual Demand Savings (MW)</th>
<th>Annual Energy Savings (MWh)</th>
<th>Total Investment ($M)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Programmable Thermostat Program Modernization and Expansion</td>
<td>Enhance existing direct load control program with modern technology and increase customer participation. Also, test smart plug technology through a pilot program targeting residential room air conditioning units.</td>
<td>100</td>
<td>2,700</td>
<td>$60</td>
</tr>
<tr>
<td>Targeted Solar PV Expansion</td>
<td>Provide incentives to commercial behind-the-meter solar PV, targeting Long Island customers unable to access existing incentives.</td>
<td>30</td>
<td>100,000</td>
<td>$45</td>
</tr>
<tr>
<td>Residential Home Energy Management</td>
<td>Provide targeted home energy reports and guidance to customers to reduce demand; 250,000 customers targeted.</td>
<td>10</td>
<td>25,000</td>
<td>$8</td>
</tr>
<tr>
<td>Incremental Energy Efficiency Expansion</td>
<td>Target additional opportunities for cost effective technology and underserved customers.</td>
<td>10</td>
<td>41,200</td>
<td>$30</td>
</tr>
<tr>
<td>Energy Conservation Program for Hospitals</td>
<td>Design and offer energy efficiency retrofit program tailored for hospital customers.</td>
<td>5</td>
<td>28,000</td>
<td>$30</td>
</tr>
<tr>
<td>Energy Efficiency Expansion on the Rockaways</td>
<td>Offer energy efficiency enhancements for low-income multi-family housing, public facilities, and other customers on the Rockaways.</td>
<td>5</td>
<td>21,500</td>
<td>$13</td>
</tr>
<tr>
<td>Combined Heat &amp; Power</td>
<td>Provide incentives for commercial CHP installations, targeting Long Island customers unable to access existing incentives.</td>
<td>5</td>
<td>39,000</td>
<td>$5</td>
</tr>
<tr>
<td>Geothermal Heating and Cooling</td>
<td>Expand rebates for geothermal heating and cooling systems.</td>
<td>5</td>
<td>7,800</td>
<td>$10</td>
</tr>
<tr>
<td><strong>Utility 2.0 Investment</strong></td>
<td></td>
<td>170</td>
<td>265,200</td>
<td>$201</td>
</tr>
<tr>
<td>South Fork Improvements</td>
<td>Proceed with various energy efficiency, distributed generation, and direct load control investments, potential combined with battery storage, to defer needed transmission and peaking generation.</td>
<td>TBD</td>
<td>TBD</td>
<td>TBD</td>
</tr>
<tr>
<td>Large Customer Advanced Metering Initiative</td>
<td>Deploy advanced metering to 25,000 customers representing 2% of customers but over 20% of the electric load on Long Island.</td>
<td>15</td>
<td>45,000</td>
<td>$15</td>
</tr>
<tr>
<td><strong>Capital Budget Investment</strong></td>
<td></td>
<td>15</td>
<td>45,000</td>
<td>$15</td>
</tr>
<tr>
<td><strong>GRAND TOTAL</strong></td>
<td></td>
<td>185</td>
<td>310,200</td>
<td>$216</td>
</tr>
</tbody>
</table>

Budgets and goals are estimates and subject to change based on detailed cost effectiveness screening and market potential.
Geothermal Heating and Cooling

• One of the most energy efficient means of heating and cooling

• Improves electric system load factor, which is approaching 44% on Long Island

• Reduces summer peak and displaces fuel oil with cleaner, more efficient electric geothermal heating during off-peak periods

• Plan is to offer more generous incentives to stimulate this market

4-yr Target
5 MW
$9 mil
Fundamental goal of Utility 2.0 is to provide the lowest cost solution to our customers.

- Energy efficiency produces round-the-clock load reduction, and demand response results in peak load reduction.
- Development costs are generally high on Long Island, and resources require location-specific electric and gas interconnection costs that can be significant.
- Energy efficiency has proven to be the lowest cost resource, with limited price volatility.

**Cost of Achieved National Energy Efficiency vs. Supply Options**

Source: ACEEE and Lazard, 2013
1. The levelized cost of electricity (LCOE) represents the per kWh cost of building and operating a generating plant or other energy resource over an assumed financial life of the investment; LCOE should represent the price a new energy resource needs in the market to be financially viable.
2. Critical assumptions in the Lazard analysis are based on national averages, and generally costs are higher on Long Island than nationwide.
3. Includes 30% Federal Investment Tax Credit for solar PV.
Geothermal/Geocolumn* Incentives:

Please Note: 2014 Rebate amounts are paid by the UNIT

<table>
<thead>
<tr>
<th>2014 Residential Geothermal/Geocolumn* Customer Incentive</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>EER</strong></td>
</tr>
<tr>
<td>&gt;= 19.0 &amp; &lt; 24.9</td>
</tr>
<tr>
<td>&gt;= 25.0</td>
</tr>
</tbody>
</table>

Replacement refers to any installation where the previous equipment was a geothermal heat pump.

ARI emulated testing procedures on Geocolumn* technology will be accepted in order to validate the Energy Efficiency Ratio (EER).
# 2014 Rebates and Incentives for Commercial GSHPs

<table>
<thead>
<tr>
<th>Equipment Type</th>
<th>Size Category</th>
<th>Sub Category</th>
<th>For replacement of Existing Equipment in working condition</th>
<th>For new equipment or replacement of Existing Equipment that does not meet the conditions in the previous columns</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Heat Pumps</strong></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Geothermal Heat Pumps</td>
<td>&lt; 11.25 Tons</td>
<td>Closed Loop</td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
<td>Open Loop</td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
<td>Direct Geoexchange (DGX)</td>
<td></td>
<td></td>
</tr>
<tr>
<td><strong>Existing Equipment Type and Efficiency</strong></td>
<td>New Equipment Efficiency</td>
<td>Code</td>
<td>Tier 1 Rebate $/ton</td>
<td>New Equipment Efficiency</td>
</tr>
<tr>
<td>must replace existing AC rated 9.5 EER or less</td>
<td>17.0 EER 3.5 COP</td>
<td>GHP100</td>
<td>$1,500</td>
<td></td>
</tr>
<tr>
<td>must replace existing AC rated 9.5 EER or less</td>
<td>20.0 EER 4.2 COP</td>
<td>GHP200</td>
<td>$1,500</td>
<td></td>
</tr>
<tr>
<td>must replace existing AC rated 9.5 EER or less</td>
<td>17.0 EER 3.5 COP</td>
<td>GHP300</td>
<td>$1,500</td>
<td></td>
</tr>
<tr>
<td></td>
<td>17.0 EER 3.5 COP</td>
<td>GHP101</td>
<td>$750</td>
<td>18.0 EER 3.9 COP</td>
</tr>
<tr>
<td></td>
<td>20.0 EER 4.2 COP</td>
<td>GHP201</td>
<td>$750</td>
<td>23.0 EER 4.5 COP</td>
</tr>
<tr>
<td></td>
<td>17.0 EER 3.5 COP</td>
<td>GHP301</td>
<td>$750</td>
<td>20.0 EER 4.0 COP</td>
</tr>
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Questions?

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