The Evolving DE Systems Landscape in Pittsburgh

Today’s Agenda – 6/24/2019

- Introduction
- Pittsburgh: Resiliency
- Pittsburgh: Connectedness
- Pittsburgh: Vision
- Pittsburgh – District Energy Systems
  - DES – Clearway Energy
  - DES – Duquesne University
  - DES – University Complex
  - DES – PACT
- Pittsburgh – The Future
Resiliency – “the capacity to recover quickly from difficulties; toughness”

• **250 Year History**
  • Strategically critical in Western Expansion and Industrial Revolution

• **Renaissance 1 - (1945 to 1975)**
  • The “Iron City” begets the “Smokey City”
  Post War Investment in Downtown Pittsburgh – “Golden Triangle”
  • Point Park, Gateway Center, Mellon Square
  • Coordinated Urban Planning / Economic Development efforts

• **Renaissance 2 – (1975 to 2005)**
  • Ramped up downtown investment
  • US Steel Tower, One Oxford Center, PPG Place, DL Convention Center
  • Fifth Avenue Place, PNC Park
  • Early adopter of clean air standards

• **Renaissance 3 – (2005 to ????)**
  • Economy in transition (→ Tech, Energy, Healthcare, Education)
  • PPG Paints Arena, Heinz Field, PNC Tower, North Shore Development
  • Eco-Innovation Districts, Sustainability
  • Penguins “Center for Energy”
Evolving DE Systems Landscape
Pittsburgh: Community & Connectedness

- Rivers, Roads & Bridges
- Neighborhoods
- Family & Tradition
- Sports Teams
- Technology & Innovation
- Arts & Education
State of the Pittsburgh Market
Economic Indicators - Convergence of Positive Influencers

Changing demographics
• Urban renewal; Millennial sensibilities
• Reduce waste; expand renewables; leverage tech

Aging Legacy Infrastructure
• 100 years old
• Steam, water, natural gas, electric

Political vision & influence
• Mayor Bill Peduto’s “Grid of Microgrids”
• Penguins “Center for Energy”
• City of Pittsburgh, Allegheny County, SEA, DOE Collaboration

Increased Non-Profit Activity
• Higher Education; STEM; Robotics
• Healthcare Competition; Expansion

City of Pittsburgh – Market Ripe for District Energy & Utility Infrastructure Investment
Evolving DE Systems Landscape
Pittsburgh: Vision
Evolving DE Systems Landscape
Clearway Energy – Energy Center Pittsburgh – System Expansion

- North Shore System (1969)
- Uptown System (2018)
- Duquesne University Integration (2019)
- Downtown District (Target 2021)
Clearway Energy, Inc.
Energy Center Pittsburgh LLC – North Shore System
<table>
<thead>
<tr>
<th>Plant Attribute</th>
<th>Data</th>
</tr>
</thead>
<tbody>
<tr>
<td>Year Established</td>
<td>1969</td>
</tr>
<tr>
<td>Services Provided</td>
<td>Steam, Chilled Water, Hot Water (to PNC Park)</td>
</tr>
<tr>
<td>No. of Customers; Buildings</td>
<td>30; 30</td>
</tr>
<tr>
<td>Heating Capacity (Installed)</td>
<td>203,000 lbs/hr (Natural Gas; multiple units)</td>
</tr>
<tr>
<td>Cooling Capacity (Installed)</td>
<td>11,250 T (Electric; Steam)</td>
</tr>
<tr>
<td>Electrical (if applicable)</td>
<td>Backup Diesel to Plant Equipment</td>
</tr>
<tr>
<td>Distribution</td>
<td>~ 2 miles direct buried pipe (Steam, condensate, CWS, CWR, HWS, HWR)</td>
</tr>
<tr>
<td>Miscellaneous</td>
<td>Rates Regulated by PA PUC. 200kW Fuel Cell Demo (FCE, NET.L, DOE) Planned capital upgrades to chiller, cooling tower and distribution assets. Satellite assets @ hospital &amp; museum.</td>
</tr>
</tbody>
</table>
Clearway Energy, Inc.
Energy Center Pittsburgh LLC – Uptown System
<table>
<thead>
<tr>
<th>Plant Attribute</th>
<th>Data</th>
</tr>
</thead>
<tbody>
<tr>
<td>Year Established</td>
<td>2018</td>
</tr>
<tr>
<td>Services Provided</td>
<td>Steam, CW, Backup Power (to UPMC Mercy)</td>
</tr>
<tr>
<td>No. of Customers; Buildings</td>
<td>1; 4 (...thus far!)</td>
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<tr>
<td>Heating Capacity (Installed)</td>
<td>150,000 lbs/hr (Natural Gas; 3 x 50,000 lbs/hr.)</td>
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<tr>
<td>Cooling Capacity (Installed)</td>
<td>8,250T (Electric; 3 x 2,750T)</td>
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<tr>
<td>Electrical Capacity (if applicable)</td>
<td>7.5MW (Emergency Backup to Plant &amp; UPMC Mercy Hospital only</td>
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<tr>
<td>Distribution</td>
<td>~ 0.5 mile direct buried pipe (Steam, condensate, CWS, CWR)</td>
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<td>Miscellaneous</td>
<td>Rates regulated by PA PUC. Strategically located to meet DE system development in Uptown district. Planned interconnection to newly acquired Duquesne University assets for redundancy, resiliency, and operational synergies.</td>
</tr>
<tr>
<td>Plant Attribute</td>
<td>Data</td>
</tr>
<tr>
<td>------------------------------</td>
<td>----------------------------------------------------------------------</td>
</tr>
<tr>
<td><strong>Year Established</strong></td>
<td>1997 (acquired by CWEN in 2019)</td>
</tr>
<tr>
<td><strong>Services Provided</strong></td>
<td>Steam, CW, Electricity (to Duq Univ Campus)</td>
</tr>
<tr>
<td><strong>No. of Customers / Buildings</strong></td>
<td>50 acre campus; 4MM square feet of building</td>
</tr>
<tr>
<td><strong>Heating Capacity (Installed)</strong></td>
<td>181,000 lb/hour (3 x 52kpph NG + HRSG)</td>
</tr>
<tr>
<td><strong>Cooling Capacity (Installed)</strong></td>
<td>6600T (Electric; Steam Absorption)</td>
</tr>
<tr>
<td><strong>Electrical Capacity (if applicable)</strong></td>
<td>5.6MW Gas Turbine (Solar)</td>
</tr>
<tr>
<td><strong>Distribution</strong></td>
<td>Owned by Duq Univ; Maintained by Clearway</td>
</tr>
<tr>
<td><strong>Miscellaneous</strong></td>
<td>Unregulated subsidiary of Clearway Energy</td>
</tr>
<tr>
<td></td>
<td>40 Year Energy Service Agreement</td>
</tr>
<tr>
<td></td>
<td>6000T Ice Storage Added in 2007</td>
</tr>
<tr>
<td></td>
<td>Planned interconnection to Uptown distribution assets for redundancy,</td>
</tr>
<tr>
<td></td>
<td>resiliency, and operational synergies.</td>
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Evolving DE Systems Landscape
Oakland Area University Complex – Bellefield Boiler Plant

Legacy (circa 1907) central steam supply to:

- University of Pittsburgh
- UPMC hospitals
- Carnegie Mellon University
- Carnegie Museums/Library
- Phipps Conservatory
- Pittsburgh Public Schools

Converted combustion fuel from coal to NG in 2009
Evolving DE Systems Landscape
Oakland Area University Complex – Carrillo Street Steam Plant

Incremental steam supply to expanding University of Pittsburgh main campus and UPMC hospital complex.

- Est. 2009
- 600,000 lbs/hour capacity
- Sized to meet current and future needs
- NG (primary) or oil
- Lower emissions than Bellefield boiler plant
Evolving DE Systems Landscape
Downtown Pittsburgh – PACT – Pittsburgh Allegheny County Thermal

Legacy (circa 1915) central steam to downtown Pittsburgh.

- Formerly “Allegheny County Steam Heating”
- Member owned cooperative since 1982
- 500,000 lbs/hr capacity
- 4 x 125kpph NG boilers
- Combination of tunnels and direct buried distribution
- Approx. 55 buildings served
**FIGURE 2.** Potential future downtown Pittsburgh district energy network.

Source: Clearway Energy, Inc.
Evolving DE Systems Landscape

Clearway Energy Vision – Downtown DE District (Proposed)
Any Questions...?

Cliff Blashford
Clearway Energy, Inc.
6/24/2019