Microgrids – District Energy & CHP Synergies

Jim Lodge, VP Strategy & Business Development
NRG by the Numbers

NRG Energy, Inc.

48K
megawatts in operation

Global, diverse energy

3,000,000
recurring customers within NRG retail brands

One of the nation’s largest
SOLAR
power generators

Ownership interest in nearly 140
diversity generation facilities across 29 states

Largest independent
power producer in U.S.

Fortune 200
District Heating and Cooling

- **San Francisco, CA**
  - Steam: 454 MMBtu/hr
  - Chilled water: 29,250 tons
  - 175 customers

- **Pittsburgh, PA**
  - Steam: 295 MMBtu/hr
  - Chilled water: 12,935 tons
  - 50 customers

- **Omaha, NE**
  - Steam: 735 MMBtu/hr
  - Chilled water: 29,250 tons
  - 120 customers

- **Minneapolis, MN**
  - Steam: 1,100 MMBtu/hr
  - Chilled Water: 40,000 tons
  - 150 customers

- **San Diego, CA**
  - Chilled water: 8,825 tons
  - 16 customers

- **San Francisco, CA**
  - Chilled water: 8,825 tons
  - 16 customers

- **Phoenix, AZ**
  - Chilled water: 38,100 tons
  - 35 customers

- **Harrisburg, PA**
  - Electricity: 12 MW
  - Steam: 370 MMBtu/hr
  - Chilled water: 3,600 tons
  - 145 customers
Combined Heat & Power

Harrisburg, PA
- 4.1 mmBTU/hr

Bridgeport U, CT
- 1.4 MW fuel cell power plant
- Capacity to deliver 4 mmBtu/hr of heat

Plainsboro, NJ
- 4.6 MW
- 34.1 mmBTU/hr
- 72.3 MLB/hr of boilers
- 3700 tons chilled water
- 1,000,000 gallon thermal storage

Princeton, NJ
- 248 KW
- 1,445 kBTU/hr

Dover, DE
- 104 MW
- 70 MLB/hr

San Francisco, CA
- Two 250 kW Reciprocating Engines
- 2.6 MMBTU/hr

San Diego, CA
- 1.5 MW Recip Eng
- 2,000 ton Gas Turbine Chiller
- 940 tons (waste heat to chilled water)
- District cooling

Corpus Christi, TX
- 560 MW
- 1 MLB/hr steam

ASU-Tempe, AZ
- 8.3 MW
- 80 MLB/hr steam
- 10,000 tons chilled water

Tucson, AZ
- 1.6 MW
- 46 MLB/hr
- District heating & cooling

Henderson, NV
- 90 MW CC
- 140 MLB/hr

San Jacinto, TX
- 176 MW
- 1200 MLB/hr

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Microgrid Systems

Network of distributed energy resources that can either be tied to the grid or "islanded" allowing a building, city or campus to leverage diversified fuels and technologies to provide clean, reliable and high-quality power.
Integrated energy systems
On-site power generation that keeps critical infrastructure running regardless of external circumstances

Resiliency
Can create an island in case of grid failure, by closing the grid connection and using the facility’s own energy production to run the facility

Reliability
Approximately 90% uptime with CHP, and up to 99%+ with added batteries or backup generators

Sustainability
Options for reduced emissions, integrated renewables and energy savings
Total Tempe Campus System

- Electrical Capacities – 16 MW PV, 9 MW CHP, 6 MW Thermal Storage, 8 MW Diesel Gen
- Thermal Capacities - Steam 200,000 lb/hr, CHW 30,000 tons (mech), Thermal Storage 6,000 tons
NRG Energy Center Princeton Princeton Hospital

A state-of-the-art combined heat and power (CHP) plant

Hospital Campus System
• Electrical Capacities – 200 KW PV, 5 MW CHP, 1 MW Thermal Storage, 6 MW Diesel Gen
• Thermal Capacities - Steam 50,000 lb/hr, CHW 3,000 tons (mech), Thermal Storage 1,000 tons
| **CHP** – 4.6MW natural gas plant supplies 100% of heating & cooling needs and most of the electrical needs |
| **Enterprise Energy Management** – Advanced software system optimizes operations for energy use and cost efficiency |
| **Backup generation** – With the grid down, the 3 back-up generators can support the hospital’s essential power needs |
| **Chillers** – Three 1,000-ton electric chillers and one 700-ton absorption chiller provide chilled water |
| **Grid** – Can draw power from or export to the PJM power grid |
| **Thermal Storage** – 1.2 M gallon chilled water storage for cooling the hospital |
| **Solar** – 200kW Solar Array provides electricity, and reduces carbon emissions |
| **EVgo** – Two 30 amp electric vehicle charging stations |

**Financing**

**Operations & Maintenance**
Growth of District Energy, CHP & Micro Grids

- Recognition of value of localized resiliency and reliability
- Local support from stakeholders & champions
- Government/utilities
- Sustainability/efficiency drivers - integrating renewables and energy efficient technologies (CHP)
- Timing
- Economics/capital
Thank you.