Distributed Generation in Connecticut

Renew your Energy
October 12, 2006

At Eastern Connecticut State University
Age of Generators in Southwest Connecticut

The bar chart shows the distribution of generator ages and their capacities in Southwest Connecticut. The x-axis represents the age of generators in years, with categories ranging from >40 to 0-10. The y-axis shows the capacity in Megawatts. The data indicates that the majority of generators are between 0-10 years old, with a significant portion having a capacity of 50% or more of the total capacity.
Load Duration

Figure 3
New England Hourly Load-Duration Curves

System Load (MW)

Percent of Hours

10%
Price Impact

Figure 17
System Price Duration Curves, Prices < $200
2001-2004

The Red Zone!!!
PA 05-1 Act Concerning Energy Independence
Encourage Distributed Resources

**Customer side Distributed Generation**

The generation of electricity from a unit not more than sixty-five megawatts on the premises of a retail end user, including; CHP, quick start units, fuel cells, photovoltaic systems or small wind turbines,
Welcome to CEAB

In 2003, An Act Concerning Long-Term Planning for Energy Facilities (PA 03-140) reconstituted the Connecticut Energy Advisory Board (CEAB) and revised its mission. The primary goal for the new entity is to encourage competing energy solutions and to provide the opportunity to review multiple energy solutions simultaneously.

The CEAB is responsible for identifying and coordinating state energy needs and recommending strategies and solutions to meet those needs in a manner that is not only environmentally responsible, but also meets reasonable cost and reliability criteria.

CEAB Guiding Principles

Citizens and businesses in Connecticut must have access to a safe, affordable, diverse and reliable energy supply.

Connecticut’s policy makers must act in forums where the state’s energy interests can be advanced.

Connecticut’s policy makers must act in a coordinated fashion on both a state & regional basis to address energy issues using CEAB’s energy plan as a blueprint for action.

What's New:

CEAB has issued its first proactive request for proposal. (See RFP_0001.) You can find both the board’s preferential criteria and all open RFPs by clicking on Requests for Proposal link along the top of this page.
CEAB’s recommends a two part, five year, state-wide Energy Goal:

- Reduce the state’s peak electric demand by 10% by 2010 and
- Reduce fossil fuel consumption by 10% by 2010
Key DPUC Dockets for DG

• Docket No. 05-07-16
  Establishes incentives for customer side distributed generation.

• Docket No. 05-07-17
  Establishes monetary grants for capital costs of customer side distributed generation.

• Docket No. 05-07-19
  Includes distributed resources as Renewable Portfolio Standard - Class III.
**Combined Heat and Power (CHP)**

**CHP:** Onsite coincident production and use of electrical or mechanical power and thermal energy.
How CHP Saves Energy

- **Power Plant**
  - 100%
  - 44-68% Generation Losses

- **Transmission and Distribution**
  - 32-56%
  - Losses: 8% (of 32-56%)

- **CHP**
  - 100%
  - 27-45%
  - 78-85% Total Efficiency
  - 15-22% Losses after Generation and Usable Heat Recovery
  - 50-40% Usable Recovered Heat
CHP Prime Movers

- Combustion Turbines 0.5 – 10 MW
- Microturbines 30 – 250 kW
- IC Engines 30 kW – 5 MW
- Fuel Cells 200 kW – 1 MW

65% - 50% WASTE HEAT
25% - 40% Electricity
Oakwood Healthcare Center

- Three reciprocating engines 850kW (2 NG, 1 Diesel)
- Heat recovery: space heating and DHW
- Integrated with load management strategies
Greater Rochester International Airport

- Two 750 kW Natural Gas Reciprocating Engines
- Heat recovered for space and DHW heating and a 300 ton absorber
SUNY Buffalo

- Two 60 kW Capstones
- Peak Reduction: 300 kW
- Application:
  - Swimming Pool
    - Power to water pumps
    - Heat water heaters
- Measured in 2003:
  - Savings = $35,000 per year
Fuel Cells at WWTP in NYC

- 2 200kW Fuel Cells at Municipal Waste Water Treatment Facility in New York City (NYCDEP)
- Heat Recovered to Support Anearobic Digester
- Reduced On-site Emissions by Eliminating Flare
Advanced CHP System

Microturbine → Electric Generator

Electric Power

Microturbine

Hot Exhaust Gas → Absorption Chiller

Hot Exhaust Gas

Dehumidification Unit

Dry Air

Air Handling Unit

Chilled Water

Thermal Chiller Unit

Steam or Hot Water

Desiccant System
## How DG Technologies Compare?

<table>
<thead>
<tr>
<th>Technology</th>
<th>Size Range</th>
<th>Electrical Efficiency (%)</th>
<th>Installed Cost ($/kW)</th>
<th>NOx Emissions (lbs./MWh)</th>
<th>Total CHP Efficiency (%)</th>
</tr>
</thead>
<tbody>
<tr>
<td>IC Engine</td>
<td>30kW - 6MW</td>
<td>28 - 38</td>
<td>500 - 1200</td>
<td>0.4 - 15</td>
<td>80</td>
</tr>
<tr>
<td>Aeroderivative Gas Turbine</td>
<td>500kW - 20 MW</td>
<td>22 - 40</td>
<td>750 - 1500</td>
<td>0.3 - 4</td>
<td>80</td>
</tr>
<tr>
<td>Micro-turbine</td>
<td>25kW - 300kW</td>
<td>20 - 30</td>
<td>1000 - 3000</td>
<td>0.4 - 2.2</td>
<td>80</td>
</tr>
<tr>
<td>Fuel Cell</td>
<td>3kW - 3 MW</td>
<td>30 - 60</td>
<td>4000 - 10000</td>
<td>&lt; 0.02</td>
<td>80</td>
</tr>
<tr>
<td>NG Combined Cycle Power Plant</td>
<td>100 MW - 500 MW</td>
<td>45 - 60</td>
<td>500 - 10000</td>
<td>0.3</td>
<td>70</td>
</tr>
</tbody>
</table>
Utility Discounts

• Natural gas rates will be reduced for Customer-side generation projects that use natural gas by waiving as distribution charges.

• Electricity rates for power used when base load customer-side generators are out of service will be reduced by eliminating backup rates and eliminating demand ratchets for these projects.
Project Financing

- $(\text{Capital Cost} + \text{Cost of $}) + (\text{Annual Maintenance Cost} + \text{Fuel}) \times \text{project life} = \text{Life Cycle Cost}$
- Deduct DPUC incentives from Capital Cost
- Deduct interest saving from DPUC Loan
- Deduct rate concessions from electric & natural gas
- Deduct fuel savings from thermal recovery
- Deduct deferred electricity from annual electric bill
- Deduct tax credits and depreciation

Alternative Financing - Performance Contracting
Benefits of DG to CT

• Improves System Reliability
• Lower FMCC and Energy Costs
• Lower Emissions (including CO2)
• Conserve Natural Resources
• Offers Price Stability

• Support Grid Infrastructure
• Defer Costly Grid Upgrades
• Utilizes Existing Infrastructure
• Facilitates Deployment of New Clean Energy Technologies
## Existing CHP in CT

<table>
<thead>
<tr>
<th>Type</th>
<th>Sites</th>
<th>Capacity</th>
</tr>
</thead>
<tbody>
<tr>
<td>Commercial</td>
<td>62</td>
<td>141.4 MW</td>
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<tr>
<td>Industrial</td>
<td>15</td>
<td>337.6 MW</td>
</tr>
<tr>
<td>Other</td>
<td>1</td>
<td>.2 MW</td>
</tr>
<tr>
<td>Total</td>
<td>78</td>
<td>479.2 MW</td>
</tr>
</tbody>
</table>

## NY/NEW-ENGLAND

- **NY/NEW-ENGLAND**
  - 524 sites
  - 9,318.6 MW
Potential for Commercial CHP is Large

Estimated CHP Potential: 500 to 2000 MW

Source: Nexus
Regional Application Centers

The regional application centers will promote combined heating and power (CHP) technology and practices, serve as a central repository and clearinghouse of CHP information, and identify and help implement regional CHP projects.
Questions?

www.state.ct.us/dpuc/

www.ct-energyinfo.com

CL&P - 1(888) 292-6533