



ENERGY SPECTRUM INC.

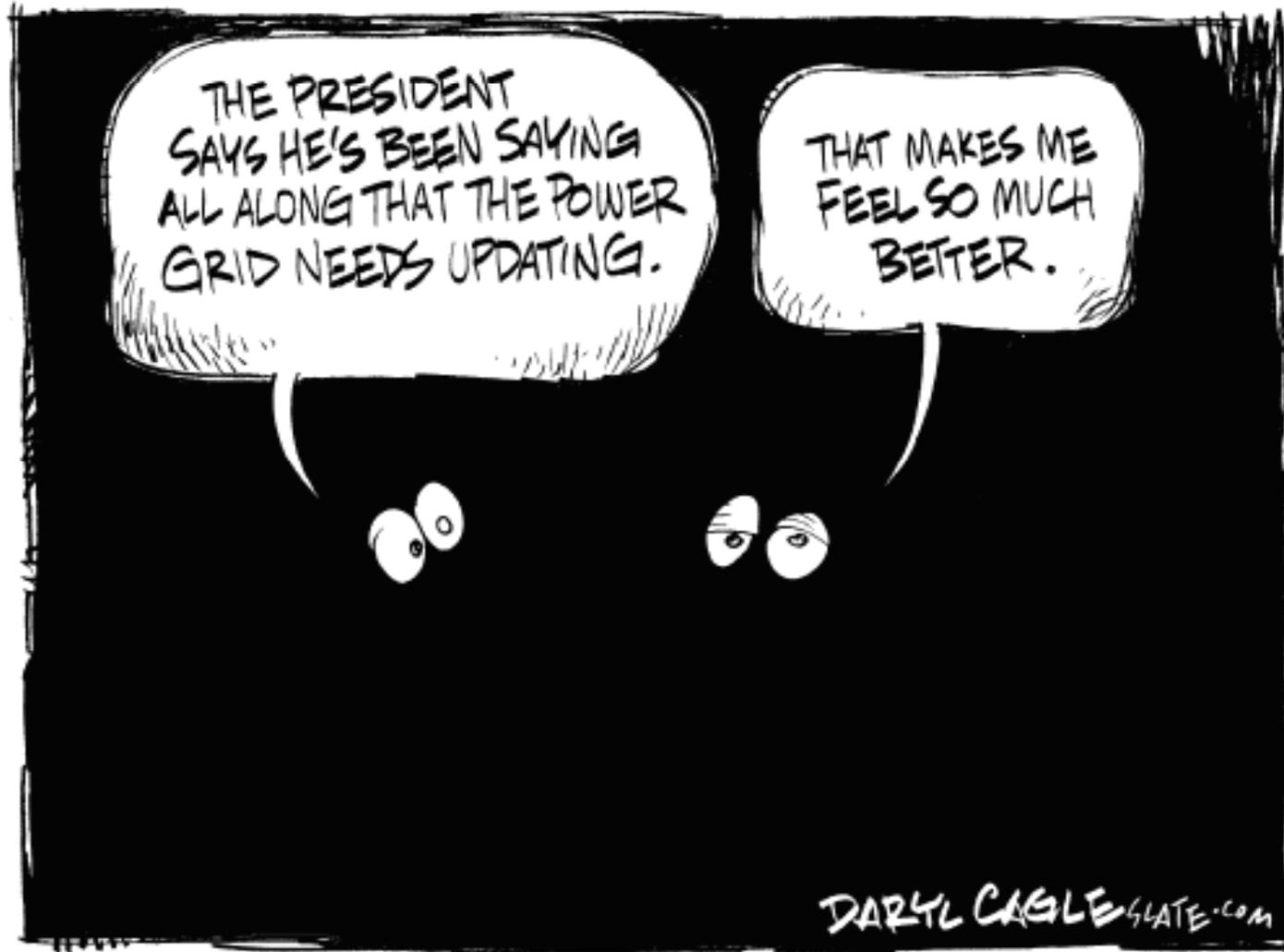
Environmentally Beneficial CHP at Clinton Hill Apartments

David M. Ahrens, P.E.
Director of Projects
Energy Spectrum, Inc.
www.energyspec.com



ENERGY SPECTRUM INC.

Alternative energy



Chop your own wood and it will warm you twice – Henry Ford



ENERGY SPECTRUM INC.



About Energy Spectrum Inc.

- Energy Spectrum is a specialized consulting group focused on the New York City market.
- Energy Spectrum develops innovative strategies and effective solutions that minimize energy costs and maximize benefits.
- Energy Spectrum's proven track record of success is evidence of its ability to meet and exceed clients expectations.



Clinton Hill Apartments

- Total Electricity Demand ~ 3,000 kW
- Annual Energy Costs before CHP- \$ 1,500,000
- Annual Energy Savings with ~ 550 kW CHP ~ \$260,000 per year
- Installation Cost ~ \$1.4 Million
- Simple payback with CHP ~ 5 years
(without NYSERDA incentive)



Project Description

- The project seeks to allow three 400HP residual oil fired boilers to be turned off in the summer by:
 - * producing the entire hot water load for seven buildings with CHP. and
 - * supplying a portion of the electric load with CHP.

- By turning off the boilers using ultra-low NOx microturbines, the project will be eligible for NY state Emission Reduction Credits.

Microturbine Emission Specifications

- On November 15, 2001, California Air Resources Board (ARB) adopted a regulation that established a distributed generation (DG) certification program as required by [Senate Bill 1298](#) (chaptered September 2000).
- The DG certification program requires electrical generation technologies that are exempt from district permit requirements to be certified by the ARB to specific emission standards before they can be sold in California.
- These technologies include Capstone microturbines.
- The Capstone 60 was certified at 0.5 lb NO^x per MWh. It is estimated that 2,400 MWh will be generated annually.



Boiler Emissions

- Boilers emission calculations may utilize the EPA AP-42 “Compilation of Air Emission Factors”.
- This document indicates that the average value for Clinton Hill’s Residual Boilers is approx. 47 lbs of NO_x per thousand gallons.
- It is estimated that Clinton Hill has been burning up to 1,600,000 gallons of residual oil per year. The CHP is estimated to save over 350,000 gallons of No. 6 oil per year by displacing hot water load.



Sizing the Microturbines

- Hot water load was calculated based on:
 - * The thermal coincidence of peak domestic hot water
 - * ASHRAE suggested HW usage was developed for A High-medium demographic building. A 30 minute peak hot water demand was also incorporated.
- The ASHRAE standard is in the 1995 Edition HVAC Applications Book A, Chapter 45.9.

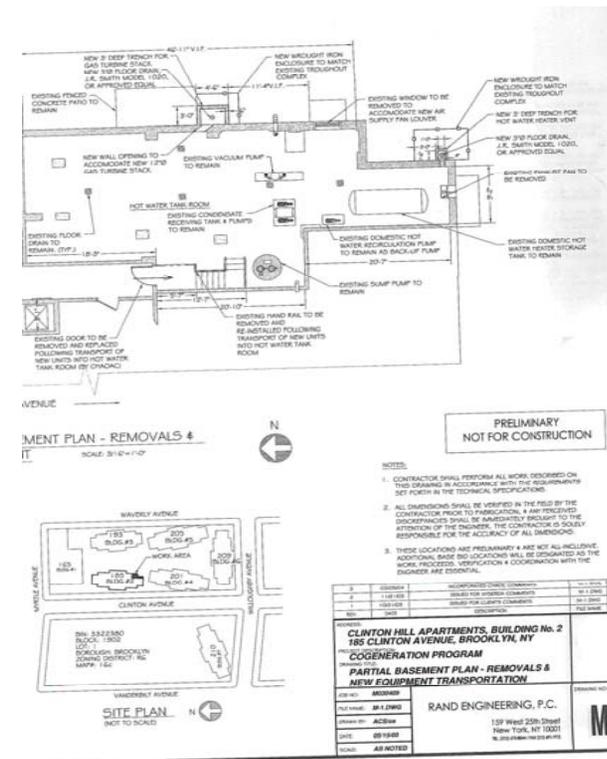


Placement of the Microturbines

- Initial design utilized the separate hot water tank rooms in each building as the location for the microturbines.
- With Rand Engineering PC's assistance, it was decided to combine some of the microturbines in an old coal storage room.
- This allowed the use of higher pressure natural gas, reduced piping runs and therefore costs.

Detailed Design

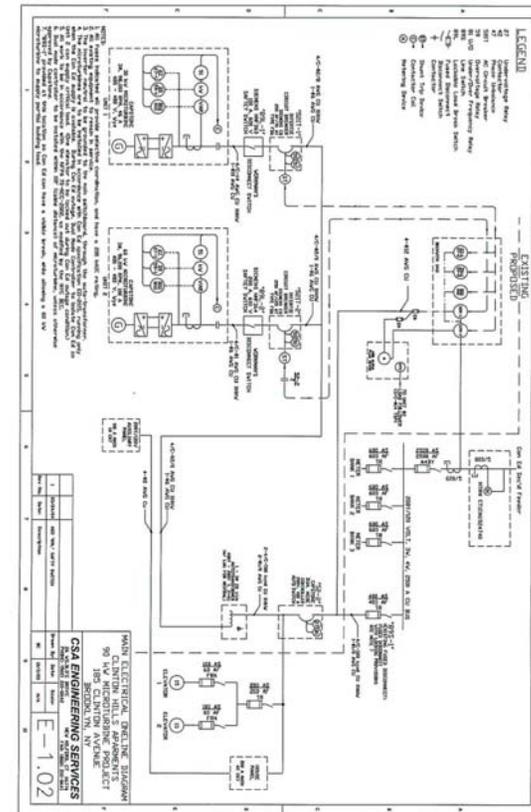
- Detailed design has been completed
- One of the issues that was addressed was temperature control.
- New Hot water temperature control systems were added.





Con Edison Interconnection

- Con Edison interconnection approval has been granted.
- The units will not be able to export power and load will follow the building's electrical load.



Other Design Issues

- How does CHAOC determine savings?
- What are the variables?
- What costs are fixed?
- What is the expected life of each major component?
- What are the potential problem areas with the Microturbines?



Other Design Issues (Cont.)

- What is the real uptime?
- How will the units runs with a grid outage?
- Will the units deliver on the low maintenance claims?
- Will the units provide synchronized, quality power?
- What will be the units stand-alone capability?



ENERGY SPECTRUM INC.

Contact Information

David M. Ahrens, P.E.
Energy Spectrum, Inc.
1114 Avenue J., Third Floor
Brooklyn, New York 11230
dahrens@energyspec.com