AES-NJ Cogen

CHP in New York State

Small Engine CHP in NYC

June 24, 2004

Host Facility Description: Hermany Farms Dairy

- *Electric Utility: Con-Ed [SC-9/10]*
  - Pre-Cogen Peak Electric Load: 575 kW
  - Pre-Cogen Annual Average Electric Load: 2,200,000 kWH
  - Pre-Cogen Annual Electric Cost: $550,000
- *Natural Gas Supplier: Con-Ed [SC-9/10]*
  - Pre-Cogen Annual Average Oil Usage: 120,000 Gal/Yr
  - Pre-Cogen Oil Cost: $120,000
- *Energy Conservation Measures Previously Implemented*
  - Energy Efficient Motors
  - Boiler Plant Replacement
  - High-Efficiency Chillers

AES-NJ Cogen Company, Inc.

- *Performance Contractor*
  - Selling Electricity/Thermal Energy from Micro-Cogeneration Systems in New York/New Jersey Area
- *Owns ~ Operates ~ Maintains*
  - 76 Cogeneration Systems
- *First 60 kW Project Installed in 1989*
  - North Shore University Hospital -- still operating
- *January 1995*
  - Purchased 17 Operating Cogeneration Projects in NJ from EUA/Cogenex Corporation

AES-NJ Cogen Company, Inc.

- *2003*
  - Generated 18,116,492 kWH of electricity
  - Began Implementation of Hermany Farms Project with NYSERDA Award
  - Partnered with AmericanDG Inc. to Develop Hermany Farms & Other Projects

AmericanDG Inc.

- *On-Site Utility*
  - Own & Operate Cogeneration and Cooling Systems
  - Sell Energy
    - Electricity
    - Thermal (Hot Water)
    - Cooling
- *National Reputation*
- *Operations & Service Support*
- *Affiliated with Tecogen Inc.*
  - Equipment Manufacturer

Equipment: Tecogen

- *Modular, Compact Units*
  - Over 800 Units Shipped
  - Over 35 Million Hours of Operation
  - 75 KW
  - Natural Gas Fueled
  - Over 90% Efficiency
  - 490,000 Btu/Hr Hot Water
  - 954,000 Btu/Hr (HHV) Fuel Consumption
  - 70 dBa @ 20’
  - Low Emissions Option

NYSERDA Grant

- *$150,000 Grant from NYSERDA*

- *Project Cost Breakdown*

— Equipment	$ 256,800
— Installation	$ 110,850
— Telecommunications	$ 3,500
— Utility Interconnection	$ 23,350
— Consulting	$ 85,000
— Project Development	$ 20,500
TOTAL	$ 500,000

NYSERDA Grant Application

- *Low Emissions Reciprocating Engine Design*
- *Micro-Cogeneration Concept*
- *Goals of Demonstration: Prove Economic Viability*
  - Incorporating Emissions Reduction System Into an Internal Combustion-Based Cogeneration System
    - Initial Capital Cost
    - Maintenance Costs
    - Reliability
  - Implementing Cogeneration In The Down-State Market
    - Initial Capital Cost
    - Maintenance Costs: Engine & Emission Reduction System
    - Fuel Cost

Project Development & Financing

- *Hermany Farms Considerations*
  - Minimize Capital Investment
  - Minimize Operational Risks
  - Maximize Financial Benefit
  - Selected Performance-Based Contract to Develop, Design, Install, Own & Operate System in September 2002
- *Project Financing & Implementation*
  - NYSERDA Grant Award
  - AES-NJ Cogen & AmericanDG Inc. Partnered in 2003 to Jointly Implement Project

Part Year Results

— Hours of Operation	3,507 Hours
— Electric Production	617,370 kWH
— Thermal Production	1,823 MMBtu
— Fuel Consumption	7,675 MMBtu
— Energy Cost Savings	$30,831 (7 months)

**Note: Project commenced operation in December 2003*

Project Implementation

- *Development*
  - Host Facility Performance Contract Approval
  - Con-Ed Electrical Interconnection Approval
  - NYCDEP Permit Registration
  - City of New York Building Permit
- *Installation & Start-Up Requirements*
  - Floor Space
  - Ventilation & Exhaust
  - Thermal Interface
  - Electric & Thermal Tie-Ins
  - Module Start-Up
  - Utility Protective Relay Testing (zero export)

Operational Issues

- *Running Engine To Minimize Emissions (with catalytic converter) @ Stoichiometric Level*
  - Increases Cylinder Temperatures
  - Increases Fuel Consumption
  - Decreases Top End Engine Life
- *Maintenance Required on Catalytic Converter*
- *Thermal Sales Optimization*
  - Minimizing Host Facility Boiler Operation/ Shutdown Boiler During Summer Operation

Project Benefits & Considerations

➢ *Permitting*

- Smaller system footprint allows for installation in or adjacent to existing boiler/mechanical room
- Per unit fuel consumption is less than 1 MMBtu/hr, allowing for reduced permit compliance issues

➢ *Maintenance*

- Increased average availability of multiple smaller units at multiple sites vs. single larger unit at a single site
- Utilization of common equipment and prime mover allow for “fleet” mentality for spare parts
- Adoption of geographic service territory to increase maintenance staff effectiveness

Project Benefits & Considerations

➢ *Operating Risk*

- Reduced capital exposure for any major equipment failure (typically less than $10,000 per event)
- Individual equipment failure will not cause irreparable financial loss to owner/operator

➢ *On-Site Utility Business Model*

- Preserve Customer Capital
- Outsource All Operations To Expert