Combined Heat & Power (CHP)

Federal Utility Partnership Working Group Seminar

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About Pepco Energy Services

**An Energy Services Company**

- **ESCO** Industry Leader Since 1995, and Pepco’s UESC Representative
- Headquarters in Arlington, VA with MD, NC, TX, NJ Offices
- Local Partners and Alliances
- UESC, ESPC, Design Build, and Related Services
- Investment Grade / Fortune 500 Utility Parent (PHI)
- Success with Over 30 Federal Agencies
- More than 400 Projects with $1B Value
- Success with Over 30 Federal Agencies

Member of:

[NAESCO Logo]

About Pepco Energy Services
Combined Heat & Power Overview

Agenda

- CHP Project Development
- Typical CHP Application
- CHP Project Characteristics
- Case Studies
- Benefits
CHP Project Development

Role of a Project Developer

- Project Scoping (Preliminary, Schematic or 10% Design Phase)
  General overview → location, equipment needs, estimated costs/savings
- Feasibility Analysis (IGA or 30% Design Phase)
  Detailed technical & financial calculations
- CHP Configuration (IGA or 30% Design Phase)
  Select primary equipment & contact vendors → price, performance, schedules
- Create Financial Proforma (IGA or 30% Design Phase)
  Detailed cash flows
- Obtain Permits (IGA or 30% Design Phase)
  Environmental/air, interconnection, site, ROW’s, etc.
- Secure Financing (Task Order, Design-Build Phase, or IFC Drawings)
- Contract with Engineering/Construction/Equipment Firms (Task Order)
  Select firms, negotiate T&C’s, execute subcontracts
- Provide **Overall** Project Management (Task Order)
  Includes entire process from design through commissioning
- Ownership/Operations (Performance Period)
CHP Typical Application

- Uses fuel to first Generate Power, then
- Capture resulting heat for use as:
  - Heating
  - Cooling
  - Both

Diagram:

- Fuel → Engine or Turbine
- Hot Exhaust Gases → Heat Recovery Unit
- Water → Heat Recovery Equipment
- Steam or Hot Water → Thermally Activated Machine
- Thermally Activated Machine → Cooling/Heating
- Electricity → Grid
- Building or Facility
- Thermal Load

Prime Mover
Electric Generation Equipment
CHP Case Study

CHP Case Study – National Institutes of Health (NIH)

- Siemens GT 10B 23MW combustion Turbine
  - Inlet air cooling
  - 1200 HP gas compressor
- Dual fuel capability
- 100,000 lbs/hour steam unfired
- 180,000 lbs/hour steam fired
- Interfaces to existing systems
- Interconnect with PEPCO/PJM
- PES designed, permitted and built
- 10 year Operation and Maintenance contract
- Provision for Temporary boilers
- CHP Energy Star Award
**DC Water BioGas CHP**

- World’s Largest Advanced Wastewater Treatment Facility (AWTP)
- Serves 2 Million residents in DC, MD and VA
- Average Capacity of 370 Million Gallons/Day of Raw Sewerage
- Peak Capacity of 1.076 billion Gallons per day
- Site is 153 Acres
CHP Case Study

**DC Water BioGas CHP**

- 15 MW Combined Heat and Power (CHP) facility
  - Three 4.6 MW Solar Mercury 50 low-nitrogen oxide gas turbines
  - Digester gas cleaning and compression
  - Heat recovery steam generators, low NOX duct burners
  - Backup boiler

- Uses biogas from DC Water’s water treatment process to produce steam and electricity
  - 33,000 lb/hr Steam returned and used in DC Water’s treatment process

- Contract value
  - Construction: $82 million
  - O&M: $90 million

- Schedule
  - Contract signed February 2012
  - Construction begins Summer 2012
  - Construction completion January 2015;
    - 15-year O&M Phase begins
DC Water is currently upgrading its facilities to replace the majority of the lime stabilization with anaerobic digestion to treat the sludge and reduce odors.

This equipment will:

- Reduce biosolids volume by 50%;
- Reduce odors;
- Reduce truck traffic and truck emissions by an estimated 1.2 Million miles;
- **Produce clean-burning digester gas for heat and power**;
- Reduce O&M of Lime Stabilization;
- Reduce Electricity Costs;
- Class A biosolids available for beneficial reuse.

This process requires the use of steam for the anaerobic digesters. **This steam will be provided by the Combined Heat and Power facility being constructed by Pepco Energy Services.**
Thermal hydrolysis takes place in reactor(s) at 329°F for 20-30 minutes. The steam is gradually released and sent back to the pulper.

Digester produces biogas, mainly consisting of approximately 60% methane and 40% carbon dioxide.
CHP Benefits

• Reduced Energy Costs / High Efficiency
  • Efficient Fuel Utilization
  • Waste Heat captured for useful work
  • No transmission and lower distribution losses

• Environmental Advantages
  • Compared to Existing Equipment

• Improved Energy Security
  • Generation is “on-site”
  • Particularly applicable to Military Bases

• Improved Electric Reliability
  • Reduced susceptibility to grid failures

• Improved Power Quality
  • Reduced line losses/steady voltage
Contact Information

Combined Heat & Power Projects

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