


# Combined Heat & Power (CHP)

## Federal Utility Partnership Working Group Seminar

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# About Pepco Energy Services

***An Energy Services Company***

HQ in Arlington, VA with MD, NC, TX, NJ Offices

UESC, ESPC, Design Build, and Related Services

Local Partners and Alliances

*ESCO Industry Leader Since 1995, and Pepco's UESC Representative*

Investment Grade / Fortune 500 Utility Parent (PHI)

More than 400 Projects with $1B Value

Success with Over 30 Federal Agencies

Member of:

NAESCO


# Combined Heat & Power Overview

## Agenda

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

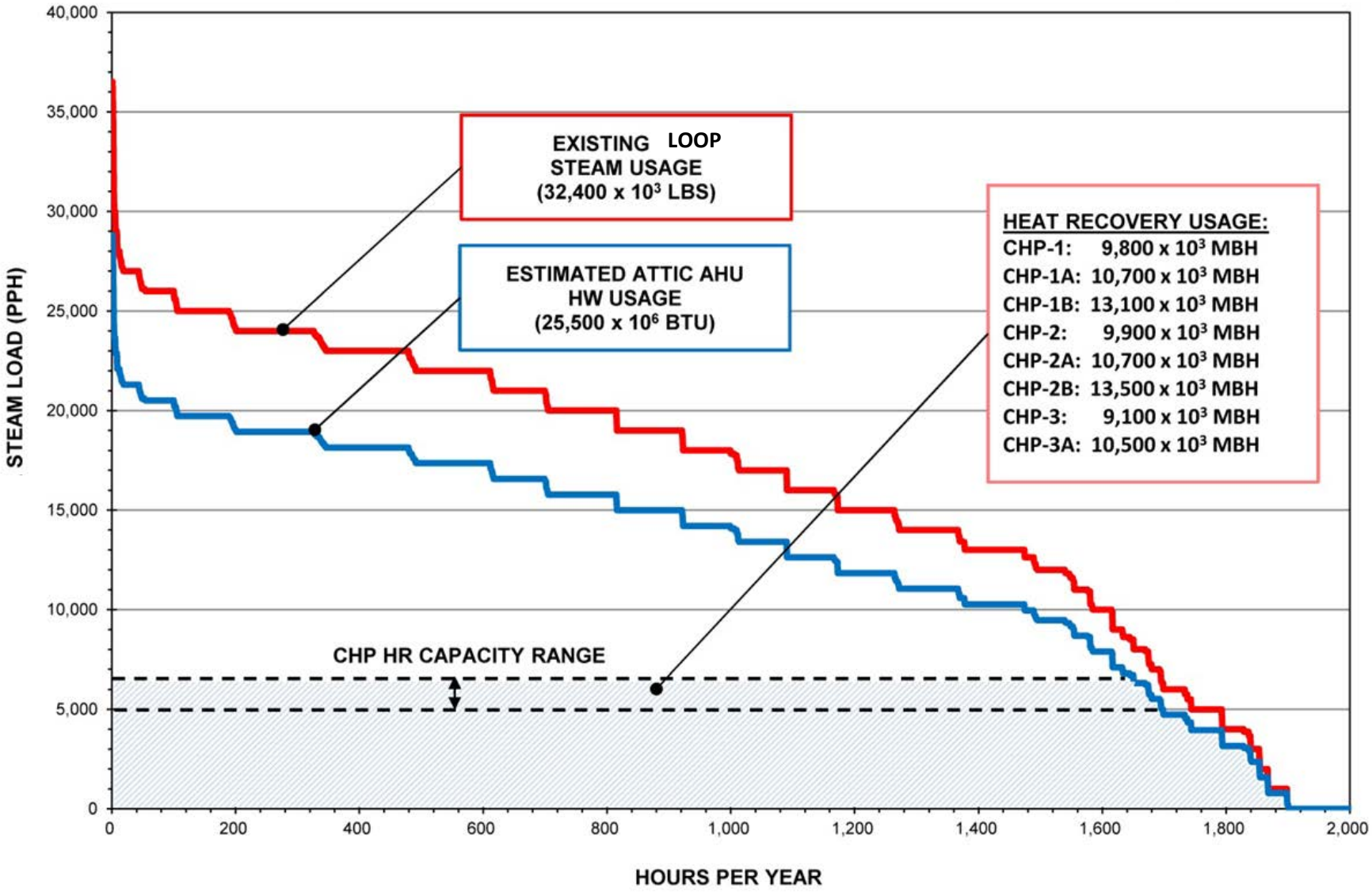
# CHP Project Development

## 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)

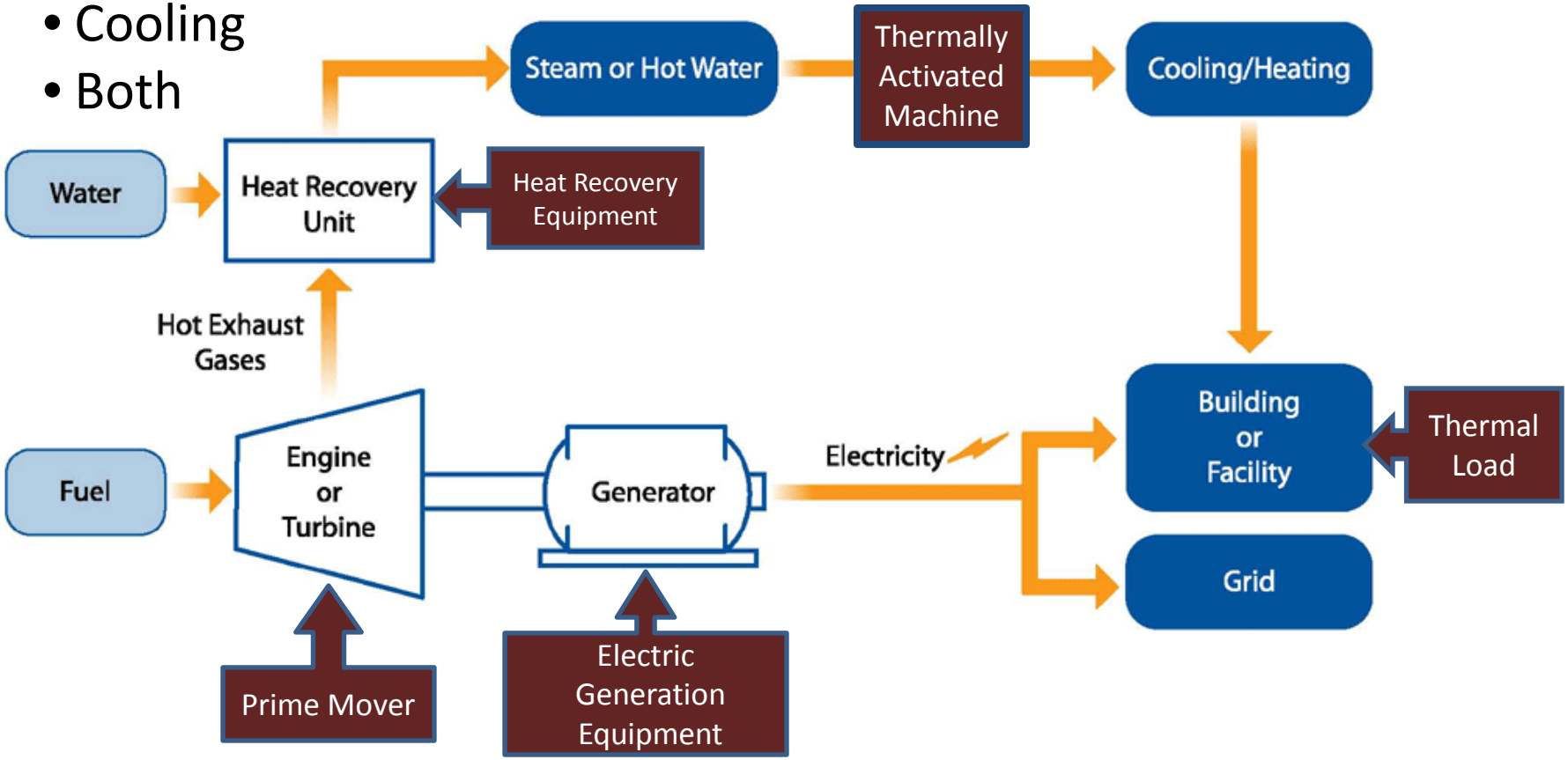
# CHP Feasibility Modeling

## Steam and/or Hot Water Load Duration Curve



# CHP Typical Application

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



# 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


# CHP Case Study

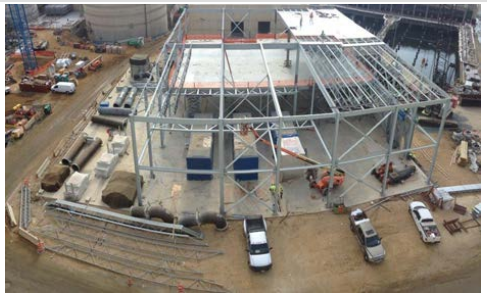
## *DC Water BioGas CHP*

- 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



# CHP Case Study (continued)

## *DC Water BioGas CHP*

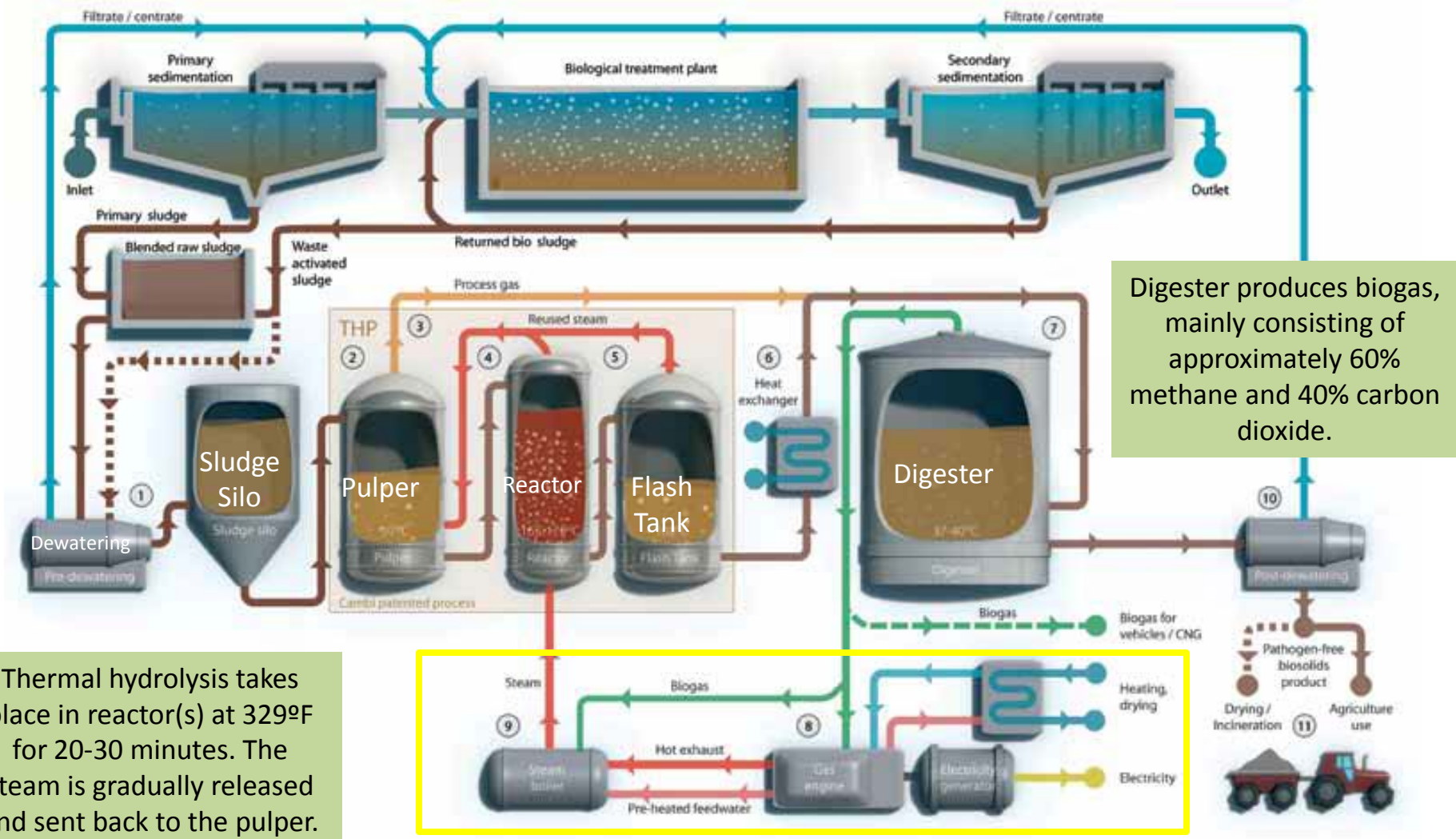
DC Water is currently upgrading its facilities to replace the majority of the lime stabilization with anaerobic digestion to treat the sludge and reduce odors.

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.**

# Cambi Thermal Hydrolysis Process (THP)




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

Thermal hydrolysis takes place in reactor(s) at 329ºF for 20-30 minutes. The steam is gradually released and sent back to the pulper.

CHP Facility

Courtesy of CAMBI

# 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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