



U.S. Department of Energy

OAK RIDGE NATIONAL LABORATORY

# CHP Subcontractors Coordination Review Meeting



April 14, 2005  
Energetics, Inc.  
901 D. Street, SW  
Suite 100  
Washington, DC

# WINNERS BY ASSOCIATION

An Awareness Campaign to Tailor and Disseminate  
The CHP Message to End-Use Sectors with  
High Potential for CHP Utilization



# Description of Task(s)

## Task 1. Select and Profile Industrial Market Sectors with High Potential for CHP Utilization

- Targeted list of end-use sectors
- Compare CHP market potential data

## Task 2. Evaluate CHP Technologies and Applications

- Industry-specific fuels, prime movers, heat recovery, and thermal energy technologies and applications

## Task 3. Exchange Information with Stakeholder Groups to Promote the Awareness & Deployment of CHP

- Build and strengthen relationships by engaging stakeholders to better understand industry energy needs, tailor the CHP message
- Conduct targeted outreach by developing and disseminating tailored information products to end-user associations

# Description of Progress Against Task(s)

## Task 1. Select and Profile Industrial Market Sectors: WWTPs

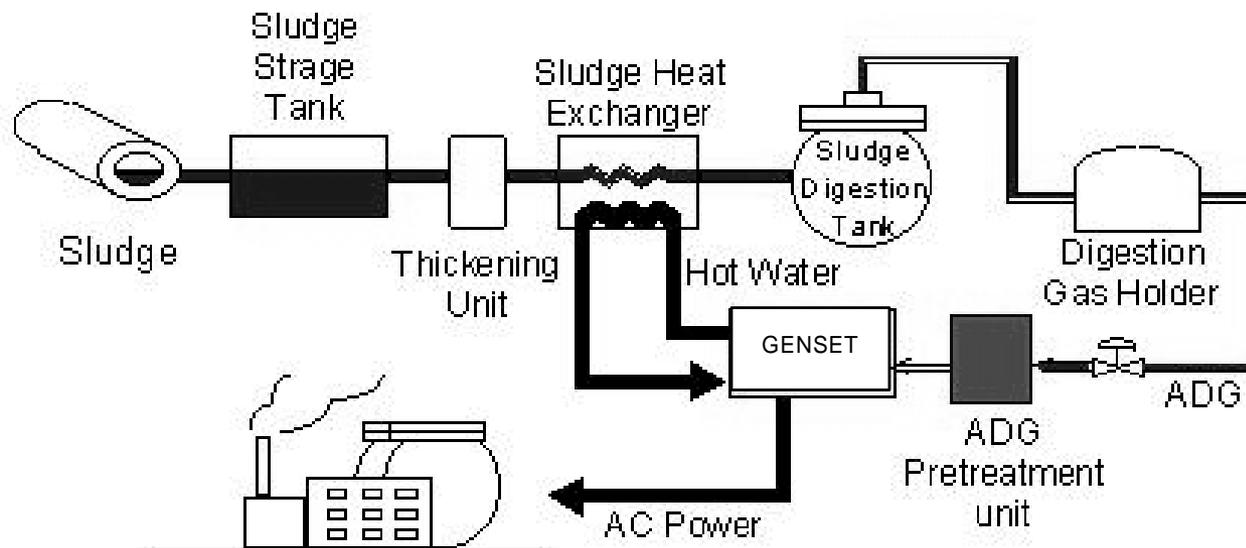
- USCHPA Team focusing on Wastewater Treatment Plants (WWTPs)
- Resource Dynamics Corporation (RDC) outlined increasing value of opportunity fuels like anaerobic digester gas (ADG)—yet ADG often flared at WWTPs
- USEPA and RDC studies on WWTPs:
  - WWTP usually one of municipality's top 2-3 energy users
  - 16,024 public plants in America, serving 72% of population
  - At least 4,290 plants with 1 MGD or greater
    - Over 1,740 of these have anaerobic digesters
    - 1,525 are not currently utilizing ADG
- Many public WWTPs serve populations of 10,000 or less—RDC
- ADG from WWTPs can be used in CHP systems to:
  - Maintain AD temperatures (~90-100°F) and heat biosolids
  - Make hot water or steam
  - Run mechanical systems
  - Cool/dehumidify buildings
  - Make electricity

# Description of Progress Against Task(s)

## Task 2. Evaluate CHP Technologies and Applications: ADG

- ADG is about 50-80% CH<sub>4</sub> and 20-50% CO<sub>2</sub>—RDC
- ADG has about heating value of 600 Btu/cubic ft, or 60% the Btu content of natural gas
- “Renewable fuel” incentives:

CHP Prime Mover	CA Self-Gen Rebate
Reciprocating Engine	<ul style="list-style-type: none"><li>▪ \$1,000/kW <i>renewable fuel</i></li><li>▪ \$600/kW <i>non-renewable</i></li></ul>
Molten Carbonate Fuel Cell	<ul style="list-style-type: none"><li>▪ \$4,500/kW <i>renewable fuel</i></li><li>▪ \$2,500/kW <i>non-renewable</i></li></ul>
Industrial Turbine	<ul style="list-style-type: none"><li>▪ \$1,000/kW <i>renewable fuel</i></li><li>▪ \$600/kW <i>non-renewable</i></li></ul>



# Description of Progress Against Task(s)

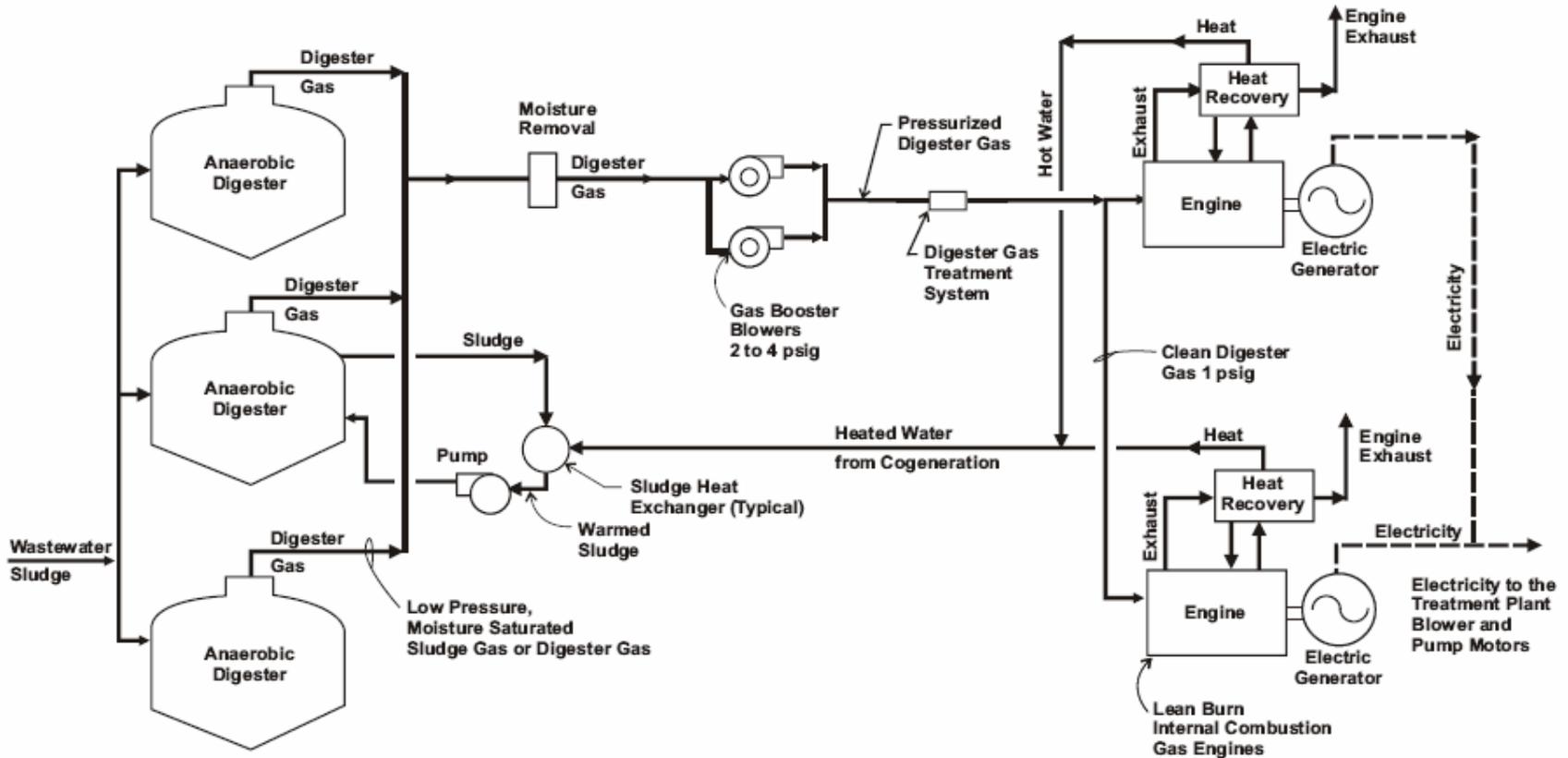
## Task 2. Evaluate CHP Technologies and Applications: Prime Mover Characteristics



Prime Mover	Characteristics Pertaining to AD/ADG
<b>Microturbine</b>	<ul style="list-style-type: none"><li>▪ One manufacturer makes “biogas” model</li><li>▪ Good size for small communities</li><li>▪ Modular to adapt to varying ADG output</li></ul>
<b>Reciprocating Engine</b>	<ul style="list-style-type: none"><li>▪ Emits fewer NO<sub>x</sub> emissions when burning digester gas than “pure” natural gas</li><li>▪ Least expensive/kW</li></ul>
<b>Molten Carbonate Fuel Cell</b>	<ul style="list-style-type: none"><li>▪ One product can internally reform biogas</li><li>▪ Key technology in non-attainment zones?</li></ul>
<b>Industrial Turbine</b>	<ul style="list-style-type: none"><li>▪ Most effective when high thermal energy is valued, e.g. heating large quantities of biosolids</li></ul>

# Description of Progress Against Task(s)

## Task 2. Evaluate CHP Technologies and Applications: AD/CHP



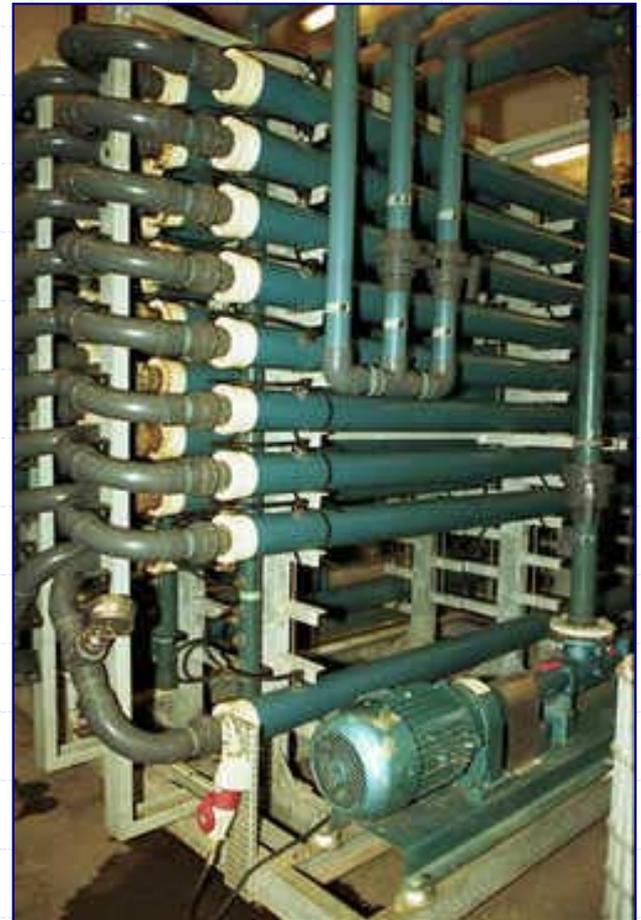
AD/CHP can create electricity for **3.5 cents/kWh**—Project Developer

The Union Sanitary District system in Union City, CA, saves \$40,000 per month

# Description of Progress Against Task(s)

## Task 2. Evaluate CHP Technologies and Applications: CAD

- Many public WWTPs can make enough ADG to generate 60-80kW of electricity
  - Economies of scale could be realized by collecting wastes from other commercial and industrial sources
- ***Centralized anaerobic digestion*** (CAD) plants—common in Denmark with 18 plants—co-digest WWTP solids with agriculture and food processing wastes, animal wastes, olive oil, paper mill sludge and solid waste
  - Des Moines WWTP increases ADG production by over **50%** by adding food processing waste
  - In another controlled test, an addition of 1% autolyzed yeast from beer brewing yielded a **34%** increase in ADG production
- Municipalities can accept wastes from commercial and industrial sector to create economies of scale AND a revenue stream by accepting commercial and industrial wastes



CAD technologies in Høirup, Denmark

# Description of Progress Against Task(s)

## Task 3. Exchange Information/Tailor CHP Message

East Bay Municipal Utility District  
(Oakland, California)



- Large WWTP serving 640,000 people in an 83 square-mile area
- **Accepts and charges for non-hazardous waste** from food processors, animal producers, etc.
- Over 70% of East Bay MUD's electric needs are met with their CHP system
- **Sells surplus power** at certain times to the local utility for about 5.4 cents/kWh
- 2,500 plants food processing and pulp and paper mills could potentially benefit from ADG—RDC
  - Interesting analysis: Overlaying locations of WWTPs and food processing plants for CAD—for short trucking distances

# Description of Progress Against Task(s)

## Task 3. Exchange Information/Tailor CHP Message

- The Team met with Kim Crossman of the USEPA's CHP Partnership about coordinating CHP market development efforts in the wastewater treatment industry.
  - USEPA would focus more on technical issues; USCHPA on the business case.
- The Team corresponded with Katie Hatcher of USEPA's ENERGY STAR Water and Wastewater Program to explore cooperative efforts.
- The Team corresponded with energy consultants, CHP project developers, public power representatives, and Federal agencies about the topics of:
  - Anaerobic digester gas from wastewater treatment
  - Centralized anaerobic digesters schemes
  - Business models
  - Case studies.
- The Team met with two representatives of the American Public Power Association (APPA) to discuss synergies which could be found with APPA members, many of whom manage wastewater treatment plants.
  - The Team developed an article for the Summer 05 edition of the APPA newsletter, the *DEED Digest*, which gave an overview of the benefits of using ADG to drive CHP systems at wastewater treatment plants.
- The Team developed presentation given at the Air & Water Management Association's 2005 Conference, April 4-5, in Arlington, VA.
  - Co-presented with Resource Dynamics Corporation on opportunity fuels, and DC Water and Sewer Authority on Blue Plains Advanced Wastewater Treatment Plant—the world's largest WWTP installing anaerobic digesters

# Description of Progress Against Task(s)

## Task 3. Exchange Information/Tailor CHP Message

### **Blue Plains Advanced Wastewater Treatment Plant (Washington, DC)**

- Wastewater collected by the DC, MD, and VA sewer system and delivered to WWTP
- Largest facility of its type in the world
- Planning to install ADs and considering CHP
- Emissions reductions via:
  - 60-70% reduction in biosolids
  - 66% reduction in truck traffic
  - Double energy efficiency if/when CHP installed



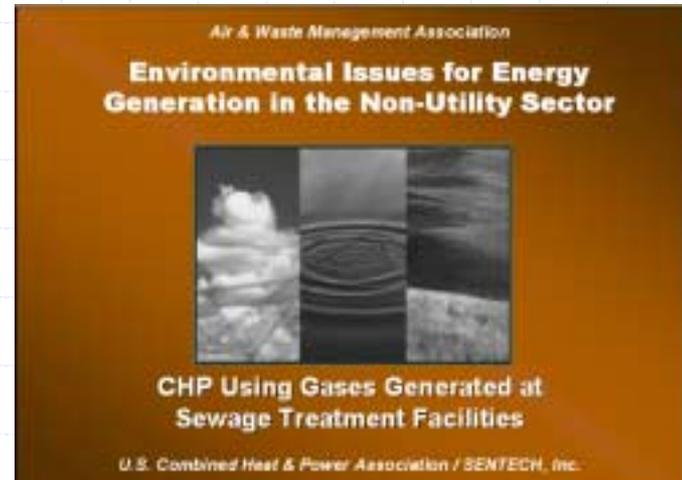
# FY05 Deliverables and Availability

- Summer '05 article in APPA's *DEED DIGEST*

- To be posted on APPA and USCHPA websites
- Available upon request via email

- A&WMA Power Point

- To be posted on USCHPA website
- Available upon request via email



# Coordination with Stakeholder Groups and Other Project Teams

- Resource Dynamics Corporation (RDC) Project Team
- USEPA's CHP Partnership
  - USEPA to focus more on technical issues
  - USCHPA to focus on the business cases
- American Public Power Association (APPA)
- NYSERDA
- East Bay Municipal Utility District (Oakland, CA)
  - Collecting industrial wastes in CAD
  - Exporting excess electricity to local utility
- Brown & Caldwell Consulting Engineers
- Air & Water Management Association's 2005 Conference attendees
- DC Water & Sewer Authority/Blue Plains WWTP
- USEPA's ENERGY STAR Water and Wastewater Program
  - Developing program on wastewater
- Other associations identified in FY04-05 Timeline

# FY04-05 Timeline

- Meeting with DCWASA to discuss synergies and possible opportunity development re Blue Plains WWTP
  - April 21, 2005
- Outreach, opportunity identification activities with APPA, RDC, etc.
  - April-May, 2005
- Development of website or brochure to continue outreach opportunities
  - June, 2005
- Further speaking engagements, meetings, leveraged outreach with end-user associations such as:
  - Water Environment Foundation (WEF)/American Water Works Association 2005 Joint Residuals and Biosolids Conference
    - Nashville Renaissance Hotel & Nashville Convention Center. April 17 - 20, 2005
  - WEF/Association of Metropolitan Sewerage Agencies National Clean Water Policy Forum
    - Washington, DC. May 3-4, 2005
  - WEF/European Water Association/Japan Sewage Works Association/ California Water Environment Association's 2nd Joint Specialty Conference for Sustainable Management of Water Quality Systems for the 21st Century
    - San Francisco, California. August 28–31, 2005
  - WEFTEC.05 - 78th Annual Conference and Exhibition
    - Washington, DC, October 29 - November 2, 2005

# Questions?



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