U.S. Department of Energy
Boiler MACT Technical Assistance Program

Combined Heat and Power
A Technical & Economic Compliance Strategy

June 11th, 2013
Alabama Summit on Industrial Energy Efficiency
DOE Southeast Clean Energy Application Center

U.S. Department of Energy
Southeast Clean Energy Application Center
Promoting CHP, District Energy, and Waste Heat Recovery
Presentation Message / Take Away

- DOE currently (through its 8 regional Clean Energy Application Centers – CEACs) provides:
  - technical information and assistance
  - market development, and
  - education on Conventional CHP, Waste Heat to Power, and District Energy CHP options

- DOE, through the CEAC network, is supplementing this ongoing effort by providing site-specific technical and cost information on clean energy compliance strategies to those major source facilities affected by the Boiler MACT rule currently burning coal or oil.

- These affected facilities may have opportunities to develop compliance strategies, such as CHP, that are cleaner, more energy efficient, and that can have a positive economic return for the plant over time.
Presentation Message / Take Away

- Take advantage of the DOE Boiler MACT Technical Assistance Program (Decision Tree Analysis):

Contact us at:
- John Cuttica: cuttica@uic.edu
- Beko Kosanovic: kosanovi@ecs.umass.edu
- Jim Freihaat: jdf11@psu.edu
- Isaac Panzarella: ipanzarella@southeastcleanenergy.org

### Decision Tree Analysis

<table>
<thead>
<tr>
<th>Cash Flow Projections</th>
<th>Upgrade Coal Boilers</th>
<th>New Natural Gas Boilers</th>
<th>Boiler Conversion to Natural Gas</th>
<th>Natural Gas CHP</th>
</tr>
</thead>
<tbody>
<tr>
<td>Capital Costs</td>
<td>$1,108,003</td>
<td>$10,288,979</td>
<td>$4,672,704</td>
<td>$63,858,447</td>
</tr>
<tr>
<td>5 YR Annual Fuel Cost</td>
<td>$22,108,091</td>
<td>$58,787,424</td>
<td>$671,185,827</td>
<td>$136,036,404</td>
</tr>
<tr>
<td>5 YR Annual O&amp;M Cost</td>
<td>$29,946,414</td>
<td>$32,433,338</td>
<td>$14,226,958</td>
<td>$27,177,829</td>
</tr>
<tr>
<td>5 YR Annual Compliance O&amp;M</td>
<td>$1,176,563</td>
<td>$0</td>
<td>$9</td>
<td>$0</td>
</tr>
<tr>
<td>5 YR Annual Electric Savings</td>
<td>$0</td>
<td>$0</td>
<td>$0</td>
<td>$0</td>
</tr>
<tr>
<td>5 YR Net Cash Flow (Out)</td>
<td>$54,539,331</td>
<td>$85,519,440</td>
<td>$89,634,289</td>
<td>$83,216,395</td>
</tr>
</tbody>
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Capital Costs: $1,108,003
5 YR Annual Fuel Cost: $22,108,091
5 YR Annual O&M Cost: $29,946,414
5 YR Annual Compliance O&M: $1,176,563
5 YR Annual Electric Savings: $0
5 YR Net Cash Flow (Out): $54,539,331

- Financial Incentives Available for Facilities that are Affected by the US EPA “National Emission Standards for Hazardous Air Pollutants for Major Sources: Industrial, Commercial, and Institutional Boilers and Process Heaters; Proposed Rule”

- December 2012

U.S. Department of Energy
Southeast Clean Energy Application
Promoting CHP, District Energy, and Waste Heat Recovery
## Affected Facilities by Technical Assistance CEAC Region

<table>
<thead>
<tr>
<th>CEAC Region for Technical Assistance</th>
<th>Number of Facilities</th>
<th>Number of Coal Units</th>
<th>Number of Heavy Oil Units</th>
<th>Number of Light Oil Units</th>
</tr>
</thead>
<tbody>
<tr>
<td>Mid-Atlantic</td>
<td>109</td>
<td>150</td>
<td>67</td>
<td>43</td>
</tr>
<tr>
<td>Midwest</td>
<td>232</td>
<td>377</td>
<td>100</td>
<td>82</td>
</tr>
<tr>
<td>Northeast</td>
<td>58</td>
<td>22</td>
<td>88</td>
<td>26</td>
</tr>
<tr>
<td><strong>Southeast</strong></td>
<td><strong>177</strong></td>
<td><strong>225</strong></td>
<td><strong>114</strong></td>
<td><strong>90</strong></td>
</tr>
<tr>
<td><strong>Total</strong></td>
<td><strong>567</strong></td>
<td><strong>774</strong></td>
<td><strong>369</strong></td>
<td><strong>241</strong></td>
</tr>
</tbody>
</table>

- Facilities are categorized by the CEAC region conducting their technical assistance, not their actual location.
- This table includes only industrial/commercial/institutional boilers.
The U.S. DOE Southeast CEAC is supplementing its normal CHP services by:

- Providing site specific technical and cost information to the 177 major source facilities (~429 boilers) in 12 states currently burning coal or oil (Decision Tree Analysis)
- Meeting with willing individual facility management to discuss “Clean Energy Compliance Strategies” including potential funding and financial opportunities.
- Assisting interested facilities in the implementation of CHP as a compliance strategy
Decision Tree

- Provides available data:
  - General Site information
  - Boiler information/configuration
  - Compliance and conversion cost estimates

- Calculations
  - Average Steam Load
  - CHP Sizing
  - CHP Paybacks compared to other options
  - 5 and 10 year cash flows
  - IRR and NPV
Cash Flows, IRR, NPV

- 5 and 10 year cash flows are calculated for each compliance option
- The 10 year internal rate of return (IRR) and net present value (NPV) are calculated for CHP versus installing compliance controls

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<td>$0</td>
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<td>$0</td>
</tr>
<tr>
<td>5 YR Annual Electric Savings</td>
<td>$0</td>
<td>$0</td>
<td>$0</td>
<td>$(143,856,284)</td>
</tr>
<tr>
<td>5 YR Net Cash Flow (Output)</td>
<td>$54,539,331</td>
<td>$81,519,440</td>
<td>$86,034,289</td>
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<tr>
<td>10 YR Annual Fuel Cost</td>
<td>$47,737,428</td>
<td>$126,938,160</td>
<td>$145,072,183</td>
<td>$293,739,880</td>
</tr>
<tr>
<td>10 YR Annual O&amp;M Cost</td>
<td>$64,662,516</td>
<td>$26,868,577</td>
<td>$30,706,945</td>
<td>$58,727,566</td>
</tr>
<tr>
<td>10 YR Annual Compliance O&amp;M</td>
<td>$2,540,522</td>
<td>$0</td>
<td>$0</td>
<td>$0</td>
</tr>
<tr>
<td>10 YR Annual Electric Savings</td>
<td>$0</td>
<td>$0</td>
<td>$0</td>
<td>$(310,625,144)</td>
</tr>
<tr>
<td>10 YR Net Cash Flow (Output)</td>
<td>$116,248,728</td>
<td>$164,095,416</td>
<td>$180,406,832</td>
<td>$105,707,749</td>
</tr>
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10 YR IRR - Natural Gas CHP vs Coal Compliance Baseline Case 3%  
10 Yr NPV - Natural Gas CHP vs Coal Compliance Baseline Case $(16,960,682.79)
Current Status¹

- Sites Contacted:
  - AL – 55%
  - SE – 58%

- Sites Remaining:
  - AL – 8
  - SE – 74

- Complete:
  - AL – 28%
  - SE – 47%

*Complete: Plant closed, have switched to natural gas or biomass, analysis complete or declined support

¹as of June 5th, 2013
Boiler MACT Assistance / Information

- List of available state incentives for emissions controls, energy efficiency measures, boiler replacements/tune-ups, CHP, and energy assessments (DOE)
  - [http://www1.eere.energy.gov/industry/states/pdfs/incentives_boiler_mact.pdf](http://www1.eere.energy.gov/industry/states/pdfs/incentives_boiler_mact.pdf)

- Extensive assistance materials for Area Source rule available from EPA
  - Tune-up guidance, fast facts, brochure, table of requirements, small entity compliance guide, etc.
  - [www.epa.gov/ttn/atw/boiler/boilerpg.html](http://www.epa.gov/ttn/atw/boiler/boilerpg.html)

- DOE technical assistance for Major Source rule
  - Site-specific technical and cost information for evaluation of clean energy compliance options for facilities with coal/oil-fired boilers through Regional Clean Energy Application Centers. Includes site visits.
DOE & Southeast CEAC Contacts

DOE Headquarters / Advanced Manufacturing Office

Katrina Pielli
Senior Policy Advisor
Office of the Deputy Assistant Secretary for Energy Efficiency
U.S. Department of Energy
Washington DC

http://www1.eere.energy.gov/manufacturing/distributedenergy/ceacs.html

Southeast CEAC

Director: Isaac Panzarella; (919) 515-0354; ipanzarella@southeastcleanenergy.org
Senior Analyst for Boiler MACT TA:
Keith McAllister; (919) 656-8183 kmcallister@southeastcleanenergy.org

States Covered: Arkansas, Alabama, Florida, Georgia, Kentucky, Mississippi, North Carolina, South Carolina & Tennessee + Louisiana, Oklahoma, Texas (Boiler MACT TA Only)

www.southeastcleanenergy.org
Thank You!