



***Output-Based Regulations
A Demonstration of CHP's Benefits in Added Power
Production and Emissions Reduction***

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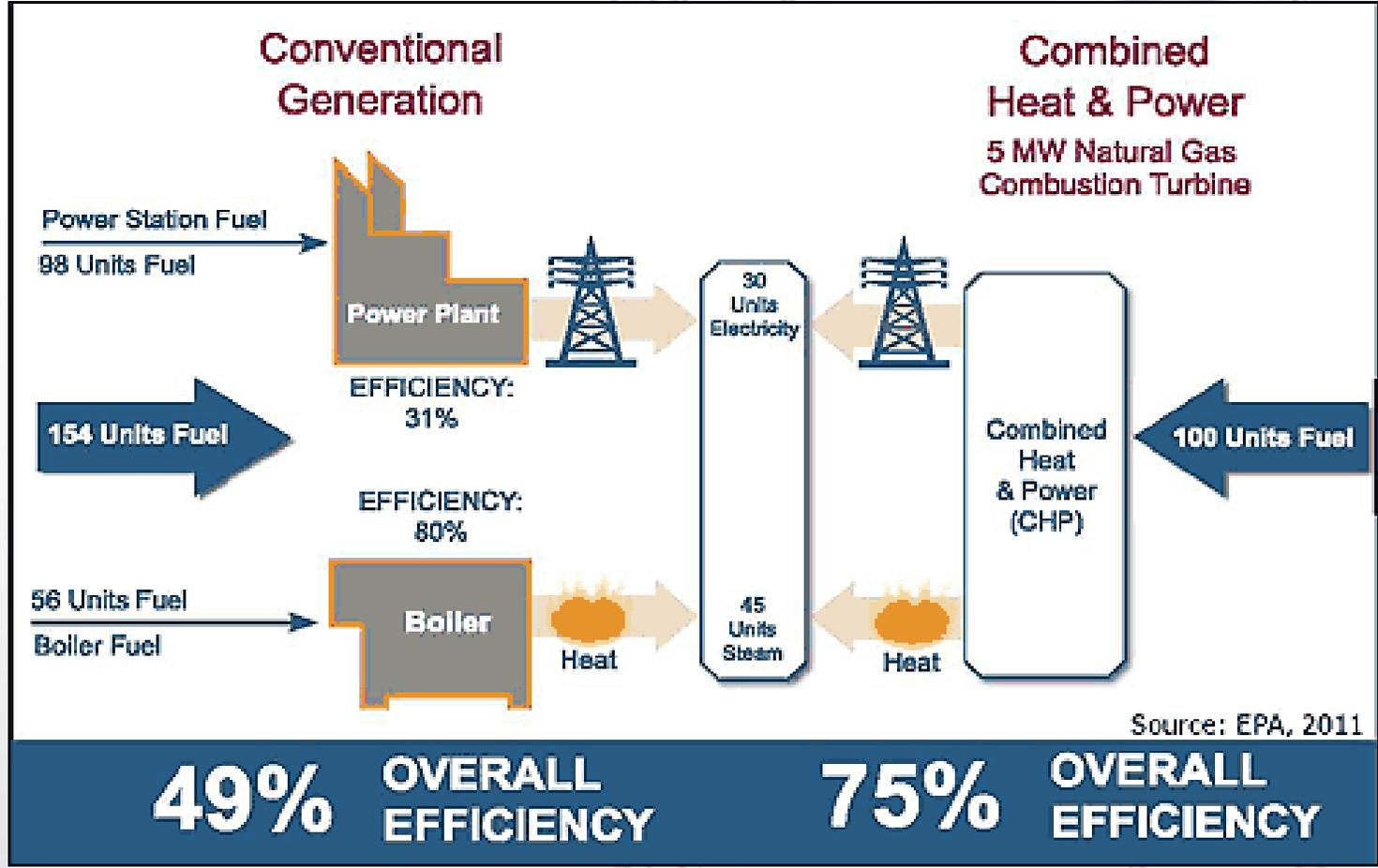
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February 15, 2012

CHP Partnership Regulatory/Policy Support

- Inform regulators, policymakers, and utilities on CHP's value proposition.
- Provide examples of model state policies for promoting CHP, such as output-based emissions regulations, CHP-friendly utility rates, and renewable portfolio standards that include CHP.
- Develop tools and resources for state energy officials in partnership with NASEO.
- Collaborate with EPA offices and States to raise awareness on CHP and support the use of CHP when appropriate.
- Collaborate with other agencies and other research organizations to better characterize CHP.

Increased Efficiency Results in Reduced Carbon Emissions



CHP Value Proposition

Category	10 MW CHP	10 MW Wind	10 MW Natural Gas Combined Cycle
Annual Capacity Factor	85%	34%	70%
Annual Electricity	74,446 MWh	29,784 MWh	61,320 MWh
Annual Useful Heat	103,417 MWh	None	None
Footprint Required	6,000 sq ft	76,000 sq ft	N/A
Capital Cost	\$20 million	\$24.4 million	\$9.8 million
Cost of Power	7.6 ¢/kWh	7.5 ¢/kWh	6.1 ¢/kWh
Annual Energy Savings	316,218 MMBtu	306,871 MMBtu	163,724 MMBtu
Annual CO ₂ Savings	42,506 Tons	27,546 Tons	28,233 Tons
Annual NO _x Savings	87.8 Tons	36.4 Tons	61.9 Tons

Source: ICF International, prepared for the EPA CHP Partnership

Combined Heat & Power (CHP)

- CHP - key supply-side energy efficiency resource
- EPA recognizes CHP's unique role in:
 - Protecting public health and welfare
 - Addressing climate change
- Advances will help address key challenges:
 - Lowering the cost of reducing GHG emissions and other air pollutants
 - Increasing clean energy generation
 - Improving electricity system reliability

What are output based regulations ?

- Regulations that relate emissions to the productive output of a device or process.
 - Unit of emissions/unit of output
 - lb emission/MWh
- Can be applied for any process
 - CHP, gas turbines, internal combustion engines, pulp and paper sector sources

Why apply output based regulations ?

- To recognize and reward efficiency
 - Reduced fuel consumption (multimedia and energy security impacts)
 - Multi-emission reductions
- To relate benefit (productive output) to cost (pollution control)
 - Operational flexibility while reducing emissions.
 - Provide incentive to use less fuel

Comparison between Output-Based and Input-Based Standards

	Plant 1	Plant 2
Base Unit (MW)	300	300
Total Output (million MWh/yr)	2.1	2.1
Fuel Use (10^6 mmBtu/yr)	15.75	13.7
Total Emissions (tpy)	945	787
Input-Based Standard (lb/mmBtu)	0.12	0.12
Efficiency (Percentage)	45	53
Output-Based Standard (lb/MWh)	0.9	0.7

Developing OBS for CHP: Process

- Develop appropriate output-based emission limits
 - Derive from an existing input-based limits
 - Apply unit conversions and efficiency factor.
 - Derive from output-based measurements
- Specify a gross vs. net energy output
 - Use of net output is closer to policy goal of recognizing overall efficiency
 - Balance tradeoff between policy goal and standard's complexity
- Specify compliance measurement methods

Compliance Measurement

- Emission measurement is the same regardless of rule format.
- Output measurement may require additional procedures
- Additional procedures would be related to a plant's current operating procedure

EPA's Incorporation of CHP and OBR

- New Source Performance Standards (NSPS)
 - Utility and industrial boiler NSPS, February 2006
 - Stationary combustion turbine NSPS (Subpart KKKK), July 2006
 - Internal combustion engine, NSPS (compression ignition and spark ignition)
- Mercury and Air Toxic Standards (MATS) and Treatment of CHP
 - Applicable to coal and oil-fired CHP facilities that sell $\geq 1/3^{\text{rd}}$ of electrical output and >25 MWe
 - Format
 - Output-based for new sources
 - Input or output-based for existing sources
 - Gross electrical + mechanical output + 75% of thermal output
- Guidance to help States account for the emission benefits of energy efficiency and renewable energy in Air Quality Plans (early 2012)
- Identify cost-effective strategies to meet clean air requirements, including how to consider CHP in their State Implementation Plans (early 2012)

Current State OB Air Regulations

State	Conventional Emissions Limits	Small DG Rule	Allowance Trading	Allowance Set Asides	Emissions Performance Standard (EPS)
Arkansas			X*		
California	X*	X*			X
Connecticut		X*	X*	X*	X
Delaware	X*				
Illinois			X*	X*	
Indiana			X	X	
Maine	X				
Massachusetts	X	X	X*	X	X*
Missouri			X*	X*	
New Hampshire	X				
New Jersey			X*	X*	
New York		X (proposed)			
Ohio			X*		
Oregon					X
Pennsylvania			X*		
Rhode Island	X*				
Texas		X*			
Washington					X
Wisconsin			X*		

Note: *Includes recognition of CHP through accounting for thermal output.

Utah Policy Drivers for CHP and Output-Based Standards

- WGA “Industrial Energy Efficiency” Improving Competitiveness, Reducing Emissions”, June 2011
 - Policies to promote CHP, including the development of output-based emission standards
- Four Corners Air Quality Task Force Report of Mitigation Options, November 2007
 - CHP identified as a voluntary mitigation option
 - Replacement of internal combustion engines with those that meet tighter emission (output-based) standards
- Renewable Portfolio Goal
 - Credit generation (both the electric and potentially the thermal) on an output basis based on actual MWh of generation.
 - Allows for waste heat to power to qualify.

Incentives to CHP Adoption

- Developing **standard interconnection rules**.
- Implementing reasonable utility rates such as **standby rates, backup rates, and exit fees**.
- Developing incentive programs for CHP in **clean energy funds**.
- Include CHP/waste heat recovery in **renewable portfolio standards** and energy efficiency portfolio standards.
- Establishing **output-based emission regulations** and incorporating other efficiency measures into state implementation plans.

Contact Information

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Output-Based Regulations Resources:
<http://www.epa.gov/chp/state-policy/output.html>

