



Combined Heat and Power Going Forward: What Can State Utility Commissions Do?

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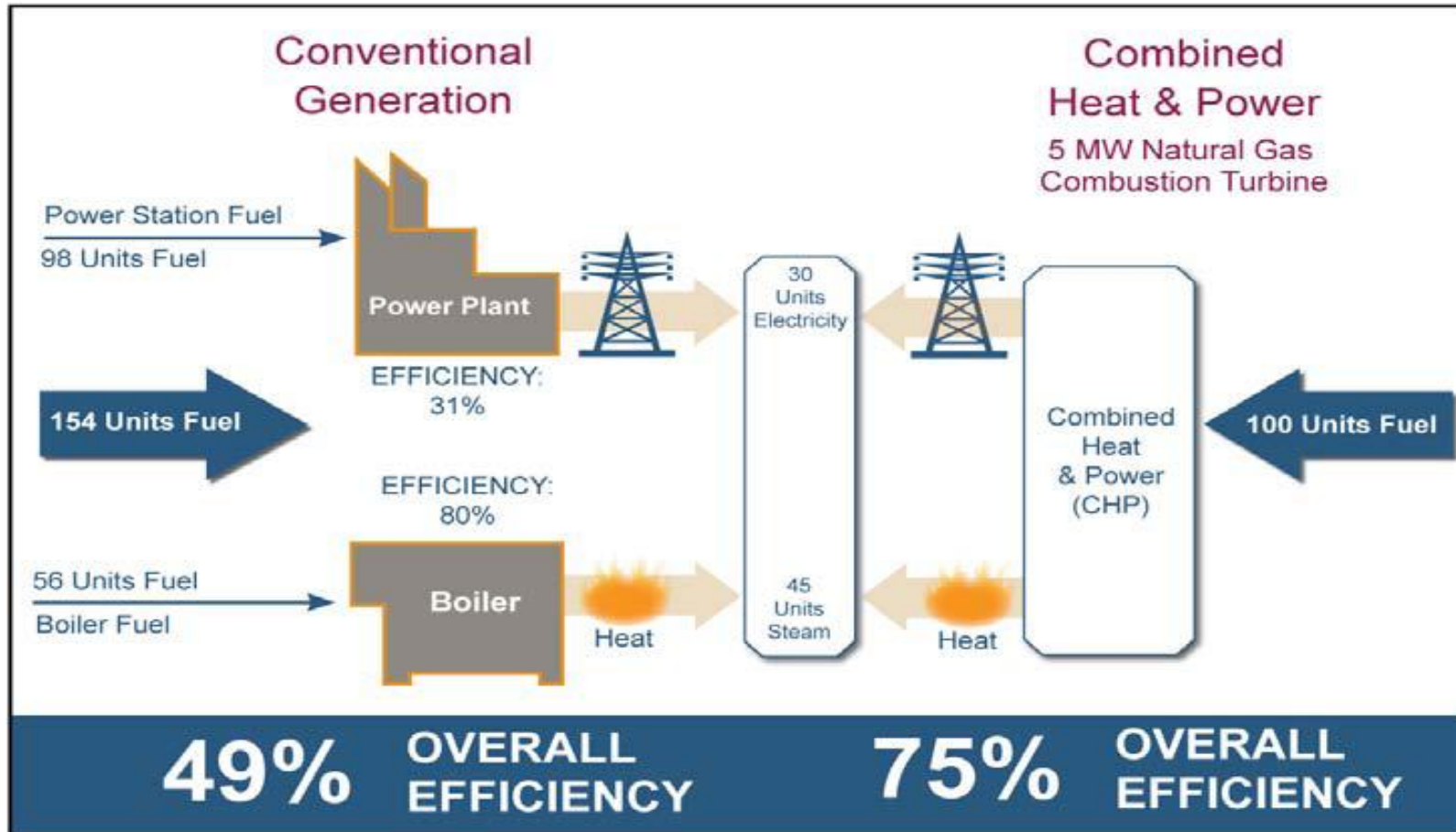
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Features of CHP Systems

- Two outputs with a single fuel input
- Two broad categories: topping and bottoming cycle
- Form of distributed generation
- Capacity to use different fuels
- Optimal application dependent upon host's energy profile
- Site-specific economics
- Economies of scale
- Mature technology
- Energy-efficient and clean energy resource
- Concentration in relatively few areas of the country

Fuel Savings from a CHP System



Source: U.S. Department of Energy, and U.S. Environmental Protection Agency, August 2012, 7.

- Higher overall energy efficiency than production of electricity and steam in separate facilities
- Energy-cost savings for the host
- Reduction in lost electricity from T&D
- Environmental benefits
- Improved power resiliency, reliability and security
- Positive macroeconomic effects
- Economic and environmental advantages over some other generation technologies



Benefits of CHP over Solar and Wind

Output	10 MW CHP	10 MW PV	10 MW Wind
Annual Capacity Factor	85%	25%	34%
Annual Electricity Production	74,446 MWh	21,900 MWh	29,784 MWh
Annual Useful Heat	103,417 MWh _t	None	None
Footprint Required	6,000 sq ft	1,740,000 sq ft	76,000 sq ft
Capital Cost	\$20 million	\$48 million	\$24 million
Annual National Energy Savings	343,787 MMBtu	225,640 MMBtu	306,871 MMBtu
Annual National CO ₂ Savings	44,114 Tons	20,254 Tons	27,546 Tons

Source: ICF International, May 2013, 22.



Different Gas-Fired CHP Technologies

- ❖ Gas turbines
 - Combined cycle
 - Combustion turbines
- ❖ Boiler/steam turbines
- ❖ Reciprocating engines
- ❖ Microturbines
- ❖ Fuel cells



Spotty History of CHP

- Early history of U.S. electricity industry
- Central station era
- PURPA
- Early 21st century
- Last few years and current status

- Technical potential vs. economic feasibility
- Abundance of natural gas
- Push by the Obama Administration
- Increased recognition at the state level of CHP technology as an energy-efficient and clean-energy resource
- Increased concern about long and costly outages on the central grid
- MACT regulations



Several Factors Affecting the Economics of CHP

- Returns from CHP relative to competing investments
- Payback period
- Electricity and natural gas prices
- Thermal energy requirements of host
- Initial investment costs
- Revenues from electricity sales
- Standby rates
- Interconnection rules
- Environmental regulations



Obstacles to CHP Growth

- What are they?
- How serious are they?
- What should policymakers do, if anything, to mitigate them?
- Distinction between “*market/regulatory failures*” and “*normal market barriers*” (Examples)



Market Barriers

- Required short payback period
- Uncertain rate of return
- Inadequate information about CHP technologies
- Inertia
- Myopic behavior by potential investors
- High initial investment costs
- High transaction costs

Which of these require governmental intervention?



Regulatory Practices as Potential Barriers

- Benefit-cost tests for evaluating CHP
- Interconnection rules
- Standby rates
- Existing ratemaking practices
- Characterization of CHP as an energy resource
- Constraints on utility activities

Which of these prevent development of cost-effective CHP investments?



Five Basic Questions for Commissions

- What should society expect from electric utilities in accommodating or supporting CHP?
- How should electric utilities meet those expectations?
- What can commissions do to require or encourage utilities to meet these expectations?
- What role should gas utilities play in support of CHP?
- What can commissions do to change their present policies and practices to assure investments in cost-effective CHP?



Final Thoughts for Commission Consideration

- The market should be the prime driver of CHP investments
- “Leveling the playing field” among generation alternatives should be the major regulatory goal
- Commissions should support subsidies, favorable treatment to CHP only under restrictive conditions; namely, the presence of serious market/regulatory failures for which the benefits of their mitigation exceed the costs