ACEEE
American Council for an Energy-Efficient Economy
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Combined Heat and Power and Clean Distributed Energy Policies

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- conducting in-depth technical & policy analyses
- advising policymakers, energy professionals & utilities
- working collaboratively with businesses & other organizations
- organizing conferences
- publishing conference proceedings and reports
- educating consumers & businesses

Collaboration is key to ACEEE's success. We work with organizations around the globe including federal, state, and local government agencies, utilities, research institutions, businesses, and public interest groups. Our focus is on 6 primary program areas:

- Energy Policy
- Economic Analysis
- Buildings, Appliances, & Equipment
- Utilities
- Industry & Agriculture
- Transportation

ACEEE is leading the development of technology and policy solutions that ensure the security of our energy systems. As energy leaders, we promote the vibrancy of the American economy and the sustainability of the environment world-wide.

ACEEE Recommendations

Congress should:

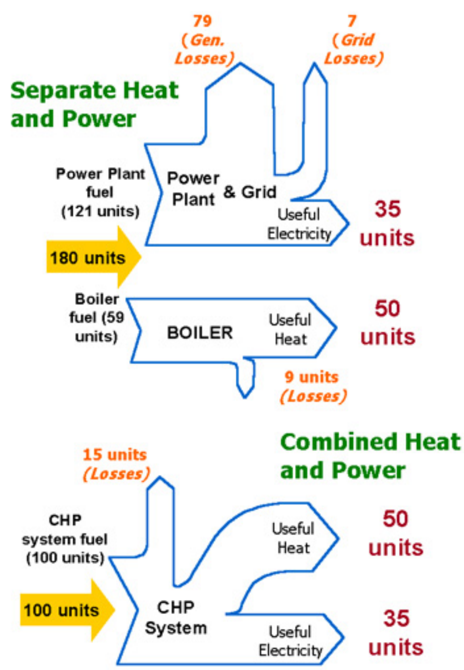
- Encourage states to adopt the NARUC model interconnection protocols.
- Encourage the adoption of output-based air emissions regulations by states.
- Provide funding for technical assistance and implementation grants of clean distributed generation as authorized in federal legislation[1]

The Issue

Combined heat and power (CHP) systems generate electricity and useful thermal energy in a single, integrated system. CHP is not a technology, but an approach to applying technologies. Heat that is normally wasted in conventional power generation is recovered as useful energy. This avoids the losses that would otherwise be incurred from separate generation of power. Due to the integration of both power and thermal generation, CHP systems are more efficient than separate generating systems and provide environmental, economic, and energy system infrastructure benefits. However, several barriers impeded cost-effective CHP applications including lack of common interconnection protocols, discriminatory standby rates, and emissions regulations that do not recognize the improved efficiency levels of CHP systems.

Summary

Combined heat and power (CHP) systems, also known as cogeneration, generate electricity and useful thermal energy in a single, integrated system (see figure). In some existing generation systems, additional equipment can be installed to recover energy that would otherwise be wasted (this is known as recycled energy). Traditionally, electricity is generated at a central power plant, and on-site heating and cooling equipment is used to meet non-electric energy requirements. In a CHP system, the electricity is produced onsite, and the thermal energy is recovered to be used for heating or cooling a nearby building, or for use in industrial processes. Because CHP captures heat that would otherwise be wasted in the case of traditional generation of electric power, the combined efficiency of these integrated systems is much greater than from traditional separate systems (e.g., in the example in the figure, the CHP system has an efficiency of 85% while the separate systems have a combined efficiency of only 45%). And since power is produced onsite, transmission and distribution losses (typically 7%) are also avoided.



CHP is widely used in the steel, chemical, paper, and petroleum-refining industries, and at large institutional campuses such as universities. In recent years, smaller CHP systems have begun to make inroads in the food, pharmaceutical, and light manufacturing industries; in commercial buildings; and at smaller institutions such as hospitals. The CHP industry, U.S. Department of Energy (DOE), and U.S. Environmental Protection Agency (EPA) set an ambitious but achievable goal to double U.S. CHP capacity between 1999 and 2010, using 1998 as a baseline, by adding 92 GW of new capacity.[2] A recent report, co-funded by DOE, suggests that CHP could represent as much as 20% of U.S. electric generation capacity by 2030, or 241 GW of total capacity.[3]

Although technologies used in CHP systems have improved in recent years and CHP has become cost-effective in many applications, significant hurdles remain that limit widespread deployment of CHP. As a result, less efficient separate heat and power systems still predominate. A major barrier to CHP is the lack of **national business practice standards for the interconnection** of distributed generation technologies to the local electric utility grid. (Interconnection is the process of connecting a CHP system, or any distributed energy resource, to the transmission and distribution grid.) This lack of uniform business practice standards results in a patchwork of regulatory models. Some utilities require costly and complex studies and installation of unnecessary and expensive equipment to discourage CHP. Many utilities also currently charge **discriminatory standby rates** and prohibitive "exit fees" to customers that implement CHP at existing facilities. The National Association of Regulatory Utility Commissioners (NARUC) has adopted model standards[4] that are favorable to CHP and distributed energy resources. This model would be acceptable for implementation at the state and utility level.

Current **emissions regulations** also act as a barrier to CHP systems as they do not recognize the overall energy efficiency of CHP or credit the emissions avoided from the displaced centralized grid electricity generation. The current regulatory approach relies on an input-based standard, which measures emissions as pounds of pollutant per BTU of input fuel, basing that calculus on the traditional relationship of fuel input to a typical power plant. This method does not account for the useful thermal output a CHP system provides. This fails to appropriately credit the efficiency of the system and ignores the added benefits CHP provides. Alternatively, output-based standards link emissions to the generator's final useful energy output. This approach rewards generators that have the highest "output" of megawatt-hours and the lowest "output" of pollutants. Output-based standards calculate emissions based on the amount of electricity generated, which can be represented in pounds of pollutant per megawatt-hour. Using an output-based measurement encourages greater energy efficiency and pollution reduction, reducing the environmental impact of the power sector while enhancing the amount of available power in the U.S.[5] U.S. EPA has provided guidance on implementation of output-based regulations, but thus far only 17 states have adopted this regulatory approach.

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[1] Section 451 of the *Energy Independence and Security Act of 2007.*
[2] http://www.chpcentermw.org/pdfs/MAC_Flyer_080915.pdf; http://www.iea.org/g8/chp/docs/us_roadmap.pdf
[3] *Combined Heat and Power: Effective Energy Solutions for a Sustainable Future*. 2008. Oak Ridge National Laboratory. Oak Ridge, TN: December 1.
[4] The National Association of Regulatory Utility Commissioners. 2003. *Model Interconnection Procedures and Agreement for Small Distributed Generation Resources*. http://www.naruc.org/Publications/dgiaip_oct03.pdf
[5] *Output-based Emissions Standards Advancing Innovative Energy Technologies.* 2003. Northeast-Midwest Institute. http://www.nemw.org/output_emissions.pdf