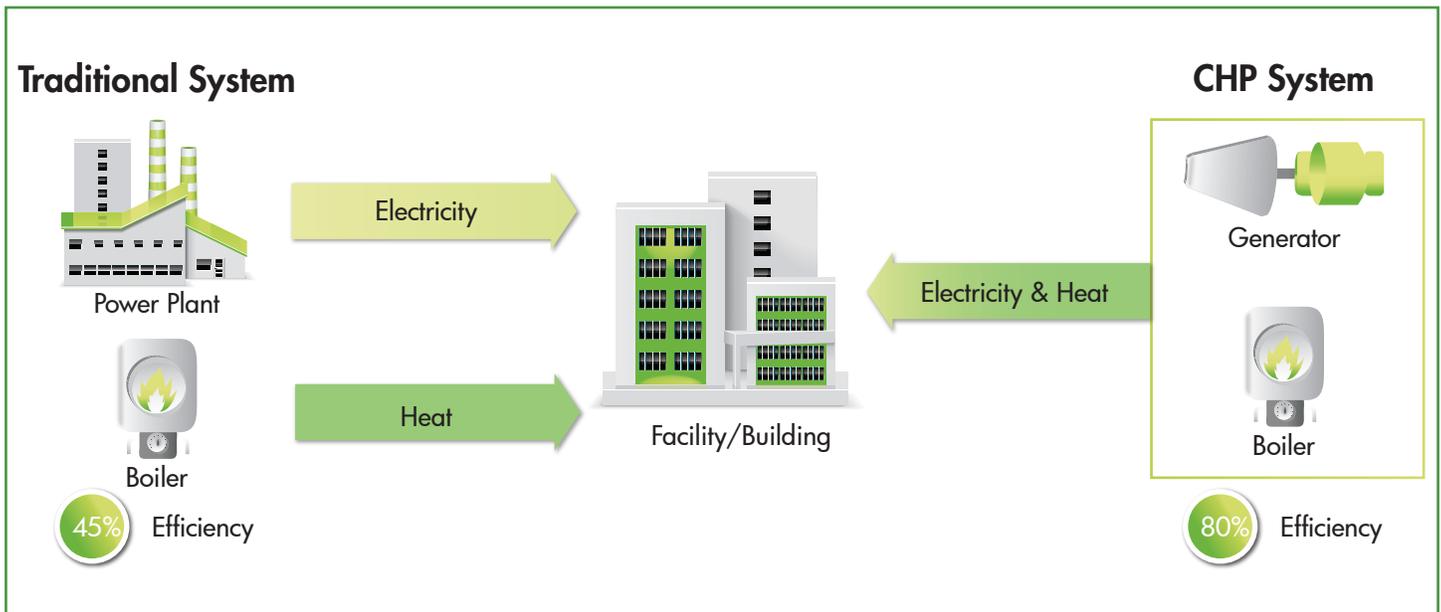


# Combined Heat and Power

Combined heat and power, or CHP, is the process of utilizing a single fuel source to produce usable electrical and thermal energy. CHP is an approach, not a technology. The approach is very efficient because it recovers heat that would otherwise be wasted and turns it into usable energy.

By integrating power and thermal generation, CHP systems are more efficient than separate generating systems. As a result, environmental, economic, financial and energy system optimization improvements can be achieved.

CHP is applicable to more types of industries and facilities than it once was. Keep reading to learn more about CHP and how the approach may be able to help your facility operate more efficiently.



## CHP is Efficient

CHP systems can operate at efficiency levels as high as 80% compared to conventional systems that can have combined efficiencies as low as 45%. CHP's higher efficiency comes from the recovery of heat that would typically be lost during power generation or industrial processes and instead uses it to provide on-site heating or to produce electricity. Additionally, because the electricity generated by a CHP system is used on-site, CHP systems are free from the transmission and distribution losses associated with electricity generated at centralized power plants.

## CHP is Feasible

CHP is being utilized across the country; most often deployed in locations with elevated electricity costs, as well as areas with public policies that are favorable to CHP. In the past, CHP was typically utilized in the steel, chemical, paper, and petroleum-refining industries, or for large university campuses. More recently, due to advances in technology, smaller CHP systems are more common and feasible for: the food and pharmaceutical industry, light manufacturing and commercial buildings, and even hospital campuses.

## CHP is Diverse

The application of CHP is not limited to any particular fuel or energy type. The process can include fuel sources such as natural gas, biomass, biogas, oil, coal and process wastes.

There are two types of CHP systems:

### 1. Bottoming Cycle Systems

'Waste' heat from an industrial process that would typically be exhausted is recovered and used to power a generator for electricity production. This type of CHP system is also known as waste heat recovery.

### 2. Topping Cycle Systems

Fuel is combusted and powers a generator that produces electricity. 'Waste' heat from the combustion process is recovered and used as the heat source for space heating, hot water heating, process demands, or other facility needs, depending on the system.

## CHP is Green

CHP systems by nature are green because their higher efficiency means less fuel is needed. By combusting less fuel, by-products of a facility's operation, such as CO<sub>2</sub> and other greenhouse gas emissions, are reduced.

## Available Financial Incentives

MidAmerican Energy Company offers incentives to eligible facilities for the installation of qualifying bottoming cycle CHP systems. In Iowa, only systems that utilize waste heat streams fueled by natural gas or electricity purchased directly from MidAmerican Energy, or monthly metered natural gas delivered by MidAmerican Energy, may be eligible for incentives. Preapproval is required prior to purchase or installation.

## Facts and Figures on CHP

- As of 2012, CHP made up about 8% of U.S. total generating capacity.<sup>1</sup>
- The installed capacity of CHP in the U.S. in 2012 was about 82 GW, and recent legislation set an official goal of 40 GW of additional CHP capacity by 2020.<sup>1</sup>
- As the U.S. Environmental Protection Agency establishes new rules to reduce CO<sub>2</sub> from power plants, CHP has been identified as a critical tool to cost-effectively reduce CO<sub>2</sub>.<sup>1</sup>
- Studies suggest that CHP could represent as much as 20% of U.S. electric generation capacity by 2030, or 241 GW of total capacity.<sup>2</sup>
- CHP generation could produce annual savings of \$77 billion for the U.S.<sup>3</sup>

<sup>1</sup>2012 joint report from the U.S. Department of Energy and U.S. EPA.

<sup>2</sup>Combined Heat and Power: Effective Energy Solutions for a Sustainable Future. 2008. Oak Ridge National Laboratory. Oak Ridge, TN: December 1.

<sup>3</sup>McKinsey & Company, Unlocking Energy Efficiency in the U.S. Economy, 2009.

## RESOURCES

### Iowa Economic Development Authority

[www.iowaeconomicdevelopment.com/Energy/CHP](http://www.iowaeconomicdevelopment.com/Energy/CHP)

### Department of Energy

[www.energy.gov/articles/top-10-things-you-didn-t-know-about-combined-heat-and-power](http://www.energy.gov/articles/top-10-things-you-didn-t-know-about-combined-heat-and-power)

### Environmental Protection Agency — Combined Heat and Power Partnership

[www.epa.gov/chp](http://www.epa.gov/chp)

### Department of Energy Waste Heat Recovery: Technologies and Opportunities in U.S. Industry report

[www1.eere.energy.gov/manufacturing/intensiveprocesses/pdfs/waste\\_heat\\_recovery.pdf](http://www1.eere.energy.gov/manufacturing/intensiveprocesses/pdfs/waste_heat_recovery.pdf)

## QUESTIONS

To learn more about MidAmerican Energy Company's EnergyAdvantage® programs visit [www.midamericanenergy.com/ee](http://www.midamericanenergy.com/ee) or call 800-432-8583 (industrial customers) or 800-292-6448 (commercial customers).