

## COMBINED HEAT AND POWER

### Energy Efficiency to Repower U.S. Manufacturing

The United States has the world's largest manufacturing economy, which produces 21 percent of global manufactured products and contributes more than 11 percent of U.S. GDP (more than any other sector).<sup>1</sup> Manufacturing is the wellspring for 11.5 million jobs in the United States, or 9 percent of the total workforce.<sup>2</sup> In order to compete more effectively in the challenging global manufacturing marketplace, U.S. industry must look for ways to become more productive and efficient.



#### COMBINED HEAT AND POWER IN WISCONSIN<sup>a</sup>

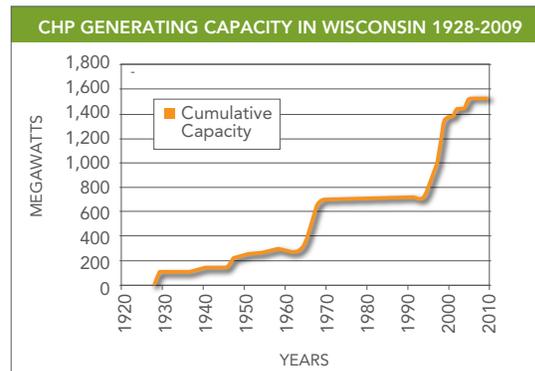
More than 1,500 megawatts (MW) of combined heat and power (CHP) generating capacity have been installed across Wisconsin.

Capacity has grown steadily since 1928, when Consolidated Papers Inc. constructed a 20.8-MW facility at a paper mill in Wisconsin Rapids. Eighty CHP sites have been installed in the state, more than one-third of them since 1997.

WISCONSIN	CAPACITY (MW)
Total (80 sites)	1,526
<b>TOP CITIES</b>	
Milwaukee	311
Whitewater	251
Madison	187

#### Case Study: Crave Brothers Farm<sup>b</sup>

The Crave Brothers Farm in Waterloo installed an upgraded 633-kilowatt (KW) CHP system operating on anaerobic digester<sup>c</sup> gas from cow manure in 2009. The farm upgraded a previously installed anaerobic digester to



help it reduce the problems associated with manure disposal. The expanded waste-to-energy plant enabled the farm to free up space that was previously needed for manure disposal. It now had more space for livestock, allowing it to increase its herd from 750 to 1,600. The electricity generated from the system is sold to a local utility, WE Energies, and the recovered heat is used to maintain the temperature of the facility and to provide hot water and heat for the farm's buildings. The system saves the farm \$250,000 to \$300,000 annually and is expected to pay for itself in four or five years.

<sup>a</sup> Department of Energy. Energy and Environmental Analysis Inc. Combined Heat and Power Units Located in Wisconsin. [www.eea-inc.com/chpdata/States/WI.html](http://www.eea-inc.com/chpdata/States/WI.html)

<sup>b</sup> U.S. Department of Energy. Midwest CHP Application Center. Crave Brothers Farm: Project Profile. [www.chpcentermw.org/rac\\_profiles/Midwest/CraveBrothers.pdf](http://www.chpcentermw.org/rac_profiles/Midwest/CraveBrothers.pdf)

<sup>c</sup> National Non-Food Crops Centre. (2011). NFCC Renewable Fuels and Energy Fact Sheet. [www.nnfcc.co.uk/publications/nnfcc-renewable-fuels-and-energy-factsheet-anaerobic-digestion](http://www.nnfcc.co.uk/publications/nnfcc-renewable-fuels-and-energy-factsheet-anaerobic-digestion)

## DOUBLE AMERICA'S CHP BY 2020

Expert analysis from the Oak Ridge National Laboratory indicates that 85 gigawatts of combined heat and power (CHP) could be added in a cost-effective manner over the next 10 years, reducing business costs and creating jobs.<sup>3</sup> This increase would double CHP by 2020 and would reduce annual energy consumption in the U.S. by 3 percent—avoiding the need to build more than 200 midsize power plants (those of about 500 megawatts).

At a time of economic uncertainty, investment tax credits encourage industry to upgrade its facilities by lowering the up-front costs for CHP projects. Unfortunately, current tax credits are not enough to spur the significant energy-efficiency investments that the industrial sector needs to return this nation to economic growth, reduced fuel consumption and global competitiveness. To reap the benefits, the United States needs a 30 percent investment tax credit for waste-heat recovery and highly efficient CHP projects, no matter their size.



PHOTO: THOMAS LOHNES/GETTY IMAGES

## WHAT IS COMBINED HEAT AND POWER?

Used in one form or another for more than 100 years, CHP is not a single technology, but instead a group of technologies that can use a variety of fuels to provide reliable electricity, mechanical power or thermal energy. Manufacturing generates large amounts of waste heat, which is typically vented into the air. The recycling of waste heat, however, can generate low-cost clean electricity. Waste-energy recovery takes two forms:

- Capturing heat produced during electricity generation and using it to heat additional buildings.
- Using industrial waste heat (or another energy-laden waste stream) as a fuel source to generate electricity.

Utilizing these technologies presents a significant opportunity for industry to maximize efficiency and productivity, cut costs, create jobs, reduce emissions and enhance competitiveness.

Combined heat and power technologies are readily available today. CHP sites exist in every state and together contribute 85 gigawatts of capacity annually, or almost 9 percent of the nation's electricity.\* Additionally, with rising energy prices affecting companies large and small, CHP can offset costs and give businesses the flexibility to invest their money elsewhere.

\* *Combined Heat and Power: Effective Energy Solutions for a Sustainable Future.* Oak Ridge National Laboratory, Dec. 1, 2008.

## COMBINED HEAT AND POWER ACROSS THE U.S.

### BMW Manufacturing Plant Spartanburg, S.C.

In 2009, BMW Manufacturing Co.'s Energy Center installed two new energy-efficient combustion turbines that together produce 11 MW of electricity. The CHP system is powered by methane gas obtained through a partnership with a local Waste Management landfill. Overall, the plant's two turbines save \$5 million to \$7 million a year in energy costs and reduce annual carbon-dioxide emissions by 92,000 tons.<sup>4</sup>



BMW Plant

### Harrah's Rio All-Suites Hotel and Casino Las Vegas

The Rio is home to the first CHP system on the Las Vegas Strip. Installed in 2004, the 4.9-MW system generates 40 percent of the electricity, 60 percent of the hot water and 65 percent of the heat needed by the hotel-casino.<sup>5</sup> The efficient combination of on-site heat and power generation reduces the property's annual energy bill by about \$750,000, resulting in a positive return on investment for the project. These savings are reflected in lower electric bills for the property. Heat recovered from the generator stacks and engine jackets, combined



Rio Las Vegas

PHOTO: MACIEJ JANIEC/FLICKR

with lower transmission line power loss, improves the project's efficiency and results in lower pollution and greenhouse gas emissions.

*"We have several combined heat and power applications across our enterprise and through our CodeGreen sustainability initiative are always looking for ways to improve energy efficiencies and promote a healthier environment for our guests, employees and communities in which we operate."*

—Eric Dominguez, Corporate Director,  
Energy & Environmental Services  
Caesars Entertainment

### Adkins Energy Lena, Ill.

Faced with rising electric rates and a history of grid outages in northeastern Illinois, Adkins Energy determined that a combined heat and power system would be perfect for its plant. In 2002, Adkins installed a 5-MW combustion-turbine-based CHP system, which benefits the company in two ways. First, the system provides energy that supplies more than 95 percent of the plant's electrical power needs and saves Adkins over \$900,000 a year in energy costs.<sup>7</sup> Additionally, the plant disconnects from the grid during power outages and continues to produce its own electricity, thus avoiding plant shutdowns.

*"The CHP system has been a very reliable and cost-effective energy solution for our ethanol plant. I would install the same energy system again."*

—Mert Green, Adkins Energy



PHOTO: SCOTT OLSON/GETTY IMAGES

## FOR MORE INFORMATION

Combined Heat and Power Projects,  
Department of Energy  
[www1.eere.energy.gov/industry/  
distributedenergy/chp\\_projects.html](http://www1.eere.energy.gov/industry/distributedenergy/chp_projects.html)

U.S. Combined Heat and Power Association  
[www.uschpa.org/i4a/pages/index.cfm?  
pageid=1](http://www.uschpa.org/i4a/pages/index.cfm?pageid=1)

- 1 *Manufacturing Strategy for Jobs and a Competitive America*. National Association of Manufacturers. January 2011.
- 2 Current Employment Statistics (CES—National). Bureau of Labor Statistics. 2010. [www.bls.gov/news.release/empsit.t17.htm](http://www.bls.gov/news.release/empsit.t17.htm).
- 3 *Combined Heat and Power: Effective Energy Solutions for a Sustainable Future*. Oak Ridge National Laboratory. Dec. 1, 2008.
- 4 "BMW Manufacturing Co." Southeast Clean Energy Application Center, Department of Energy. [www.southeastcleanenergy.org/profiles/se\\_profiles/BMW\\_Case\\_Study.pdf](http://www.southeastcleanenergy.org/profiles/se_profiles/BMW_Case_Study.pdf)
- 5 Energy and Environmental Analysis Inc. *CHP in the Hotel and Casino Market Sectors*. December 2005. [www.epa.gov/chp/documents/hotel\\_casino\\_analysis.pdf](http://www.epa.gov/chp/documents/hotel_casino_analysis.pdf).
- 6 *CHP in the Hotel and Casino Market Sectors*.
- 7 "Adkins Energy LLC." Midwest CHP Application Center, Department of Energy. [www.epa.gov/chp/documents/adkins\\_energy.pdf](http://www.epa.gov/chp/documents/adkins_energy.pdf)

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