COMBINED HEAT AND POWER

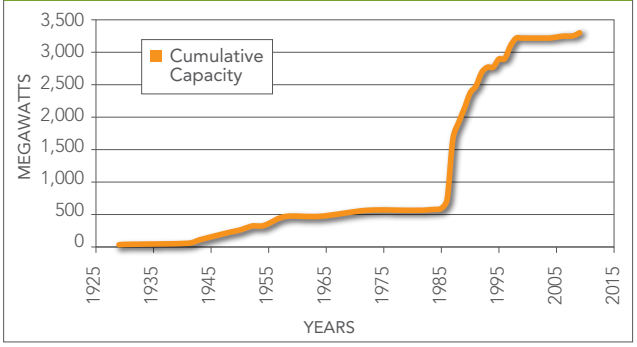
Energy Efficiency to Repower U.S. Manufacturing

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).[1] Manufacturing is the wellspring for 11.5 million jobs in the United States, or 9 percent of the total workforce.[2] 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 PENNSYLVANIA[a]

Combined heat and power (CHP) began to take off in Pennsylvania in the mid-1980s. From 1986 to 1990, the state tripled its capacity, primarily because of CHP additions in the refinery-heavy borough of Marcus Hook. FPL Energy built a 798-megawatt (MW) system there in 1987, and it remains the largest CHP system in the state. Pennsylvania now has 124 sites that generate more than 3,300 MW of power.

CHP GENERATING CAPACITY IN PENNSYLVANIA 1929-2009



PENNSYLVANIA	CAPACITY (MW)
Total (124 sites)	3,301.1
TOP CITIES	
Marcus Hook	803.5
Philadelphia	291.4
Monaca	235.0

Case Study: Bucknell University[b]

Bucknell University replaced a coal-fired power plant built in 1949 with a 6-MW CHP system that powered 95 percent of the campus upon completion. The school saves hundreds of thousands of dollars annually in utility payments and estimates measured savings of more than $1 million a year. The system runs independently of the local grid and can operate fully in an emergency.

a www.eea-inc.com/chpdata/States/PA.html
b www.maceac.psu.edu/project_profiles/Bucknell-Project-Profile.pdf

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.[3] 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.[4]

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.[5] 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 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.[7] 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

Rio Las Vegas PHOTO: MACIEJ JANIEC/FLICKR

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

U.S. Combined Heat and Power Association
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.

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.

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.

6 *CHP in the Hotel and Casino Market Sectors*.

7 "Adkins Energy LLC." Midwest CHP Application Center, Department of Energy. http://public.ornl.gov/mac/pdfs/factsheets/Adkins%20Energy%20-%20Project%20Profile.pdf.

Contact: Jessica Frohman Lubetsky | Senior Associate, Clean Energy Program | Pew Environment Group
202-540-6356 | jlubetsky@pewtrusts.org

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