

SAFER DATA COMMENTARY

Combined Heat and Power Facilities in the South



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Combined Heat and Power (CHP) technology is not new. CHP—the simultaneous generation of electricity, heating and/or cooling from the combustion of a fuel or a solar collector—already provides 12 percent of U.S. electricity generation.³

What is new about CHP is the source of fuels. Traditionally, CHP relied on coal and natural gas. Increasingly, the fuels of CHP consist of renewables such as wood, farm wastes, and algae. Biogas, mostly composed of methane, is produced from anaerobic digestion of waste, and typically fuels reciprocating engines. Woody biomass is commonly used as a boiler fuel to produce steam

conventional approaches of purchasing electricity generated offsite and producing thermal energy onsite. CHP systems can also support facility operations during grid interruptions or black outs, with biomass CHP systems providing an extra reliability and security element if designed with onsite storage of fuel supply.

CHP has the potential to provide environmental, as well as economic, benefits. In 2008, existing CHP capacity in the U.S. saved 242 million metric tons of carbon dioxide and represented a four percent reduction in the total carbon dioxide emissions from all sources (see Table 1).

The future potential for CHP is even greater. In August of 2012, President Obama issued an executive order to “achieve a national goal of deploying 40 gigawatts of new, cost effective industrial CHP in the United States by the end of 2020.”⁴ This means increasing the total CHP capacity in the U.S. by 50 percent in less than a decade.

Although CHP has experienced sustained growth, the increase in new CHP capacity has recently slowed—below one gigawatt per year since 2006. This contrasts with a peak of over five gigawatts in new capacity in 2002.⁵ Factors such as volatile natural gas prices, changes in wholesale power market

Table 1: Energy and Greenhouse Gas Reductions from Existing CHP in the U.S.

| | |
|--|-----|
| Reduced Fuel Consumption with CHP (Quadrillion BTUs) | 1.9 |
| Total CO2 reductions with CHP (Million Metric Tons) | 242 |
| Million Metric Tons of Carbon | 66 |
| Equivalent Acres of Forest Planted (Millions Acres) | 55 |
| Equivalent Number of Cars Removed from Road (Millions of Cars) | 44 |
| Reduction of Total U.S. CO2 from CHP (2006) | 4 |
| <i>CP/DHC Country Scorecard: United States, The International CHP/DHC Collaborative.</i> | |

for turbine generators. More recently, gasification technologies that extract cleaner burning gaseous fuels from solid feedstocks, such as agricultural wastes, have seen commercial use. Regardless of the feedstock and CHP technology used, onsite CHP systems operate with 65-75 percent overall efficiency, compared to a combined efficiency of only 45 percent with the

The combined economic and environmental benefits have many non-traditional industry sectors such as hospitals, institutions, food production and chemicals investigating CHP. Traditionally however, the paper and pulp, and wood products manufacturing industries in the South have been leaders in the development of biomass CHP.

rules, and perhaps most important, the financial crisis, are factors in this slowdown.⁶ Many trends favor future CHP utilization, including the upward pressure on electricity prices and the economic recovery.

As Table 2 illustrates, the use of biomass as a CHP fuel varies greatly by Southern state. In states with large local sources of natural gas and large industrial plants in chemicals, pulp and paper, refining, and other areas, CHP usage is high, but biomass utilization is low. Texas has the most CHP capacity, with over 17.5 million kW, with five percent coming from biomass. It has large CHP facilities, with an average of about 139,000 kW capacity per facility. Louisiana is similar, with almost 7,000 kW of capacity and an average kW production size of almost 105,000 kW—and six percent from biomass.

However, Southern states are instituting additional policies that should help spur CHP growth.

- Two states with significant hurricane risk to electrical grids—Louisiana and Texas— have recently passed bills requiring critical government facilities to conduct “feasibility assessments” for CHP during construction or renovation.
- Alabama, Arkansas and Tennessee were three of five states nationwide that were selected to participate in the National Governors Association’s Policy Academy on

shared with both governors as well as participants at the summits. In Tennessee, the Industrial Energy Efficiency Network and the Tennessee Energy Education Initiative held a summit aimed at encouraging peer-to-peer dialogue between manufacturing companies related to energy efficiency best practices.

In addition, in March 2013 the State and Local Energy Efficiency Action Network released *Guide to the Successful Implementation of State Combined Heat and Power Policies* to focus on regulatory and policy barriers to CHP.

Table 2: CHP Facilities in the South

| | Total Number | Total kW | Avg. kW Facility | Total with Alt. Fuel | Percent Alt Fuel/ Total |
|----------------|--------------|------------|------------------|----------------------|-------------------------|
| Alabama | 41 | 3,217,045 | 78,465 | 8 | 20% |
| Arkansas | 15 | 493,325 | 32,888 | 5 | 33% |
| Florida | 70 | 3,379,626 | 48,280 | 11 | 16% |
| Georgia | 41 | 1,231,338 | 30,033 | 10 | 24% |
| Kentucky | 7 | 123,120 | 17,589 | 1 | 14% |
| Louisiana | 66 | 6,918,190 | 104,821 | 4 | 6% |
| Mississippi | 20 | 513,877 | 25,694 | 8 | 40% |
| Missouri | 21 | 236,220 | 11,249 | 4 | 19% |
| North Carolina | 67 | 1,541,306 | 23,005 | 14 | 21% |
| Oklahoma | 15 | 693,938 | 46,263 | 0 | 0% |
| South Carolina | 23 | 1,220,144 | 53,050 | 6 | 26% |
| Tennessee | 24 | 511,998 | 21,333 | 6 | 25% |
| Texas | 126 | 17,524,074 | 139,080 | 6 | 5% |
| Virginia | 50 | 1,732,074 | 34,641 | 6 | 12% |
| West Virginia | 13 | 381,900 | 29,377 | 0 | 0% |

Based on data provided by the *Combined Heat and Power Installation Database* .

The states with the highest percentages of renewable-fuel CHP are Arkansas (33) and Mississippi (40). Both states are about average in their number of CHP facilities—15 for Arkansas and 20 for Mississippi.

The South’s investment in biomass CHP over the last five years (2008-2012) reflects the national slowdown in CHP generally, and biomass specifically. Since 2008, North Carolina (with seven), and Alabama, Georgia, and South Carolina (with four each), had appreciable investment during this national recessionary period.

Enhancing Industry Through Energy Efficiency and Combined Heat and Power, which took place from September 2012 to April 2013. Alabama and Arkansas hosted Governor’s summits on Industrial Energy Efficiency and CHP in the summer of 2013 as a culmination of that work. Governors of each state attended, and addressed participants from the public service commission, electric and gas utilities, industrial end users, project developers and government entities. Policy recommendations to accelerate the adoption of CHP were

The guide assists state utility regulators and other state policymakers in implementing key state policies that impact CHP.⁷

Examples of renewed activity in biomass CHP are apparent throughout the region.

- MeadWestvaco Corporation installed a new biomass boiler and a 75-megawatt steam turbine generator at its paper facility in Covington, Virginia.⁸ The facility will use feedstocks such as bark, wood residues from logging operations, and wastewater residuals from the paper-making process. The bio-

mass plant will allow the mill to become self-sufficient in electrical power and steam generation, along with significantly reducing operating and maintenance costs. The project represents a \$285 million investment in biomass CHP.

- Winner of the 2012 Groundbreaker of the Year award at the International Biomass Conference & Expo, the Savannah River Site Biomass Cogeneration Facility near Aiken, South Carolina is a 20 MW CHP facility that uses mostly forest resi-

dues from a 40 mile radius. The facility requires 325,000 tons of biomass per year and will decrease the amount of water drawn from the Savannah River by 1.4 billion gallons per year.⁹ The facility may save the Savannah River National Laboratory almost a billion dollars (\$944 million) over 20 years.¹⁰

- Perdue AgriBusiness installed two 600-horsepower biomass boilers at Perdue's Cofield, North Carolina complex.¹¹ The boilers help power

a soy crushing facility and feed mill while minimizing the risks from volatile energy markets for the business. The boilers are owned and operated by Wellons Energy Solutions, with Perdue contracting to purchase steam heat for the next six years. An estimated 18,000 tons of carbon credits per year will be generated compared to using fossil fuel.

As the South continues to explore alternative energy development, biomass CHP can play a vital role.

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³ *CP/DHC Country Scorecard: United States*. The International Energy Agency CHP/DHC Collaborative. <http://www.iea.org/media/files/chp/profiles/us.pdf>.

⁴ *White House Calls for Boosting Combined Heat and Power: Biomass Can Help*. Environmental and Energy Study Institute. <http://www.eesi.org/white-house-calls-boosting-combined-heat-and-power-biomass-can-help-31-aug-2012>.

⁵ *Snapshot of the Cogeneration/CHP Market and Industry Trends*. Midwest Clean Energy Application Center. <http://www.cogeneration.org/111011Conf/Presentations/Haefke.pdf>.

⁶ Ibid.

⁷ *Guide to the Successful Implementation of State Combined Heat and Power Policies*. http://www1.eere.energy.gov/seeaction/chp_policies_guide.html

⁸ *75-megawatt CHP plant proposed and supported in Virginia*. *Biomass Magazine*. <http://biomassmagazine.com/articles/5628/75-megawatt-chp-plant-proposed-and-supported-in-virginia>.

⁹ *Industry leader, CHP project awarded for contributions to biomass*. *Biomass Magazine*. <http://biomassmagazine.com/articles/6278/industry-leader-chp-project-awarded-for-contributions-to-biomass>.

¹⁰ *SRS Marks Successful Operational Startup of New Biomass Cogeneration Facility*. Ameresco Press Release, <http://www.ameresco.com/press/srs-marks-successful-operational-startup-new-biomass-cogeneration-facility>.

¹¹ *Perdue AgriBusiness and Wellons Energy Celebrate Opening of North Carolina Biomass Boiler Project*. Wellons Energy Solutions Press Release. <http://www.wellons.com/energysolutions/pressreleases/102111-wesperduecofieldcommissioning.pdf>.

For More Information and Data:

Southeast CHP Technical Assistance Partnership: <http://www.southeastchptap.org>

EPA Combined Heat and Power Partnership: <http://www.epa.gov/chp/>

State and Local Energy Efficiency Action Network: <http://www1.eere.energy.gov/seeaction/>

International Energy Agency CHP/DHC Collaborative: <http://www.iea.org/chp/>



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