

Why Combined Heat and Power?

THE FOLLOWING ARE QUOTES AND PARAPHRASES FROM THE DOE DECEMBER 1, 2008 CHP REPORT. ACTUAL QUOTES ARE IN “QUOTES”. IF IT IS NOT IN QUOTES THE ITEM PARAPHRASES WHAT THE REPORT SAID.

The United States Department of Energy states in its just released report “Combined Heat and Power – Effective Energy Solutions for a Sustainable Future”, dated December 1, 2008:¹

“Combined heat and power (CHP) solutions represent a proven and effective near-term energy option to help the United States enhance energy efficiency, ensure environmental quality, promote economic growth, and foster a robust energy infrastructure.” (Executive Summary page 3.)

Furthermore, the report also states that,

“In addition, CHP is one of the few options in the portfolio of energy alternatives that combines environmental effectiveness with economic viability and improved competitiveness.” (Executive Summary page 3.)

Page 5 - “CHP positively impacts the health of local economies and supports national energy policy goals in a number of ways. Specifically, CHP can:

- Enhances our energy security by reducing our energy requirements and help businesses weather energy price volatility and supply disruptions.
- Advances climate change and environmental goals by reducing emissions of CO₂ and other pollutants.
- Improves business competitiveness by increasing energy efficiency and managing costs.
- Increases resiliency of our energy infrastructure by limiting congestion and offsetting transmission losses.
- Diversifies energy supply by enabling further integration of domestically produced and renewable fuels.
- Improves energy efficiency by capturing waste heat that is normally wasted.”

¹ The report itself can be downloaded at:

<http://www1.eere.energy.gov/industry/distributedenergy/>

Page 3 – “Using CHP today, the United States already avoids more than 1.9 Quadrillion British thermal units (Quads) of fuel consumption and 248 metric tons of carbon dioxide (CO₂) emissions annually compared to traditional separate production of electricity and thermal energy. This CO₂ reduction is the equivalent of removing more than 45 million cars from the road.”

Page 3 – “CHP, or cogeneration, has been around in one form or another for more than 100 years; it is proven, not speculative. Despite this proven track record, CHP remains underutilized and is one of the most compelling sources of energy efficiency that could, with even modest investments, move the Nation strongly toward greater energy security and a cleaner environment.”

Page 4 – If 20% of US electricity production came from CHP, this “would be equivalent to the CO₂ savings of taking 154 million cars off the road”, (roughly half the fleet of cars on US roads). “CO₂ emissions could be reduced by more than 800 million metric tons (MMT) per year....” “In this 20 percent scenario, over 60 percent of the projected increase in CO₂ emissions between now and 2030 could be avoided.”

Page 4 - If 20 percent of US energy supply was produced by CHP by 2030, “it could save an estimated 5.3 quadrillion BTUs (quads) of fuel annually, the equivalent of nearly half the total energy currently consumed by US households”.

Page 4 - The report also states that if CHP generated 20% of US energy needs by 2030 it would cumulatively “generate \$234 billion in new investments and create nearly 1 million new highly skilled, technical jobs throughout the United States”.

Page 5 – “CHP offers several distinct advantages over many other electricity and thermal energy generating technologies with regard to performance, availability, and cost.”

Page 8 – “CHP systems offer flexibility in fuel selection and can take advantage of both fossil fuels and locally-sourced and renewable fuels such as landfill gas, biomass, or digester gas.” “This flexibility will be an ever more important advantage in an environment where thermal energy is required and fossil-fuel price and availability is volatile or uncertain.”

Page 9 - CHP is “one of the most cost-effective methods of reducing CO₂ emissions”.

Page 9 – Distributed generation can also “play an important role” in solving energy delivery constraints and avoiding costly infrastructure investments.

Page 10 – “CHP is first and foremost an energy efficiency resource. It allows users to produce needed electricity, heat, and mechanical energy while using as little fuel as possible. As an efficiency technology, CHP can lower overall energy demand, reduce reliance on traditional energy supplies, make businesses more competitive, cut GHG emissions, and reduce the need for infrastructure improvements.”

Page 12 – A 2007 study by McKinsey, “Reducing US Greenhouse Gas Emissions: How Much at What Cost?” showed that “under proper conditions” investing in CHP can provide a positive economic return for system owners, while reducing emissions and that it “has an economic advantage over many other environmentally-friendly technologies”.

Page 15 – The report also discusses numerous economic benefits that would be enjoyed via the use of CHP. A study in Texas, (ACEEE, Laitner, et al, 2007 – “The Economic Benefits of an Energy-Efficient and Onsite Renewable Energy Strategy to Meet Growing Electricity Needs in Texas”), showed numerous net cumulative benefits including energy savings of \$37.4 billion by 2023, annual SO_x and NO_x emissions reductions of 31,400 and 23,400 tons respectively and, the creation of 38,00 new jobs which would contribute over \$1.6 billion in new wages in Texas by 2023.

Page 16 - We should also point out that this DOE study referenced additional benefits including the potential for reducing natural gas costs. Studies released in 2003, (EE, Inc. 2003 Natural Gas Impacts of Increased CHP” and Elliot, et al, 2003, ACEEE, “Natural Gas Price Effects of Energy Efficiency and Renewable Energy Practices and Policies”), showed that reducing natural consumption with efficiency and CHP measures lowers pressure on natural gas wholesale prices. Specifically, a 5-6 percent reduction in use can result in a 20 percent reduction in commodity price.

Additional advantages of CHP as stated in the report:

Page 19 – Transmission and bulk power transformer losses that Average 6% to 8% are avoided. Also the report on page 20 states these losses can hot as high as 15% to 50% during peak periods.

Page 19 – “Additionally, if coordinated with the electric utility, CHP can have a role in the safe restoration of the power grid by balancing demands with available supply.”

Page 19 – “Distributed energy technologies, such as CHP, offer a more secure, modernized, reliable, and robust electricity system than the Nation’s current centralized grid paradigm.”

Page 20 – “CHP and distributed energy allow the grid to function more efficiently.” The report then goes on to say, among other things that “distribution feeder and substation transformer loading (and associated losses) are lowered” and that CHP “can benefit the electrical system by reducing both baseload and peak demand”.

Page 20 – “CHP also increases the economic efficiency of the power system. Today, large investments in transmission and distribution (T&D) infrastructure are made where they may only serve the top few hundred hours in the year when the power system is peaking. CHP helps the utility extend the ability of the existing T&D system to serve growing peak loads.”

What is limiting CHP adoption in the US?

The report references a number of things that are barriers to the wider adoption of CHP. Among them are the need for education, lack of standard interconnection guidelines and also the following items.

Page 22 – The report states that, “...many of the system and societal benefits that CHP provides are not accounted for under current ratemaking processes. Rate structures that recover the majority of the cost of service in non-bypassable fixed charges and/or ratcheted demand charges reduce the money-saving potential of CHP”.

Page 22 – The report states that standby/backup rates can “without proper consideration of all benefits” result in “unintended and burdensome barriers to CHP”.

Page 23 – Emissions regulations historically are based on heat input or exhaust concentration. “These input-based limits do not recognize or encourage the higher efficiency offered by CHP, nor do they account for the pollution prevention benefits of efficiency in ways that encourage application of more efficient generation approaches”. To address this issue on page 26 the report suggests, “Output based regulations that include both the thermal and electric output of a CHP process can recognize the higher efficiency and emissions benefits of CHP”.

Page 23 – “The Clean Air Act’s New Source Review (NSR) is another permitting barrier...”. Since CHP can increase emissions at the site of the system even though the high efficiency of CHP may reduce gross region emissions, NSR requirements can make CHP installations very difficult in non-attainment areas.

CONCLUSIONS – All On Page 28

“CHP should be one of the first technologies deployed for near-term carbon reductions. The cost-effectiveness and near-term viability of widespread CHP deployment place the technology at the forefront of practical alternative energy solutions such as wind, solar, clean coal, biofuels, and nuclear power. Clear synergies exist between CHP and most other technologies that dominate the energy and environmental policy dialogue in the country today. As the Nation transforms how it produces, transports, and uses the many forms of energy, it must seize the clear opportunity afforded by CHP in terms of climate change, economic competitiveness, energy security, and infrastructure modernization.”

“The energy efficiency benefits of CHP offer significant, realistic solutions to near-and long-term energy issues facing the Nation. With growing demand for energy, tight supply options, and increasing environmental constraints, extracting the maximum output from primary fuel sources through efficiency is critical to sustained economic development and environmental stewardship. Investment in CHP would stimulate the creation of new “green-collar” jobs, modernize aging energy infrastructure, and protect and enhance the competitiveness of US manufacturing industries.”

“The complementary roles of energy efficiency, renewable energy, and responsible use of traditional energy supplies must be recognized. CHPs proven performance and potential for wider use are evidence of its near-term applicability and, with technological improvements and further elimination of market barriers, of its longer term promise to address the country’s most important energy and environmental needs.”

“A strategic approach is needed to encourage CHP where it can be applied today and address the regulatory and technical challenges preventing long-term viability. Experience in the United States and other countries shows that a balanced set of policies, incentives, business models, and investments can stimulate sustained CHP growth and allow all stakeholders to reap its many well-documented benefits.”