

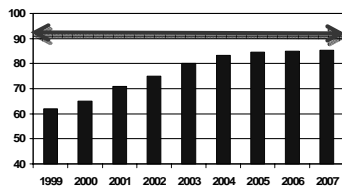


CHP US Federal Partnership: The Road to 92 GW

The United States has long supported collaborative approaches to solving problems. In the energy arena, one such collaboration has been the National Combined Heat and Power (CHP) Roadmap, the culmination of numerous meetings, discussions, planning studies, and assessments over a two-year period, among key stakeholders at the federal, state, regional, and local levels of government, as well as industry, academia, scientific institutions, and policy leaders across the energy spectrum. Beginning with the *CHP Summit* in December of 1998, at which the “CHP Challenge” was issued, and continuing through today, the U.S. Department of Energy (DOE), the U.S. Environmental Protection Agency (EPA), the U.S. Clean Heat and Power Association (USCHPA), and the International District Energy Association (IDEA) have led a multi-pronged effort to double the amount of CHP capacity in the U.S. to 92 gigawatts by 2010. This has meant adding approximately 46 gigawatts of new CHP installations by the end of the decade.

The plan of action to meet the CHP Challenge was published as the *National CHP Roadmap – Doubling Combined Heat and Power Capacity in the United States by 2010*, in March 2001, and it has served as the guide for national, regional, state, and local policies, programs, technologies, and educational efforts on CHP since that time. The CHP Partnership has spearheaded many efforts to accomplish the Roadmap action agenda and in the last six and one-half years has grown to such a level that over 85 GW of CHP has been installed at over 3,000 sites across the country.

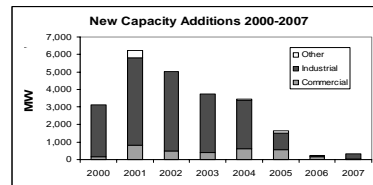
Where Are We Today?



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Capacity Additions: 2000 - 2007



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Although there is more to be accomplished, the CHP Partnership in the U.S. can take pride in the significant installation of combined heat and power in industrial, commercial, and institutional facilities. This paper describes the efforts of the Partnership and the many lessons learned in three major areas:

- Technology development, demonstration, and market deployment, led primarily by the DOE with support and co-funding from EPA, USCHPA and IDEA, private corporations and industry associations;
- Regulatory and institutional decision-making, led by forward-acting states, trade associations, EPA, and non-governmental associations; and
- Education, awareness, training, and outreach on CHP, led by the DOE supported CHP Regional Application Centers (RACs), with support from a multitude of stakeholders, including educational institutions, trade associations, non-governmental agencies, government agencies at all levels, utilities, research institutions, private companies, and independent energy consultants.

A. Drivers and Barriers

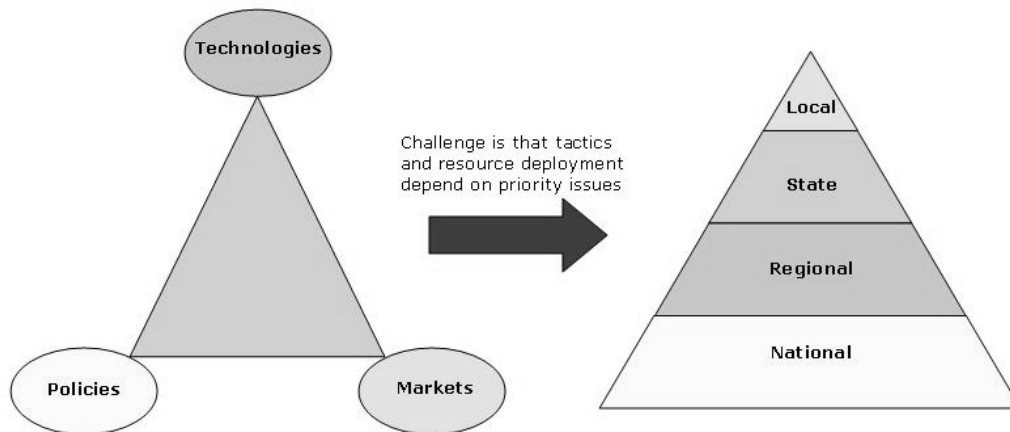
CHP development and implementation has been driven by a number of factors that have remained fairly constant since the CHP Partnership began, including:

- Energy supply and cost uncertainties
- Energy demand growth and resulting transmission and distribution constraints
- Regulatory frameworks at the retail (state) level that define the purchase, and independent development of distributed generation
- Technological innovation
- Environmental concerns, particularly emissions reduction and global climate change
- Infrastructure security and reliability
- Utilization of byproduct/opportunity fuels

All stakeholders in the CHP Partnership have worked collaboratively to address these drivers through financial support for technology development, regulatory and legislative actions at the state and federal level, and targeted education and outreach within market sectors that have been most appropriate for CHP. Many states in the U.S. have initiated regulatory proceedings or passed legislation to further address barriers to CHP, including:

- Utility concerns – and barriers to – CHP
- Grid interconnection
- Costly standby and backup charges
- Stranded costs
- Stringent environmental regulations and siting and permitting requirements
- Lack of incentives for energy efficiency and distributed generation
- Inconsistent tax policies which hinder cost-effectiveness of CHP
- Discomfort with, and lack of information about, CHP technology

Despite these barriers, all stakeholders in the Partnership, led by DOE, EPA, the USCHPA, and IDEA, have embraced the *CHP Challenge* and implementation of the *CHP Roadmap* and have worked tirelessly throughout the last six years to reach the 92 GW goal by 2010. Doing so has required funding, administrative and policy support among all Partnership members, in an integrated, strategic approach that has resulted in improved CHP equipment and system technologies, an improved regulatory and institutional environment, and enhanced markets for CHP. The following discussion highlights the successes achieved to date.



Execution of strategy - Raising Awareness, Addressing Regulatory and Institutional Barriers, and Developing Markets and Technology – with ultimate goal of a competitive marketplace for expanding clean, efficient, reliable and affordable DE resources

B. Technology Development, Demonstration, and Deployment

DOE has led CHP technology development, demonstration, and deployment, partnering with consortia in the commercial building marketplace, and with owners and operators of merchant stores, light industry, supermarkets, restaurants, hospitality, hospital and health care, multi-family dwellings, and high-tech industries. Through technical and financial support, best practices information, and education and training, improvements in energy efficiency, cost-effectiveness, and integration have resulted in enhanced market penetration. Among the targeted technology enhancements have been the following:

- Improvements in medium sized reciprocating gas engine energy efficiency, reduced nitrogen oxide emissions, and reduced operational and maintenance costs
- Improvements to microturbine's (up to 500 kW size) energy efficiency, reduced nitrogen oxide emissions, and reduced operational and maintenance costs
- Improvements in energy efficient industrial gas turbines for industrial and commercial installations, including composite ceramics and thermal barrier coatings, as well as low-emission technologies that have reduced NOx and CO produced without negatively affecting turbine performance
- Developments in on-site energy conversion technologies and absorption and desiccant technologies to improve high efficiency space conditioning that addresses indoor air quality
- Development and demonstration of integrated, packaged energy systems that prove the cost-effectiveness of skid-mounted, off-the-shelf systems for commercial and institutional applications

C. Regulatory and Institutional Policies

Elimination of regulatory and institutional barriers to CHP has been primarily focused at the state and local levels of government. A "patchwork" of state and local policies and regulations still exists, controlled by public utility commissions, state energy offices, governors and state legislative bodies responsible for interconnection rules, renewable portfolio standards (RPS's), and environmental permitting issues. National collaborative efforts, led by the USCHPA, non-governmental organizations, and volunteer stakeholders, however, have led to the following accomplishments:

- Standard interconnection rules, prepared by the International Electrical and Electronics Engineers (IEEE) and adopted by numerous states and legislative bodies
- Twenty-three states with renewable portfolio standards, many of which include provision for CHP, primarily through the use of biomass fuels
- Output-based emissions standards adopted instates
- Support for CHP and distributed generation (DG) projects through public benefits funds (PBFs), collected through ratepayer fees in restructured-market states, the most robust of which are California, New York, New Jersey, and Connecticut

Success at the national level has been focused on the federal government's support for CHP through the Federal Energy Management Program (FEMP) and building standards that reward energy efficiency and CHP, called the Leadership in Energy Efficient Design (LEED) program. These two programs provide public reward and recognition for utilizing CHP and energy efficiency, in residential, commercial, and institutional buildings, in the public, private, and non-profit sectors.

Additionally, efforts undertaken by the Federal Energy Regulatory Commission (FERC), which regulates the U.S. transmission grid, have resulted in CHP projects of value to the wholesale power grid. FERC has issued mandatory electricity reliability standards; designed new tools to prevent market manipulation; issued rules to promote enhancements to grid infrastructure; and issued rules on thermal efficiency requirements for cogeneration facilities. These regulatory actions have served not only to ease the regulatory environment for CHP, but have sent a clear signal that the federal government supports CHP.

Passage of the Energy Policy Act of 2005 (EPAct) created additional opportunities for federal leadership in CHP. Among the directives were enhanced federal building performance standards (Sec. 109); improved electric transmission and distribution RD&D (Sec. 925); a study of distributed generation (Sec. 1817); and a study of energy efficiency programs underway at electric utilities (Sec. 139). Important national "conversations" about the electricity grid – and the role of DG and CHP in strengthening the grid – are now taking place as DOE sponsors public meetings on congested grid transmission and opening up western public lands to additional transmission lines.

D. CHP Education and Outreach

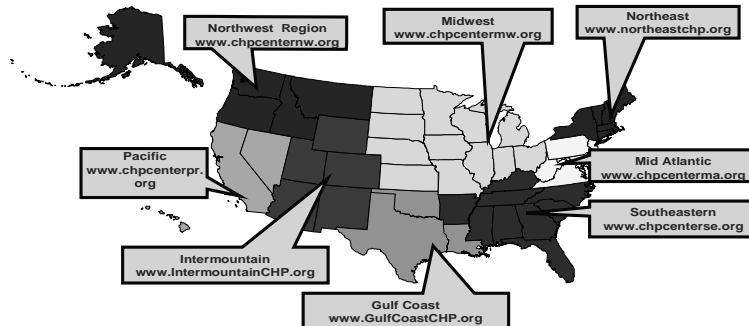
One of the most innovative and exciting areas of work undertaken under the *CHP Challenge* and the *CHP Initiative* has been education and outreach on CHP technologies, market potential, regulations, policies, voluntary programs, legislative opportunities. These efforts have been deployed by hundreds of local, state, regional, and federal governments, private organizations and businesses, non-governmental and non-profit entities, educational organizations, and private individuals, all working together to increase the installation of CHP systems throughout the country.

DOE provided funding support early in the *CHP Challenge* and *Roadmap* years to establish the Midwest CHP Regional Application Center (RAC), based at the University of Illinois – Chicago. This RAC served as the model for seven more centers across the country, primarily housed at colleges and universities, and all partnering with other public organizations, universities, and research centers. The RACs offer CHP technical assistance, training, educational opportunities, and outreach support. The RACs have evolved over the six years, so that in addition to providing educational and outreach activities, many of them conduct research on CHP in selected market segments, e.g., CHP on the farm and in wastewater treatment facilities; packaged CHP systems in hospitals, etc., as well as provide substantive technical support for installation of CHP projects in their regions.

The RACs have developed to the extent that they are well respected, un-biased, providers of CHP technology support in their regions. The eight existing RACs are shown below.

Regional Application Centers

Promoting CHP technology through technical assistance, project support, education and public outreach



To further improve educational and outreach on CHP, DOE, with the assistance of Oak Ridge National Laboratory, provided funding support for eighteen education and outreach contracts in 2004, some of which were extended through 2007. These contracts have supported implementation of the *CHP Roadmap* in the areas of raising CHP awareness, eliminating regulatory and institutional barriers, and developing CHP markets and technologies. Projects were completed in specific sectors – such as district energy and key commercial accounts – as well as in support of particular *Roadmap* goals, such as improving the use of opportunity fuels for CHP and identifying DG siting procedures that could overcome local and state environmental barriers to CHP. Additional information about the 18 projects is available on the DOE website at http://www.eere.energy.gov/de/chp/chp_applications/projects.html.

EPA further collaborated with DOE and other stakeholders by establishing the Combined Heat and Power Partnership (CHPP) in 2001 to support and assist cost-effective CHP projects in the United States. The CHP Partnership is a voluntary program that promotes high-efficiency CHP technology, thereby reducing pollution created by less-efficient, large-scale energy generation. The Partnership promotes CHP by fostering cooperative relationships among the CHP industry, state and local governments, and other relevant stakeholders. The CHPP has produced a number of important guides, fact sheets, and technical reports, including a *CHP Emissions Calculator*, *CHP Funding Opportunities*, and analyses of CHP in targeted markets. The Partnership provides targeted analysis and outreach in those targeted markets – dry mill ethanol production; hotels and casinos; and municipal wastewater treatment facilities. Other outreach efforts include assistance to states focused on technical and market opportunities for CHP in the three targeted markets, and development of policies that encourage CHP, such as output based standards, interconnection rules, and standby rates. In addition, DOE and EPA have jointly promoted and awarded CHP ENERGY STAR Awards. The **ENERGY STAR CHP Award** recognizes highly efficient CHP systems that reduce emissions and use at least 5 percent less fuel than comparable, state-of-the-art, separate heat and power generation.

DOE and EPA have jointly supported numerous other awareness, education, and outreach activities, including meetings, workshops, and conferences of many kinds, sponsorship and support of the EPA CHP Partnership, CHP Partner meetings, ENERGY STAR CHP Award events, and involvement in RAC and state sponsored policy meetings. In summary, their collaborative approach to implementation of the *CHP Challenge* and the *CHP Roadmap* – with hundreds of stakeholders throughout the country – has resulted in the successful installation of 85 GW of CHP.

E. Case Study Written and Submitted by:

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The International CHP/DHC Collaborative

The International Energy Agency launched the International CHP/DHC Collaborative in March 2007 to help evaluate global lessons learned and guide G8 policy makers, industry and other nations as they attempt to assess the potential of CHP and district energy as an energy technology solution.

The Collaborative includes the following activities:

- collecting global data on CHP/DHC
- assessing growth potentials for key markets
- developing country scorecards with data and relevant policies
- documenting best practice policies for CHP and DHC
- convening an international CHP/DHC network, to share experiences and ideas

Participants in the Collaborative include government and industry Partners, as well as over 300 government, industry and non-governmental organizations that provide expertise and support via the Network.

If you are interested in participating in the Collaborative or want more information, please visit www.iea.org/G8/CHP/chp.asp.

For more information about the IEA's International CHP/DHC Collaborative:
Contact Tom Kerr, email tom.kerr@iea.org.