American Council for an Energy-Efficient Economy
529 14th Street, N. W., Suite 600 Washington, D.C. 20045 202.507.4000 202.429.2248 www.aceee.org

Local Technical Assistance for Deploying Combined Heat and Power (CHP) Projects: A Compendium of Resources

Anna Chittum (achittum@aceee.org), Nate Kaufman, and Ben Foster
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Introduction

Combined heat and power (CHP) projects can offer substantial economic and environmental benefits to its users. These benefits include lower overall energy costs, improved reliability, and reduced thermal energy consumption. In its popular 2008 report, *Combined Heat and Power: Effective Energy Solutions for a Sustainable Future*, the Oak Ridge National Laboratory made the case for scaling up the use of CHP to 20% of U.S. generating capacity by 2030. The simultaneous production of heat and electricity is a more efficient use of fuel than traditional power generation, creating more usable energy while burning less fuel than would otherwise be burned. CHP systems can be deployed in existing and new buildings, and can be sized to meet energy demand loads of a variety of sizes. These systems can be great investments and provide tremendous benefit when appropriately designed for a local need.

CHP systems can be complex and involve many players, so it is critical that system designers consider and plan for the many regulatory and logistical hurdles that may emerge. CHP systems can fail to produce their claimed benefits if they are poorly designed, constructed, or operated, so it is also important that prospective CHP users undertake substantial due diligence to ensure that a new CHP system is properly designed to meet the local power needs and will be constructed and operated as planned.

The following list of resources and guidance documents will help those interested in deploying CHP access regional and local experts and understand the elements of a successfully implemented CHP project. Most projects involve the use of mature technologies so finding support from those familiar with CHP technologies is not difficult. Equipment manufacturers and CHP engineering firms are located throughout the United States, ensuring that municipalities and community and regional organizations can find local experts to help deploy their projects.

Getting a Lay of the Land: Reaching Out to Local Resources

The regulatory and economic landscape for CHP differs dramatically across the country. In some areas, high electricity rates and comparatively cheap CHP fuels—such as natural gas—make CHP projects highly cost effective and capable of paying back their initial investment in just a few years. In other areas, cheap electricity rates and expensive fuel costs make CHP more difficult to justify economically. In some areas, state energy programs and regulations serve to encourage CHP across all sectors. In other areas, state programs and utilities actively discourage CHP.

The first resource to refer to in order to understand how your region views and supports CHP is the local Clean Energy Regional Application Center (RAC), sponsored by the U.S. Department of Energy (DOE). Eight different RACs serve eight regions of the country and are well versed in the particular regulatory and economic realities of CHP project development in their regions. Each RAC's Web site features substantial information on case studies and policy issues pertinent to its region.

- The U.S. DOE maintains a list of all active RACs. The map of RAC regions and the contact information for each is available here: Clean Energy Application Centers

- Learn about other CHP projects in your state or region. Reach out to other companies or facilities with similar needs that have implemented CHP. A list of RAC-supported CHP projects is available here: Combined Heat and Power Projects

- Explore CHP projects across a variety of market sectors that haven't necessarily benefited from the support of the local RAC. This list is available here: EEA CHP Installation Database.

- Many utilities and state energy offices have CHP programs with dedicated staff and specific CHP deployment goals. In many cases, CHP support is found within industrial energy efficiency programs. Here are a few examples of state programs dedicated to supporting CHP deployment:

    - New Jersey—New Jersey SmartStart Buildings
    - New York—New York State Energy Research and Development Authority (NYSERDA)

Before You Build Anything: Fleshing Out Project Details

Before any equipment purchases are made, CHP must be determined to be a good fit for the facility in question. If so, a full feasibility assessment must be planned to identify the specific technologies that will be used in the CHP project. These assessments also paint a solid picture of the economics of the CHP project so that all parties are clear about the project's payback, its up-front capital requirements, and the financing challenges ahead. Finally, the facility must determine how the CHP project will be developed and what kinds of internal and external resources and partners to use.

- The U.S. Environmental Protection Agency's (EPA) CHP Partnership has developed a very useful suite of tools for facilities considering CHP. The Partnership outlines five distinct stages of project development and appropriate resources for each stage. A full overview, with links to all associated documents, can be found here: Streamlining Project Development.

- The Partnership's online project development toolkit and related resources have been incorporated into one document, available for download here: *U.S. EPA CHP Partnership CHP Project Development Handbook* [PDF].

- The Partnership also hosts regular Webinars focusing on specific issues of CHP project development and CHP policy challenges. A full list of past Webinars can be found here: CHP Partnership Past Webinars.

- The U.S. DOE's Industrial Technologies Program has compiled a list of useful screening tools as well as an emissions calculator for determining the environmental benefits of potential projects, which can be found here: DOE ITP CHP Screening Tools.

Accessing Incentives: Stretching the Project Dollar

A variety of financial incentives are available to CHP projects across the U.S. Financial incentives come in a variety of types, but generally include grants, loans, loan guarantees, tax incentives, energy production rebates, and project rebates. Some incentives are only available to CHP projects fired by certain fuels or utilizing certain technologies, so be sure to investigate what types of fuels and technologies are supported in your state.

- Most incentives are administered by states or state-regulated utilities, and thus vary from state to state. To find incentives specific to your state, visit: The American Council for an Energy-Efficient Economy's State Energy Efficiency Policy database. Click on your state and click on "Clean Distributed Generation" to learn about financial incentives for CHP where relevant.

- The federal government currently provides several financial incentives for CHP projects. A few of the federal incentives most relevant to CHP projects are:

    - Business Energy Investment Tax Credit

- Energy Efficiency Loan Guarantees
- Renewable Energy Production Incentive
- Renewable Energy Production Tax Credit
- Rural Energy for America Guaranteed Loan Program

Below we will discuss specific examples of each type of incentive as they apply to CHP and point out several incentive programs that exist around the country.

Loans

States offer low-interest loans for a wide variety of energy efficiency measures. Rates and terms vary by program, though a maximum 10-year term is common. For example, **New Jersey**'s Clean Energy Solutions Capital Investment Loan/Grant Program provides interest-free loans and grants to New Jersey-based industrial, commercial, or institutional entities for end-use efficiency combined heat and power projects. Loans are limited to $5 million, of which up to $2.5 million may be taken as a grant.

Connecticut's Low-Interest Loans for Customer-Side Distributed Resources program, in effect since 2006, provides loans to customers for the installation of distributed generation systems, including CHP, with a capacity range of 50 k W to 65 MW. Interest rates are 1% below the customer's applicable rate, or no more than the prime rate.

The Energy Efficiency Loans for State Government Agencies program, run by Green Bank of **Kentucky**, offers three types of loans for state government agencies undertaking efficiency improvements; loan specifics and program requirements depend on the level of funding requested. The program is funded by the American Recovery and Reinvestment Act (ARRA) State Energy Program.

Grants

Most grant programs are designed primarily to offset the costs of eligible technologies, although some promote research and development or support project commercialization. For example, **Massachusetts**' Green Communities Grant Program provides funding for municipalities to pursue energy efficiency and renewable energy projects. Among the conditions for eligibility are a requirement to establish an energy use baseline and develop a plan to reduce energy use 20% below this baseline within five years.

Ohio's Advanced Energy Fund Grants program offers grants up to 25% of project cost (with a maximum of $100,000) for, among other things, CHP and waste heat recovery projects up to 25 MW. Applications are evaluated according to a number of criteria, including overall system efficiency, the balance of financing committed, and project cost per kW produced.

Tax Credits and Exemptions

Like most property tax exemptions, **Arizona**'s Energy Equipment Property Tax Exemption program excludes the added value of eligible renewable and energy-efficient systems from the valuation of the property for tax purposes. **Oregon**'s Business Energy Tax Credit provides tax credits to businesses for a wide variety of renewable and energy efficiency initiatives. A 50% tax credit is awarded to high efficiency CHP projects that achieve 20% annual energy savings.

Rebates

New York's Energy $mart New Construction Program provides technical assistance and cash rebates for the installation of energy efficiency measures, including CHP, in new or substantially renovated buildings owned by businesses, state and local governments, not-for-profits, colleges and universities, and other facilities. The state also offers a smaller scale program for existing facilities.

Bonds

The use of bonds to incentivize CHP deployment is rare. **New Mexico**'s Energy Efficiency and Renewable Energy Bonding Act authorizes up to $20 million in bonds to finance energy efficiency and renewable energy improvements in state government and school buildings. State agencies of school districts may request an energy assessment from the New Mexico Energy, Minerals and Natural Resources Department to identify specific energy-saving measures. CHP and waste heat recovery systems are eligible for funding. Bonds are to be paid back by realized energy savings.

Preparing to Interconnect and Net Meter Your CHP System: Working with Utilities for Mutual Benefit

Benefits of CHP accrue to both system owners and utilities. Some utilities are more supportive of CHP in their service territories than others. It is important to remind utility representatives that the benefits of CHP to utilities and the electric systems include: reduced system energy consumption and overall emissions, reduced demand and grid congestion, deferred or avoided investments in generation and distribution infrastructure, improved system reliability and diversity, and enhanced energy security.

To remain economically viable, CHP systems typically rely on the ability to purchase backup power from the electric grid, and to sell excess electricity they generate back to it. To do this, a CHP system must be interconnected to the local electric grid. In some states, the lack of a consistent standard explicitly establishing parameters and procedures for connecting to the grid drives up both monetary and transaction costs for technology manufacturers and owners, discouraging CHP deployment.

Smaller CHP systems may also benefit from the presence of net metering rules, which allow distributed generation systems to receive credit for excess electricity produced on-site. This can dramatically impact the economics of smaller CHP systems. Oftentimes net metering standards are developed in conjunction with interconnection standards. In some states, systems must plan to be net metered to receive interconnection.

- Research the interconnection and net metering standards in your state:
    - The Interstate Renewable Energy Council (IREC) has produced a list of each state's interconnection standards and a list of each state's net metering standards.
    - ACEEE maintains information on interconnection and net metering standards in its State Energy Efficiency Policy database. Click on your state and click on “Clean Distributed Generation” to learn about the Interconnection Standards in your state.
    - The Network for New Energy Choice's 2009 version of *Freeing the Grid* [PDF] for a state-by-state scorecard on interconnection and net metering standards.

- If the interconnection and net metering standards aren’t currently supportive of CHP, there may be active legislation or open utility regulatory dockets allowing for comment from interested parties. IREC provides substantial information for those interested in moving forward policies in their states that support better interconnection standards for distributed generation such as CHP.
    - Check out IREC’s 2009 edition of *Connecting to the Grid, 6th Edition* [PDF] for a comprehensive discussion of the institutional and technical issues surrounding grid interconnection and net metering.
    - IREC has also produced a useful document outlining *Model Interconnection Procedures* [PDF], providing policymakers with model legislation for state interconnection policies.
    - IREC has also produced a document outlining *Net Metering Model Rules* [PDF], providing policymakers with model legislation for state net metering policies

Maximizing a Project's Economic Benefits: Understanding Other Relevant Policies

Besides all of the above-mentioned considerations, other policies and practices can impact the economics of CHP projects. These policies and practices vary substantially from state to state, and are oftentimes out of the direct control of the project developers. Three of the most important ones to be aware of are described below:

Standby rates are the rates an electric utility charges a CHP-using facility for the backup electricity the facility may require when the facility's electric load is not fully met by the CHP system. Sometimes the CHP system needs to be taken offline for routine maintenance and, less frequently, a CHP system goes offline unexpectedly. The structure of these rates can change dramatically from utility to utility, and, though they are regulated by the state utility regulatory authority, they are often designed separately from other CHP policies.

CHP's treatment in an energy efficiency resource standard (EERS) can impact the economics of a system when specific CHP goals are in place and a utility is required to meet those goals. An EERS is a quantitative, long-term energy savings target for utilities under which they must procure a portion of their future electricity and natural gas needs using energy efficiency measures, typically equal to a specific percentage of their load or projected load growth. In many cases, CHP qualifies as an eligible efficiency resource, which can create an incentive for deployment.

Output-based emission standards further incent CHP by encouraging and giving credit for the higher levels of efficiency inherent in CHP energy generation. Traditionally, electricity generation technologies have been subject to input-based emissions regulations, which measure and limit emissions per unit of fuel input. Since CHP creates more energy with its fuel input than standard generation, such traditional measures fail to account for the system's efficiency. Output-based standards measure and limit emissions per unit of useful energy output, allowing emissions from CHP systems to be easily compared to those of other energy-generating technologies. Some states have output-based standards in place, recognizing that more efficient generation creates the same amount of useful energy with fewer emissions than traditional generation. In these states, the cost of compliance with air emission regulations may be reduced for CHP systems, since the efficiency of the system will be considered when complying with local regulations.

- ACEEE maintains information on standby rates, CHP's treatment in state EERS goals, and the presence of output-based emission standards in its State Energy Efficiency Policy database. Click on your state and click on "Clean Distributed Generation" to learn about the policies affecting your project.

- The U.S. EPA's CHP Partnership's 2009 document *Standby Rates for Customer-Sited Resources: Issues, Considerations, and the Elements of Model Tariffs* [PDF] illustrates the effects of different standby rates on system economics and explains some basic principles of rate design.

- The U.S. EPA's CHP Partnership's handout *Energy Portfolio Standards and the Promotion of Combined Heat and Power* further explains how CHP benefits from inclusion in EERS and similar policies.

- The U.S. EPA's CHP Partnership's 2004 publication *Output-Based Regulations: A Handbook for Regulators* is a very useful summary of the issues surrounding output-based standards, and provides guidance to regulators on developing an output-based standard and examples of some in-place standards.

- ACEEE has produced a *Policies and Resources for CHP Deployment Toolkit*, which provides additional information on state policies that help to enable the deployment of CHP.