Preliminary Review of Utility Practices Toward CHP

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ABSTRACT

In the past five years, an increasing amount of attention has been given to identifying and addressing barriers to expanded use of combined heat and power (CHP) by industry. In 2002, ACEEE completed a survey of state incentive, utility commission, and air quality regulatory practices. The report indicated that the largest barrier or collection of barriers can be grouped under the theme "utility practices." These include interconnection policies, and practices regarding the speed at which the conditions of the interconnect agreement are met, as well as fees and tariffs imposed on the CHP system operator.

This paper presents the preliminary results of the policy study's second phase: Utility Policies. Preliminary research regarding utility policies suggests a categorization scheme for approaching utility practices that is outlined here. The full study will refine this categorization through characterization of utilities within all 50 states. The preliminary screening is intended to use in the states of New York and Texas to show the range of utility practices under the established umbrella of state policies streamlining CHP installation.

CHP Background

A CHP system produces both useful heat and power from one fuel source. By combining the production of these energy streams, much of the waste heat that would result from power generation can be avoided, as shown in Figure 1 (Elliott and Hedman 2001).

Increased interest in CHP is attributable to multiple changes in the energy market over the last 30 years. Perhaps the most major of these is the deregulation of the energy market. In theory, deregulation opens the market to individual power producers and merchant plants to sell their power just as the large regulated utilities of the past did. This allows industrial facilities to take advantage of fluctuating prices to sell the energy they produce when this is more profitable than using it to manufacture their own products. A heightened focus on national energy security (Lovins and Lovins 2001) and decentralization of central power plants has also increased the profile of CHP. Distributed power resources like CHP can have a large effect on increasing the resilience of the grid (Gordes 2002). Decreasing our dependence on large centralized power systems increases energy security by separating the power supply.

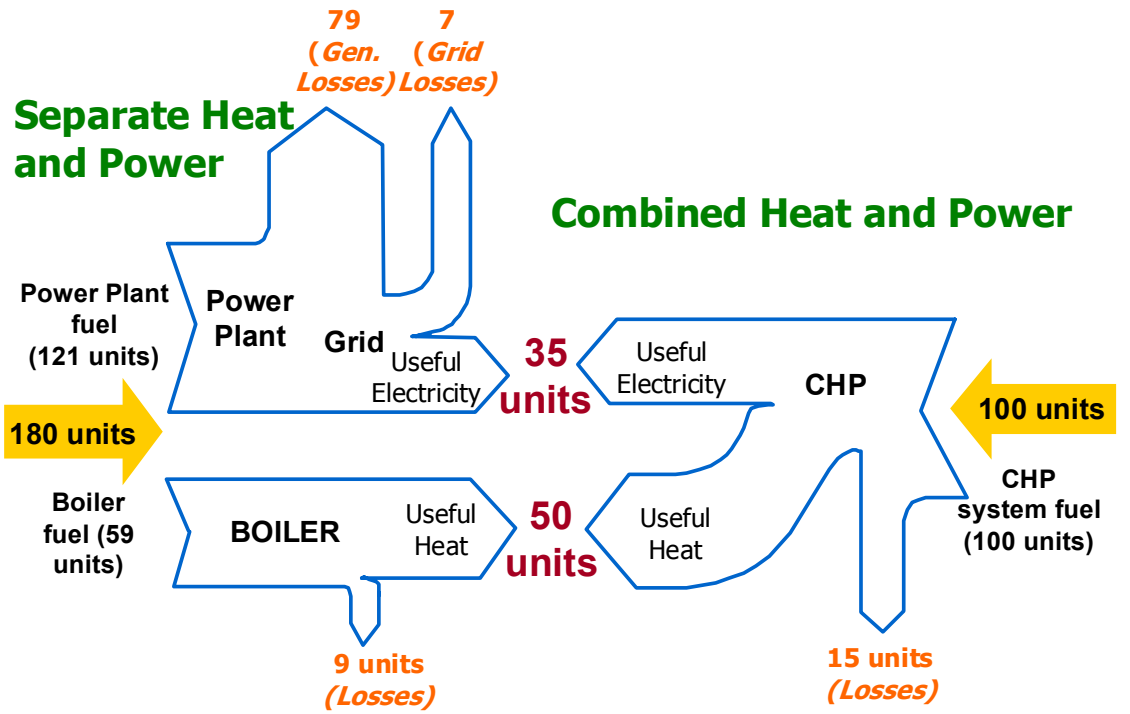
The final driver mainstreaming CHP is increased stress on the electricity grid, paired with larger and larger areas of environmental pollutant non-attainment. Clean CHP is a clear solution for non-attainment areas, given that it uses a single fuel to complete the same processes that require two fuels in a traditional system. One example of this is the Houston-Galveston area. Through clean CHP, the area has the potential to both decrease stresses on the grid and pollution (Elliott and Hedman 2001). The problem, however, in Houston and all over the country is the numerous barriers that exist for CHP. Many factors affect the ease of installation of CHP in states: utility commission regulations; state legislation; and permitting

by the environmental regulatory bodies within the state. Much of the research, however, points to the individual utility practices as the deciding factor for many installers and manufacturers.

Utility Barriers to CHP

Traditional utility barriers to CHP derive from a monopoly-oriented electricity grid system based on central station generation and a network for transmission and distribution lines. Coupled with the rate design issues within this model, there are both technical and institutional problems with establishing a system of distributed generation (DG) (and therefore CHP) for the electric grid. Over time, as interest in DG has increased, these barriers have been approached from a variety of angles. There have been many studies regarding the importance and barriers to CHP and DG, so these will not be detailed here (Elliott and Hedman 2001; Elliott and Spurr 1998; NREL 2000; Shipley and Elliot 2000).

Figure 1. Schematic Comparing Separate and Combined Heat and Power Systems



Source: Elliott and Hedman 2001

Initially, technical difficulties with interconnection to the utility grid were perceived as the largest problems for many small, non-utility generators. These barriers included addressing safety standards, impact of the distributed generator on grid reliability and power quality, and difficulties regarding allocation of transmission capacity. Once technical barriers were overcome (for the most part), CHP advocates moved on to approaching market practice barriers. Among these barriers are lack of education in the community, lack of clear and standardized procedures for developers, lack of communication between stakeholders, challenging tax policies, environmental permitting and siting issues, state and regulatory barriers for encouragement of CHP, and challenging utility policies.

As these barriers have been approached one by one, CHP has gained recognition and market share. The creation of the U.S. Combined Heat and Power Association (USCHPA) and the CHP roadmap (http://www.uschpa.org) exemplifies how stakeholders have come together in an effort to fairly increase the market share of CHP. With this increasing recognition, the most current qualitative research indicates that the largest remaining barrier to CHP is restrictive and costly utility practices (Brown, Elliott, and Scott 2002; NREL 2000).

Framing Utility-Based Barriers

Approaching utility practice barriers is a sensitive and complicated issue that requires a balanced view. Fundamental to the tension is that under the existing regulatory structure utilities realize little if any direct benefit from DG in their service territories. What is needed is a mechanism to reward the utility for its cooperation. The first step in addressing these barriers is to understand how utilities respond to CHP applicants under the regulations and legislation set forth by state agencies. Categorizing the barriers into a manageable format so all stakeholders can approach them effectively and fairly is imperative to the continued growth of CHP in the power production market.

The barriers that exist for increased CHP can be grouped into two categories: those that can be overcome with legislation/regulation, and those that must be overcome by encouraging utilities to aid in the removal of barriers. The following is a list of barriers with brief descriptions and what the most effective approach to lowering the barriers has been.

- Technical Interconnection: Utilities bear the responsibility for delivering power safely to and from the grid. This includes keeping the line workers safe: the utility has to be able to control with a high level of confidence whether a section of the grid is powered or not for maintenance purposes. Physically connecting to the grid was initially the largest barrier to increased market share for CHP. Today, national technical standards and guidelines (IEEE 2002) are in place addressing most of these concerns. The remaining issues relate to concerns about the impact of adding generation to the distribution system, and what impact that may have on reliability. Recent research suggests that DG may increase reliability (NREL 2000).
- Interconnection Procedures: Clarity in the procedures that are required for interconnection with the utility has been necessary for developers to maintain a true cost balance for projects. State- or national-based regulation has offered the best solution for standardized interconnection procedures thus far at the transmission level (FERC 2002). A state or national standard creates a clear pathway for developers and utilities alike to install efficient CHP on the grid.
- Interconnection Study Costs: Interconnecting to the grid may require the utility to run several engineering studies, some of which can only be prescribed once the site and situation are made clear. For utilities, putting a fixed cost on these studies is a gamble since some customers will undoubtedly pay too much and some too little. In states where a standardized procedure is in place, placing a fixed application fee on the developer allows the utility to perform preliminary tests that indicate what further engineering studies must be done, as well as attach a cost estimate of those tests for

the developer. States with standardized interconnection guidelines include New York (NYPSC 2000), Texas (PUCT 2002), and California (CPUC 2000).

- Tariff Issues: The various types of tariffs that have been assessed by utilities are summarized below. Although tariff issues have been covered by extant state regulations regarding CHP, given the variant and specific nature of each project, a generalized way to fairly distribute these costs has not been determined. The preliminary data from this study suggests that creating an incentive that would result in utilities having a vested interest in increasing DG on the grid would create a more amicable and working relationship between utilities and developers.
  - *Supplemental Power Charges.* When an on-site generator does not provide all the power for the facility, power is still bought from the utility. Part of the charge for this power includes transmission and distribution charges. Determining how much will be paid for this power is a barrier.
  - *Maintenance and Emergency Power*. Planned and unplanned outages of onsite generators require that the utility be able to provide enough power to keep the facility running. This requires that the utility have the infrastructure prepared for the load, when the load is not constant or always predictable. The cost of maintaining this infrastructure must be recovered by the utility.
  - *Stranded Costs.* This is a more general categorization for the costs that the utility incurred for preparing to distribute power, or the infrastructure that was in place to serve the load when the facility decided to install an onsite power generator. A way to fairly and consistently determine the magnitude of these costs has not been agreed upon.

Case Studies of CHP-Friendly States

There is increasing knowledge of CHP at the state level, in both energy and environmental offices, according to a state policy study (Brown, Elliott, and Scott 2002). States' progress in approaching barriers varies widely and depends largely on the progress of deregulation, the authority of the public utility commission, the need for supplemental generation, and the size of the areas of pollutant non-attainment. Texas and New York are represented here as the preliminary case studies for the utility practice section of ACEEE's project. The states both have relatively large generating capacity, state-level regulation and legislation governing CHP developer/utility interaction, and numerous different utilities within each state. The next section reviews Texas and New York's state-based policies and integrates them into descriptions of the utility policies, as well as interviews with developers and utility employees to give a realistic portrait of installing CHP in these states (where available).

New York

New York has been groundbreaking on CHP legislation and regulation in the Northeast and most of the nation. Beginning in 1998, New York began gathering stakeholders to discuss interconnection issues and has since regularly been on the cutting edge of change in order to promote CHP. In an effort to streamline the process for CHP to be

installed, the regulatory bodies have worked extensively with stakeholders to overcome barriers and create a more CHP-friendly climate.

Another notable promotion technique for CHP is through support from the Service Benefit Charge (SBC). The New York State Research and Development Authority (NYSERDA) allocates New York State's SBC. This organization recognizes the benefits of CHP, as reflected through an approximately $15 million grant program for CHP research, development, and demonstration projects. Eligible projects for the grant money include development and commercialization of CHP systems, feasibility studies, and case studies of CHP facilities. A number of the projects are regarded as successful, as reported at a NYSERDA workshop in June 2002. It was clear that the demonstration funds reduced industrial, residential, and commercial facility managers' perceived risk of investing in CHP projects. This has allowed CHP to reach a broader market: these projects show a large commercial and industrial audience both the benefits and the process for installing CHP, thereby encouraging its use in New York State. The program now receives several hundred proposals annually for the installation of CHP.

In New York, there are two points of contention between developers and utilities that result in market barriers to CHP projects. Market and technical barriers intersect at interconnection (technical) and tariff (market) issues. Recognizing that interconnection and tariff issues were important barriers, the state of New York began a process on both fronts to provide regulation.

Interconnection Issues. The New York Department of Public Service (NYDPS) interconnect guideline for CHP made the process of installing CHP more transparent and streamlined. To combat the complexity and lack of clarity regarding interconnection fees and processes that have discouraged the installation of CHP as noted nationwide by designers, New York set up a systematic process for applicants wishing to apply.

The interconnection guideline agreement process began in 1997 with the passage of the Solar Choice Act of 1997. The act allowed, among other things, residential customers the opportunity to sell excess solar power produced on their premises back to the grid (see http://www.nyseia.org/incentives.htm). In order to encourage small photovoltaic installation, the interconnect guidelines needed to be uniform and generalized, a task taken on by the NYDPS in 1998. Although the process was long and riddled with compromise on all sides, the outcome is a mutually agreed-upon process that allows for transparency through the interconnect process.

There are shortcomings to the New York guideline, however, from the perspective of both developers and utilities (Hinge 2003). Generally, developers feel that the guideline, while clarifying some costs and the timeline, leaves some aspects of the interconnection agreement (like the cost of engineering studies) up to the utility, and that the pricing for these services is often arbitrary. Some developers argue that this opens the door for utilities to slow the process of CHP installation (thereby making it less cost-effective for the developers). Other developers claim that the openness to utility discretion makes the guideline less effective as a streamlining tool, as it results in different utilities with different processes within the state. Utilities, alternatively, feel that there is no appropriate way to generalize the process of interconnection, and setting standard costs would not fairly reflect the variation in costs between projects.

Tarriffs. The cost of providing the infrastructure of the grid is difficult to divide fairly between the CHP developer and the utility and, in a market where the cost-effectiveness of CHP projects is in fine balance, defining the cost can end potential projects. The two issues here are equitably charging the developer for the costs of power needed from the utility grid (standby tariffs) and allowing the utility to recover costs that it spends on infrastructure as well as for any planned power use decreases due to CHP (stranded costs). Standby tariffs that must be identified are the charge for the utility to provide power to the facility during planned (maintenance) and unplanned (emergency) outages, as well as a charge for any supplemental power that the facility may need on a regular basis. The division of this payment is a critical part of creating a market for CHP. As for utilities, if they do not recover the full necessary payments for these services, they will require the remainder of the customers on the grid to pay for them. There has been speculation that some utilities in New York use excessive charges for these services to discourage the use of CHP and other DG. Whether these speculations are substantiated or not, the rates are a highly contentious area between developers and utilities and must be dealt with carefully to maintain a working relationship between both parties.

The utility and developer also disagree over the rates for paying the stranded costs that result from the actual power need from the utility falling short of projections for increases in power infrastructure necessary, often due to the installation of CHP or DG facilities. Historically, some New York utilities charged CHP facilities based on what they would have used had they not installed CHP, or on what the facilities used prior to the installation.

Under orders from Case 99E1470, the NYDPS produced the Guidelines for Design of Standby Tariffs to approach both of these issues between utilities and developers and attempt to create an equitable division of the cost load. The guidelines were published in October 2002. In summary, the guidelines used the jurisdiction given to the NYDPS from the Federal Energy Regulatory Commission to determine that onsite generators serving a non-islanded load will be charged standby tariffs, but not "as used" demand charges when the onsite generator is functioning. The guidelines further stated that onsite generators that use power from the utility as backup, or purchase power from the utility for some other reason, are required to pay an allotment for the utility's stranded cost as dictated by a percentage mark-up of the standby service so that there is a fairness in the proportion of customer payments for the service the generators receive and their contribution to the infrastructure from which they get power.

Texas

On January 1, 2002, Texas' electrical utilities deregulated. In preparation for and since deregulation, the regulatory bodies in Texas have attempted to streamline the process for installation of CHP through ease of interconnection and output-based emission standards. These actions, with the regulatory bodies working extensively with manufacturers, distributors, installers, and utility representatives, may have resulted in a climate in Texas that is supportive of CHP.

The state of Texas has the largest installation of DG in the United States (Elliott and Hedman 2001). There are many reasons for this, not the least of which being Texas's enormous size and large amount of industrial facilities in parts of the state. In cities in Texas

(especially Houston), the state was confronting the lack of generation capacity as well as increasing areas of pollutant non-attainment (described below). For these reasons, the state government of Texas realized that DG was necessary to keep the lights on (and the factories working) in its major cities.

Based on pollution non-attainment areas as well as an anticipated capacity shortfall in 2000, the Texas Public Utilities Commission (TPUC) began investigating the potential of DG. In 2001, Texas completed state-level interconnection standards (PUCT 2002). These standards represent a compromise between utilities and generators. The guidebook is intended to outline procedures for small-scale DG and CHP generators and to stand as a uniform reference for all parties involved. PUCT will continue to update this volume and also expand its work on DG.

Texas is faced with significant environmental challenges due to its expanding need for power and existing air quality challenges (Elliott and Hedman 2001). The Texas Commission on Environmental Quality [TCEQ – Formerly The Texas Natural Resource Conservation Commission (TNRCC)] has recognized the contribution that CHP could make to addressing these linked problems, and confronted the barrier of CHP appearing less efficient due to input-based standards by altering the generator guideline to reflect output-based standards[1]. In 2001, TCEQ established an air emissions permit for nitrous oxides (NO_x) reductions from DG. Eligible CHP systems, either pre-certified or with appropriate documentation, can gain a credit through the permit for which they are granted relief for 1 megawatt electricity generated for every 3.4 million British thermal units of recovered heat. Although the output-based standard does not impact the individual utility practices toward CHP directly, it is an important piece of the big picture since the standard creates an atmosphere that is conducive to CHP while helping both the distribution constraints and the pollution problems in large areas of Texas.

The revised guideline allows for the efficiency of CHP applications to be recognized. This rule works in conjunction with the interconnection guidelines issued by the PUCT to significantly lower installation and operating barriers to CHP. Alleviating the regulatory barriers to CHP in Texas has made the state first in the union in CHP capacity, and has eased stress on the Texas grid and contributed to a decrease in projected pollution. Increasing CHP capacity even further in Texas would maintain and increase clean generation and dependable power.

The greatest opportunity for CHP is in the gas congested and air non-attainment eastern region of the state. In these locations, CHP minimizes the localized gas shortage problem, as well as contributes to alleviating the pollution problem.

Conclusion

Clearly, CHP has the potential to greatly reduce fuel use and pollution in the United States. The past years have seen extensive activity on the part of advocates and state government and regulatory agencies to lower the barriers for CHP and create an equal opportunity for increased market share in suitable applications. In states where significant progress has been made on that front, the remaining barrier of utility practices has been thrust to the forefront. Utility reactions to regulations and legislation are widely varied throughout

[1] This brief guideline is located at http://www.tnrcc.state.tx.us/permitting/airperm/nsr_permits/files/segu_permitonly.pdf.

the country and even within states. These practices ultimately decide the financial viability of an installation.

Utility practices have their roots in a regulated monopolistic system for electricity generation. In the current climate, developing distributed resources with less pollution production is increasingly necessary. The practices encountered are a result of a combination of (1) the type of deregulation background, (2) supply issues within the state, (3) the availability of utility champions, and (4) the type of relationships that utilities have with other stakeholders in the community.

The lesson to take from this preliminary review is that state policy encouraging installations of CHP is only the first step in designing a CHP-friendly environment. In order to accomplish the national goal to double the amount of CHP in the United States by 2010, and to decrease pollution and American dependence of foreign fossil fuels, utilities must be encouraged to be the catalysts for this type of power generation.

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