How Natural Gas Utilities Can Find Value in CHP

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Executive Summary

Combined heat and power (CHP) is the most efficient way of generating power available today. CHP conveys benefits to its host facilities, but it also conveys significant benefit to the utility system to which it is connected. Natural gas distribution utilities — also called local distribution companies, or LDCs — are well positioned to take advantage of some of these benefits because most CHP systems use natural gas as their primary fuel. CHP systems are reliable consumers of natural gas and offer LDCs the opportunity to lock in long-term, high quality customers.

Utilities in general are comfortable with and have a long history of making long-term investments. They often have access to capital at a cost lower than private sector facilities and are structured around investments that may take years to pay back. LDCs have strong existing relationships with the same customers who could be excellent hosts for CHP, and they can leverage those relationships to identify opportunities for CHP deployment and to help those customers reduce their operating costs.

CHP offers LDCs a particular growth opportunity at a time when making money on delivering the commodity has proven to be more difficult. Some LDCs view CHP as one of the few ways they can stimulate demand growth — and revenue growth — in the current economic climate.

Today, CHP is used by a variety of sectors, such as the hospitality industry, manufacturers, public sector buildings, and colleges and universities. Despite CHP's many benefits, these facilities often find the high upfront costs of CHP equipment to be a deterrent to investment. They are also typically less comfortable becoming energy producers, as that is often beyond their core competency. These kinds of customers are attracted to ownership models involving a third party, which can be encouraged by LDCs.

LDCs can find opportunity in the untapped market for new CHP. An estimated 130 GW of new CHP potential can be found just in existing facilities in the United States. By offering direct incentives, financing assistance, technical assistance, and help identifying appropriate third parties, LDCs could take advantage of the significant remaining potential for CHP.

Policies and regulations that encourage LDCs to pursue customer-sited CHP can be found around the United States. However, CHP programs offered by LDCs are still rare, due in part to a lack of policies designed to encourage them. Challenges to the existence of natural gas utility-led programs include a failure to treat CHP as eligible within natural gas efficiency goals; prohibitions against fuel-switching within efficiency programs; and a lack of measuring efficiency investments for their overall societal impact.

In order to reach President Obama's goal of 40 GW of new CHP by 2020, policymakers will need to encourage LDCs to support CHP investments in their service territories. In many cases, natural gas consumption will increase; however, the overall efficiency benefit to society will be positive. LDCs can play an instrumental role in dramatically increasing the share of CHP in U.S. electricity generation.

This paper is one of three in a series on CHP and utilities. The other two papers, also available for free download from ACEEE, are:

- *How Electric Utilities Can Find Value in CHP* (July 16, 2013) — a white paper describing specific examples of how electric utilities can monetize the benefits of CHP.
- *Utilities and the CHP Value Proposition* (July 16, 2013) — a peer-reviewed research report outlining all of the primary benefits of CHP to utilities and energy systems at large.

Introduction

Natural gas distribution utilities are very well positioned to promote combined heat and power (CHP) to their customers. CHP programs or direct investments in CHP can strengthen natural gas distribution utilities' long term economic position, while increasing customer satisfaction and encouraging local economic development. A tremendous opportunity for investment in CHP remains, and natural gas distribution utilities are better positioned than most other entities to take advantage of it.

One of the biggest challenges to increased CHP deployment is that individual private companies view the large upfront capital costs of CHP as too risky, or as unlikely to be approved as a major capital investment. Companies with facilities that could benefit substantially from CHP are primarily focused on their core businesses: manufacturing companies are focused on improving their production process and products; hospitals are focused on healing their patients; and schools are focused on educating their students. These companies are often not well-versed in the details of generating electricity onsite, nor do they wish to be.

This reluctance of individual facilities to make investments in CHP systems creates an opportunity for utilities that are willing to put resources into capturing the remaining CHP potential. Like electric utilities (see Chittum 2013), natural gas distribution utilities are uniquely positioned to take advantage of the increased deployment of CHP within their service territories, realizing the benefits of increased sales of natural gas and increased energy efficiency. Natural gas distribution utilities — or local distribution companies, or LDCs:

- Can leverage their existing long-term relationships with would-be hosts of CHP systems, such as large commercial, institutional, and industrial customers;
- Generally view CHP as economically beneficial within their existing business structure;
- Are familiar and comfortable with making long-term capital expenditures;
- Can enter into reliable long-term contracts with CHP system hosts in order to mitigate risk;
- Can enjoy CHP's efficiency benefits within state-level energy efficiency goals and targets; and
- Have better bond ratings and access to cheaper capital than most other industries.

Today CHP represents only about 8% of the entire U.S. electric generation capacity. CHP-based capacity could be much higher, and LDCs could benefit greatly from addressing the untapped remaining opportunity. While some LDCs are currently encouraging and pursing increased CHP within their own service territories, CHP is still not generally viewed as a real business opportunity.

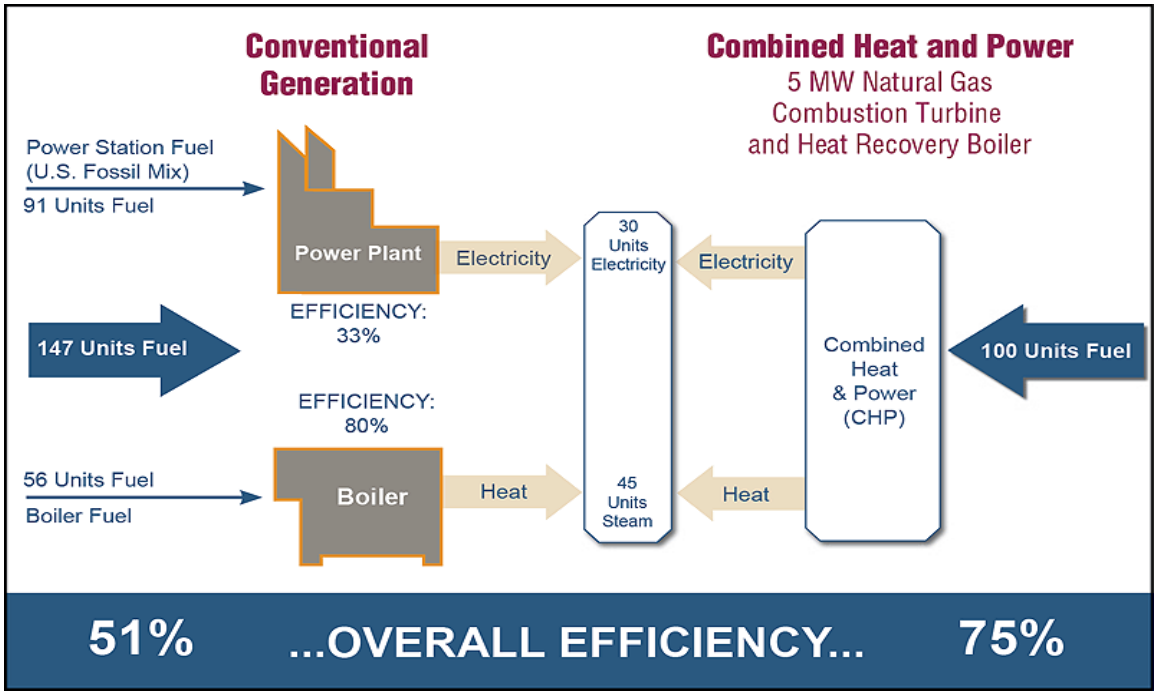
Since LDCs do not generally make money on the gas commodity itself -- instead passing the cost of gas thru to the customer and charging mostly for the distribution and transportation of the gas – low gas prices and declining consumption in parts of the country have reduced revenues and earnings for LDCs. Increased competition has also reduced the reliability of a continually growing customer base, and gas utilities are hard-pressed to find new ways to earn revenue (ICF and AGA 2013). Offering services and programs that directly support investments in CHP systems is one way LDCs could increase revenue from their existing customer bases.

How CHP Works

CHP has much to offer individual facilities and the local energy systems at large, due largely to CHP's efficiency benefits. CHP systems simultaneous generate electricity and thermal energy, often using a single fuel. CHP is not a single technology, but rather an approach to using a suite of technologies. The simultaneous generation of two types of energy confers tremendous efficiency benefits, as more useful energy is squeezed out of each unit of input fuel. CHP systems can run on a variety of fuels, including natural gas, biomass, and biogas; they can include a wide range of technologies, including microturbines, reciprocating engines, and fuel cells.

Figure 1 shows a simplified schematic of how CHP confers efficiency benefits. It illuminates the significant efficiency benefits of CHP over conventional power generation. By making use of the waste heat generated during power generation, CHP systems are much more productive with their energy inputs than conventional power plants.

Figure 1. Simplified Schematic of CHP Versus Conventional Generation



Source: EPA 2013

CHP systems can operate at combined efficiencies of over 80%, whereas the standalone electric-generating efficiency of an average power plant is about 36%. CHP's increased efficiency offers many benefits to individual customers and can help these customers better control their energy costs and improve their overall efficiency. CHP is uniquely suited to address some of the biggest challenges facing the U.S. economy today, including aging infrastructure and increased catastrophic weather events. It is also offers a strategic response to the challenges presented by more stringent environmental regulations and unknown future energy costs.

Due to CHP's tremendous benefits, a new executive order[1] signed by President Obama in August 2012 established a national goal of 40 GW of new CHP installed by 2020, in addition to the 82 GW of CHP that exists in the United States today. An estimated 130 GW of CHP potential can be found in the country's *existing* facilities (SEEAction 2013, DOE 2012). The remaining opportunity for CHP is substantial, but the President's new goal can only be met with a dramatic increase in the rate at which CHP is installed in the United States.

This paper will explore the various benefits to natural gas and natural gas/electric utilities offered by CHP systems, and some of the existing programs that currently encourage or incentivize CHP deployment. It will also discuss how current policies and regulations could better encourage LDCs to support CHP.

The Benefits of CHP to Natural Gas Utilities

Today about 71 percent of all installed CHP capacity runs on natural gas (ICF and AGA 2013). About half of that is directly connected to a local natural gas distribution utility; the remainder is connected directly to interstate pipelines (Noll et al. 2012). The benefits of CHP connected to local distribution utilities is the focus of the remainder of this paper.

Reliable High-Load Customers

The strongest market for LDCs interested in CHP is in smaller systems since larger industrial systems are either connected to interstate gas pipelines or powered by other fuels. CHP systems smaller than 100 M W typically connect to local gas distribution utility networks, and of all CHP systems smaller than 100 MW, about half are fueled by natural gas. According to an analysis by the American Gas Association and ICF International, these systems represent annual natural gas consumption of about 1.1 trillion cubic feet,[2] equivalent to about 7.7 percent of all natural gas consumed by every sector of the economy except electric utilities (ICF and AGA 2013; EIA 2013). LDCs already owe a noticeable slice of their business to CHP; given the remaining potential for CHP just in existing facilities, that slice of their business could be much larger.

CHP is a clear opportunity for growth, as total throughput is increased for customers installing new natural gas-powered CHP systems (Noll et al. 2012). One analysis of the impact of raising installed CHP in Texas to 35% of that state's electric production (up from the existing 20% of electric production) found that natural gas consumption would increase 3.3 trillion cubic feet from 2012 through 2025 relative to business as usual (Bullock 2011).

More gas sales generally mean more revenue for gas utilities, but CHP customers are also high-load customers, meaning that their average consumption tends not to deviate from their peak as much as that of other customers. These customers are beneficial to LDCs, as the LDCs enjoy the reliable gas

[1] The full language of the Executive Order can be found here: http://www.whitehouse.gov/the-press-office/2012/08/30/executive-order-accelerating-investment-industrial-energy-efficiency

[2] See the full ICF and AGA (2013) report for a detailed assessment of the extent to which different economic sectors are currently relying on natural gas to fuel existing CHP systems.

demand profiles of CHP-using facilities as discussed in the next section. CHP customers are also generally long-term customers, often locking in contracts for ten or fifteen years, which is immensely attractive to LDCs concerned about their long-term customer base in a competitive market (Noll et al. 2012).

Gas System Benefits

While there are fewer opportunities for LDCs to monetize the benefits of CHP compared to electric utilities, CHP could potentially be viewed as a tool to more cost-effectively build out natural gas infrastructure and reduce the risk associated with build-out. For instance, a natural gas utility could view a new customer-sited CHP system as an anchor load that helps justify the extension of a new natural gas line. This in turn could allow the utility to attract more customers and more cost-effectively bring them online, especially by targeting customers that are well suited to take advantage of the excess thermal energy produced by a CHP system.

Over time, LDCs tend to see customer attrition and reduced demand per customer. This is due to the continued increased efficiency of new end-use appliances; increased customer participation in energy efficiency programming; and, as opposed to electricity, a lack of new end-uses for natural gas as time goes on (Noll et al 2012; Sedano 2011). Utilities that build out new gas distribution infrastructure, which assumes a certain minimum level of gas consumption, could view CHP as an insurance policy on certain distribution lines, helping to prevent gas demand from dipping below a certain level (Noll et al. 2012).

In situations where a new development requires the extension of a natural gas line, the cost is often borne in part by the customers requiring the new service. By considering CHP in conjunction with a new line, customers may be able to enjoy a reduced total energy cost, and the overall net burden to them for requiring new natural gas infrastructure will be reduced. For these exact reasons, the Connecticut Department of Energy and Environmental Protection suggests local distribution gas utilities make the consideration of CHP a part of the planning process for all natural gas line extension projects (CDEEP 2013).

Finally, maintaining an overall higher load factor for a gas distribution system as a whole could theoretically reduce costs for all customers. Though no specific proof of this exists, several of the natural gas utility representatives interviewed for this project believe it to be true.

Customer Attraction and Retention

CHP reduces energy costs, and LDCs could help customers understand how CHP could benefit them in a number of different contexts. CHP reduces customers' energy costs, increasing their competitiveness and raising the likelihood that the customer will remain in business and continue buying natural gas for years to come (Noll et al. 2012, Bachmann 2013).

Additionally, as utilities aim to present a "greener" face to customers, offering services to support CHP could help some utilities appear more progressive or innovative compared to other competing utilities (Esparza 2013). With some customers expressing an interest in pursuing energy options that

are cleaner, CHP helps LDCs "remain relevant" and offer a more "sustainable product," according to one natural gas utility official.

System Resiliency

As seen most recently during Superstorm Sandy, CHP can offer facilities a higher degree of reliability and resiliency in the face of severe weather events (see Chittum 2012). LDCs could better market and highlight these benefits to potential customers, noting that most CHP systems are directly connected to the underground natural gas infrastructure and better protected from the impact of wind, trees and, in some cases, flooding.

Some CHP advocates have suggested that "resiliency portfolios" be adopted at the state level, much like renewable energy portfolios. In such scenarios, CHP connected to natural gas lines would likely be viewed quite favorably, and potential economic benefit could confer to system owners or utility programs that acquired or encouraged such resources.

Assistance with Environmental Compliance

Recognizing that CHP can offer tremendous reductions in harmful emissions, the U.S. Environmental Protection Agency (EPA) and state air regulatory authorities have in some cases indicated support for the deployment of CHP and other energy efficiency measures as compliance mechanisms within air regulations. For instance, State Implementation Plans (SIPs) to meet federal air quality standards can include CHP programs and specific CHP-related emission reductions in their calculations (EPA 2012). For over a decade EPA has made clear that the air quality benefits of CHP are substantial and can be used for air quality compliance (EPA 2000).

CHP can also be marketed to facilities for its ability to help them comply with environmental regulations. For instance, industrial customers affected by the new federal Boiler MACT rules[3] will likely be good candidates for consideration of CHP, and LDCs may view the support of CHP as a "service" to help existing customers address these new regulations. ICF and AGA estimate that over 700 facilities will be affected by these rules, which represents over 24 GW of potential new CHP capacity (ICF and AGA 2013).

Summary of Benefits

CHP can provide LDCs a range of benefits. Table 1 summarizes the various benefits of CHP to gas utilities.

[3] See the U.S. Environmental Protection Agency's website for more information about these rules: http://www.epa.gov/airquality/combustion/actions.html.

Table 1. Benefits of CHP to Natural Gas Utilities

Benefit	Benefit Magnitude	Opportunities to Monetize
Reliable, High-Load Customer	Major	Increased throughput
Gas System Benefits	Medium	Reduced costs for system expansion
Customer Attraction and Retention	Medium	Increased sales and accounts
System Resiliency	Medium	Customer satisfaction, customer competitiveness, increased sales
Environmental Compliance Assistance	Minor	Customer satisfaction, customer competitiveness, increased sales

Despite these many benefits, only a few LDCs are actively encouraging new CHP systems in their service territories. Some of the leading examples are discussed next.

Successful Natural Gas Utility CHP Programs

LDCs can encourage and enjoy the benefits of CHP via five mechanisms: by providing direct assistance and incentives; by including CHP in larger natural gas efficiency programs; by owning the CHP infrastructure themselves; by encouraging the partnering of individual facilities and CHP developers; and by offering special gas rates for CHP systems.

CHP Financing and Assistance Programs

LDCs that identify their customers' CHP needs and then directly support them with services and financing assistance can take advantage of the substantial remaining CHP opportunity.

To help spur CHP project development, Philadelphia Gas Works (PGW) begins its work with customers for its CHP program by paying for an initial feasibility assessment. Often overlooked within energy efficiency programs, a CHP feasibility assessment is a critical tool to identify where true CHP opportunity exists. PGW relies on internal engineering staff to identify potential CHP candidates after basic billing data is collected. After a facility has been identified as a potential candidate, a more detailed investment-grade assessment is performed, which is initially financed by PGW. If the project gets approved, the cost of this assessment is rolled into the total project cost (Youssef 2013).

If a CHP system is deemed attractive to both PGW and the customer, the customer chooses contractor(s) to execute the design and build-out of the CHP system. PGW pays these contractors for their services, and the contractors are responsible for developing and installing the whole project. PGW pays all the initial upfront costs and then aggregates them together to yield a total project cost. The customer then pays PGW back via an additional charge on its regular monthly gas delivery bill.

The total cost should not exceed what the customer was already paying for natural gas and electricity, both of which were already paid out of the customer's operating budget.

PGW recovers its total costs as well as its cost of capital but does not earn additional profit since PGW is a public utility. Instead, it views its program as primarily an economic development tool to keep good companies in Philadelphia and to help existing companies operate more efficiently and with reduced emissions profiles. Citing a recent CHP installation at a hotel, PGW program manager Sherif Youssef said, "At the end of the day, [CHP-provided power] costs less than the status quo...when you reduce a hotel's operating expenses by $1 million a year, it allows them to make more investments in their business, hire more people, etc." (Youssef 2013).

The money collected back from customers is returned to PGW's operating budget over the course of five years or less, depending on the agreement structure. In this way, the program is sustainable, because as CHP system owners pay back PGW, PGW can dedicate more of its operating budget to new CHP projects. The individual customers often find payback to be less than five years, especially in situations where their existing steam systems were so old and inefficient that they were losing thousands of dollars every week in wasted energy. PGW has found that customers are generally successful at obtaining internal approval for their CHP projects through their program because facility managers do not need to ask for additional capital budget allocations. Instead, they continue to pay monthly energy bills of the same magnitude as they did prior to the CHP system. When the repayment period is over, the customers then enjoy significant monthly savings over what their business as usual would have been (Youssef 2013).

PGW currently is supporting 15 projects, about equally split among those that are completed, those that are being constructed, and those in the design phase. The program's success can be attributed in large part to a deep understanding of how to speak to customers about CHP. It is explicitly designed to reduce risk and the perception of risk to customers. Beyond covering the initial upfront cost, PGW also ensures that each project includes a full operation and maintenance contract and a parts and labor guarantee from the contractor. "If the customer doesn't perceive a clear reward, but they do perceive a risk, it's not going to happen," says Youssef. PGW works to educate customers and openly address the concerns of facility managers and other people who may be "sticking their neck out" to make the project happen. "We begin the conversation by saying, 'Your job will not face any type of risk,'" says Youssef. "We teach our staff how to approach people, how to speak in their language. If you don't understand psychology and the way people think, a project won't move forward." (Youssef 2013).

CHP IN ENERGY EFFICIENCY INCENTIVE PROGRAMS

In Arizona, Southwest Gas offers a CHP incentive of $400 to $500 per kW as part of its energy efficiency programming. Southwest Gas is allowed to recover the costs of this program within its larger energy efficiency portfolio (Brinker 2013; Esparza 2013; AAR 2011). The incentive program can fund up to 50 percent of a project cost and is currently funded at about $750,000.

The program was approved by regulators as a demand-side management program due to the identified natural gas efficiency benefits CHP can convey system-wide. The program uses a societal

cost test to account for its costs and benefits, which more fully accounts for the benefits CHP provides to the larger energy system as a whole. As originally proposed, the program dedicates the bulk (87.5%) of its funding to direct incentives, with the remaining budget reserved for marketing, training, external contractors for implementation, and external contractors for project measurement and evaluation (AZCC 2007).

Direct Natural Gas Utility Ownership

A large natural gas subsidiary of a natural gas and electric holding company (name withheld due to the sensitive nature of ongoing regulatory findings) is currently exploring a model that would have the utility design and make the initial capital outlay to own CHP assets themselves. The customer facility at which the CHP system is sited would pay the utility a fixed flat rate each month for ten or fifteen years, and would enjoy access to the electricity and thermal energy produced onsite for no additional cost. The customer would enjoy lower monthly payments — paid out of their operating budget instead of their capital budget — and the utility would enjoy fixed monthly payments that effectively offer a rate of return similar to what it is already earning on other, more traditional generation and distribution assets.

The program described above is based on the premise that only with utility involvement will certain projects move from theoretical to actual investments. As CHP is increasingly adopted by market players, this utility expects that some of the barriers to and risks associated with CHP will be reduced, and more customers will become comfortable with the technology. Ultimately it sees this program as securing a suite of long-term and highly reliable customers that will provide steady revenue and help build a new business services arm. It also plans to seek credit for the efficiency savings within its state's natural gas energy efficiency goals, and emissions savings in current and future emissions trading markets.

Third-Party Ownership Structures

For natural gas/electric utilities that cannot own generation directly, there are some models that still allow them to enjoy some of CHP's benefits. United Illuminating in Connecticut designed and tested a zero-capital program, which was to help pair third-party owners with customers interested in having CHP onsite. United Illuminating shares a parent company, UIL Holdings, with three LDCs, making CHP in the financial interest of the larger parent company.

The program would encourage five- or ten-year power purchase agreements between customers and the third party developers and owners. United Illuminating could enjoy the benefits of CHP on its electric system — reduced congestion, emissions, etc. — without having to own the CHP systems itself. United Illuminating's exploratory activities were funded from business development funds, and the utility considered asking for approval to operate as the third party themselves, entering into the agreements with customers and maintaining ownership of the CHP systems. To do so, it would have to develop an unregulated subsidiary that can legally own generation resources.

Though the program was just a test one, United Illuminating viewed potential third-party ownership of CHP as a way to make money on natural gas in an environment in which the margins on the

delivery of the commodity are very small. It remains an interesting model and evidence that ownership of CHP can be attractive to utilities.

CHP-Friendly Natural Gas Rates

Multiple LDCs offer discounted natural gas rates to customers using gas for CHP systems. While these are not fully fledged CHP "programs," they are critical to improving the economics of CHP systems and stimulating CHP growth around the country.

In Connecticut, LDCs offer rebates to CHP-using customers equal to the gas delivery charge. This program is funded by the collection of federally required congestion charges (Connecticut General Assembly Statutes 2013).

In California, LDCs are required to charge CHP systems the same price for natural gas that they charge electric utilities (EPA 2013). In Hawaii, The Gas Company offers owners of propane-powered CHP systems a "dedicated" price structure that keeps costs and risks lower than they would otherwise be (PCEAC 2011). In New Jersey, commercial and residential customers of New Jersey Natural Gas can enjoy discounts on their gas delivery charges of up to 50 percent if they are using the gas for a CHP system (NJNG 2013).

In New York, CHP system owners are eligible for a discount on their gas delivery charges as well. CHP systems must have a dedicated gas line for the CHP system to enjoy the discount. These discounts are mandated by the state, based on the notion that LDCs enjoy substantial benefits from increased CHP (Levy 2013).

Challenges and Opportunities in the Natural Gas Utility Business Structure

Investor-owned gas distribution utilities earn revenue just on the distribution of the commodity. The gas itself is either purchased by the distribution company on behalf of the customer or purchased by the customer. The cost of the commodity is a pass-thru or direct charge to the customer, and LDCs do not earn a profit from the sale of the actual gas commodity (AGA 2013).

One challenge facing LDCs is that much of the CHP installed today is connected directly to interstate natural gas pipelines rather than the distribution infrastructure maintained by gas distribution companies (Noll et al. 2012). A recent analysis of existing CHP by the American Gas Association and ICF International showed that, of systems larger than 100 MW, about 40 to 50 percent have a direct connection to an "inter or intrastate pipelines," and for systems between 50MW and 100MW, only about 20 to 30 percent are connected to such pipelines. These systems convey no direct benefit to the local natural gas distribution systems because the revenue associated with the related gas sales is earned directly by the wholesaler of gas with which the CHP system owner maintains a contract (ICF and AGA 2013). Thus, LDCs will benefit more directly by encouraging CHP deployment at facilities like schools and hospitals rather than very large industrial operations.

The potential benefits of CHP to LDCs are significant. However, most LDCs lack a dedicated CHP program and are not equipped to support increased CHP deployment. In cases where CHP qualifies

as an approved technology within energy efficiency programming, LDCs may have more leeway to encourage CHP deployment and support it with ratepayer dollars.

Energy Efficiency Program Structures

One challenge to stronger CHP programs at LDCs is CHP's complicated relationship with energy efficiency programs. As opposed to traditional natural gas efficiency programs, increased natural gas-fueled CHP will likely *increase* the total gas consumption for the participating customer. Thus, on its face, CHP does not appear to be a natural gas efficiency measure. However, CHP conveys energy efficiency benefits system-wide and thus is an energy efficiency measure when considering the entire energy system in a more holistic manner. Reducing centralized electricity generation will, depending on the local electricity mix, reduce natural gas consumption as a result of CHP's increased efficiency and ability to avoid line losses.[4] The Arizona Corporation Commission recognized this important point in its approval of Southwest Gas's aforementioned CHP incentive program:

> *Off-site, or system-wide, savings provided by CHP projects should also be taken into account in evaluating CHP projects. Avoided line losses are savings of electricity at the margin, and electric savings at the margin are usually savings of electricity that would have been generated through the burning of natural gas. This means that, on a system-wide basis, on-site generation of electricity through a CHP unit generates natural gas savings as well as electric savings* (AZCC 2007).

Regulation of LDCs and electric utilities is typically conducted completely separately, with completely separate dockets and processes. This includes the regulation and approval of these utilities' energy efficiency programs. However, by looking at only one type of utility, the big picture energy efficiency opportunities may be overlooked. One example of how to better incentivize CHP within LDCs' energy efficiency goals can be found in Oregon, where a recent piece of legislation lays the groundwork for CHP and other energy efficiency projects to be supported by LDCs, with money from ratepayers. The projects and programs supported by this legislation will be measured by their overall emissions impact. So though a project may increase natural gas consumption for a certain site, it may provide system-wide emission reduction benefits, and thus be approved as an applicable energy efficiency project (Oregon Legislative Assembly 2013).

Additionally, within energy efficiency programming, many states do not allow utilities to offer incentives to customers for "fuel switching," which may very well be what facilities that could be served by CHP would need to do. As described by Southwest Gas in a regulatory filing in support of its energy efficiency programs:

> *The most effective energy efficiency programs should take into account the full or complete energy cycle, which measures the energy efficiency from the source to the site. These programs may result in what has been termed fuel-switching or fuel substitution* (Gallo 2009).

[4] See Chittum (2013) for a more detailed discussion of the benefits CHP conveys to the electric system.

Though a typical facility building a new natural gas-powered CHP plant would be reducing its electricity consumption, it would be increasing its natural gas consumption, and some states lack the framework within which credit for such an action could be given. This is especially true if the state lacks incentives or efficiency programs for CHP within its electric energy efficiency goals and programs, and if its LDCs cannot claim CHP savings as savings toward their own goals.

Finally, where utilities can realize the value of CHP within energy efficiency programming and goals, the cost-benefit analyses that consider CHP as an efficiency opportunity do not fully value many of the significant benefits CHP provides. For LDCs generally, the impact of CHP on maintaining higher system load factors has not been quantified and is not part of energy efficiency cost-benefit analyses.

Natural Gas Utility Business Structure

In general, collected moneys from ratepayers are allowed to fund new natural gas infrastructure and maintenance, but not electric generation. A typical regulatory structure for LDCs has no place for investments in technologies like CHP. At present, the only LDCs that appear to be exploring CHP asset ownership are those that have a parent company that also owns an electric utility.

Additionally, while "decoupling" of natural gas revenues from sales volumes can significantly increase natural gas utility interest in efficiency programs, it has the perverse impact of making CHP less attractive to LDCs. In situations where natural gas decoupling exists, specific provisions for CHP and allowances for revenue benefits associated with greater CHP may be required.

Suggested Policy and Regulatory Responses

Regulatory and policy changes on the state level could help LDCs and utility customers enjoy the many benefits of greater deployment of CHP. We suggest state policymakers:

- Allow flexibility in the construction of CHP programs, allowing for long-term financing assistance and early-stage feasibility assessments as part of energy efficiency programming;
- When developing decoupled natural gas rates that encourage LDCs to reduce customer gas consumption, consider that the increased gas consumption of new CHP systems will still yield an overall net energy and emission reduction benefit, and should likewise be incentivized;
- For joint natural gas/electric utilities, allow the costs of utility-owned and customer-sited CHP assets to be recoverable in rates, as well as eligible for a comparable rate of return to traditional generation, distribution, and transmission investments;
- Establish methods to account for location-specific benefits of CHP to the gas distribution system and provide guidance on how additional benefits should be integrated into cost-benefit analyses for energy efficiency resources;
- Prioritize thermal energy planning within energy planning activities to ensure CHP opportunities and waste energy recovery opportunities are given the same consideration as other resources when planning for long-term energy needs;

- Establish statewide energy efficiency goals and treat net CHP savings[5] from all types of CHP and waste heat recovery as equivalent to other energy efficiency resources;
- Support performance-based rate structures for utilities, which would allow utilities to earn revenues based on their performance in certain areas like reliability, environmental performance, etc.;
- Allow CHP to generate compliance credits in any program designed to control carbon dioxide emissions from existing fossil fuel-fired power plants under the federal *Clean Air Act*, and allow CHP supply to offset other state or regional greenhouse gas control programs; and
- Aggressively pursue the quantification of CHP's reliability benefits and more directly integrate these benefits into cost tests that consider the costs and benefits of energy efficiency resources.

Appendix I in Chittum and Farley (2013) offers specific examples of states and utilities that have taken some of the above steps, and specific policy language used in some of these cases.

Conclusion

CHP is the most cost-effective and efficient way to generate electricity today. Significant potential for CHP is found in existing facilities, but much of that potential is left untapped because individual facilities are wary of making such significant capital investments. LDCs are well-positioned to encourage these investments in CHP and can enjoy the increased reliability of a CHP-using customer base.

While LDCs are, by default, structured to view CHP in their economic interest, most do not offer dedicated CHP programming. Regulatory and policy changes could help LDCs better identify and enjoy the benefits increased CHP might bring.

By taking advantage of CHP opportunities within their service territories, LDCs can enjoy reduced risk, increased energy efficiency performance, and improved customer retention and satisfaction. Policymakers should encourage the development of policies that provide gas utilities with clear incentives to embrace CHP.

[5] Read more on ACEEE's suggested approach for measuring CHP savings within an energy efficiency standard here: http://aceee.org/blog/2012/11/determining-chp-savings-energy-effici.

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