Market Experiences in Overcoming Barriers to CHP and DG in Wisconsin's Municipal and Investor-Owned Utilities, and Brownfield Redevelopments

Thomas Giffin, Science Applications International Corporation
Preston Schutt, Wisconsin Department of Administration
Doug Presny, Science Application International Corporation
John Nicol, Science Application International Corporation

ABSTRACT

Installations of Combined Heat and Power (CHP) applications, as well as other forms of Distributed Generation (DG) can yield substantial improvements in energy efficiency, electric reliability and environmental performance. Despite these and other benefits, economic factors and Wisconsin's regulatory climate in the electric industry have relegated CHP/DG to a niche application. Unless the market forces and market barriers are understood and strategically targeted at appropriate market niches, efforts to promote CHP/DG in Wisconsin and similar markets will have limited effectiveness.

Barriers to increasing CHP/DG penetration in Wisconsin are:

- Low-cost, reliable electricity,
- Balkanized interconnection requirements, and
- Stalled electric industry restructuring.

Approaches were developed to address these barriers by targeting three distinct CHP/DG market areas of municipal utilities and their customers participating in Focus on Energy, brownfield redevelopment sites, and sponsors of proposed large power plants.

This project targeted the most promising market segments, to capitalize on CHP/DG's wider benefits through building partnerships among DOE, utilities, businesses and state programs such as Focus on Energy.

This paper presents the findings and experiences in establishing and performing technical outreach to develop DG/CHP in these Wisconsin markets. Discussions of the design challenges, the development of opportunities, and experiences in the on-going delivery of the CHP/DG initiatives are discussed. The results of this program's experience can serve as a model in advancing CHP/DG in low-cost, regulated and challenging electricity markets.

Introduction

Installations of Combined Heat and Power (CHP) applications, as well as other forms of Distributed Generation (DG) can yield substantial improvements in energy efficiency, electric reliability and environmental performance. Despite these and other benefits, economic factors and Wisconsin's regulatory climate in the electric industry have relegated CHP/DG to a niche application. Unless the market forces and market barriers are understood

and strategically targeted at appropriate market niches, efforts to promote CHP/DG in Wisconsin and similar markets will have limited effectiveness.

This paper presents the findings and experiences in establishing and performing technical outreach to develop DG/CHP in these Wisconsin markets. Discussions of the design challenges, the development of opportunities, and experiences in the on-going delivery of the CHP/DG initiatives are discussed.

Existing Markets and Design Challenges

Most of Wisconsin's 22 known CHP applications can be found in Wisconsin's forest products industry or at government facilities. Paper makers have long taken advantage of their wood wastes for CHP or thermal uses, and 15 CHP applications are in use at Wisconsin paper companies. Electric utilities, the University of Wisconsin system, as well as a few state and local government facilities use CHP for district heating and cooling purposes in Madison, Milwaukee, Whitewater, Manitowoc and a few other cities. However, commercial and industrial (C&I) CHP applications are rare in Wisconsin.

Barriers to increasing CHP/DG penetration in Wisconsin's C&I market are well known and understood. They are:

- Low-cost, reliable electricity,
- Balkanized interconnection requirements, and
- Stalled electric industry restructuring.

Wisconsin's Low-Cost, Reliable Electricity

Low retail electricity prices reduce the incentive for businesses to install CHP applications, and Wisconsin has a proud history of low-cost, reliable electricity. In 2000, electricity prices were the lowest in the Midwest for commercial (6.03¢/kwh) and industrial (4.04¢/kwh) customers (Wisconsin DOA 2001). Since the summer of 1997, the state's electric grid has not experienced reliability problems, nor has the state experienced rolling blackouts like neighboring Illinois. Reliable power mitigates customer's perceived need for self-generation.

Wisconsin's low rates and reliable power have a two-fold effect on CHP. C&I customers are less interested in CHP, and CHP vendors concentrate their sales efforts in other, more promising states. For example, Illinois has noticeably more CHP installations and market activity than Wisconsin. Illinois electric rates were about 29 percent higher for industries and 26 percent higher for commercial customers in 1999. The combination of Wisconsin's low electric rates and reliable power creates a disincentive for C&I buyers as well as the sellers of CHP systems. An added disincentive occurred in the winter of 2000 when natural gas prices spiked, making some gas-fired CHP systems uneconomic to operate. This added fuel price risk became another reason for C&I customers to avoid CHP.

Wisconsin Interconnection Issues

CHP interconnection issues are being addressed through the Wisconsin Distributed Resources Collaborative www.wisconsindr.org, which is working in conjunction with the

Midwest CHP Initiative www.nemw.org/uschpa/regional.htm#midw to standardize interconnection requirements throughout the Midwest. In Wisconsin, the technical working group is developing administrative rules that will recommend interconnection requirements for single and three-phase applications in three size ranges: less than 20 kilowatts (kW), 20 kW to 1 megawatt (MW) and 1 MW to 15 MW. The proposed rules are expected to become effective in April of 2003.

The Collaborative will also produce three documents for each size range: 1.) an Interconnection Application; 2.) an Interconnection Agreement (the contract); and 3.) Interconnection Guidelines (includes process flowchart, sample single-line drawings, glossary).

Wisconsin's Stalled Electric Industry Restructuring

Wisconsin began electric industry restructuring in May 1998 with passage of Wisconsin Act 204 (The Reliability Bill). This bill substantially changed the regulatory planning process by which electric power plants and high voltage transmission lines were approved and ultimately constructed. This began a series of legal and regulatory changes that: 1.) opened up power plant construction and operation to competition; 2.) required utilities to spin off ownership and control of their transmission facilities into a private entity; and 3.) removed the responsibility of delivering energy efficiency programs from utilities to the State of Wisconsin.

The state appeared to be headed for customer choice, which promises to be a catalyst to further DG/CHP market penetration. Then events in California put a halt to further restructuring discussions in the Legislature, and there are no plans to resurrect them in the near future. This stalled electric industry restructuring has left the state with some unusual conditions and incentives regarding DG/CHP.

First, the state's once comprehensive planning process for generation additions has been largely dismantled. CHP need no longer be considered by companies planning to build large power plants. Over 12,000 MW of new capacity are proposed to be built in Wisconsin over the next ten years. Not all these plants will be built, but only 75 MW are proposed to be built as CHP. There is presently no regulatory or added economic incentive for utilities or independent power producers to spend the added time and money to investigate or design CHP options into new facilities. This is a large potential market for CHP, and is currently a huge lost opportunity.

Second, the state's utilities were required to divest all transmission assets. American Transmission Company (ATC) is the entity formed to build, operate and maintain the eastern Wisconsin utilities transmission assets. In the past, DG applications, including CHP, were typically considered as options for alleviating transmission constraints. This is no longer the cast in Wisconsin. ATC is a company that invests in traditional transmission assets. It does not consider DG as an option. Utilities, having divested of transmission assets, also have no incentive to consider DG options for transmission bottlenecks. The state's half completed restructuring has eliminated DG and CHP benefits in the due diligence efforts of large power projects and transmission additions.

Finally, industry restructuring moved the responsibility of providing energy efficiency programs from electric utilities to the State. Wisconsin Focus on Energy www.focusonenergy.com is the result of the last round of restructuring in the state. The

Focus on Energy (Focus) program is a public/private partnership that delivers energy efficiency and renewable energy programs to the residential, commercial, agricultural and industrial customers of the 12 investor-owned utilities and 19 municipally owned utilities. The programs are quite comprehensive and well funded.

However, the legislation that created these programs does not allow for Focus dollars to be spent on electric generation-related activities or technologies. Monies spent on DG/CHP-related systems may only be directed at thermal production. Once again, the full benefits of CHP are stymied by Wisconsin's unique restructuring formula.

Market Opportunities

Despite the state's seemingly gloomy prospects for DG/CHP, there are opportunities for them to deliver their benefits to specific, targeted C&I customers as well as the utilities that serve them. Approaches have been developed to address these barriers by targeting three distinct CHP/DG market areas. Working with the Focus on Energy program, electric utilities participating in Focus, and related state- and federally-sponsored initiatives, outreach and technical support for CHP/DG solutions were designed and delivered into three target markets:

- Municipal utilities and their customers participating in Focus on Energy,
- Brownfield redevelopment sites, and
- Sponsors of proposed large power plants.

The three target markets for this project were chosen after an examination of Wisconsin's regulatory and economic climate regarding CHP. As stated earlier, Wisconsin's low-cost, reliable, grid-supplied power is typically too competitive to give businesses the needed economic incentives to install, own and operate CHP/DG. In addition, the hodgepodge of interconnection requirements increases the difficulty and the owner's cost of installing small CHP/DG.

Wisconsin's electric providers have also shown great interest in building new CHP/DG installations. State electric industry restructuring separated utility ownership of generation from transmission. Therefore, the wider benefits of CHP/DG such as reduced transmission congestion or avoiding power plant construction do to accrue to any single entity.

The most promising market segments were targeted to capitalize on CHP/DG's wider benefits of CHP, such as reduced transmission congestion or avoiding power plant construction, through building partnerships among DOE, utilities, businesses and state programs such as Focus on Energy. Consideration and analysis of CHP/DG solutions were embedded into standard practices of Wisconsin's state programs, businesses, municipal electric utilities and major power plant sponsors.

Target # 1: Municipal Utilities

Nineteen of the state's 82 municipal utilities chose to participate in the Focus on Energy program, which delivers energy efficiency and renewable energy programs. These

19 municipal utilities are small, but progressive. Municipal utilities in general are good candidates for CHP/DG solutions because:

1. These publicly owned companies are accustomed to working very closely with their customers, and customers are accustomed to working with each other. This is often necessary with CHP/DG solutions.
2. Their service area is a small, contiguous grid so monitoring, measurement and verification is easier, more valid and reliable.
3. The wider, more public benefits of CHP/DG solutions such as lower emissions, more efficient energy production, or the reduced need for distribution line or substation upgrades, are contained within the service area and shared within the community.
4. In the face of future restructurings, Wisconsin's municipal utilities are actively looking for ways to partner with customers.
5. Most of these utilities buy the majority of their power from the large utilities. Peak power purchases are very expensive for their small, public budgets.
6. The summer and winter MW peaks of many Wisconsin municipal utilities are nearly equal, which is encouraging because a key factor for successful CHP solutions is to have the proper balance of heating, cooling and power loads.
7. The average price per kWh of industrial electricity for 15 of the 19 municipal utilities is between 4.4 ¢/kWh and 6.0 ¢/kWh. These higher than average industrial power costs make CHP solutions more attractive to customers.
8. These C&I customers may be a largely untapped market for advanced energy efficiency or CHP/DG solutions. The municipal utilities typically do not have the staff people or budgets to support solutions that require these types of technical expertise.

Target #2: Brownfield Redevelopment Sites

CHP solutions have not been integrated within the existing structure of the state's brownfield redevelopment programs. This project will provide outreach to the agencies and technical assistance through over 40 Focus on Energy Field Staff to embed the consideration of CHP solutions into these existing state programs and the communities that participate in them. CHP applications have unique advantages in the older, "rust belt" industrial areas, including brownfields, where there are varieties of potential industrial and commercial facilities. There are scores of these potential applications across Wisconsin.

The Wisconsin Department of Commerce's Brownfields Initiative is a well-established, well-funded initiative to redevelop brownfields. The Brownfields Initiative Grant Program provides funding for brownfield projects that promote economic development and have a positive effect on the environment. http://www.commerce.state.wi.us/CD/CD-bfi.html.

The Wisconsin 2001-2003 biennial budget allotted $7 million in Brownfield Grants to be awarded for each fiscal year. In 2001, 41 applicants, who requested a total of $23 million, entered the competition for $6.4 million of available grant funds.

The Wisconsin Department of Commerce and the Wisconsin Department of Natural Resources manage or help applicants with federal brownfield-related programs that this project will seek to partner with such as:

- Blight Elimination and Brownfields Redevelopment (BEBR) Grants,
- Environmental Remediation Tax Credit Program,
- Enterprise Development Zone Program, and
- Technical Assistance Grants.

Target #3: Sponsors of Proposed Large Power Plants

Any electric utility or independent power producer may propose to construct a power plant in Wisconsin. Past restructuring legislation has reduced the previously long and arduous planning requirements, which included consideration of CHP as an option.

Now, a power plant with a designed capacity of 100 megawatts or more must have a Certificate of Public Convenience and Necessity (CPCN) from the Commission before plant-related construction may begin. The developer must also gain the other necessary permits and approvals as required by Wisconsin statutes. This approval process for a new power plant has been shortened to less than two years in some cases.

As mentioned earlier, over 12,000 MW of new power plants have been proposed in Wisconsin and only 75 MW are proposed to be CHP. This will be a 40-year lost opportunity if the plants that do eventually get constructed do not consider CHP. This project seeks to partner with the Midwest CHP www.nemw.org/uschpa/regional.htm#midw and the Wisconsin Public Service Commission staff to conduct outreach to the current group of new power plant sponsors as well as sponsors of new plants as they are proposed.

Goals and Objectives

The goal is to embed the consideration and analysis of CHP/DG solutions in Wisconsin's state programs, businesses, municipal electric utilities and major power plant sponsors so that it becomes a standard business practice. The objectives are as follow:

1. Develop partnerships among state and federal government, businesses, electric providers, and other programs.
2. Organize teams and develop outreach materials and approaches that are targeted at the state's best CHP/DG candidates: Customers of 19 Focus on Energy municipal utilities, Groups dedicated to Brownfield Redevelopment sites and Sponsors of large power plants in Wisconsin.
3. Educate the partners about CHP/DG opportunities and work with them to integrate, embed and ease the consideration and analysis of CHP/DG in state programs and every day business decisions concerning energy.
4. Conduct outreach sessions to the three CHP/DG target markets to educate them about CHP/DG opportunities, better understand their specific needs and develop specialized technical assistance to address the needs.
5. Supply targeted technical assistance through Focus on Energy field staff and other partners to eliminate CHP/DG implementation barriers
6. Integrate advanced CHP/DG and energy efficiency through up to two pilot projects as available at municipal utilities using the Targeted Area Planning (TAP) approach.
7. Provide a final report describing the recommendations and findings of a sustainable, targeted, integrated approach to CHP/DG advancement in Wisconsin.

Actions and Experiences

Work addressing the three targeted areas is moving forward simultaneously.

CHP/DG Outreach Initiative to the 19 Municipal Utilities Participating in Focus on Energy

The 19 municipal utilities participating in Focus are being recruited through their Association, the Municipal Electric Utilities of Wisconsin (MEUW) as well as through contacts with Focus. They are requested to attend a session where they will learn about DOE tools and resources, CHP/DG opportunities and the potential for TAP to help them manage their systems.

Municipals with potential TAP projects will be asked to provide more information. Focus technical assistance is available to help them gather information and internally assess their proposed project. A TAP study conducted for these two projects will be performed to recommend a combination of localized energy efficiency and CHP/DG solutions as well as their costs, benefits and potential implementation strategies. Potential implementation strategies could involve a business, utility and Focus partnership.

CHP/DG is receiving outreach throughout the state because the Focus Energy Advisors have been trained and provided tools to quickly screen CHP/DG opportunities. Through the pilot work, the Energy Advisors will also have data to encourage the large, investor-owned utilities (all are Focus participants) to consider and analyze partnering with their customers on CHP/DG solutions that improve local area reliability and or defer the costs of new distribution or substation facilities.

Experiences and lessons to date are as follow:

1. There is no shortage of information and materials for CHP and DG. In fact, an overwhelming amount of information was obtained in the course of developing tools and information to support the various market needs. The challenge was to whittle down the information into a manageable and meaningful subset that the Energy Advisors could readily apply.
2. There are a select few engineering firms that serve the T&D needs of municipal utilities. As such these firms offer a unique channel for CHP/DG outreach. The work has been somewhat modified to respond specifically to this very small, but very important part of the market.
3. The full economic value from Total Area Planning perspectives have not yet manifested itself into the overall decision-making. Specific conditions and situations remain the primary driving influences on CHP/DG decisions.

CHP Outreach Initiative to Brownfield Redevelopments

Wisconsin's Brownfields Initiative, related brownfield redevelopment programs and the groups that traditionally apply for brownfield redevelopment grants are a target CHP/DG market. The grants are essential to redevelopment efforts, and CHP can become an innovative approach to redevelopment that will help applicants win grant funds.

The Wisconsin Department of Commerce has not considered CHP in its grant criteria prior to being contacted to be a participant in this project. However, they have agreed that the efficiency and environmental benefits of CHP complement their program's objectives. Each year, Commerce holds an information session to potential brownfield developers. This project leverages those sessions to conduct outreach to brownfield developers that are in the planning stages of their projects.

Nearly all of the State's brownfields lie within the utility territories served through Focus. For existing sites, the Focus Energy Advisors can easily target outreach to C&I customers in and around brownfield redevelopments to bring CHP and energy efficiency solutions to these businesses and property developers. Through the sessions and the Energy Advisors, this project can bring CHP outreach to new and existing brownfields as well as DOE tools and resources.

Focus Energy Advisors can use the screening tool to quickly assess brownfield CHP opportunities. Facilitation and limited technical assistance is provided to CHP candidates that pass the screen and wish to further develop their project proposals for the next upcoming round of Commerce grants.

Experiences and lessons to date are as follow:

1. While there are a multitude of funding sources and support efforts for brownfield redevelopment, there is little or none that have incentives for primary energy efficiency as available thought CHP/DG.
2. It is clear that the governing agencies that are in the lead positions for brownfield redevelopment support must be coordinated with for any advancement of CHP/DG.
3. There appears to be limited number of specialized developers and designers who are active in brownfield redevelopment. These groups are well known to the governing agencies who administer brownfield redevelopment.

CHP Outreach Initiative to Large Power Plant Developers

This is perhaps the most difficult area of the initiative, but also it may offer the highest upside. The PSC staff is very aware that CHP is not being considered by the vast majority of power plant sponsors. This biggest barrier to overcome will be gaining an audience with the power plant sponsors. PSC Staff believe the strategy should be to gather the relevant information on CHP and hold a small roundtable session with sponsors. The session would provide for CHP outreach, but also a listening session to identify, prioritize barriers to large scale CHP. Then, a large CHP Action Plan can be developed so the barriers can be addressed as quickly as possible. While somewhat specific to Wisconsin, this Action Plan can easily be used as a template in other states' efforts to promote large CHP projects.

Experiences and lessons to date are as follow:

1. The PSC is a primary point of influence for the consideration of CHP/DG in these large applications. Strategies to outreach to and inform the PSC, the commissioners and the staff need to be carefully planned and coordinated to be effective. The use of regional entities that have perspectives from multiple states is also useful.

Conclusion

Unless the market forces and market barriers are understood and strategically targeted at appropriate market niches, efforts to promote CHP/DG in Wisconsin and similar markets will have limited effectiveness. Therefore, targeting the most promising market segments can capitalize on CHP/DG's wider benefits through serving the needs of the niche CHP/DG markets with inherent benefits of CHP/DG. Embedding consideration and analysis of CHP/DG solutions into standard practices of Wisconsin's state programs, businesses, municipal electric utilities and major power plant sponsors serve to increase awareness and consideration into existing market activities.

The findings and experiences in establishing and performing technical outreach to develop DG/CHP in these Wisconsin markets may serve as a model in advancing CHP/DG in low-cost, regulated and challenging electricity markets.

References

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