BCHP Baseline Analysis for the Michigan Market
2003 UPDATE

Prepared by:
Midwest CHP Application Center

Under
ORNL Contract #4000007633

University of Illinois at Chicago – Energy Resources Center

March 2003
(Version: 3/6/2003 12:52 PM)

Table of Contents

Executive Summary

In March 2002 the Midwest CHP for Buildings Application Center (MAC) completed its original Michigan Baseline Analysis, which detailed the regulatory and private sector activities in the Buildings Combined Heat and Power (BCHP) market in the state. That baseline analysis concluded that there was a significant need to improve the regulatory environment for BCHP systems and educate state regulators and private firms on the benefits of BCHP technologies. In the year since that baseline analysis there has been enough development in the BCHP field in Michigan to prompt an update of the original study.

While the MAC did not identify the construction of any new CHP sites since the original characterization was completed for the year 2002, several feasibility studies for potential CHP sites were conducted in Michigan during this time. These include a CHP feasibility study for a hospital complex in Grand Rapids as well as a CHP project at Grand Valley State University. The Grand Valley State University project was funded by the Michigan Low-Income and Energy Efficiency Fund (LI/EE). This fund also provided a grant to NEXT Energy for a microgrid study with a distributed resources focus.

Lately one group has been particularly active in promoting BCHP technologies in Michigan. The Midwest Clean Technology Cluster (MCTC) with sponsorship from the Small Business Administration of Michigan has held two CHP Stakeholder Workshops on January 14 and February 19, 2003 in Lansing, Michigan. Representatives interested in CHP from the private as well as regulatory sector met to develop an action plan for promoting CHP in Michigan. This action plan focuses on activities that can be undertaken within the next 18-months that will expedite the installation of CHP systems in Michigan, including a CHP end-user workshop to be held later this year.

Over the last year the University of Michigan Ann Arbor and General Motors Corp. joined the Environmental Protection Agency (EPA) CHP Partnership Program, in which they commit to actively promote CHP technologies.

In Michigan approximately 40 technical companies and energy services companies are actively pursuing BCHP deployment and installation. There are several large well-known engineering firms, as well as equipment manufactures and distributors who are aggressively pursuing the BCHP market in Michigan. One of the companies that is leading the way for BCHP in Michigan is DTE Energy Technologies, which is an unregulated affiliate of Detroit Edison, one of the largest electric utilities in Michigan. DTE, working under contract to United Technologies Research Center (UTRC), is involved in one of the seven BCHP Packaged System Development awards made by the Department of Energy, Office of Power Technologies (DOE-OPT) in 2001. The UTRC/DTE system will be based on the new 400kW DTE Energy Technologies Microturbine system coupled to Carrier absorption chillers. The use of waste heat driven ammonia water refrigeration systems, desiccant systems, and thermal storage are also being considered for use in the system. DTE is also actively marketing several lines of distributed energy technologies. Continued engagement of these companies is essential to the successful deployment of BCHP in Michigan. DTE has also been actively involved in the MCTC CHP Workshops.

The Midwest is home to many non-profit organizations and associations that have come forward to support the deployment of BCHP. In fact the Midwest appears to be leading the way in promoting the deployment of BCHP with such organizations as the Midwest CHP Initiative and the Midwest Cogeneration Association. In Michigan, Energy Michigan, a trade association for the cogeneration, independent power and waste to energy industries, helps support these industries by legislative and regulatory activities; intervening in cases on retail wheeling, competitive bidding, standby rates and other similar issues; by participating in State legislation, and in certain selected national cases and rule makings. And as discussed above, the MCTC is taking a "grass-roots" approach to promoting CHP in Michigan.

Focusing on BCHP systems in commercial installations, the Midwest CHP Application Center (MAC) identified a total of 20 BCHP systems, producing a little over 146,000 kW in Michigan. Schools/Universities constitute the biggest installed BCHP market segment in Michigan (122,000 kW) followed by installations at airports (17,000 kW) and hospitals (3,800 kW). There is also a large potential market for an additional 105,000 kW where thermal heat recovery technologies could be added to installations where there is only distributed generation. The largest potential for adding BCHP to existing distributed generation installation exists in the Municipal Water/Resource Recovery sectors (45,000 kW).

Capital costs as well as operating costs are generally viewed as some of the major hurdles to utilize BCHP technologies. The predominant technologies in BCHP power generation utilize natural gas. They range in size from reciprocating engines and microturbines in the tens of kilowatts to gas turbines in the tens of megawatts range. The least expensive technologies (large natural gas turbines) installed start around $600/kW and increase in cost up to fuel cell technologies that may cost up to $5,000/kW. Natural gas reciprocating engines are the predominate technology, and can range in price from $1,000 to $1,800/kW. Although prices of all of these technologies are expected to decrease as the technologies and system designs become more common. For smaller generating capacity units, this initial cost can have a long payback period unless electric costs are very high and thermal loads well matched.

For most BCHP systems natural gas constitutes the majority of the variable/operating cost. Volatile natural gas prices, such as those experienced recently, introduce uncertainties into the financial aspects of CHP and have negative affects on the BCHP market development.

The EIA expects natural gas prices to move higher as technology improvements prove inadequate to offset the impacts of resource depletion and increased demand. Natural gas prices are projected to increase in an uneven fashion as higher prices allow the introduction of major new, large-volume natural gas projects that temporarily depressed prices when initially brought on line. Prices are projected to reach about $3.70 per MMBtu by 2020 (about $0.35 higher than last year's projection) and $3.90 per MMBtu by 2025. The average price paid for natural gas by commercial customers in Michigan was $5.49 in 2001. Natural gas is readily available in Michigan; they produce about 25% of their own gas needs and have substantial gas storage facilities. The average cost of electricity in the state is relatively high at 7.9¢/kWh for commercial customers in 2000.

Additional electricity pricing information by customer class and electricity demand can be found at http://www.cis.state.mi.us/mpsc/electric/rates1.htm.

Standby rates and the cost of electricity affect the payback on BCHP installations. Detroit Edison's (Michigan's largest utility) Standby Rider (R3) is the rate that most affects the installation and operation of 100kW and above onsite electricity generation installations. This standby rate has charges for standby capacity based on a complicated formula of usage over a 12-month period. However, the rate provides a less complicated and restrictive option for those generating 2000 kW or less. Detroit Edison has a simpler Rider for installations under 100 kW: Rider DG that appears to be significantly less complex and restrictive to small-scale (<100kw) installations.

Interconnection poses to be one of the biggest barriers to BCHP in Michigan because there is no State standard for the interconnection process and related fees, which is compounded by the large number of electric suppliers within Michigan, each with their own interconnection requirements and fees.

On a positive note, per the Michigan Customer Choice and Electricity Reliability Act (Public Act 141), there are no exit fees for those who decide to exit form the grid to provide their own electricity. Open access for all customers of utilities and large co-ops occurred on January 1, 2002. Open access to natural gas is available but has been slow to occur.

The most effective deployment of BCHP technology will come from regional and local activities. This is true because most of the barriers are due to local issues, such as site permitting, interconnection requirements and studies, local utility pricing, and local building codes and standards. These barriers can be overcome with support from regional and local entities. Some of the entities that the MAC has identified that could assist with the development and/or deployment of BCHP in Michigan are:

- Energy Michigan
- Michigan Clean Technology Cluster
- Midwest CHP Initiative
- Michigan Independent Power Producer Association
- Michigan Senate Technology and Energy Committee Members
- Michigan Senate Natural Resources and Environmental Affairs Committee Members
- Michigan House Energy and Technology Committee Members

A very favorable partner for BCHP is DTE Energy Technologies. As mentioned earlier, they are participating in one of the DOE packaged BCHP development projects (with United Technologies) and they are actively marketing distributed energy technologies.

ONSITE Energy Corporation in January 2000 prepared a study for the Energy Information Administration titled "The Market and Technical Potential for Combined Heat and Power in the Commercial/Institutional Sector." For Michigan, ONSITE estimated a total market potential for electric production to be in the range of 2,400 to

7,500 MW. This potential may only be realized if the regulatory and policy issues become more supportive of BCHP installations.

This report concludes with recommendations, which address the need to educate state regulators and private market participants on BCHP benefits. Case studies are needed which show the tremendous economic and environmental benefits of BCHP systems. As mentioned above alliances have to be formed with already influential companies in the BCHP field such as DTE Energy Technologies, Energy Michigan and others to develop synergies between these companies and the Midwest CHP Application Center to promote the use of BCHHP. Finally, the Midwest CHP Application Center should partner with the Michigan Public Service Commission to reduce or remove regulatory barriers.

1. Introduction and Purpose

Information provided in this document represents an update in all major areas to the original "BCHP Baseline Analysis for the Michigan Market", which was completed in March 2002. Like the original Baseline Analysis the purpose of this document is to assess the current status of the BCHP sector in Michigan and identify current hurdles that prevent the widespread use of BCHP systems. This updated information will be used to identify target markets for BCHP systems as well as development of education and market transformation programs, which will foster BCHP applications. Finally, an action plan will be developed to further BCHP deployment in Michigan.

Cooling, Heating, and Power for Buildings (BCHP) refers to technologies which generate electricity at or near the point of use, such as a building or building complexes, while simultaneously recovering up to 80% of the waste heat for heating, cooling and/or dehumidification purposes.

In order to assess the current state of BCHP in Michigan, a comprehensive survey of key players involved with this technology was conducted. Key engineering firms, manufacturers, distributors, architectural firms, energy suppliers and federal, state and local agencies were identified. Furthermore a survey of existing and pending BCHP installations was conducted. Also identified in this survey were distributed generating installations that do not recover the waste heat; these installation represent relatively good candidate sites for conversion to BCHP systems since only heat recovery equipment needs to be added to the existing system.

In this report, the initial cost of current BCHP related technologies were evaluated to assess their impact on the marketability of BCHP.

A status assessment of policy related issues pertaining to BCHP was conducted. The assessment was performed for five policy areas; access and interconnection rules, exit fees, general progress with state electric deregulation, emerging legislation, and potential partners/advocates of BCHP.

The market capacity potential for BCHP in Michigan was evaluated to identify the best target sectors for deployment.

This report concludes with recommendations to effectively promote the deployment of BCHP in Michigan.

2. BCHP Contacts in Michigan

2.1 Key Michigan Firms with BCHP Project Experience or Capabilities

One of the major methods to promoting market acceptability of BCHP technologies is to engage the efforts of commercial firms that can promote the installation of BCHP technologies. Besides those that can benefit directly through profits and savings from BCHP, there are other firms which have the interest and capability to get involved with BCHP applications either because they promote energy efficiency, green building technologies, or have other BCHP supporting missions. The purpose of this section is to identify those key firms that currently exist and that can be allied with the Midwest CHP Application Center to promote the deployment of BCHP in Michigan.

There are about 40 companies in Michigan that are engaged in BCHP system applications or have BCHP system capabilities. Interest in BCHP applications in the State has increase significantly over the last year through the activities of a multitude of local and regional organizations that are involved with the promotion of BCHP applications.

Architectural and Engineering firms are important to promoting BCHP technologies because the most economical time to install a BCHP system is during the construction of a new building or during an extensive renovation, when the central heating and cooling plant is being initially installed or completely replaced. This is because the payback period associated with the cost to install a BCHP system need only be justified on the cost differential between the BCHP system and a conventional central cooling/heating system which otherwise would have to be installed. Architectural and engineering firms are generally engaged in the design and installation of such facilities in commercial and light industrial applications. Appendix A provides information on architectural firms and engineering firms that are potential allies in the promotion of BCHP installation in Michigan. There are currently about 20 architectural and engineering firms that have developed and deployed BCHP systems in Michigan.

Manufacturers of power generation equipment, absorption chillers, and desiccant dehumidification equipment, and their sales representatives are important to promoting BCHP technologies for obvious reasons, to sell their equipment. In most cases these manufactures have established a market presence and have built relationships with those most likely to install BCHP technologies. However, these manufactures are now just beginning to work together to develop “package” integrated power, heating, and cooling systems. The Department of Energy has awarded seven contracts for the development of packaged BCHP systems. DTE Energy Technologies, a subsidiary of Detroit Edison, is involved in the award given to United Technologies Research Center (UTRC). These awards are for the accelerated development of BCHP systems based on off-the-shelf components. The UTRC/DTE system will be based on the new 400kW DTE Energy Technologies Microturbine system coupled to Carrier absorption chillers. Both recuperated and un-recuperated microturbine combinations will be used. Possible use of waste heat driven ammonia water refrigeration systems, desiccant systems, and thermal storage also are being evaluated under the award.

In the mean time, it is still important to strive to find technically and financially suitable applications where manufactures can work with engineering and architectural firms to install “custom” systems. Appendix B provides information on manufacturers that

promote BCHP installations in Michigan. There are currently approximately 10 manufactures/sales offices involved in deployment of BCHP related technologies in Michigan.

Property management firms are important in promoting BCHP technologies because they are the operators of many commercial buildings for which BCHP technologies are suitable. Building codes for commercial buildings often times require emergency generation backup-power. Since property management firms may already be required to install generation equipment, the cost differential to install BCHP over a conventional central heating/cooling system is again smaller and easier to justify. The two main organizations that represent property management firms in Michigan are BOMA (Building Owners and Managers Association) and IREM (Institute of Real Estate Managers), which accredits recognized real estate management organizations. Information on the Michigan BOMA chapter and IREM accredited Michigan property management companies can be found in Appendix C.

Local energy suppliers are also important to promoting BCHP. Many have formed subsidiary companies to promote distributed generation. Especially the gas supply companies are interested in CHP since natural gas constitutes an important fuel source for CHP systems and hence tremendous profit potential for gas supply companies. A list of energy supply companies in Michigan is provided in Appendix D.

As mentioned above, DTE Energy Technologies is involved in one of the DOE packaged BCHP awards. They are also actively marketing a whole line of distributed energy technologies, working with such companies as:

- Stirling Thermal Motors
- Energy Conversion Devices
- Detroit Diesel
- Michigan Caterpillar

Energy Services companies (ESCOs) are just beginning to become interested in BCHP technologies. In the past they have not been interested because it is easier for them to find other cost saving measures like lighting retrofits and energy control systems in commercial and light industrial applications, and in many cases regulations and siting requirements served as a disincentive for them to install BCHP. Appendix E lists ESCO's that are active in Michigan.

2.2 Associations and Organizations Involved with BCHP Deployment

Federal, State, and regional governmental entities are becoming more and more interested in BCHP systems because of the energy savings potential and reduction in emissions from this technology. While the Federal government, through the Department of Energy, has provided substantial support, the most effective deployment of BCHP technology will come from regional and local activities. This is true because most of the barriers are due to local issues, such as site permitting, interconnection requirements and studies, local utility pricing, and local building codes and standards. These barriers can be overcome with support from regional and local entities.

The Midwest is home to many non-profit organizations and associations that have come forward to support the deployment of BCHP. In fact the Midwest appears to be leading the way in promoting the deployment of BCHP.

Within the State of Michigan, Energy Michigan and the Michigan Clean Technology Cluster (MCTC) have the potential to be strong allies in the deployment of BCHP. Energy Michigan is a trade association for the cogeneration, independent power and waste to energy industries in Michigan. Energy Michigan aids these industries by legislative and regulatory activities; intervening in Michigan Public Service Commission cases on retail wheeling, competitive bidding, standby rates and other similar issues; participating in legislation; and participating in certain selected national cases and rule makings. MCTC is an initiative, which promotes the use of clean technologies, materials and processes. The initiative is organized by Shepherd Advisors, a business consultaning firm.

On January 14, 2003 and again on February 19, 2003 MCTC with sponsorship from the Small Business Administration of Michigan held workshops to discuss the potential opportunities for expanding the CHP market in Michigan within the next 18-months. Attendance and support from potential stakeholders exceeded expectations with more than 50 participants for the first workshop and about 30 for the second workshop. The initial workshop identified that there was sufficient reason and interest among stakeholders to organize a collective effort. As a result of the second meting an Action Plan was developed and "Champions" and volunteer supporters for each Action Plan item stepped forward. This "grass root" effort has gained some momentum and has been promised support from the State and Chicago Regional DOE Office.

A list of these associations and organizations and their web-addresses, where available, is provided in Appendix F.

3. Survey of BCHP Installations and BCHP Targets in Michigan

3.1 Survey Summary

This survey was conducted to identify existing and pending BCHP installations in order to assess the current statutes of BCHP in Michigan; to establish where we are today and to identify those facility types where BCHP was most prevalent. Also identified in this survey were distributed generating installations that do not recover the waste heat. For the purposes of this survey, they represent relatively easy candidate sites for conversion to BCHP because they may be able to easily add heat recovery to their existing generation equipment.

The information in this section is based on input from various sources including; personal interviews, manufactures and distributors, websites, associated organizations, and journals. The survey of BCHP installations and potential BCHP targets is primarily based on personal interviews as well as the use of published data. Published data consisted of the Energy Information Administration's "Inventory of Nonutility Electric Power Plants in the United States" (http://tonto.eia.doe.gov/FTPROOT/electricity/0095992.pdf), dated November 2000. Sites that are greater than 1 MW are easier to identify because they must file sitting reports with the Environmental Protection Agency (EPA). However sites less than 1 MW may or may not have a to file with the EPA, making them more difficult to identify. The sites identified represent the best efforts of the Midwest CHP Application Center to identify actual and potential BCHP installations in Michigan at the time of this report. Other existing or potential BCHP sites may exist; they will be added to the database and will be available over the website in the future as they are identified.

A total of 20 BCHP systems, producing a little over 146,000 kW, are known to be in operation in Michigan. Appendix G categorizes and lists the known distributed generation installations based on the facility type in which the system is installed and provides the size of the installed generation capacity. Where it is known, thermal heat recovery has been noted, or if the system is installed for peak shaving or back-up purposes power only.

This report focuses primarily on BCHP applications for buildings. However, for the purpose of providing a comprehensive overview, a similar summary table on industrial applications is attached to this report in Appendix H.

3.2 Sector Analysis of the Survey Data

The sites identified during the survey represent the best efforts of the Midwest CHP Application Center to identify actual and potential BCHP installations in Michigan. Other existing or candidate BCHP sites may exist. An analysis of the survey information for the commercial and light industrial sectors is provided in Table 3-1 and Figure 3.1.

Table 3-1 BCHP Capacity Installed by Sector in Michigan

CHP Sector	Installed Generation *(MWe)*	% Installed Generation	Installed Generation w/ Heat Recovery *(MWe)*	% w/ Heat Recovery Installed
Hospitals	10.86	4%	3.80	3%
Municipal Water/Resource Recovery	46.30	18%	0.43	0%
Hotels/Offices	4.10	2%	0.06	0%
Schools/Universities	126.33	50%	121.90	83%
Landfill Gas	7.64	3%	2.06	1%
Airports	17.10	7%	17.10	12%
Others	40.60	16%	1.00	1%
Total:	**252.93**	**100%**	**146.35**	**100%**

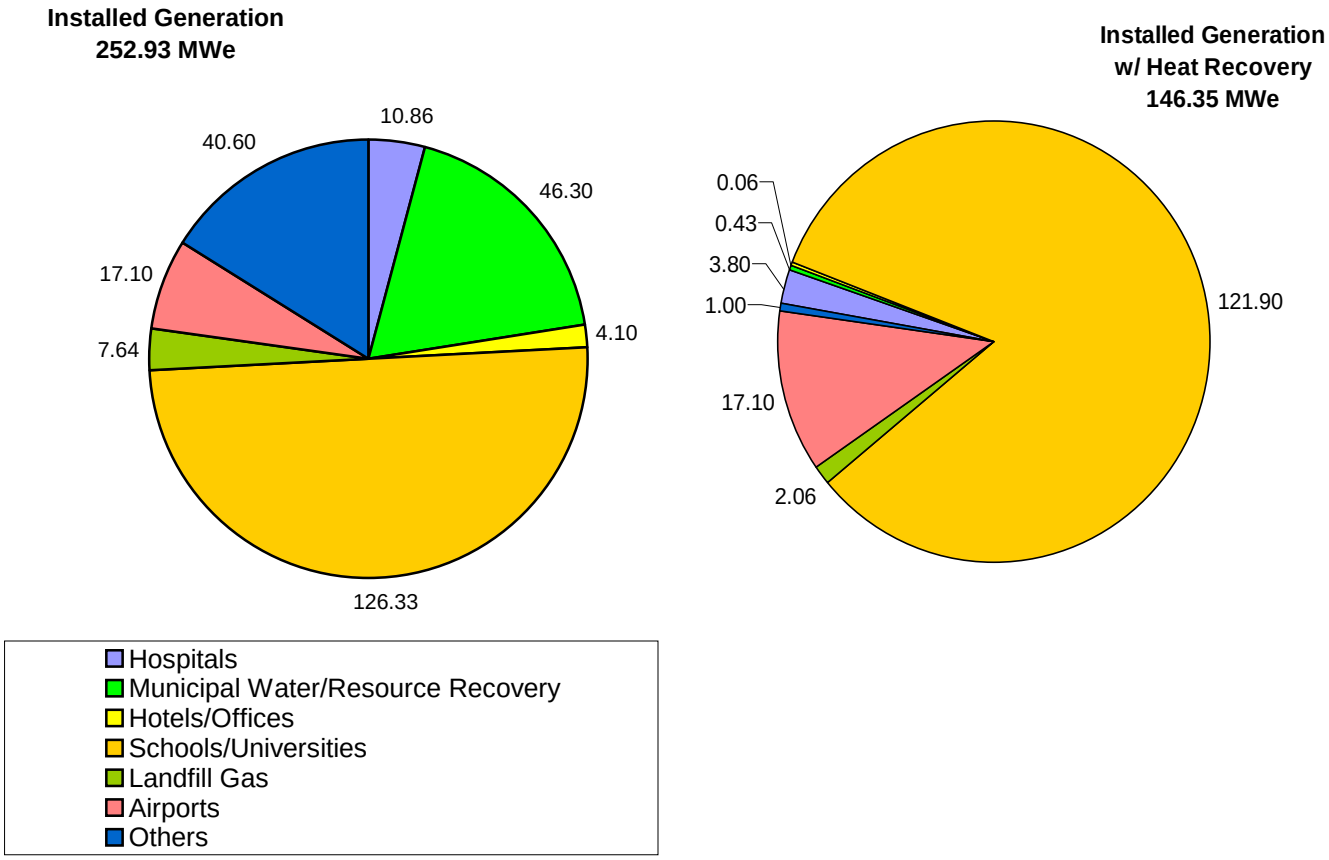


Figure 3.1 BCHP Capacity Installed by Sector in Michigan

As can be seen Schools/Universities constitute the biggest installed BCHP market segment in Michigan followed by airports, hospitals and landfill/gas operations. There is a large potential market to add BCHP, especially in the Municipal Water /Resource Recovery sector where there is a large percentage of installed generation without heat recovery.

4. Current Pricing Issues

Capital costs as well as operating costs are generally viewed as some of the major hurdles to utilize BCHP technologies. This section will address these issues.

4.1 Equipment and Maintenance Costs

The predominant prime mover technologies in BCHP applications are reciprocating engines, combustion turbines, and microturbines. In the near future fuel cell technology is expected to become a prevalent BCHP technology as well. Absorption chillers convert the waste heat stream from prime movers into cooling.

Each technology operates at different efficiency and capacity size levels. The following table compiled by the Midwest Combined Heat and Power Application Center indicates the cost and other relevant technical data for the various equipment types.

Table 4-1 CHP Technologies

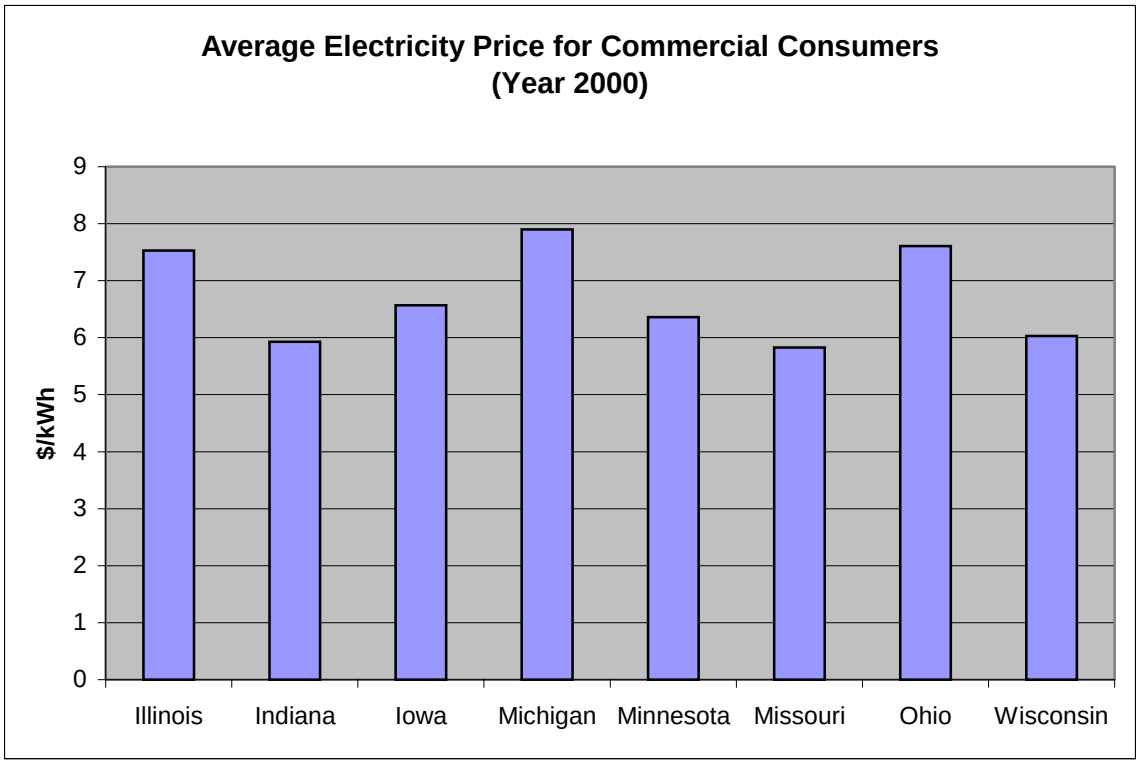
	Gas Engine		Gas Turbine - Simple Cycle		Micoturbines	Fuel Cells
Size Range (kWe)	**100 - 500**	**500 - 2,000**	**1,000 - 10,000**	**10,000 - 50,000**	**100 - 500**	**30 - 3,000**
Efficiency (LHV)						
Btu/kWh	**12,000 - 14,000**	**10,000 - 12,000**	**12,000 - 14,000**	**9,500 - 11,000**		
%	**24 - 28**	**28 - 34**	**24 - 28**	**31 - 36**	**14 - 40**	**40 - 57**
Installed Cost ($/kWe)* *(with Heat Recovery)*	**$1,400 - $1,800**	**$1,000 -$1,500**	**$1,000 - $1,500**	**$600 - $1,000**	**$1,000 - $1,500**	**$2,000 - $5,000**
O & M Costs ($/kWh)	**$0.012 - $0.015**	**$0.010 - $0.012**	**$0.003 - $0.006**	**$0.003 - $0.006**	**$0.005 - $0.010**	**$0.002 - $0.05**
Recoverable Heat						
Steam (lb/h/kWe)	**4 - 5** ***(15 - 30 psi)***	**4 - 5** ***(15 - 30 psi)***	**5 - 6** ***(300 - 600 psi)***	**5 - 6** ***(300 - 600 psi)***		
Hot Water (Btu/kWe/h)	**4,000 - 4,500**	**4,000 - 4,500**	**4,500 - 5,00**	**4,500 - 5,00**		
Absorption Cooling						
Single ($/RT)	**$500 - $1,000**	**$250 - $500**	**$200 - $250**	**$200 - $250**		
Double ($/RT)	**N/A**	**N/A**	**$400 - $500**	**$350 - $400**		
RT/kWe	**0.22 - 0.28**	**0.22 - 0.28**	**0.28 - 0.33**	**0.28 - 0.33**		
Electric Chillers ($/RT)	**$200 - $300**	**$200 - $300**	**$180 - $250**	**$180 - $250**		

** Costs can vary significantly due to interconnection and other siteing requirements.*

4.2 Energy Pricing

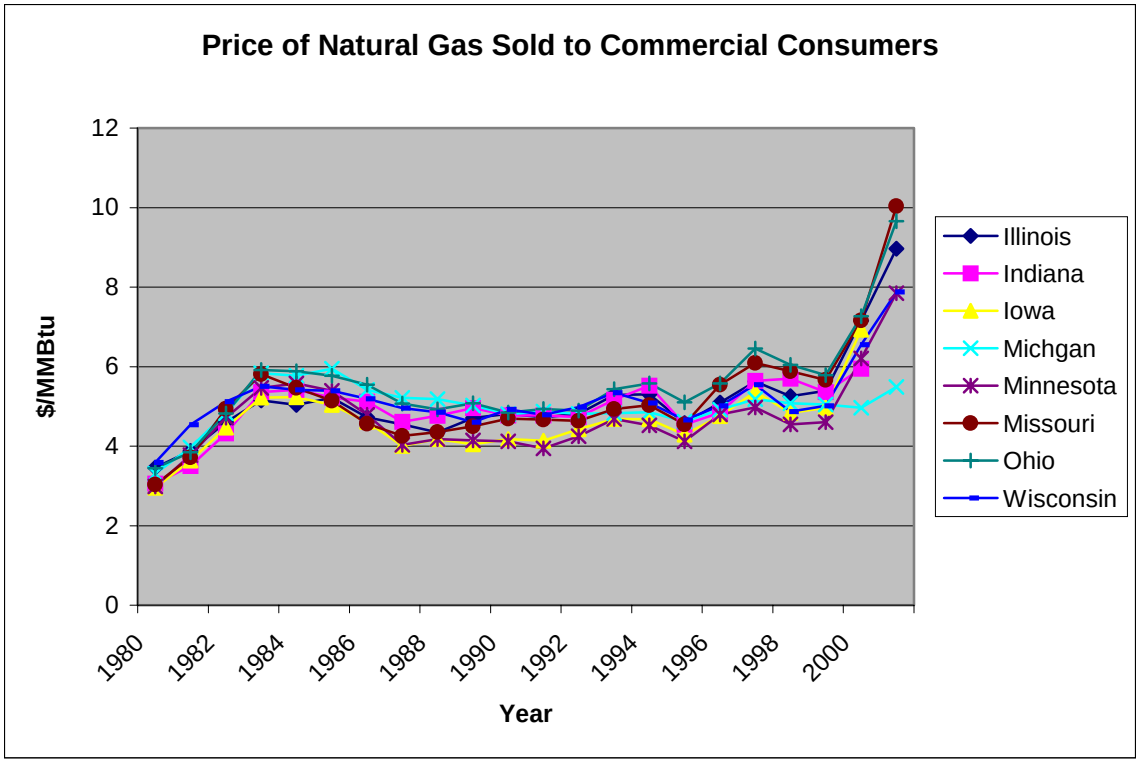
The potential for BCHP in a state depends largely on the prevailing electricity prices as well as on the prevailing natural gas prices, since natural gas is the fuel of choice for many BCHP systems. Relatively high electricity prices and low natural gas prices result in favorable financial paybacks for BCHP.

The graph below shows the average electricity prices for commercial consumers for the eight Midwestern states. As can be seen Michigan exhibits the highest electricity prices in the Midwest (7.9 cents/kWh in year 2000).



Source: Energy Information Administration http://www.eia.doe.gov/cneaf/electricity/esr/erst12p1.html

Natural gas prices in Michigan on the other hand are the lowest in the Midwest (5.49$/MMBtu in 2001). Furthermore, relative to its neighboring states, Michigan was the least affected by the 2001 natural gas price spikes.



Source: http://www.eia.doe.gov/neic/historic/hngas2.htm#Price

The prevailing electricity and natural gas prices should result in an attractive environment for CHP in the State of Michigan.

4.3 Standby Rates

Standby rates can be a disincentive for BCHP, since customers have to pay utilities for power "just in case" they need it. Detroit Edison's (Michigan's largest utility) Standby Rider (R3) (provided in Appendix I) is the rate that most affects the installation and operation of 100kW and above onsite electricity generation installations in their territory. This standby charge, as many others in the Midwest, is complex, and has charges for standby capacity based on a complicated formula of usage over a 12 month period. However, the rate provides a less complicated and restrictive option for those generating 2000 kW or less. Detroit Edison has a simpler Rider for installations under 100 kW: Rider DG (provided in Appendix J) that appears to be significantly less complex and restrictive to small-scale (<100kw) installations.

Consumers Energy Company also has a standby rate (CG). An electronic version of this rate can be viewed at their website www.consumersenergy.com/welcome.htm, under Energy Information, Rates and Rules, Electric Tariffs, then Cogeneration. This rate is complicated and it charges for the highest standby demand experienced over the contract period.

The complexity of the standby rate structures and the uncertainty of the cost of maintaining standby power "just in case" underscores one of the major barriers in

determining the actual economics of the installation and operation of larger BCHP installations.

4.4 Financial Incentives for BCHP Systems

On September 28, 2001, Governor John Engler signed the 2001-2002 Department of Consumer and Industry Services fiscal year appropriations bill which included a provision authorizing the Michigan Public Service Commission (MPSC) to begin making distributions from the Low-Income and Energy Efficiency Fund (LI/EE) of up to $60 million annually, for a period of 6 years. As part of the LI/EE distributions money was provided for a CHP project at Grand Valley State University and to NEXT Energy for a microgrid study.

5. Summary and Status of BCHP Policy Issues

Policy issues at the State level play an important role in the deployment of BCHP within a State. The purpose of this section is to provide a summary and status of policy related issues pertaining to the advancement of BCHP in the State of Michigan. The following policy areas are summarized below: Access and Interconnection Rules, General Status on Progress of Deregulation, Emerging Legislation, Exit Fees, and Standby Charges.

5.1 Access and Interconnection Rules

In Michigan there is no State standard for the interconnection process and related fees, however, policy is in the process of being developed. The Michigan Public Service Commission has submitted proposed interconnection rules to the legislative, with comments from the legislative expected by March 2003. The proposed interconnection rules are modeled after Texas' approach (Case No U-12485). Details can be accessed at http://efile.mpsc.cis.state.mi.us/efile/docs/12485/0005.pdf.

5.2 Exit Fees

In the State of Michigan there are no exit fees charged to companies or others that decide to exit from the grid and produce their own electricity for on-site use, as stated in Section 6 of the Michigan Customer Choice and Electricity Reliability Act (Public Act 141) (http://198.109.173.11/printdocument.asp?objName=2000-PA-0141&version=txt).

5.3 General Status of Progress on Deregulation

Full open access for all customers of investor owned utilities (IOUs) and electric cooperatives equal to or greater than 1 MW occurred on January 1, 2002. The remainder of co-op customers will have open access starting January 1, 2005. MPSC Staff provides annual reports to the Governor and Legislature on the status of electrical restructuring. The latest report dated February 1, 2003 can be found at http://cis.state.mi.us/mpsc/electric/restruct/ compreport2003.pdf. According to this report more than 5700 customers are currently participating in Michigan's retail open access program, twice as many as in 2001.

The MPSC also approved a "green rate" (http://efile.mpsc.cis.state.mi.us/cgi-bin/efile/viewcase.pl?casenum=13029) for Consumers Energy Company to buy zero emissions renewable energy and sell it back to consumers through their distribution system. The basis for "zero emissions" is a net reduction in existing emissions, therefore a bio-power application using a BCHP system might be eligible to provide green power to Consumer's Energy Company for resale.

Natural gas open access is proceeding in Michigan. The MPSC has licensing authority for alternative gas provides in the state (as of December 2002).

5.4 Emerging Legislation

There is currently no significant emerging legislation in Michigan which is relevant to CHP.

5.5 U.S. EPA CHP Partnership

The EPA CHP Partnership is a voluntary program designed to foster cost-effective CHP projects. Through the program EPA engages the CHP industry, state and local governments, and other stakeholders in cooperative relationships to expand the use of CHP.

As part of the partnership program, state and local governments agree to host a CHP workshop and review EPA documents detailing state and local regulations that may affect CHP development. Industrial partners agree to work with EPA to evaluate the use of additional CHP at their facilities. Partners in Michigan include the University of Michigan Ann Arbor and General Motors.

5.6 Potential Political Partners or Advocates of BCHP

Below is a list of groups, other than the Midwest Application Center, that could assist with the development and/or deployment of a BCHP in Michigan.

- Energy Michigan
- Michigan Clean Technology Cluster
- Midwest CHP Initiative
- Michigan Independent Power Producer Association
- Michigan Senate Technology and Energy Committee Members
- Michigan Senate Natural Resources and Environmental Affairs Committee Members
- Michigan House Energy and Technology Committee Members

Obviously, the Michigan Governor, the Mayor of Detroit, or the leadership in the Michigan House or Senate could also help, however, they are likely to be more difficult to reach and/or influence. Members of their staff's may be better targets with any BCHP initiative. The groups listed above are not to be viewed as all-inclusive, as there are other groups and or organizations to be targeted. Those listed above, however, should make for a good starting point.

A very favorable partner for BCHP is DTE Energy Technologies. As mentioned earlier, they are participating in one of the DOE packaged BCHP development projects (with United Technologies) and they are actively marketing distributed energy technologies. In September of 2002, they hosted the second "Micro Generation to Power Parks" Conference, which focused on distributed energy. This conference was very well attended.

6. The Market Capacity Potential of BCHP in Michigan

The previous sections identified the key parties currently involved with BCHP technology and detailed some of the areas preventing market transformation. However, market transformation in favor of BCHP technologies is only viable if the market potential exists. Therefore this report discusses the market potential for each BCHP category: industrial, commercial, and multi-unit residential.

Estimates for the Industrial/Commercial Sector were derived from a previous study conducted by ONSITE-SYCOM Energy Corporation (ONSITE). Estimates for the Multi-family Residential Sector are based on Midwest CHP Application Center research.

6.1 Industrial and Commercial Market

ONSITE Energy Corporation in January 2000 prepared a study for the Energy Information Administration titled "The Market and Technical Potential for Combined Heat and Power in the Commercial/Institutional Sector." This study identified potential BCHP application sites using the iMarket, Inc. MarketPlace Database to select commercial/industrial building types based on SIC codes.

The potential buildings were: hotels/motels, nursing homes, hospitals, schools, colleges, commercial laundries, car washes, health clubs, golf clubs, museums, correctional facilities, water treatment plants, extended service restaurants, supermarkets and refrigerated warehouses. The buildings were divided into different groups based on their electric demand. The electric demand was estimated using data from Wharton Economic Forecasting. As a result ONSITE selected 1,431,805 buildings in the United States as suitable for BCHP applications requiring a capacity of 77,281 MW.

There study focused on applications where thermal energy load was in the form of steam or hot water usage. It did not take into consideration the use of thermal activated technologies such as absorption chillers or desiccant dehumidifiers as potential candidates for thermal load. Taking into consideration these technologies will likely increase the market potential from their estimates.

On a state-by-state basis, ONSITE estimated the following potential as shown in Figure 6.1 on the next page.

For Michigan, ONSITE estimated a total market potential for electric production to be in the range of 2,400 to 7,500 MW. This represents 5 to 16% of the projected DOE long-term goal of 47 gigawatts of installed BCHP capacity that was developed as part of the BCHP Roadmap Workshop. This potential may only be realized if the regulatory and policy issues become more supportive of BCHP installations. Also if incentives are provided, additional market potential capacity could be realized.

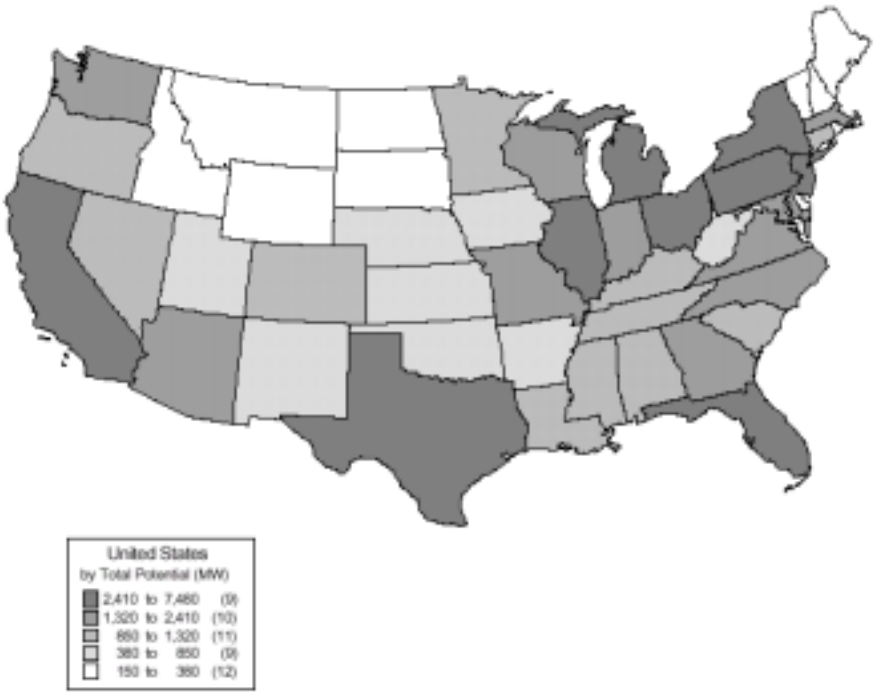


Figure 6.1 CHP Potential in the US at the State Level

6.2 Multi-Family Residential Market

Besides commercial and industrial applications BCHP systems also have potential market viability for multi-unit residences (those with 2 or more units). Compared to conventional HVAC systems BCHP installations are particularly competitive when it comes to new construction or complete replacement of old HVAC systems. Since all new and replacement HVAC systems need to be permitted in Michigan, permitting data provides a good estimate of buildings where BCHP systems may be a potential alternative. As Figure 6.2 below indicates, overall privately owned construction activities in the State of Michigan are fairly high.

Applying the following assumptions the potential market for BCHP applications for multi-unit residences can be estimated:

- New construction remains at or near the same level as in the year 2001 (10,287 units, excludes single-family units),
- HVAC systems need to be replaced every 20 years, therefore units installed in 1981 would need to be replaced in the year 2001, and
- The number of HVAC units replaced in 2001 is consistent with the number of units installed in 1981 (7,670 units).

Applying these assumptions the new building permit data for multi-unit residences was obtained for 1981 and 2001. Therefore the market potential for multi-unit residential BCHP installation in Michigan for 2002 is estimated to be about 18,000 units (replacement plus new construction units).

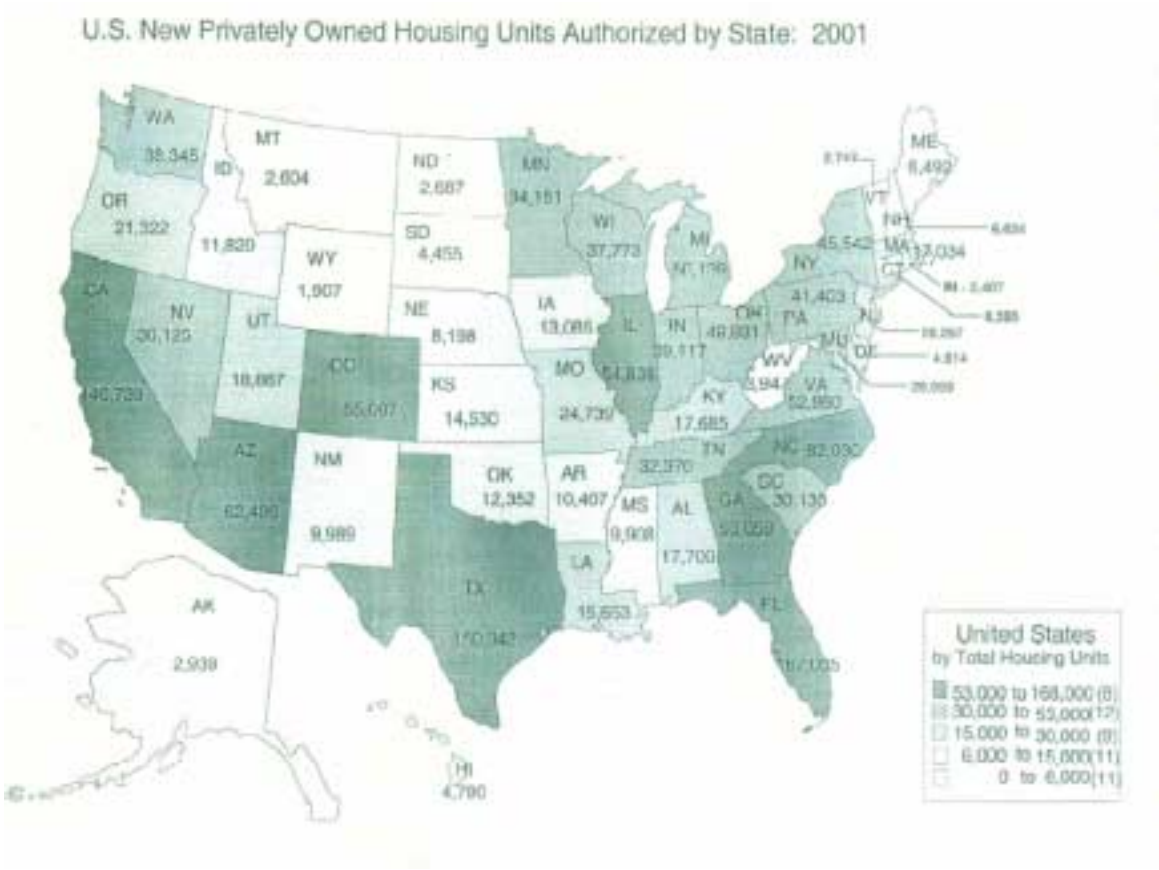


Figure 6.2 U.S. New Privately Owned Housing Units Authorized by State: 2001

7. Conclusions and Recommendations

7.1 Conclusions

7.1.1 Interest Level

In Michigan approximately 40 technical companies are actively involved in BCHP deployment in the State. There are several large well-known engineering firms, as well as equipment manufactures and distributors who are aggressively pursuing the BCHP market in Michigan.

The Midwest is home to many non-profit organizations and associations that have come forward to support the deployment of BCHP, in fact the Midwest appears to be leading the way in promoting the deployment of BCHP with such organizations as the Midwest CHP Initiative.

7.1.2 Installation Status

There is currently not a significant amount of BCHP in Michigan; the Midwest Application Center identified a total of 20 BCHP systems, producing a little over 146,000 kW in Michigan. Schools/Universities constitute the biggest installed BCHP market segment in Michigan (122,000 kW) followed by installations at airports (17,000 kW) and hospitals (3,800 kW). There is also a large potential market for an additional 105,000 kW where thermal heat recovery technologies could be added to installations where there is only distributed generation. The largest potential for adding BCHP to existing distributed generation installation exists in the Municipal Water/Resource Recovery sectors (45,000 kW).

7.1.3 Barriers

Interconnection poses to be one of the biggest barriers to BCHP in Michigan because there is no State standard for the interconnection process and related fees. This is compounded by the large number of electric suppliers within Michigan, each with their own interconnection requirements and fees. However, the Michigan Public Service Commission has recently submitted proposed standards to the legislative, with a response due in March 2003.

Capital costs and payback time frames are of concern. The least expensive electric generating technologies (large natural gas turbines) installed start around $600/kW and increase up in cost to fuel cell technologies that run up to $5,000/kW. Additional costs, associated with thermal recovery equipment and engineering costs further add to the cost of the project. Prices are expected to decrease as the technologies and system designs become more common. For smaller generating capacity units, this initial cost can have a long payback period unless electric costs are very high and thermal loads well matched.

Operating costs due to fluctuating gas prices as recently experienced, although not as severe as the winter of 2000/2001, may be perceived as a concern. The EIA expects natural gas prices to be around $3 per MMBTU by 2020. The average price paid for natural gas by commercial customers in Michigan was 5.49$/MMBtu in 2001.

Standby charges and ***Electricity rates*** are also a factor in BCHP because they affect the payback period. Detroit Edison's Standby Rider (R3) affects the onsite electricity generation installations of 100kW or more. This rate can be a disincentive for BCHP because charges for standby capacity are calculated on a complicated method based on

standby usage over a 12-month period. However, the rate provides a less complicated and restrictive option for those generating 2000 kW or less. Detroit Edison also has Rider DG, which is less restrictive and complicated for installations less than 100 kW, which may be viewed as more favorable towards BCHP installations. The average cost of electricity in Michigan is also relatively high at 7.9¢/kWh for commercial customers in 2000 making BCHP more competitive.

7.1.4 Favorable Characteristics

Open access to the grid was made available on January 1, 2002 to all customers of utilities and large co-ops. Open access to natural gas is also available.

Exit fees do not apply to those decide to exit form the grid to provide their own electricity. This was provided for in the Michigan Customer Choice and Electricity Reliability Act (Public Act 141).

Favorable political climate for energy efficient technologies appears to exist in Michigan. The Low Income and Energy Efficiency Fund, established by Public Act 141, Customer Choice and Electricity Reliability Act, might be able to provide funds for BCHP projects because they can be considered energy efficient.

Favorable alliances exit in Michigan. The Midwest appears to be leading the way in promoting the deployment of BCHP with such organizations as Energy Michigan and the Michigan Clean Technology Cluster. Energy Michigan helps support self generating interests by legislative and regulatory activities; intervening in cases on retail wheeling, competitive bidding, standby rates and other similar issues. Another very favorable partner for BCHP in Michigan is DTE Energy Technologies. They are participating in one of the DOE packaged BCHP development projects (with United Technologies) and they are actively marketing distributed energy technologies.

Market potential appears to be reasonable for BCHP. ONSITE Energy Corporation estimates for Michigan a total market potential of between 2,400 to 7,500 MW. Besides commercial and industrial estimates by ONSITE the MAC estimated that the potential Michigan market for BCHP installations in the multi-unit residential sector to be about 18,000 units.

Availability of natural gas is good in Michigan; they produce about 25% of their own gas needs and have substantial gas storage facilities.

7.2 Recommendations

1) Increase Interest and Market Penetration

   Develop a higher level of interest in BCHP by providing information and education to Architects, Engineers, Property Management Firms on the

   - Technical and financial benefits of BCHP.
   - Siting and permitting process.
   - Successful BCHP installations (Case Studies).
   - Technical and financial assessments tools and resources available.

2) Influence the Removal of Regulatory Barriers

Work with the Michigan Public Service Commission to

- Reduce or eliminate stand-by charges.

Work with the Legislative to

- establish appropriate incentives for BCHP such as tax breaks and environmental credits.
- Promote net metering legislation

3) Build Alliances

Build alliances with potential partners such as:

- Large Architect/Engineering Firms with BCHP capabilities
- Energy Michigan
- Michigan Clean Technology Cluster
- DTE Energy Technologies

Appendix A Architect and Engineering Firms Promoting BCHP Technologies in Michigan

1) American Institute of Architects, Michigan (AIAMI)
555 East Jefferson Ave.
Detroit, MI 48226
Tel: (313) 965-4100

2) Albert Kahn Associates, Inc.
7430 Second Ave.
Detroit, MI 48202
313-202-7000
Capabilities: Architecture and Engineering

3) Ballard Engineering
3555 Electric Avenue
Rockford, IL 61125
(815) 229-1800
Capabilities: BCHP Turnkey Systems

4) CAI Commenwealth Associates, Inc.
P.O. Box 1124
Jackson, MI 49204
(517) 788-3474
Capabilities: Consulting Engineers and Construction Management

5) Charles Equipment Co.
1340 S. Waverly Road
Lansing, MI 48917
(517) 322-0864
Capabilities: BCHP Turnkey Installations

6) CMS Energy Corporation
Fairlane Plaza South
Suite 1100
330 Town Center Drive
Dearborn, MI 48126Cummins & Barnard, Inc. Consulting Engineers
5405 Data Court, Suite 100
Ann Arbor, MI 48108
Capabilities: BCHP Turnkey Installations, Consulting Engineers
(734) 761-9130

7) DTE Biomass Energy
425 South Main Street, Suite 201
Ann Arbor, MI 48104
(800)216-3338, x2092

8) GKC-EME
205 W. Wacker Drive
Chicago, IL 60606
Capabilities: BCHP Turnkey Installations

9) DTE Energy/Michcon
333 Bridge Street NW
P.O. Box 420
Grand Rapids, MI 49501
616-776-2919
or
37849 Interchange Drive
Farmington Hills, MI 48335
248-427-2361

10) ESB Consulting, Inc.
606 Bartbridge Drive
East Lansing, MI 48823
517-332-0761

11) First Power
900 Third Street
Muskegon, MI 49440
231-726-4500

12) La Salle Associates
3700 North Southport
Chicago, IL 60613
Capabilities: BCHP Turnkey Installations

13) Montgomery Watson Harza
175 West Jackson Blvd
Chicago, IL 60604-2814
Capabilities: BCHP Turnkey Installations

14) Peter Basso Associates, Inc.
5145 Livernois, Suite 100
Troy, MI 48098
Capabilities: Consulting Engineers

15) Stanley Consultants, Inc.
225 Iowa Avenue
Muscatine, IA 52761
(563) 264-6457
Capabilities: BCHP Engineering, Environmental and Construction Services

16) NextEnergy
Detroit, MI
313-873-9260

17) Primera Engineering
25 E. Washington St.
Suite 510
Chicago, IL 60602
Contact: Ken Panunci
(312) 606-0629
Capabilities: HVAC Engineering, BCHP Potential

18) Sierra
91 South Maine Street, P.O. Box 136
Kent City, MI 49330
800-769-7437
Capabilities: Geological and Environmental Consultants

19) STM Power
275 Metty Drive
Ann Arbor, MI 43103
734-995-1755

20) Smith, Adams & Associates, LLC
2133 University Park, Ste. 700
Okemos, MI 48864
Capabilities: Bio-sustainable technology

21) W.R. Bradley Co., LLC
29235 Lorie Lane
Wixom, MI 48393
Capabilities: VOC Abatement, Boilers, Burners

NOTE: *This list represents only those firms that the MW BCHP Application Center was able to identify at the time of this report. Other firms may exist that promote BCHP; they will be added to the database and will be available over the website in the future as they are identified.*

Appendix B Equipment Distributors/Manufactures That Promote BCHP Technologies in Michigan

1) Caterpillar
   Distributor: Michigan CAT
   19500 Dix Toledo Rd.
   Brownstown Township, MI 48183-1040
   Capabilities: Electric Generation Equipment Manufacturer

2) Coffman Electrical Equipment Co.
   3300 Jefferson Avenue SE
   Grand Rapids, MI 49548
   (616)-452-8708
   Capabilities: Cogeneration Equipment Distributor

3) Solar Turbines Incorporated
   40 Shuman Blvd. Suite 350
   Naperville, IL 60563
   (630) 527-1700
   Capabilities: Electric Generation Equipment Manufacturer

4) Trane
   3353 Lousma Drive S.E.
   Grand Rapids, MI 49548
   Capabilities: HVAC systems, Air Handling Products

5) Generac Power Systems
   5625 Van Born Ct.
   Dearborn Hts., MI
   Capabilities: Power Generators

6) Detroit Diesel Corporation
   Corporate Offices
   13400 Outer Drive West
   Detroit, Michigan, 48239-4001

7) Hess Microgen
   12 Industrial Parkway, Unit B-1
   Carson City, NV 89706
   (775) 884-1000
   Capabilities: Generators with Heat Recovery

8) Eisenmann
   150 E. Dartmoor Dr.
   Crystal Lake, IL 60014
   Contact: Mark West
   (815) 455-4100
   Capabilities: Air Purification

9) ADA Systems
955 North Lively Boulevard
Wood Dale, IL 60191
Capabilities: Evaporative Cooling Systems, Energy Recovery

10) Huntington Environmental Systems, Inc.
707C West Algonquin Road
Arlington Heights, IL 60005
Capabilities: Emissions Control Equipment

NOTE: *This list represents only those firms that the MW BCHP Application Center was able to identify at the time of this report. Other firms may exist that promote BCHP; they will be added to the database and will be available over the website in the future as they are identified.*

Appendix C Property Management Organizations and Firms in Michigan

1) BOMA Detroit Metro
   38800 Country Club Dr.
   Farmington Hills, MI 48331-3411

2) Mid-Michigan BOMA
   730 E Hazel Street
   Lansing, MI 48912

3) BOMA Greater Grand Rapids
   c/o Campau Square Plaza Building
   99 Monroe Ave., NW
   Suite 202
   Grand Rapids, MI 49503-2639

IREP Accredited Real Estate Management Firms:

4) McKinley Properties
   Nancy E. Dolan
   320 N. Main Street, Suite 200
   Ann Arbor, Michigan 48104

5) McNeil Real Estate Management, Inc.
   Laura S. Johnson
   49000 Denton Road, Building 27, Suite 103
   Belleville, Michigan 48111

6) The FOURMIDABLE Group, Inc.
   J. Ronald Slavik
   32605 W. 12 Mile Road, Suite 350
   Farmington Hills, Michigan 48334

7) Village Green Management Co.
   Michael Hirschelman
   30833 Northwestern Highway, Suite 300
   Farmington Hills, Michigan 48334-2551

8) Piper Realty Co.
   Robert S. Piper
   5454 Gateway Centre, Suite B
   Flint, Michigan 48507

9) Phoenix Properties, LLC
   Steven W. Cadwallader
   PO Box 200000
   Kalamazoo, Michigan 49019-1000

10) First Housing Corp.
Gleason E. Amboy, Jr.
4275 Five Oaks Drive
Lansing, Michigan 48911

11) P.M. One, Ltd.
Michael G. McGhie
5215 Jolly Cedar Court
Lansing, Michigan 48911

12) Meadow Management, Inc.
Cleon J. Wills
27780 Novi Road, Suite 110
Novi, Michigan 48377

13) Farbman Management Group of Michigan, Inc.
Lawrence Miller
28400 Northwestern Highway, #400
Southfield, Michigan 48034

14) Schostak Brothers & Co., Inc.
Jerome L. Schostak
25800 Northwestern Highway, Suite 750
Southfield, Michigan 48075

15) Signature Associates, Inc.
Marvin Perlin
1 Towne Square, Suite 1200
Southfield, Michigan 48076

16) Kirco Management Services, Ltd.
Inta Hubbard Davis
201 W. Big Beaver Road, Columbia Center, Suite 1200
Troy, Michigan 48084

17) The Hayman Co.
Cheryl Boul
5700 Crooks Road, Suite 400
Troy, Michigan 48098

NOTE: *This list represents only those firms that the MW BCHP Application Center was able to identify at the time of this report.*

Appendix D Energy Supply and Service Companies in Michigan

Natural Gas Providers:

1) Aurora Gas Company
   7038 Black River Road
   Onaway, MI 49765

2) Citizens Gas Fuel Company
   127 North Main Street
   Adrian, MI 49221-0040

3) Consumers Energy Company
   212 West Michigan Avenue
   Jackson, MI 49201-2277

4) Michigan Consolidated Gas Company
   500 Griswold Street
   Detroit, MI 48226

5) Michigan Gas Utilities, a Division of UtiliCorp United, Inc.
   899 S. Telegraph Road
   Monroe, MI 48161

6) Peninsular Gas Company
   4205 S. 94th Street
   Omaha, NE 68127

7) Peoples' Natural Gas Company, a Division of UtiliCorp United, Inc.
   1815 Capitol Avenue
   Omaha, Nebraska 68102

8) Presque Isle Electric & Gas Coop., Inc.
   19831 M-68Onaway, MI 49765

9) SEMCO Energy Gas Company a division of SEMCO Energy, Inc.
   405 Water StreetP.O. Box 5026
   Port Huron, MI 48061-5026

10) Superior Energy Company|
    14428 Wuoski
    Kaleva, MI 49645

11) Wisconsin Public Service Corp.
    700 N. Adams St.P.O. Box 19001
    Green Bay, WI 54307-9001

12) Xcel Energy
    1414 W. Hamilton
    P.O. Box 8
    Eau Claire, WI 54702-0008

Electricity Providers:

Investor Owned Electric Utilities

1) Alpena Power Company
310 North 2nd Avenue
Alpena, MI 49707
(517)356-2293
FAX:517-356-4760

2) American Electric Power Company
(Indiana Michigan Power Company)
110 West Michigan
Suite 1000-A
Lansing, Michigan 48933-1603

3) Consumers Energy Company
212 W. Michigan Avenue
Jackson, MI 49201-2277

4) The Detroit Edison Company
2000 Second Avenue
Detroit, MI 48226-1279

5) Edison Sault Electric Company
725 E. Portage Avenue
Sault Ste. Marie, MI 49783

6) Michigan Electric Power Coord. Center
1901 S. Wagner Road
Ann Arbor, MI 48103

7) Upper Peninsula Power Company
600 Lakeshore Drive
P.O. Box 130
Houghton, MI 49931-0130

8) Wisconsin Electric Power Company
231 W. Michigan St.
P.O. Box 2046
Milwaukee, Wisconsin 53201

9) Wisconsin Public Service Corporation
700 N. Adams St.
P.O. Box 19001
Green Bay, Wisconsin 54307-9001

10) Xcel Energy (formerly Northern States Power)
1414 West Hamilton Avenue
P.O. Box 8
Eau Claire, Wisconsin 54702-0008

Cooperative Electric Utilities

11) Alger Delta Cooperative Electric Association
426 North 9th Street
Gladstone, MI 49837

12) Bayfield Electric Cooperative, Inc.
P.O. Box 68
Iron River, Wisconsin 54847

13) Cherryland Electric Cooperative
5930 U.S. 31 South
P.O. Box 298
Grawn, MI 49637

14) Cloverland Electric Cooperative
Highway M-28
P.O. Box 97
Dafter, MI 49724

15) Great Lakes Energy Cooperative
1323 Boyne Ave.
P.O. Box 70
Boyne City, MI 49712-0070

16) Midwest Energy Cooperative
901 E. State St.
P.O. Box 127
Cassopolis, MI 49031

17) Ontonagon County Rural Electrification Association
500 J.K. Paul Street
P.O. Box 97
Ontonagon, MI 49953

18) Presque Isle Electric & Gas Co-op
19831 M-68 Highway
P.O. Box 308
Onaway, MI 49765

19) Thumb Electric Cooperative
2231 Main Street
P.O. Box 157
Ubly, MI 48475-0157

20) Tri-County Electric Cooperative
7973 E. Grand River Avenue
P.O. Box 379
Portland, MI 48875

21) Wabash Valley Power Association
722 North High School Rd.
Indianapolis, Indiana 46214

22) Wolverine Power Supply Cooperative, Inc.
[Unregulated by the Michigan Public Service Commission (MPSC)]
10125 West Watergate Rd.
P.O. Box 229

Municipal Electric Utilities
[Unregulated by the MPSC]

23) Village of Baraga
100 Hemlock Street
P.O. Box 290
Baraga, MI 49908-0290

24) Bay City Electric Light & Power
900 S. Water Street
Bay City, MI 48708-7098

25) City of Charlevoix
210 State Street
P.O. Box 550
Charlevoix, MI 49720-1345

26) Chelsea Electric and Water Department
305 South Main Street, #100
Chelsea, MI 48118-1085

27) Clinton Board of Public Works
119 E. Michigan Avenue
Clinton, MI 49236

28) Coldwater Board of Public Utilities
28 W. Chicago Street,
P.O. Box 469
Coldwater, MI 49036-0469

29) Croswell Light & Power Dept.
120 E. Sanborn Avenue
P.O. Box 197
Croswell, MI 48422-1224

30) City of Crystal Falls
401 Superior Avenue
Crystal Falls, MI 49920-1424

31) Daggett Electric Department
Daggett, MI 49821-9999

32) Detroit Public Lighting Department
9449 Grinnell Avenue
Detroit, MI 48213

33) Dowagiac Department of Public Services
241 South Front Street
P.O. Box 430
Dowagiac, MI 49047-0430

34) City of Eaton Rapids
City Hall
200 S. Main
Eaton Rapids, MI 48827-1256

35) Escanaba Electric Department
1711 Sheridan Road
Escanaba, MI 49829-1800

36) City of Gladstone
1100 Delta Avenue
P.O. Box 32
Gladstone, MI 49837-0032

37) Grand Haven Board of Light & Power
1700 Eaton Drive
Grand Haven, MI 49417-2872

38) Harbor Springs Municipal Utility
170 Zoll Street
Harbor Springs, MI 49740-1513

39) Hart Hydro Electric
407 State Street
Hart, MI 49420-1228

40) Hillsdale Board of Public Utilities
45 Monroe St.
Hillsdale, MI 49242-1236

41) Holland Board of Public Works
625 Hastings Avenue
Holland, MI 49423-5427

42) Village of L'Anse
101 N. Main Street
P.O. Box 166
L'Anse, MI 49946-1101

43) Lansing Board of Water and Light
1232 Haco Drive
P.O. Box 13007
Lansing, MI 48901-3077

44) Lowell Light and Power
127 N. Broadway Street
P.O. Box 229
Lowell, MI 49331-0229

45) Marquette Board of Light and Power
2200 Wright Street
Marquette, MI 49855

46) City of Marshall
323 W. Michigan Avenue
Marshall, MI 49068-1547

47) Michigan South Central Power Agency
P.O. Box 62
720 Herring Road
Litchfield, MI 49252-0062

48) Negaunee Electric Department
100 Silver Street,
P.O. Box 70
Negaunee, MI 49866-1434

49) Newberry Water & Light Board
307 East McMillan Avenue
P.O. Box 493
Newberry, MI 49868-1550

50) Niles Utilities Department
322 E. Main Street
P.O. Box 217
Niles, MI 49120-0217

51) Norway Electric Department
915 Brown Street
P.O. Box 99
Norway, MI 49870-1243

52) Paw Paw Department of Public Services
111 E. Michigan Avenue
P.O. Box 179
Paw Paw, MI 49079-0179

53) City of Petoskey
101 East Lake Street
Petoskey, MI 49770-2311

54) Portland Light and Power Board
259 Kent Street
Portland, MI 48875-1458

55) Sebewaing Light & Water Department
110 W. Main
Sebewaing, MI 48759

56) South Haven Board of Public Works
539 Phoenix St.
South Haven, MI 49090-1499

57) Stephenson Utilities Department
W. 628 Samuel Street
Stephenson, MI 49887

58) Sturgis Municipal Electric Plant
130 N. Nottawa
P.O. Box 280
Sturgis, MI 49091

59) Traverse City Light & Power Department
400 Boardman Avenue
Traverse City, MI 49684

60) Union City Electric Department
208 N. Broadway
Union City, MI 49094

61) Wakefield Electric Light Department
311 Sunday Lake St.
Wakefield, MI 49968

62) Wyandotte Municipal Service Commission
3005 Biddle Avenue
Wyandotte, MI 48192

63) Zeeland Board of Public Works
350 E. Washington Avenue
Zeeland, MI 49464

Links to Major Utilities in Michigan	Consumers Energy: www.consumersenergy.com/ Detroit Edison: www.detroitedison.com/ Michigan Public Power Agency: www.mpower.org/
List of Electrical Suppliers in Michigan	Utilities Suppliers**:** www.eia.doe.gov/cneaf/electricity/utility/esraddr7.txt Non-Utility Suppliers**:** www.eia.doe.gov/cneaf/electricity/nonutility/nc_km_fac.txt

Appendix E Energy Service Companies

1) Thermax Inc.
   S. S. Shastri
   President
   Novi, MI

2) CMS MS&T Michigan
   One Jackson Square
   Jackson, MI 49201

3) Siemens Building Technologies
   Branch Detroit
   31623 Industrial Rd
   Livonia MI, 48150

4) Siemens Building Technologies
   Branch Grand Rapids
   1525 Gezon Pkwy SW
   Suite A
   Wyoming MI 49509

5) ESG Energy Systems Group
   Detroit, MI

NOTE: *This list represents only those firms that the MW BCHP Application Center was able to identify at the time of this report. Other firms may exist that promote BCHP; they will be added to the database and will be available over the website in the future as they are identified.*

Appendix F Associations/Organizations Associated with BCHP Deployment in Michigan

Michigan/Regional Organizations

	Organization	Website
1.	American Institute of Architects	http://www.aia.org
2.	BOMA Building Owners and Managers Association	http://www.boma.org
3.	Center for Neighborhood Technology	http://www.cnt.org
4.	Delta Institute	http://www.delta-institute.org
5.	Ecology Center of Ann Arbor	http://www.hvcn.org/info/ecaa/about.html
6.	Energy Michigan	http://www.energy-michigan.org/
7.	Energy Resources Center – University of Illinois at Chicago	http://www.erc.uic.edu
8.	Environmental Law and Policy Center	http://www.elpc.org
9.	Gas Technology Institute	http://www.gastechnology.org
10.	Grand Valley State University School of Engineering	www.engineer.gvsu.edu
11.	Great Lakes Renewable Energy Association	http://glrea.org
12.	Interstate Renewable Energy Council (IREC)	http://www.eren.doe.gov/cro
13.	Michigan Clean Technology Cluster	http://www.micleantech.org
14.	Manufacturing Extension Program (MEP)	http://www.mep.nist.gov/index3.html
15.	Michigan Department of Consumer & Industry Services	http://cis.state.mi.us
16.	Michigan Department of Natural Resources	http://www.dnr.state.mi.us/
17.	Michigan Electric and Gas Association	http://www.gomega.org
18.	Michigan Electric Cooperative Association	http://www.countrylines.com
19.	Michigan Environmental Council	http://www.mecprotects.org/
20.	Michigan Independent Power Producer Association	http://www.mippa.net/
21.	Michigan Public Service Commission	http://www.cis.state.mi.us/mpsc/
22.	Midwest CHP for Buildings Application Center	http://www.chpcentermw.org
23.	Midwest Cogeneration Association	http://www.cogeneration.org
24.	Midwest Energy Efficiency Alliance (MEEA)	http://www.elpc.org/energy/index.htm
25.	Small Business Association of Michigan	http://sbam.org

26.	State of Michigan, Department of Environmental Quality	http://www.deq.state.mi.us/
27.	University of Michigan Industrial Assessment Center	http://www.engin.umich.edu/prog/pim/iac.html

NOTE: *This list represents only those organizations that the MW BCHP Application Center was able to identify at the time of this report. Other organizations may exist that promote BCHP; they will be added to the database and will be available over the website in the future as they are identified.*

Federal Government Agencies

	Agency	Website/Contact Information
1.	DOE Combined Heat and Power (BCHP) Initiative	http://www.eren.doe.gov/der/BCHP/
2.	DOE Distributed Energy Resources (DER) Taskforce	http://www.eren.doe.gov/der/
3.	DOE Distributed Power (DP) Program	http://www.eren.doe.gov/distributedpower/
4.	DOE Energy Efficiency and Renewable Energy Network (EREN)	http://www.eren.doe.gov/
5.	DOE Energy Information Administration	http://www.eia.doe.gov/
6.	DOE Industries of the Future (IOF)	http://www.oit.doe.gov/industries.shtml
7.	DOE Inventions & Innovation Program (I&I)	http://www.oit.doe.gov/inventions/
8.	DOE Office of Energy Efficiency and Renewable Energy (EERE)	http://www.eren.doe.gov/ee.html
9.	DOE Office of Industrial Technologies	http://www.oit.doe.gov/
10.	DOE Office of Power Technologies (OPT)	http://www.eren.doe.gov/power/
11.	EPA Climate Protection Division (CPD)	http://www.epa.gov/cpd.html
12.	EPA Office of Air & Radiation	http://www.epa.gov/oar/
13.	EPA Office of Air Quality Planning and Standards	http://www.epa.gov/oar/oaqps/
14.	EPA-DOE Energy Star Program	http://www.energystar.gov
15.	Federal Energy Management Program (FEMP)	http://www.eren.doe.gov/femp/
16.	Federal Laboratory Consortium for Technology Transfer	http://www.fedlabs.org
17.	Manufacturing Extension Partnership (MEP)	http://www.mep.nist.gov/
18.	US Department of Energy (DOE)	http://www.energy.gov
19.	US Department of Housing & Urban Development (HUD)	http://www.hud.gov/
20.	US Environmental Protection Agency (EPA)	http://www.epa.gov

NOTE: *This list represents only those organizations that the MW BCHP Application Center was able to identify at the time of this report. Other organizations may exist that promote BCHP; they will be added to the database and will be available over the website in the future as they are identified.*

Others Associations and Organizations

	Organization/Association	Website/Contact Information
1.	Alliance to Save Energy	http://www.ase.org
2.	American Council for an Energy-Efficient Economy (ACEEE)	http://aceee.org
3.	American Planning Organization (APA)	http://www.apa.org
4.	Brookhaven National Laboratory	http://www.bnl.gov
5.	Consortium for Energy Efficiency (CEE)	http://www.ceeformt.org/
6.	Distributed Power Coalition of America (DPCA)	http://www.dpc.org
7.	Electric Power Research Institute (EPRI)	http://www.epri.com
8.	Electric Power Supply Association (EPSA)	http://www.epsa.org
9.	International District Energy Association (IDEA)	http://www.districtenergy.org/
10.	National Association of Regulatory Utility Commissioners (NARUC)	http://www.naruc.org
11.	National Association of State Energy Officials (NASEO)	http://www.naseo.org
12.	National Energy Technology Laboratory	http://www.netl.doe.gov
13.	National Renewable Energy Laboratory	http://www.nrel.gov
14.	Natural Resources Defense Council (NRDC)	http://www.nrdc.org
15.	Northeast Midwest Institute	http://www.nemw.org
16.	Oak Ridge National Laboratory	http://www.ornl.gov
17.	Regulatory Assistance Project	http://www.rapmaine.org
18.	U.S. Combined Heat and Power Association (USBCHPA)	http://www.nemw.org/usBCHPa/

NOTE: *This list represents only those organizations that the MW BCHP Application Center was able to identify at the time of this report. Other organizations may exist that promote BCHP; they will be added to the database and will be available over the website in the future as they are identified.*

Appendix G Distributed Generation – Commercial/Light Industrial Facilities in Michigan

	Considered BCHP Installation for purposes of this study

Project Name	Capacity (MW)	Generator Type	Primary Energy Source	Generating Unit Status	Heat Recovery
Hospitals					
Henry Ford Medical Center	0.3	Recip Engine		Operation	Adsorption
Hutzel Hospital - Generator 2	0.8	Gas Combustion Turbine	Natural Gas	Standby	
Spectrum Hospital, Grand Rapids	3.5			Operating	Yes
Hutzel Hospital - Generator 1	0.8	Gas Combustion Turbine	Natural Gas	Standby	
Oakwood Hospital & Med Center - Generator 1	0.5	Gas Combustion Turbine	Natural Gas	Operating	
Oakwood Hospital & Med Center - Generator 2	0.5	Gas Combustion Turbine	Natural Gas	Operating	
Oakwood Hospital & Med Center - Generator 3	0.5	Gas Combustion Turbine	Natural Gas	Operating	
St Lawerance Hospital	0.16	Recip Engine		Standby	No
William Beaumont Hospital - Generator 1	1.9	Gas Combustion Turbine	Light Oil	Standby	
William Beaumont Hospital - Generator 2	1.9	Gas Combustion Turbine	Light Oil	Standby	
Total DG	**10.86**				
Total CHP	**3.8**				

Project Name	Capacity (MW)	Generator Type	Primary Energy Source	Generating Unit Status	Heat Recovery
Municipal Water/Resource Recovery					
Central Wayne Air Quality Energy Recovery Project	22	Steam Turbine	Natural Gas	Standby	
City of Adrian - Fresh Water System - Backup	0.5	Recip Engine		Standby	No
City of Ann Arbor - Water Pumping Station	0.6	Recip Engine		Standby	No
City of Benton Harbor		Recip Engine		Standby	Yes
City of Gross Pointe Park – Backup Pumping	0.113	Recip Engine		Standby	Jacket
City of Gross Pointe Park – Backup Pumping	0.224	Recip Engine		Standby	Jacket
Detroit Water Department – Backup Unit	0.11	Recip Engine		Standby	No
Jackson County Resource Recovery Facility	3.7	Steam Turbine	Natural Gas	Operating	
Kent County Waste to Energy Facility	18	Steam Turbine	Natural Gas	Operating	
Lansing Waste Water Treatment Plant	0.275	Recip Engine		Operation	Yes
Lansing Water Department	0.113	Recip Engine		Standby	No
Lansing Water Department	0.225	Recip Engine		Standby	No
Ludington Water Department	0.113	Recip Engine		Standby	No
Oakland County – Backup Pumping	0.113	Recip Engine		Standby	No
Pontiac Waste Water Treatment Plant	0.113	Recip Engine		Operation	Jacket
Pontiac Water Department	0.056	Recip Engine		Standby	No
Saline Waste Water Treatment Plant	0.045	Recip Engine		Operation	Yes
Total DG	**46.3**				
Total CHP	**0.433**				

Project Name	Capacity (MW)	Generator Type	Primary Energy Source	Generating Unit Status	Heat Recovery
Hotels/Offices					
Blue Cross Blue Shield - Corporate Headquarter	0.45	Recip Engine		Standby	Yes
Clarion Hotel	0.06	Recip Engine		Operation	Yes
McNamana Federal Building (Detroit)	0.625	Recip Engine		Standby	No
Park Davis - Pharmaceutical Laboratory	0.16	Recip Engine		Standby	No
Parkedale Pharmaceuticals Inc	2.8	Gas Combustion Turbine	Light Oil	Operating	
Schuler Corp.		Recip Engine		Standby	No
Total DG	**4.1**				
Total CHP	**0.06**				

Project Name	Capacity (MW)	Generator Type	Primary Energy Source	Generating Unit Status	Heat Recovery
Schools/Universities					
Eastern Michigan University	4	Recip Engine		Standby	Yes
Focus Hope - Technical School/Tooling Comp.	0.425	Recip Engine		Standby	No
Focus Hope - Technical School/Tooling Comp.	0.5	Recip Engine		Operation	Ebullient
Focus Hope - Technical School/Tooling Comp.	1	Recip Engine		Operation	Ebullient
Michigan State University - Generator 1	12.5	Steam Turbine	Coal	Operating	Yes
Michigan State University - Generator 2	12.5	Steam Turbine	Coal	Operating	Yes
Michigan State University - Generator 3	15	Steam Turbine	Coal	Operating	Yes
Michigan State University - Generator 4	21	Steam Turbine	Coal	Operating	Yes
Ferris State University	1			Operating	Yes
University Microfilm	0.45	Recip Engine		Operation	Ebullient
University of Detroit Mercy	0.45	Recip Engine		Operation	Ebullient
University of Michigan - Generator 1	12.5	Steam Turbine	Light Oil	Operating	Yes
University of Michigan - Generator 2	3.5	Gas Combustion Turbine	Light Oil	Operating	Yes
University of Michigan - Generator 3	4	Steam Turbine	Light Oil	Operating	Yes
University of Michigan - Generator 4	10	Steam Turbine	Light Oil	Operating	Yes
University of Michigan - Generator 5	10	Steam Turbine	Light Oil	Operating	Yes
University of Michigan - Generator 6	3.5	Gas Combustion Turbine	Light Oil	Operating	Yes
Central Michigan University	4			Operating	Yes
Western Michigan University	10			Operating	Yes
Total DG	**126.325**				
Total CHP	**121.9**				

Project Name	Capacity (MW)	Generator Type	Primary Energy Source	Generating Unit Status	Heat Recovery
Landfill Gas					
BFI Lyons - Landfill Gas	1	Recip Engine		Operation	Yes
BFI Marshall - Landfill Gas	1	Recip Engine		Operation	Yes
BFI Toledo - Landfill Gas	0.298	Recip Engine		Operation	No
Ealon Rapids Gas Storage Co	0.45	Recip Engine		Operation	Yes
EQ Waste Energy Services Inc - Generator 1	0.5	Internal Combustion Engine	Landfill Gas	Operating	
EQ Waste Energy Services Inc - Generator 2	0.4	Internal Combustion Engine	Landfill Gas	Operating	
EQ Waste Energy Services Inc - Generator 3	0.4	Internal Combustion Engine	Landfill Gas	Operating	
EQ Waste Energy Services Inc - Generator 4	0.4	Internal Combustion Engine	Landfill Gas	Operating	
Genix	1.05	Recip Engine		Standby	No
Great Lakes Gas	0.483	Recip Engine			
Southeastern Michigan Gas	0.06	Recip Engine		Operation	Absorption
Southeastern Michigan Gas		Recip Engine		Operation	No
Venice Resources Gas Recovery – Generator 1	0.8	Internal Combustion Engine	Landfill Gas	Operating	
Venice Resources Gas Recovery – Generator 2	0.8	Internal Combustion Engine	Landfill Gas	Operating	
Total DG	**7.641**				
Total CHP	**2.06**				

Project Name	Capacity (MW)	Generator Type	Primary Energy Source	Generating Unit Status	Heat Recovery
Airports					
Detroit Metro Airport	**17.1**				
Total DG	**17.1**				
Total CHP	**17.1**				
Others					
Cadillac Renewable Energy	39.6	Steam Turbine	Natural Gas	Operating	
Coles Bakery	0.5			Operating	Yes
Country Fresh Dairy	0.5	Recip Engine		Operation	Ebullient
Martin Mariette - Freshwater Pumping		Recip Engine		Standby	No
Total DG	**40.6**				
Total CHP	**1**				
TOTAL DG	**252.926**				
TOTAL CHP	**146.353**				

NOTE: *This list represents only those commercial and light industrial facilities that the MW BCHP Application Center was able to identify at the time of this report. Other commercial and light industrial facilities may exist that have distributed generation; they will be added to the database and will be available over the website in the future as they are identified.*

Appendix H Distributed Generation - Industrial Facilities in Michigan

Project Name	Generator Capacity *(MW)*	Generator Type	Primary Energy Source	Generating Unit Status	Heat Recovery
Industrial Facilities					
Ada Cogeneration LP - Generator 1	23.000	Gas Combustion Turbine	Natural Gas	Operating	
Ada Cogeneration LP - Generator 2	10.100	Steam Turbine	Natural Gas	Operating	
Adrian Energy Associates LLC - Gen 1	0.800	Internal Combustion Engine	Natural Gas	Operating	
Adrian Energy Associates LLC - Gen 2	0.800	Internal Combustion Engine	Natural Gas	Operating	
Adrian Energy Associates LLC - Gen 3	0.800	Internal Combustion Engine	Natural Gas	Operating	
Ajax Metal Processing		Recip Engine		Operation	Ebullient
ASA		Recip Engine		Operation	Hot Water
ASA		Recip Engine		Operation	Hot Water
Battle Creek Gas		Recip Engine		Operation	Yes
Brent Run Generating Station	0.800	Internal Combustion Engine	Landfill Gas	Operating	
Cargill Salt Inc - Generator 1	2.000	Steam Turbine	Coal	Operating	
Cargill Salt Inc - Generator 2	1.300	Steam Turbine	Coal	Operating	
Cellu Tissue Holdings Inc	2.500	Steam Turbine	Coal	Operating	
Champion International Corp	28.000	Steam Turbine	Black Liquor	Operating	
Chase Brass and Copper	0.600	Recip Engine		Standby	Yes
City of Saginaw		Recip Engine		Standby	No
Consumer Power	0.045	Recip Engine		Standby	No
Crown Paper Co Parchment Mill - Generator 1	9.400	Steam Turbine	Light Oil	Operating	

Project Name	Generator Capacity *(MW)*	Generator Type	Primary Energy Source	Generating Unit Status	Heat Recovery
Crown Paper Co Parchment Mill - Generator 2	9.400	Steam Turbine	Light Oil	Operating	
Dearborn Industrial Generation	159.000	Gas Combustion Turbine	Natural Gas	Operating	
Fletcher Paper Co	3.200	Steam Turbine	Natural Gas	Operating	
Formidable Brookhaven - Retirement Community	0.105	Recip Engine		Operation	Yes
Formidable Shorhaven Manor - Retirement Community	0.060	Recip Engine		Operation	Yes
Genesee Power Station LP	39.500	Steam Turbine	Natural Gas	Operating	
GM WFG Pontiac Site Power Plant	28.900	Steam Turbine	Coal	Standby	
Grand Blanc Generating Station - Generator 1	0.800	Internal Combustion Engine	Landfill Gas	Operating	
Grand Blanc Generating Station - Generator 2	0.800	Internal Combustion Engine	Landfill Gas	Operating	
Grand Blanc Generating Station - Generator 3	0.800	Internal Combustion Engine	Landfill Gas	Operating	
Grand Rapids East	1.100	Gas Combustion Turbine	Natural Gas	Operating	
Granger Electric Generating Station Generator 1	0.800	Internal Combustion Engine	Landfill Gas	Operating	
Granger Electric Generating Station Generator 2	0.800	Internal Combustion Engine	Light Oil	Operating	
Granger Electric Generating Station Generator 3	0.800	Internal Combustion Engine	Landfill Gas	Operating	
Granger Electric Generating Station Generator 4	0.800	Internal Combustion Engine	Light Oil	Operating	
Granger Electric Generating Station Generator 5	0.800	Internal Combustion Engine	Landfill Gas	Operating	
Granger Electric Generating Station Generator 6	0.800	Internal Combustion Engine	Light Oil	Operating	
Granger Electric Generating Station Generator 7	0.800	Internal Combustion Engine	Landfill Gas	Operating	
Granger Electric Generating Station Generator 8	0.800	Internal Combustion Engine	Light Oil	Operating	

Project Name	Generator Capacity *(MW)*	Generator Type	Primary Energy Source	Generating Unit Status	Heat Recovery
Granger Electric Generating Station Generator 9	0.800	Internal Combustion Engine	Light Oil	Operating	
Granger Ottawa Generating Station Generator 1	0.800	Internal Combustion Engine	Landfill Gas	Operating	
Granger Ottawa Generating Station Generator 2	0.800	Internal Combustion Engine	Landfill Gas	Operating	
Granger Ottawa Generating Station Generator 3	0.800	Internal Combustion Engine	Landfill Gas	Operating	
Granger Ottawa Generating Station Generator 4	0.800	Internal Combustion Engine	Landfill Gas	Operating	
Granger Ottawa Generating Station Generator 5	0.800	Internal Combustion Engine	Landfill Gas	Operating	
Granger Ottawa Generating Station Generator 6	0.800	Internal Combustion Engine	Landfill Gas	Operating	
Granger Seymour Road Generating Station	0.800	Internal Combustion Engine	Landfill Gas	Operating	
Grayling Generating Station LP	38.000	Steam Turbine	Natural Gas	Operating	
Greater Detroit Resource Recovery Facility	68.400	Steam Turbine	Light Oil	Operating	
Hillman Power Co LLC	20.000	Steam Turbine	Natural Gas	Operating	
James River Corp of Virginia - Generator 1	10.000	Steam Turbine	Natural Gas	Operating	
James River Corp of Virginia - Generator 2	1.800	Steam Turbine	Natural Gas	Operating	
Kalamazoo Paper Division	7.500	Steam Turbine	Coal	Operating	
Kalamazoo River Generating Station	73.100	Gas Combustion Turbine	Natural Gas	Standby	
Kimberly Clark Corp	6.300	Steam Turbine	Coal	Operating	
LaFarge Corp Alpena - Generator 1	12.000	Steam Turbine	Coal	Operating	
LaFarge Corp Alpena - Generator 2	10.000	Steam Turbine	Coal	Operating	
LaFarge Corp Alpena - Generator 3	11.000	Steam Turbine	Coal	Operating	
LaFarge Corp Alpena - Generator 4	11.000	Steam Turbine	Coal	Operating	

Project Name	Generator Capacity *(MW)*	Generator Type	Primary Energy Source	Generating Unit Status	Heat Recovery
LaFarge Corp Alpena - Generator 5	3.200	Steam Turbine	Coal	Operating	
Langenberg Machine	0.140	Recip Engine		Standby	Yes
Livingston Generating Station - Generator 1	42.900	Gas Combustion Turbine	Natural Gas	Standby	
Livingston Generating Station - Generator 2	42.400	Gas Combustion Turbine	Natural Gas	Standby	
Livingston Generating Station - Generator 3	42.400	Gas Combustion Turbine	Natural Gas	Standby	
Livingston Generating Station - Generator 4	42.400	Gas Combustion Turbine	Natural Gas	Standby	
Louisiana Pacific Co	6.200	Steam Turbine	Coal	Operating	
Marco Acquisition Corp	2.500	Internal Combustion Engine	Diesel Oil	Operating	
Mead Paper Corp - Generator 1	22.100	Steam Turbine	Black Liquor	Operating	
Mead Paper Corp - Generator 2	54.000	Steam Turbine	Black Liquor	Operating	
Mead Paper Corp - Generator 3	27.200	Steam Turbine	Black Liquor	Operating	
Michigan Cogeneration Sys Inc - Generator 1	0.800	Internal Combustion Engine	Landfill Gas	Operating	
Michigan Cogeneration Sys Inc - Generator 2	0.800	Internal Combustion Engine	Landfill Gas	Operating	
Michigan Power LP - Generator 1	58.000	Steam Turbine	Natural Gas	Operating	
Michigan Power LP - Generator 2	96.100	Gas Combustion Turbine	Natural Gas	Operating	
Midland Cogeneration Venture - Generator 1	13.500	Steam Turbine	Diesel Oil	Operating	
Midland Cogeneration Venture - Generator 2	380.000	Steam Turbine	Waste Heat	Standby	
Midland Cogeneration Venture - Generator 3	87.200	Gas Combustion Turbine	Natural Gas	Operating	
Midland Cogeneration Venture - Generator 4	87.200	Gas Combustion Turbine	Natural Gas	Operating	
Midland Cogeneration Venture - Generator 5	87.200	Gas Combustion Turbine	Natural Gas	Operating	

Project Name	Generator Capacity *(MW)*	Generator Type	Primary Energy Source	Generating Unit Status	Heat Recovery
Midland Cogeneration Venture - Generator 6	87.200	Gas Combustion Turbine	Natural Gas	Operating	
Midland Cogeneration Venture - Generator 7	87.200	Gas Combustion Turbine	Natural Gas	Operating	
Midland Cogeneration Venture - Generator 8	87.200	Gas Combustion Turbine	Natural Gas	Operating	
Midland Cogeneration Venture - Generator 9	87.200	Gas Combustion Turbine	Natural Gas	Operating	
Midland Cogeneration Venture - Generator 10	87.200	Gas Combustion Turbine	Natural Gas	Operating	
Midland Cogeneration Venture - Generator 11	87.200	Gas Combustion Turbine	Natural Gas	Operating	
Midland Cogeneration Venture - Generator 12	87.200	Gas Combustion Turbine	Natural Gas	Operating	
Midland Cogeneration Venture - Generator 13	87.200	Gas Combustion Turbine	Natural Gas	Operating	
Midland Cogeneration Venture - Generator 14	87.200	Gas Combustion Turbine	Natural Gas	Operating	
Midland Cogeneration Venture - Generator 15	410.000	Steam Turbine	Natural Gas	Operating	
Midland Cogeneration Venture - Generator 16	5.300	Internal Combustion Engine	Diesel Oil	Standby	
N American Natural Resources	3.200	Internal Combustion Engine	Landfill Gas	Operating	
Ominex	0.870	Recip Engine		Operation	No
Omni-Source	0.870	Recip Engine		Operation	No
Pine Tree Acres - Generator 1	0.800	Internal Combustion Engine	Landfill Gas	Operating	
Pine Tree Acres - Generator 2	0.800	Internal Combustion Engine	Landfill Gas	Operating	
Pine Tree Acres - Generator 3	0.800	Internal Combustion Engine	Landfill Gas	Operating	
Pine Tree Acres - Generator 4	0.800	Internal Combustion Engine	Landfill Gas	Operating	
Pine Tree Acres - Generator 5	0.800	Internal Combustion Engine	Landfill Gas	Operating	
Powertrain Warren GMC	4.000	Gas Combustion Turbine	Natural Gas	Operating	

Project Name	Generator Capacity *(MW)*	Generator Type	Primary Energy Source	Generating Unit Status	Heat Recovery
Rawsonville Plant Ford Motor Co	4.500	Gas Combustion Turbine	Natural Gas	Operating	
Riverview Energy Systems - Gen 1	3.300	Gas Combustion Turbine	Natural Gas	Operating	
Riverview Energy Systems - Gen 2	3.300	Gas Combustion Turbine	Natural Gas	Operating	
Romulus Operations Powertrain Division	10.700	Gas Combustion Turbine	Natural Gas	Standby	
S D Warren Co 1 Muskegon - Gen 1	3.500	Steam Turbine	Black Liquor	Operating	
S D Warren Co 1 Muskegon - Gen 2	19.100	Steam Turbine	Black Liquor	Operating	
S D Warren Co 1 Muskegon - Gen 3	28.400	Steam Turbine	Black Liquor	Operating	
Smurfit Stone Container Corp	14.800	Steam Turbine	Coal	Operating	
Sumpter Energy Associates - Generator 1	0.800	Internal Combustion Engine	Landfill Gas	Operating	
Sumpter Energy Associates - Generator 2	0.800	Internal Combustion Engine	Landfill Gas	Operating	
Sumpter Energy Associates - Generator 3	0.800	Internal Combustion Engine	Landfill Gas	Operating	
Sumpter Energy Associates - Generator 4	0.800	Internal Combustion Engine	Landfill Gas	Operating	
Sumpter Energy Associates - Generator 5	0.800	Internal Combustion Engine	Landfill Gas	Operating	
Sumpter Energy Associates - Generator 6	0.800	Internal Combustion Engine	Natural Gas	Operating	
Sumpter Energy Associates - Generator 7	0.800	Internal Combustion Engine	Natural Gas	Operating	
Sumpter Energy Associates - Generator 8	0.800	Internal Combustion Engine	Natural Gas	Operating	
Sumpter Energy Associates - Generator 9	0.800	Internal Combustion Engine	Natural Gas	Operating	
Sumpter Energy Associates - Generator 10	0.800	Internal Combustion Engine	Natural Gas	Operating	
Sumpter Energy Associates - Generator 11	0.800	Internal Combustion Engine	Natural Gas	Operating	
Sumpter Energy Associates - Generator 12	0.800	Internal Combustion Engine	Natural Gas	Operating	

Project Name	Generator Capacity *(MW)*	Generator Type	Primary Energy Source	Generating Unit Status	Heat Recovery
Sumpter Energy Associates - Generator 13	0.800	Internal Combustion Engine	Natural Gas	Operating	
Sumpter Energy Associates - Generator 14	0.800	Internal Combustion Engine	Natural Gas	Operating	
Sumpter Energy Associates - Generator 15	0.800	Internal Combustion Engine	Natural Gas	Operating	
TES Filer City Station LP	70.000	Steam Turbine	Coal	Operating	
Viking Energy of Lincoln	18.000	Steam Turbine	Railroad Ties	Operating	
Viking Energy of McBain	18.000	Steam Turbine	Railroad Ties	Operating	
Voss Lantz	0.500	Gas Combustion Turbine	Natural Gas	Operating	
Voss Lantz	0.500	Gas Combustion Turbine	Natural Gas	Operating	
Voss Lantz	0.500	Recip Engine		Operation	Ebullient
Voss Steel	0.500	Recip Engine		Operation	Ebullient
Voss Taylor	0.500	Gas Combustion Turbine	Natural Gas	Operating	
Voss Taylor	0.500	Gas Combustion Turbine	Natural Gas	Operating	
Warner Lambert Co	2.800	Gas Combustion Turbine	Light Oil	Operating	
Total	**3126.39**				

NOTE: *This list represents only those industrial facilities that the MW BCHP Application Center was able to identify at the time of this report. Other industrial facilities may exist that have distributed generation; they will be added to the database and will be available over the website in the future as they are identified.*

Appendix I Detroit Edison Parallel Operation and Standby Service (Rider 3)

THE DETROIT EDISON COMPANY

STANDARD CONTRACT RIDER NO. 3
PARALLEL OPERATION AND STANDBY SERVICE
SYNOPSIS

Effective for service rendered on and after January 22, 1994

APPLICABLE TO: General Service Rate Schedule Designation D3
Interruptible General Service Rate Schedule Designation D3.3
Large General Service Rate Schedule Designation D4
Primary Supply Rate Schedule Designation D6
Alternative Primary Supply Rate Schedule Designation D6.1
Interruptible Supply Rate Schedule Designation D8
Primary Pumping Schedule Designation E4
Secondary Pumping Schedule Designation E5

STANDBY SERVICE: Customers who desire to run electrical generating equipment in parallel with the Company's system or customers who desire the Company to serve load that is normally served by the customer's generator or prime mover must take standby service under the provisions of this rider and must take supplemental service on one of the applicable filed rates listed above.

Customers who desire to run electrical generating equipment in parallel with the Company's system must have written permission by the company for parallel operation. Any customer operating in parallel with the Company's system under written permission by the Company but not taking service under Rider No. 3 as of January 1, 1989, will not be required to take service under Rider No. 3 as long as there is no change in the customer's generating facilities or other source of energy.

Customers purchasing their entire energy requirements from the Company with generators or prime movers installed for use only in emergency will not be considered as taking standby service. The effective date for service under this rider will be the first full billing cycle for each customer which begins on or after July 1, 1989. All customers operating in parallel with the Company's system must install the necessary equipment to permit metering by July 1, 1989. The Company will supply the metering equipment. Parallel operation without metering will not be permitted after July 1, 1989, except by written permission of the Company.

PARALLEL OPERATION: The customer must meet the interconnection requirements of Detroit Edison specified in "Protective Relaying Operating and Telemetering Guidelines for Independently-Owned Generation," published by the Company, as approved by the Michigan Public Service Commission, before parallel operation will be

permitted. The Company must approve in writing any subsequent changes in the interconnection configuration before such changes are allowed. Operating in parallel with the Company's system without written approval by the Company of the interconnection and any subsequent changes to the interconnection will make the customer subject to disconnection.
Except for the acts or omissions of the Company's employees or agents which occur on the Customer's side of the point of interconnection the customer shall indemnify, defend and hold the Company and its officers, agents and employees harmless from any liabilities, claims, losses, demands, costs, damages or damage which (i) occur on the Customer's side of the point of Interconnection resulting from the installation, maintenance, possession or operation of the Facility, or (i i) occur on the Company's side of the point of interconnection up to the first point of the Company's General Facility Protection if at the time of the injury or damage, the Company is not providing electric energy to the customer and the injury or damage was caused by the customer's intentional defeat of the protective relays.

The Company shall indemnify, defend and hold the Customer and its officers, agents and employees harmless from any liabilities, claims, losses, demands, costs, damages or judgments, including reasonable attorneys' fees, arising out of all personal injuries or property damages which occur on the Company's side of the point of interconnection resulting from the installation, maintenance, possession or operation of the Company's General Facilities; (i) except for the acts or omissions of the Customer's employees or agents which occur on the Company's side of the point of interconnection; and (i i)except for those injuries or damages for which the Customer is to indemnify the Company pursuant to the preceding paragraph.

The Customer shall maintain and furnish current evidence of comprehensive general liability insurance in the amount of $2,000,000 per occurrence. This insurance can be a combination of primary and excess insurance. The Company shall be named as an additional insured under the customer's policy. The customer need not provide insurance if it can demonstrate that its current assets exceed current liabilities by $7,500,000 or more. If the customer fails to provide insurance or does not meet the requirements of the preceding sentence for waiver of insurance, then the Company will purchase insurance in the amount of $2,000,000 to protect the Company (but not the customer). The cost of such insurance will be paid by the customer. The customer’s insurance, its waiver, or insurance purchased by the Company shall not limit the Customer's indemnity obligations. Parallel operation will not be permitted (or will be terminated) if the Customer fails to provide insurance, meet the waiver requirements or pay the cost of insurance obtained by the Company.

STANDBY CONTRACT CAPACITY: **Standby contract capacity in kW will be established for electric capacity sufficient to meet the customer's standby load according to the following method.**

If the customer's generating unit has a least 5000 hours of metered operation with output greater than zero kW over the latest 12-month period, then the standby contract capacity

for the next 12 months will be set at the 1001st highest hourly kW output. At the customer's option, the standby contract capacity for June through October will be set at the 501st highest hourly kW output during the months of June through October and the standby contract capacity for November through May will be set at the 501st hourly kW output during the months of November through May. A customer may not later choose the 1001-hour determination above, unless with the Company's permission for permanent changes in the customer's facilities. For multiple generating units, "output" means the simultaneous output of all units.

If the customer's generating unit does not have at least 5000 hours of metered operation with output greater than zero kW over the latest 12-month period, then the standby contract capacity will be set at the generator's nameplate rating for one year, after which time paragraph (a) above will apply if the generator's output has been greater than zero for at least 5000 hours. If not, then the standby contract capacity will continue at nameplate rating for the next 12-month period. Where multiple nameplate ratings are specified, the rating at 60 degrees Fahrenheit will be used.

For customers demonstrating unusual operating conditions, including but not limited to generation greater than the customer's own load, standby contract capacity may be set by mutual agreement of the Company and the customer.

For generators which do not operate during the months of November through May, standby contract capacity will be set at zero for November through May and will be set at the nameplate rating for June through October.

The standby contract capacity shall not be decreased over the life of the contract, except by mutual agreement of the Company and the customer for permanent changes in a customer's facilities and except as provided for in paragraph (f) below. Such a reduction in standby contract capacity will not be allowed more than once per year.

The standby contract capacity will be adjusted on an annual basis according to paragraphs (a) and (b) above.

For customers with multiple generating units which do not have 5000 hours of metered operation with simultaneous output greater than zero over the latest 12-month period, the standby contract capacity may be set by mutual agreement of the Company and the Customer for one year.

For the first time only that a customer takes service under this rider, if the customer has not previously operated in parallel with the company's system and if the customer's generating unit does not have at least 5000 hours of metered operation with output greater than zero over the latest 12-month period, then the standby contract capacity will be set at zero kW for 30 days, after which paragraph (b) above will apply.

SUPPLEMENTAL POWER: Supplemental power is electric energy and capacity provided by Detroit Edison to serve the customer's total internal load which is in addition

to that portion of the customer's total internal load equal to the standby contract capacity. For each point of service, total internal load equals the output of the customer's generation plus the power supplied by the Company. Supplemental demand equals total internal load less standby contract capacity, but not less than zero. Supplemental power will be billed under the applicable rate schedule for supplemental service ("supplemental rate schedule").

METERING REQUIREMENTS: The output of customer generation or, if appropriate, the load served by another source of power or the customer's prime mover will be metered by Detroit Edison. For customers served on supplemental rate schedules D3, D3.3, D4, and E5, the entire load served by the Company will be metered with demand-recording equipment.

STANDARD CONTRACT RIDER NO. 3
PARALLEL OPERATION AND STANDBY SERVICE RATES:

Service Charge:
$210.00 per customer per month for customers served at primary voltages and above.
$ 70.00 per customer per month for customers served at secondary voltages.

Monthly Generation Reservation Fee:
$0.86 times the standby contract capacity in kW, per month.

Non-Generation Charge:
Monthly non-generation fixed charges per kW of standby contract capacity will be as follows.

For standby contract capacity set according to paragraph (d) of the "Standby Contract Capacity" section above, the charge for all months will be based on the standby contract capacity specified for June through October.
$1.51 per kW at transmission voltage
$2.36 per kW at subtransmission voltage
$3.25 per kW at primary voltage
$3.80 per kW at secondary voltage

Demand Charge:
A daily on-peak demand charge for back-up or maintenance demand will be charged based on the determination of supplemental and back-up or maintenance power coincident with the daily highest 30-minute integrated reading during on-peak hours of the demand meter which measures the total load served by Detroit Edison.
The daily on-peak demand charge for back-up power is $0.90 per kW per day. Back-up demand equals standby contract capacity minus the 30-minute output of the customer's generator, but not less than zero, and not greater than the total load served by the Company, measured during periods other than maintenance periods as defined below. If the customer's total internal load is less than or equal to the output of the generator, then back-up demand will be zero for that day.

The daily on-peak demand charge for maintenance power is $0.48 per kW per day. Maintenance demand equals standby contract capacity minus the 30-minute output of the customer's generator, but not less than zero, and not greater than the total load served by the Company, during maintenance periods as defined below. If the customer's total internal load is less than or equal to the output of the generator, then maintenance demand will be zero for that day.

Energy Charge:
An energy charge for back-up and maintenance power will be charged based on standby contract capacity less the output of the customer's generator, but not less than zero. For customers served on supplemental rate schedules D4, D6, D6.1, D8, and E4, the energy charge will be the D6 on-peak energy charge, 2.49¢ per kWh, plus appropriate credits and surcharges, including but not limited to off-peak credit, voltage level credit, and substation credit. For customers served on supplemental rate schedules D3, D3.3, and E5, the energy charge will be the applicable energy charge plus surcharges less a credit per kWh equal to the non-generation fixed charge per kW, $3.80, divided by 500, applied to the first 500 hours use of standby contract capacity per month for back-up or maintenance power. The energy gas stated herein is also subject to the provision of schedule designation B-4.6 PSCR clause.

Waivers and limits for demand/energy rates:
For customers served on supplemental rates schedules D4, D6, D6.1, D8, and E4, the following applies:

If the total of daily demand charges for the month is less than the monthly generation reservation fee, then the daily demand charges will be waived for that month.
If the total of daily demand charges for the month is greater than the monthly generation reservation fee, then the generation reservation fee will be waived for that month.
If the total of daily demand charges for the month is greater than the D6 on-peak billing demand charge times the standby contract capacity plus the difference between the product of the D6 maximum demand charge times the standby contract capacity and the standby non-generation fixed charges, then the customer will pay the D6 on-peak billing demand charge times the standby contract capacity plus the above difference. For customers on supplemental rate schedule D4, the above difference will be set to zero.

Waivers and limits for energy-only rates:
For customers served on supplemental rates schedules D3, D3.3, and E5, the following Applies:

If the total of daily demand charges for the month is less than the monthly generation reservation fee, then the daily demand charges will be waived for that month.

If the total of daily demand charges for the month is greater than the monthly generation reservation fee, then the daily demand charges will be waived for that month provided that the supplemental rate continues as an energy-only rate. If not, then paragraphs 6(b) and 6(c) above will apply.

MAINTENANCE PERIODS: A customer may specify, subject to conditions below set by the Company, up to 20 on-peak days during a year as maintenance days. In addition, the day after Thanksgiving and on-peak days occurring during the period from December 24 through January 1 plus contiguous recognized legal holidays may be scheduled as maintenance days subject to conditions below excluding (d). A maintenance day is a calendar 24-hour day.

Conditions:

The customer must request maintenance days in writing.

The Company must receive the request at least 45 days before the first requested maintenance day.

Requests will be honored according to the date received.

Requests may be refused by the Company if they conflict with the Company's own schedule of maintenance and expected demands. The Company will offer alternative maintenance days.

After the Company and the customer have agreed upon maintenance days, if there is a substantial change in circumstances which make the agreed upon schedule impractical for either party, the other party upon request shall make reasonable efforts to adjust the schedule in a manner that is mutually agreeable.

ADJUSTMENT OF PRIOR RATCHETS: When a customer takes standby service under Rider No. 3, the setting or the increasing or decreasing of standby contract capacity will affect the existing ratchet levels on the supplemental rate as follows:

An amount in kW equal to the initial standby contract capacity (or to the increase or decrease) will be subtracted from (or subtracted from or added to) the existing ratcheted maximum demand level for customers on supplemental rates D6, D6.1, D8, and E4.
An amount in kW equal to 65% of the initial standby contract capacity (or of the increase or decrease) will be subtracted from (or subtracted from or added to) the existing ratcheted on-peak billing demand level for customers on supplemental rates D4, D6, D6.1, and D8.
An amount in kW equal to 50% of the initial standby contract capacity (or of the increase or decrease) will be subtracted from (or subtracted from or added to) the existing ratcheted on-peak billing demand for customers on supplemental rate E4.

INTERRUPTIBLE STANDBY SERVICE:

Interruptible standby service is supplied in conjunction with supplemental rates D8 and D3.3, provided that the customer qualifies for D8 or D3.3 under the provisions of the respective rates.

For customers taking service on supplemental rate D8, the daily demand charge for back-up power and maintenance power will be waived on a day that the Company requests interruption, provided that the customer is assessed neither a non-interruption fee nor a non-interruption penalty under the terms of the D8 rates.

For customers taking service on supplemental rate D3.3, the customer's generator, prime mover, or other source of energy must be connected only to the interruptible circuit. The energy charge for back-up power and maintenance power will be the same as the energy charge for the D3.3 rate. The daily demand charge will be waived on a day that the Company interrupts the circuit.

Interruptible standby service will also be supplied in conjunction with any new interruptible supplemental rates approved by the Michigan Public Service Commission after January 1, 1989, under terms to be incorporated in this section.

EXPERIMENTAL STANDBY PROVISION:

Customers taking service on rates D3, D3.3, and E5 who install generating equipment on or after January 1, 1989, or who are operating generating equipment installed prior to January 1, 1989, with the Company's written permission may take standby service under this provision subject to conditions herein.

The total of standby contract capacity from all customers permitted under this provision may not exceed 2000 kW.

Customers requesting service under this provision will be eligible to take service in the order that the Company approves their applications for interconnection. If a customer does not begin parallel operation within 12 months of the date of initial Company approval of the interconnection, then the customer must submit a new request for service under the provision.

A customer without generation facilities installed and operating with the Company's written permission prior to January 1, 1989, and who is being served at a supplemental rate other than D3, D3.3, and E5 may not change supplemental service to rates D3, D3.3, or E5 and take service under this provision.

This provision will terminate on December 31, 1993.

For customers served under this provision:
The service charge will be waived.
The monthly generation reservation fee will be waived.
The non-generation reservation fee will be waived.
The daily demand charge will be waived.

The Company will reimburse the customer for the cost of liability insurance specified in the "Parallel Operation" section above that is in excess of the customer's cost prior to interconnection, or the Company may waive the additional insurance requirement and accept the customer's current level of insurance.
The credit to the first 500 hours use of standby contract capacity, described in paragraph 5 of the "Rates" section above, will not apply.

SUBSTATION CREDIT: Available to customers served at subtransmission voltage level (24 to 41.6 kW) or higher who provide the on-site substation including all necessary transforming, controlling, and protective equipment. A credit of $.30 per kW shall be applied to the non-generation charge per kW of standby capacity.

BASE RATE REDUCTION: A credit of 3.227% applied to the base bill.

5% SECURITIZATION REDUCTION: A credit of 5% applied to the base bill and surcharges.

LATE PAYMENT CHARGE: See Schedule Designation B-2.10.

SCHEDULE OF ON-PEAK HOURS: See Schedule Designation B-4.4

POWER FACTOR CLAUSE: The rates and charges under this tariff are based on the customer maintaining a power factor of not less than 85% lagging. Customers are responsible for correcting power factors less than 70% at their own expense. The size, type and location of any power factor correction equipment must be approved by the Company. Such approval will not be unreasonably withheld. A penalty will be applied to the total amount of the monthly billing for supplemental and standby service for power factor below 85% lagging in accordance with the table in Power Factor Determination, Schedule Designation B-4.5. The penalty will not be applied to the on-peak billing demand ratchet nor to the minimum contract demand of the supplemental rate, but will be applied to metered quantities.

SPECIAL TERMS AND CONDITIONS: Customer-owned equipment must be operated so that voltage fluctuations on the Company's system shall not exceed permissible limits. Upon the request of a customer, the Company will provide monthly reports of the data from the meters measuring the load served by the Company and the output of the customer's generators, for a charge of $10.00 per report per month. Each report contains data from one meter. Application of Rider No. 2 for redundant service for customers served under this rider will be the same as for customers without generating equipment. Service under this rider will not be affected by ownership of the generation facility provided that:

The generation facility is located on the customer's site,
The load served by the generation facility is on the same site, and
The total output of the generation facility is utilized by the customer or sold to the Company.

CONTRACT TERM: The contract term is for a five-year period unless terminated by mutual consent and extending thereafter from month to month until terminated by mutual consent or by thirty day's written notice by either party.

DISPUTE RESOLUTION PROCEDURE: Any customer who disputes a determination or interpretation made by the Company under this rider may deliver a written notice of such dispute to the customer's service representative at the Company. The Company will respond to the notice in writing within 20 working days.

Disputes between the Company and the customer may be presented to the Michigan Public Service Commission for informal resolution.

Any customer who disputes a determination made by the Company under this rider may at any time file a formal complaint with the Office of the Secretary of the Michigan Public Service Commission.

Appendix J Detroit Edison Company Standard Contract Rider Distributed Generation

THE DETROIT EDISON COMPANY
STANDARD CONTRACT RIDER DG
DISTRIBUTED GENERATION
SYNOPSIS

Issued: March 7, 2001 Effective for service rendered on and after February 14, 2001

STANDARD CONTRACT RIDER DG
DISTRIBUTED GENERATION

APPLICABLE TO: Residential Service Rate Schedule Designation D1
General Service Rate Schedule Designation D3
Large General Service Rate Schedule Designation D4

AVAILABILITY OF SERVICE: Available to customers with on-site distributed generation desiring tooperate in parallel with the Company's system and take service for their supplemental needs underone of the applicable tariffs listed above. The on-site generation capacity shall be no greater than 100 kW at a single location. Distributed generation resources include reciprocating engine generator sets, small turbine-generators, fuel cells, regenerative dynamometers and renewable resources.

PARALLEL OPERATION: The customer must meet the interconnection requirements of the Companyspecified in "Protective Relaying, Operating and Telemetering Guidelines for Independently Owned Generation" ('Guidelines') published by the Company, as approved by the Michigan Public ServiceCommission, and have written permission from the Company before parallel operation will bepermitted. For single-phase equipment less than 25 kVA, the requirements are simplified and can usually be satisfied by performing an automatic shutdown test as described in Section 5.1 of the Guidelines.

The customer is advised to consult its insurers and insurance policies regarding the existence of coverage for on-site distributed generation resources. Homeowners' policies and insurers may afford varying degrees of coverage for this exposure, or may exclude it altogether. This statement is not to be viewed as the rendering of advice regarding the customer's insurance coverage.

RATES: The customer shall pay all direct costs of controlling and protective equipment necessitated by the presence of a source of power on his premises and costs to comply with the Guidelines.

Sell-Back Energy Rate:

For customers with a standard energy meter, the Company's monthly average top incremental costof power will be applied to all kilowatt-hours delivered to the Company's system.
For customers with a time-of-day meter, the Company's average monthly top incremental cost of power for each time-of-day period will be applied to all kilowatt-hours delivered to the Company's system during that time-of-day period.

For customers with an interval meter, the Company's top incremental cost for each hour will be applied to all kilowatt-hours delivered to the Company's system during that hour.

METERING REQUIREMENTS: The Company will install separate metering for energy sold by the Company to the customer and for energy sold-back to the Company by the customer. The Company will, at the customer's request, upgrade the sell-back meter to either a time-of-day or interval meter, but the incremental cost of such upgrade is the responsibility of the customer.

CONTRACT TERM: Open order, terminable on three day’s written notice by either party. Where special services are required, the term will be as specified in the applicable contract rider.