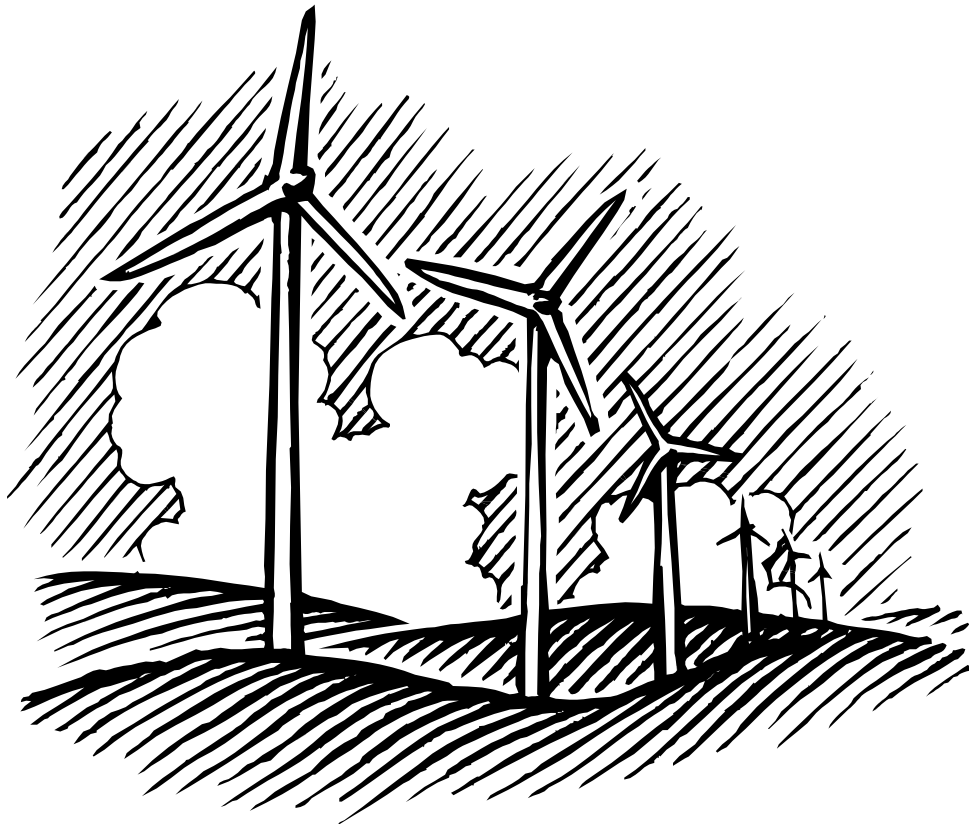



Wind Energy



3/1/2011



People's Cooperative Services

Your Touchstone Energy® Cooperative 

Wind Energy

Introduction.

Minnesota's wind energy resources are the focus of great interest as the state looks for efficient, environmentally friendly resources to help meet future power demands as well as supplement traditional fuels to generate electricity. Wind is proving itself as a cost-effective, reliable energy resource across the US and around the world.

The basic parts of a wind machine include the blades and an electrical generator. The wind causes the blades to rotate a shaft that is connected to a generator. The generator produces electricity that can be used at the site, stored for future use, or sold to a local electric utility. The amount of energy produced depends on the wind speed and the design of the wind machine.

To determine if a wind machine is a good investment for you, it is important to have as much information as possible. The initial cost of a wind machine can be \$20,000 or more, and will provide much of the electrical energy for a typical farm or residence.

These ten steps will help you decide if wind energy is right for you.

1. **Estimate your energy requirements.** Wind is an energy source that could help reduce your electric bills. Look at your energy consumption on your last 12 months bills. How much energy in kilowatt-hours have you used? Will your consumption in the future be the same, more, or less? Perform an energy audit of your home or farm to give you a better understanding of how much electricity is needed on your property.
2. **Evaluate energy conservation measures.** Many people consider using wind machines to reduce their energy bills. Energy conservation methods and equipment may be more cost effective than buying a wind machine.
3. **Evaluate legal and environmental concerns.** Wind is a clean, safe energy source that poses little threat to the general public. However, there are some environmental and safety concerns associated with the operation of a wind machine. Included are noise, tower height, TV signal interference, location, aesthetics, building codes and permits, and lightning. These concerns should be addressed in the early stages of your investigation. The answers may affect whether you install a wind machine, and what type it can be. Don't overlook the benefits of wind energy, including economic development, fuel diversity, fuel price stability, and environmental benefits such as avoiding gas emissions.

4. **Measure your wind resource.** Wind speed at your site will determine the amount of energy that a wind machine can produce. Wind speed is extremely site-dependent due to obstructions such as hills, trees and buildings. The best method of determining wind speed is to measure it with monitoring equipment. The measurement should be taken at the height and location you would install a wind machine. A minimum of one year of wind speed information is required to have an understanding of your wind resource as it may change from season to season. It is better to spend the time and money to determine what you have than to spend a large amount of money for a wind machine that doesn't give you adequate energy. The Minnesota Department of Public Service has performed some wind testing and may provide information about wind speed in your area.
5. **Collect wind machine information.** Begin collecting information on wind machines that can meet your energy needs. There are many types and sizes available. A list of manufacturers is enclosed.
6. **Estimate miscellaneous costs.** Be sure to include cost estimates for purchase, installation, operation and maintenance of the wind system you are interested in. To these estimates, miscellaneous costs must be added, including: site preparation, zoning permits, insurance, finance charges, property tax, utility requirements and storage capabilities.
7. **Potential government incentives.** Some state and federal agencies have offered financial incentives for alternative energy development. If you own a farm or business, you may be able to depreciate all or part of the cost of a wind system as a business expense. The Minnesota Department of Public Service can provide you with information on incentives and tax credits.
8. **Estimate your energy and cost savings.** The annual savings resulting from the energy generated by a wind machine depends upon the rate your utility charges for electricity. Annual savings for each system is calculated by multiplying the yearly energy production by the cost of energy that you would have bought from the utility.
9. **Wind machine evaluation.** Because a wind system's cost is significant, look at this expenditure as a long-term investment, like a house or farm. Calculate how many years it would take for the wind machine to pay for itself. You may want to have a wind machine dealer review your calculations.
10. **Making a final decision.** If you have researched wind energy as outlined in the previous nine steps, you should have an understanding of wind energy and it's potential benefits to you.

People's Cooperative Services Requirements for Interconnection

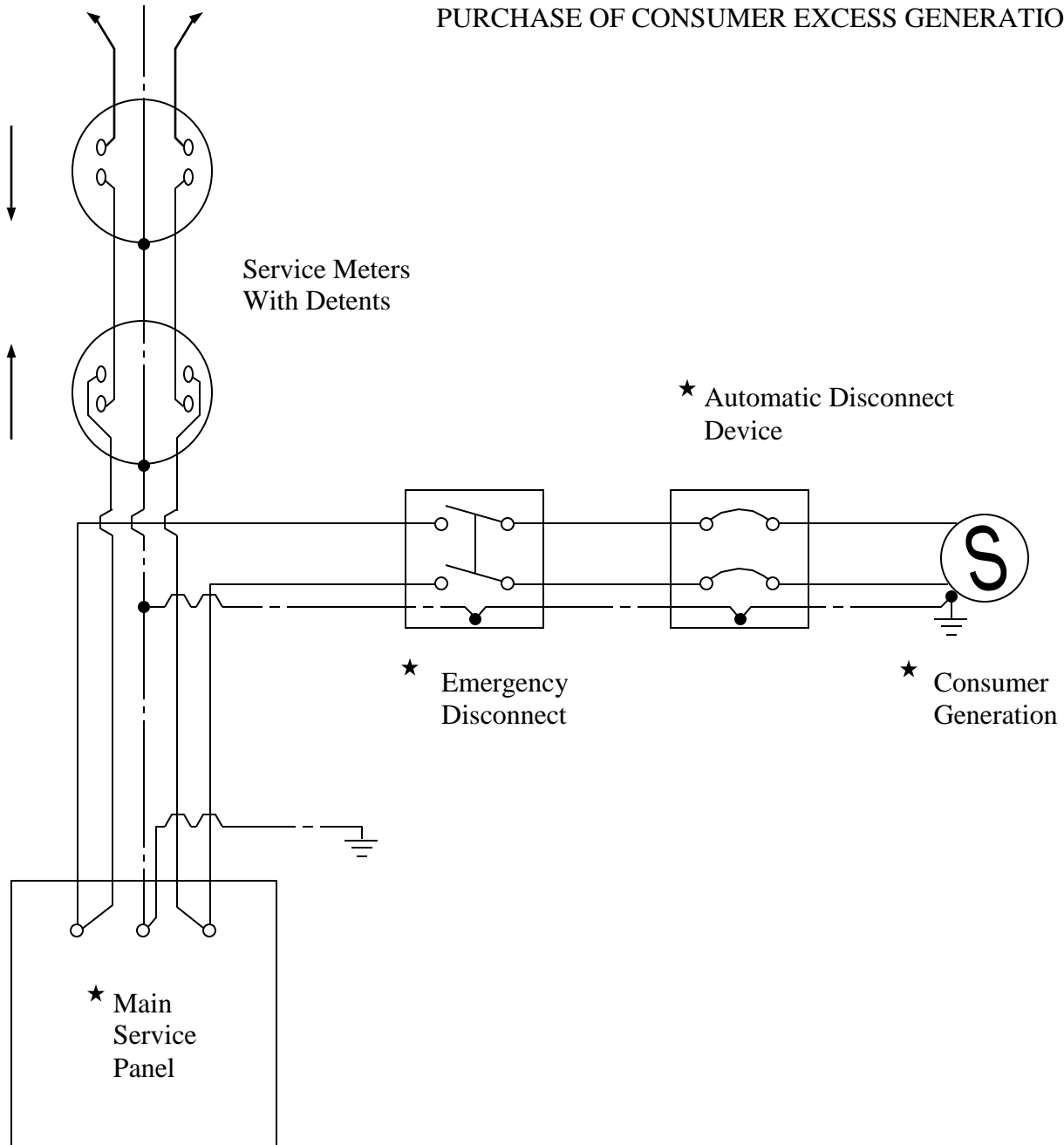
People's Cooperative Services is obligated by State and Federal law to interconnect with and purchase electricity from co-generators and small power producers. The diagram on the following page shows metering requirements for compliance.

Interested parties should contact People's Cooperative Services for copies of our Member Service Agreement for Cogeneration Facilities as well as a copy of our Application for Interconnection and rate schedules.

People's Cooperative Services
3935 Highway 14 East - PO Box 339
Rochester, MN 55903-0339
(507) 288-4004
fax: (507) 288-9438
email memberservices@peoplesrec.com

METERING DIAGRAM

PARALLEL GENERATION INTERCONNECTION FOR PURCHASE OF CONSUMER EXCESS GENERATION



★ Consumer owned subject to Cooperative's Rules & Regulations.

For three phase installations all circuit interrupting devices shall have poles for all ungrounded circuit conductors.

Manufacturers of Small Wind Turbines

The American Wind Energy Association (AWEA) has compiled the following list of U.S. manufacturers of wind turbines suitable for residential or farm applications. Many have Web sites or are accessible through E-mail links.

Atlantic Orient Corporation

P.O. Box 1097

Norwich, VT 05055

(802) 649-5446

Fax (802) 649-5404

Email: atlanticorient@juno.com

Web: <http://www.rsvp.nrel.gov/rsvp/organizations/aoc.html>

Sales Contact: Peter Hughes

Atlantic Orient Corporation manufactures the AOC 15/50, a three-bladed, 15-m rotor, 50-kW wind turbine generator. AOC is also developing a 12-kW unit, the 8/12, that it plans to bring to the market in 1998.

Bay Winds

1533 Kimball Street

Green Bay, WI 54302

(920) 468-5500 Email: sales@baywinds.com

Web: <http://www.baywinds.com>

Contact: Doug Johnson

Bay Winds is a wind turbine dealer and installer.

Bergey Windpower Company

2001 Priestley Avenue

Norman, OK 73069

(405) 364-4212

Fax (405) 364-2078

Email: mbergey@bergey.com

Web: <http://www.bergey.com>

Contact: Michael Bergey

Bergey Windpower manufactures small wind systems for a variety of applications, including distributed generation (home or farm), telecommunications, village power and water pumping. Sizes range from 2.4-m to 7-m rotor diameters with power ratings from 0.85 kW to 10 kW. Complete installation and training services available.

Lake Michigan Wind & Sun, Ltd.

1015 County Road "U"
Sturgeon Bay, WI 54235
(920) 743-0456
Fax (920) 743-0466
Email: lmwands@itol.com
Sales Contact: Kim Bowker

Lake Michigan Wind & Sun (LMW&S) specializes in the repair and remanufacture of residential size wind systems, from 0.25 kW to 20 kW in size. The company can supply or fabricate parts for almost any residential wind generator, and is a dealer/distributor for all reliable small wind systems on the market today. LMW&S makes quality Sitka spruce generator blades for rotors from 1.2 m to 7.3 m. The company also offers classes on wind generator design and maintenance.

Northern Power Systems

One North Wind Road
P.O. Box 999
Waitsfield, Vermont 05673
(802)496-2955 Fax (802)496-2953
E-mail: lmotte@northernpower.com
Web: www.northernpower.com
Special Projects Director: Lawrence Mott

NPS wind turbines have been proven in severe Antarctic conditions, including 88.5 m/s winds and 80 degree C temperatures. The 3-kilowatt HR3 wind turbine is suited for telecommunications applications.

Southwest Windpower

1801 W. Route 66
Flagstaff, AZ 86001
(928)-779-9463
Fax (928)-779-1485
WWW: <http://www.skystreamenergy.com>
Contact: Andy Kruse

Southwest manufactures the Skystream residential wind system for home power, battery charging and remote applications. The Windseeker has a rotor diameter of 3.72 m (12 ft.) and a capacity of 1.8 KW.

Synergy Power Corporation

*20/F Wilson House
19-27 Wyndham Street, Central
HONG KONG
85-22-8463168
Fax: 85-22-8100478
e-mail: 100314.2615@compuserve.com
Sales Contact: Manoj Dani*

Synergy Power Corporation designs and manufactures variable axis wind turbines rated at low wind speeds (4.5 m/s) for remote and grid-connected power systems and water pumping systems.

WindTech International, L.L.C.

*P.O. Box 27
Bedford, NY 10506
(914) 232-2354
Fax (914) 232-2356
e-mail: info@windmillpower.com
WWW: <http://www.windmillpower.com>
Contact: Jeffrey Bowden*

WindTech International manufactures the high-performance OASIS water-pumping windmill, designed to pump water in wind speeds as low as 2 mph to 8 mph from depths reaching 4,000 feet. The OASIS 3, with a 3-m rotor, can draw up to 500 gallons per hour from a depth of 30 feet at a wind speed of 7 mph. The OASIS 7, with a 7-m rotor, can draw up to 2,000 gallons per hour under the same conditions. These systems can be used for irrigation, land reclamation or drinking water in remote areas. The OASIS windmill is designed for easy installation, requires minimal maintenance and is backed by complete customer support.

Wind Turbine Industries Corporation

*16801 Industrial Circle South East
Prior Lake, MN 55372
(612) 447-6064
Fax (612) 447-6050
Contact: Steve Turek*

Wind Turbine Industries manufactures the 10-kW to 20-kW Jacobs wind turbines, with rotor sizes ranging from 7 m (23 ft.) to 8.8 m (29 ft.). These systems can be used in both grid inter tie (residence/farm utility bill reduction) and remote applications.

WindLite Corporation

11425 State Route 1
P.O. Box 325
Point Reyes, CA 94956
(415) 663-5496
Fax (415) 663-5495
e-mail: sales@windlite.com
Web: <http://www.windlite.com>
Sales Contact: Robert Harmon

WindLite Corporation is a developer of small wind turbines and integrated power systems for homes, villages, and small businesses. The products can be used where no utility lines exist or they can be connected to the utility transmission system. WindLite's independent (off-grid) hybrid power systems utilize wind, solar, battery, diesel-generator, and controller technologies.

World Power Technologies

19 N. Lake Avenue
Duluth, MN 55802
(218) 722-1492
Fax (218) 722-0791
Email: wpt@cp.duluth.mn.us
WWW <http://www.worldpowertech.com/index.htm>
Sales Manager: Vicki Klein

World Power Technologies manufactures the Whisper line of wind turbines, available in 600-W (2.1 m/7 ft. rotor), 1-kW (2.7 m/9 ft. rotor) and 3-kW (4.5 m/14.8 ft. rotor) low- and high-voltage models, with a choice of 2 or 3 blades. All models have an efficient permanent-magnet generator and a perfectly matched high performance propeller to create a reliable and affordable source of wind power for home, small farm or sailboat. Whisper wind generators can be used in remote areas and can withstand a variety of environments.

For Further Information

Following are sources for additional information on wind energy. Many have Web sites or are accessible through E-mail links.

Windustry

2105 First Avenue South
Minneapolis, MN 55404
(800) 365-5441
(612) 374-2261
fax: (612) 374-2601
email infor@windustry.org
web site www.windustry.org
(Affiliated with Institute for Agriculture and Trade Policy)

American Wind Energy Association

122 C Street NW, Suite 380
Washington, DC 20001
(202) 383-2500
fax: (202) 383-2505
email windmail@awea.org
web site www.awea.org

National Renewable Energy Laboratory

1617 Cole Blvd.
Golden, CO 80401-3393
(303) 275-3000
web site www.vrel.gov
(Operated for the U.S. Department of Energy)

U.S. Department of Energy

1000 Independence Ave. SW
Washington, DC 20585
(800) dial-DOE (343-5363)
fax: (202) 586-4403
web site www.energy.gov

Minnesota Department of Commerce

85 7th Place East, Suite 500

St. Paul, MN 55101

(651) 296-5175

(800) 657-3710

web site www.commerce.state.mn.us

For Web site users, Click on "consumer publications"

Under "Energy", check out -

"Small Wind Energy Systems"

"Renewable Energy: Harvesting the Wind"

(when calling, request the above publications)

For information on Minnesota and Federal tax incentives, call the above number
or www.commerce.state.mn.us/pages/Energy/ModTech/taxincentives.htm



People's Cooperative Services

Small Power Producers

"Plan for Compliance"

PEOPLE'S COOPERATIVE SERVICES

Minnesota 59 Olmsted
Rochester, Minnesota

SCHEDULE PG-1: Cogeneration & Small Power Production

Effective: Rate for year 2010.

Availability: Available to all members where the member has qualified small power production or cogeneration facilities connected in parallel with the cooperative's facilities. The member is required to execute an electric service agreement with People's Cooperative Services.

Service Characteristics: Alternating current, 60 Hz, at available voltages.

Rate: The cooperative shall pay or credit the member monthly for all energy furnished during the month at the appropriate rate shown below. All applicable rates will be adjusted by the Power Cost Adjustment (PCA) when applicable. The rate selected shall be at the member's option and shall conform to the capacity rules established by the Minnesota Public Utility Commission. Members with qualified facilities that exceed 100 kW may agree with the cooperative to execute this standard agreement with the 'Time of Day Rate' or the parties may agree that a negotiated agreement is more appropriate.

- 1.01 Net Energy Billing Rate. Available to qualified facilities with capacity of less than 40 kW that do not select either the 'time of day rate' or 'Simultaneous Purchase & Sale Billing Rate'. The cooperative shall pay the member as follows:

Type of Service	Rate
General Service	\$0.06287
Three phase General Service	\$0.05953
Three phase General Service/demand	\$0.02031

- 1.02 Simultaneous Purchase & Sale Billing Rate. Available to qualified facilities with capacity of less than 40 kW that do not select the 'time of day rate'. The cooperative shall pay the member as follows:
- A. The energy component of the rate is specified in Exhibit A.
 - B. Payment for capacity furnished on-peak will reflect the per kWh value of such capacity as shown in Exhibit B.

- 1.03 Time of Day Rate. Required for qualified facilities with capacity equal to or greater than 40 kW and less than or equal to 100 kW. 'Time of Day' rates are available with the mutual consent of the cooperative and the member for qualified facilities with capacity of less than 40 kW and with capacity greater than 100 kW when firm power is provided. The cooperative shall pay the member as follows:

Energy furnished on-peak (see Exhibit A)	
Summer season	\$0.01871/kWh
Winter season	\$0.02015'kWh
Energy furnished off-peak (see Exhibit A)	
Summer season	\$0.01243/kWh
Winter season	\$0.01429/kWh

Payment for capacity furnished on-peak will reflect the per kWh value of such capacity as shown in Exhibit B.

**People's Cooperative Services
3935 Highway 14 East - PO Box 339
Rochester, MN 55903-0339
Application for Interconnection
Member Owned Qualifying Facility**

Date: _____ Account #: _____

Member Name: _____ Map Location: _____

Address: _____

Manufacturer of Qualifying Facility: _____

Nameplate Rating (kW): _____

UL or Other Approving Authority: _____

Generation Type: _____

Type of Generator: _____

Inverter: _____

Operational Data:

Voltage _____ Phase _____ (single, three phase)

Amperage _____ Power Factor _____ (%)

Copy of Manufacturer's Technical Specifications attached? Yes ___ No ___

Description of Interconnection Equipment, including location of manual disconnect switch:

Proposed Interconnection Date: _____

Estimated Site Energy Consumption: _____ kWH _____ kWH
(May - Oct.) (Nov. - Apr.)

_____ kWH
(Annual)

Estimated Site Energy Production: _____ kWH _____ kWH
(May - Oct.) (Nov. - Apr.)

_____ kWH
(Annual)

Estimated Site Demand: _____ KW/Month

Estimated Site Capacity: _____ KW/Month
(if capable of supplementing firm power)

Signature

Date

Small Power Production Facility or Cogeneration Facility

Terms and Conditions

1.0 Requirements for Interconnection:

- 1.1 **Cooperative Membership:** Any Individual, or corporation, or partnership wishing to interconnect with the Cooperative's electric system shall become a Member of the Cooperative in accordance with the Bylaws of the Cooperative.
- 1.2 **Member Service Agreement:** The owner of a QF wishing to interconnect with the Cooperative's system will be required to sign a Member Service Agreement. The Agreement commits the Cooperative and the Member to operation under the terms and conditions of the Agreement.
- 1.3 **Application for Interconnection:** The Cooperative requires that all QF's file an Application for Interconnection not less than 30, nor more than 90 days, prior to the proposed date of an interconnection. The Application includes the Cooperative's Requirements for Interconnection. All QF's are required to abide by the requirements as stated and provide the Cooperative with the following information:
 - A. Technical specifications of all power production and interconnection equipment.
 - B. Proposed date of interconnection.
 - C. Projected net output or consumption by the QF.

The Cooperative shall accept or reject the Application for Interconnection within 30 working days. Acceptance depends on the accuracy of information provided on the Application and on the QF's proposed compliance with the National Electrical Code, the National Electrical Safety Code, the Cooperative's Service Rules and Regulations, and other local codes which apply to cogeneration and small power production facilities. If, in the Cooperative's opinion, the proposed facility does not qualify, the Cooperative will provide the Member with a written explanation. Acceptance of the Application shall not be construed as permission to interconnect with the Cooperative's system.

- 1.4 **Inspection:** An Inspections Certificate issued by the state electrical

inspector having jurisdiction in the QF's area is required to assure wiring complies with the National Electrical Code, National Electrical Safety Code, and other applicable local electrical codes.

An Inspection Certificate issued by the local governing agency is required to assure compliance with building codes and environmental rules and regulations where applicable.

1.5 **Interconnection Costs:** The Member shall reimburse the Cooperative for its incremental cost resulting from interconnecting with the QF. The incremental interconnection cost shall include all reasonable costs of connection, switching, metering, transmission, distribution, safety provisions, and administrative costs incurred by the Cooperative directly related to the installation and maintenance of the physical facilities necessary to permit interconnected operations with the QF, to the extent such costs are in excess of the corresponding costs which the Cooperative would have incurred had it not interconnected.

1.6 **Interconnection:** Interconnection is permitted only after all of the requirements stated in Sections 1.0 and 2.0 are met and only after written authorization to interconnect is issued by the Cooperative. This authorization cannot be issued until all interconnection costs are paid and does not relieve the member from the responsibility of installing, operating, and maintaining the facilities in a responsible and safe manner.

If, in the opinion of the Cooperative, the Member fails to abide by the terms and conditions of the Member Service Agreement, including subsequent operation of his generating facilities in a nonqualifying manner, the Cooperative will no longer be obligated to operate in parallel and purchase any capacity and energy made available and may notify the Member to disconnect the generating facilities from the Cooperative's system. In the event the Member fails to immediately comply with a disconnect notice, the Cooperative reserves the right to make such disconnection including the discontinuation of electric service if necessary.

1.7 **Cooperative Access:** Employees and authorized representatives of the Cooperative have the right to enter upon the Member's property at any reasonable time to ensure continued compliance with the Cooperative's Safety and Operating Standards and the accuracy of its meters. Such inspection by the Cooperative shall not relieve the Member from the responsibility of installing, operating, and maintaining the facilities in a responsible and safe manner.

- 1.8 **Automatic Shutdown and Disconnection:** In order to provide adequate safety to the Cooperative's employees when performing certain operation and maintenance on the Cooperative's system it is essential that a means be available to automatically shut down and/or disconnect the QF from the system upon interruption of the utility source voltage such that there is no possibility that the QF could back-feed through the service transformer and energize the primary system. The Member shall furnish and install an Underwriter's Laboratory (UL) listed manual disconnect switch which shall be located between the Member's QF and the Cooperative's system and readily accessible by Cooperative personnel. The location of the switch shall be approved by the Cooperative and shall be housed in an approved enclosure which can be secured with a padlock or locking device. Where feasible and with mutual consent, the Cooperative may permit the use of a service transformer disconnect in place of the Member furnished disconnect switch.

2.0 **Safety and Operating Standards:**

Safety and Operating Standards under which the Cooperative operates are imposed to protect Cooperative employees and the general public and are intended to guarantee a quality of service to the consumer members. All QF's must operate in a manner that will ensure the safety of the employees and the general public and must allow electric service to other consumers to remain within prescribed limits.

- 2.1 **Isolation of Qualifying Facility:** The Cooperative reserves the right to open the disconnect switch (isolating the Member's QF) without prior notice for any of the following reasons:

- A. A system emergency and/or maintenance operations require such action.
- B. A potentially hazardous condition relating to the QF is discovered.
- C. The operation of the QF interferes with the quality of service provided to other Members and/or the operation of the Cooperative's system.

- 2.2 **Disclaimer:** The Cooperative does not assume any responsibility for the safety and electrical protection of the Member's facilities irrespective of the condition of the Cooperative's facilities. The Cooperative shall not be liable to the Member for any damage to the Member's facility, including damage caused by disconnection of the QF from the Cooperative's system by automatic or manual devices or

pursuant to the Safety and Operating Standards.

- 2.3 **Single Phase Limitations:** The rated capacity of the QF to be connected in parallel with a low voltage service shall be no greater than 20 KW for single phase installations, unless authorized in writing by the Cooperative consistent with the Cooperative's limitation for single phase motors. Single phase installations greater than 20KW will be permitted if engineering calculations indicate that the installation will not adversely affect the operational characteristics of the Cooperative's system.
- 2.4 **Quality of Service:** Operation of the QF must not cause any reduction in the quality of service provided to other consumers nor interfere with the operation of the Cooperative's system. The Member shall be responsible for taking whatever corrective action might be required and/or reimbursing the Cooperative for the cost of corrective action which it deems necessary to restore service to prescribed limits.
- 2.5 **Electrical Characteristics:** The electrical characteristics of the QF shall conform with standards established by the Cooperative. The standards may include voltage, current, frequency, harmonics, and automatic synchronization, etc. Wherever possible, the Cooperative will base its standards on industry wide standards.
- 2.6 **Power Factor:** The Member shall endeavor to operate the QF as near unity power factor as possible. For QF's with rated capacity above 50KW, the Cooperative reserves the right to require the Member to install power factor correction equipment or reimburse the Cooperative for its cost of installing power factor correction equipment.

3.0 **Metering:**

The Cooperative will meter the QF to obtain billing data and to fulfill its reporting requirements.

- 3.1 **Required Metering:** Two meters are required. One meter will be installed in such a manner that it records only the energy sold by the Cooperative to the QF. The second meter will be installed in such a manner that it records only the energy sold by the QF to the Cooperative. The QF shall pay for the requisite metering as an interconnection cost. In addition to required metering, the Cooperative, at its option but with the consent of the QF, may install additional metering equipment for the collection of data for research purposes. The Cooperative will furnish such research metering

equipment and pay all associated operation and maintenance.

- 3.2 **Meter Reading:** The meters shall be read monthly, at the same time and in the same manner as prescribed for other Members of the Cooperative in the same consumer classification. Monthly meter readings are required from all consumer classifications. Metering records shall be available for inspection at all reasonable times.

4.0 **Service Condition:**

The furnishing and taking of service hereunder shall be subjected to the Service Rules and Regulations of the Cooperative. Such Service Rules and Regulations are subject to change from time to time by superseding schedules as published by the Cooperative.

5.0 **Insurance:**

The Member, at his sole cost and expense, shall obtain and maintain an insurance policy that provides liability insurance covering the operation of the QF and its associated equipment of not less than \$ 300,000. In addition, it is the Member's responsibility to consider that the liabilities of operating a QF may exceed \$ 300,000, so adequate coverage should be obtained to protect the Member's possible exposure to liability claims. Said policy shall include the Cooperative as an additional insured. Satisfactory evidence of such insurance shall be provided to the Cooperative before the QF will be allowed to operate with the disconnect switch in the closed position. The Member shall notify the Cooperative of any policy changes and of the periodic policy renewals.



People's Cooperative Services

Your Touchstone Energy® Cooperative

