

# PUC Workshop

## April 11, 2014

### Experience Using the Minnesota Interconnection Standards



# Topics

- \* Interconnection Standards History
  - \* Craig Turner – Engineering Manager  
(Dakota Electric Association)
- \* A Rural Utility Experience
  - \* Kristi Robinson – Distribution System Engineer  
(Steele Waseca Elect Coop)
- \* A Suburban Utility Experience
  - \* Jeff Schoenecker – Senior Engineer  
(Dakota Electric Association)

# History 1990-2000

- \* No national interconnection standards
- \* Each Utility had their own standards
- \* Utilities were learning about issues as they went
- \* Few systems being installed and most were custom.
- \* Manufacturers needed to customize to the local utility's standards.

# History (2001-2004)

- \* Texas and California produced interconnection standards
- \* Minnesota Omnibus Energy Bill (2001)
  - \* Reliability Standards (SRSQ)
  - \* DG Standards
    - \* Each Electric Utility shall maintain records concerning applications generation interconnections.
      - \* Must be filed once each year.
    - \* Regulated Utilities –
      - \* shall file distributed generation tariff for approval
      - \* Must provide “standardized interconnection of facilities”
      - \* Standard application form
      - \* Standard process
      - \* Standard interconnection agreement
  - \* All Minnesota Utilities Required to use same (Similar) interconnection process and standards.
- \* IEEE 1547 Standard (2003)

# History 2001-2004

- \* MN PUC 2001-2002 Requested Comments
- \* Regulated Utilities worked together to resolve technical differences between the interconnection standards (MP, OTP, Xcel, Alliant, DEA)
- \* Regulated Utilities submitted Joint comments, which included draft technical and procedure documents.
- \* 2003 Dept. of Commerce organized two working groups to develop uniform guidelines for DG
  - \* Rates working group
  - \* Technical working group

# Technical Work Group

- \* Technical Working Group developed the following
  - \* Interconnection Process
  - \* Technical Requirements for Interconnection
- \* Group Included;
  - \* Korridor Capital Inv.
  - \* Institute for Local Self – Reliance
  - \* MN Chamber of Commerce
  - \* Hennepin County and DG group
  - \* Prairie Gen
  - \* The Minnesota Project
  - \* Izaak Walton League
  - \* Utilities - Center Point, DEA, RPU, Alliant, MP, OTP, Xcel
  - \* Staff – MEQB, DOC



# Technical Groups “Goals”

- \* Safety / Reliability
  - \* Protect the safety of the Public
  - \* Maintain the reliability of the electrical system
- \* Costs – look for ways to reduce interconnection costs. (without reducing safety)
  - \* Standard technical requirements across all utilities in Minnesota
  - \* Looked for ways to also match other states standards
  - \* Manufacturers only need to make one model to meet all standards
- \* Time – look for ways to reduce time to complete interconnection process
  - \* Standard process across all utilities in Minnesota
  - \* Standard application

# History 2003

## Comparison of Interconnection Standards

3/28/2003

	Utility 12/3/01 Filing	IEEE Rev 10	Texas	NARUC	FERC	Misc. con. in Draft 6.25	California	Proposed Minnesota Standard
<b>Electrical Code Compliance</b>								
Installer must meet codes and permit requirements	Yes	-	Yes	-	Yes	Yes	Yes	Yes
<b>Open Transition</b>								
Mechanical Interlock	Yes	-	-	-	-	-	-	Yes
Describes Protective Elements Required	Yes	-	-	-	-	-	-	Yes
<b>Quick Closed Transition Transfer Switch</b>								
Mechanical Interlock	Yes	-	-	-	-	-	-	Yes
Describes Protective Elements Required	Yes	-	Yes	-	-	Yes	Yes	Yes
<b>Closed Transition Transfer Switch (3-off Loading)</b>								
Describes Protective Elements Required	Yes	Some	Yes	-	-	Yes	Yes	Yes
<b>Extended Parallel Operation</b>								
Describes Protective Elements Required	Yes	Yes	Yes	-	Yes	Yes	Yes	Yes
<b>Inverter Connection</b>								
Describes Protective Elements Required	Yes	-	Yes	-	-	Yes	Yes	Yes
Describes Inverter Certification Requirements	Yes	-	Yes	-	-	-	Yes	Yes
<b>Interconnection Issues and Requirements</b>								
Visible Disconnect Requirement	Yes	Allowed	Yes	-	-	Yes	Yes	Yes
Grounding Requirements	Yes	Yes	-	-	-	Yes	Yes	Yes
<b>Maximum Single Phase Generation Size</b>								
			50kW			-	20kVA	40kW
<b>Operating Limits</b>								
Voltage	Yes	Yes	Yes	-	-	Yes	Yes	Yes
Establishes Maximum Voltage Dip Magnitude Level		4-5%	3%					4%
Frequency	Yes	Yes	Yes	-	-	Yes	Yes	Yes



# History 2003-2010



- \* 2003
  - \* IEEE 1547 approved
- \* 2004
  - \* PUC approved MN process and standards
- \* 2005
  - \* FERC small gens procedure issued (20MW is small!)
  - \* IEEE 1547.X documents started to appear
- \* 2006
  - \* FERC small gens revised
- \* 2005-2010?
  - \* UL 1741 – Inverter Test Standard harmonized with IEEE 1547

# 2005-2014 Enhancements

- \* Created <40kW inverter based interconnection technical standard
  - \* Sub-set of full technical standards document
  - \* For solar systems with UL rated inverter
  - \* 5 pages vs. 29 pages!
- \* Created web pages with interconnection documents and information
- \* Assigned single point of contact at utility
- \* Utilities and installers educated on procedure and standards

# Minnesota Interconnection Process

- \* Standard Documents
  - \* Process
  - \* Application
  - \* Agreements
  - \* Standard Technical Requirements
  
- \* All Utilities are using the same documents (not true in other states)

<b>OWNER/APPLICANT</b>		
Company / Applicant's Name:		
Representative:	Phone Number:	FAX Number:
Title:		
Mailing Address:		
Email Address:		
<b>LOCATION OF GENERATION SYSTEM INTERCONNECTION</b>		
Street Address, legal description or GPS coordinates:		
<b>PROJECT DESIGN / ENGINEERING (if applicable)</b>		
Company:		
Representative:	Phone:	FAX Number:
Mailing Address:		
Email Address:		
<b>ELECTRICAL CONTRACTOR (if applicable)</b>		
Company:		
Representative:	Phone:	FAX Number:
Mailing Address:		
Email Address:		
<b>GENERATOR</b>		
Manufacturer:		Model:
Type (Synchronous Induction, Inverter, etc):		
Rated Output (Prime kW):	(Standby kW):	Phases: 1 or 3
Rated Power Factor (%):	Rated Voltage (Volts):	Frequency:
Energy Source (gas, steam, hydro, wind, etc.):		
<b>TYPE OF INTERCONNECTED OPERATION</b>		
Interconnection / Transfer method:		
<input type="checkbox"/> Open <input type="checkbox"/> Quick Open <input type="checkbox"/> Closed <input type="checkbox"/> Soft Loading <input type="checkbox"/> Inverter		
Proposed use of generation: (Check all that may apply)		Duration Parallel:
<input type="checkbox"/> Peak Reduction <input type="checkbox"/> Standby <input type="checkbox"/> Energy Sales		<input type="checkbox"/> None <input type="checkbox"/> Limited <input type="checkbox"/> Continuous
<input type="checkbox"/> Cover Load		
Pre-Certified System: Yes / No (Circle one)		Exporting Energy Yes / No (Circle one)
<b>ESTIMATED LOAD INFORMATION</b>		
The following information will be used to help properly design the interconnection. This Information is not intended as a commitment or contract for billing purposes.		
Minimum anticipated load (generation not operating):	kW:	kVA:
Maximum anticipated load (generation not operating):	kW:	kVA:

# Status of Interconnection in Minnesota

- \* Technical Standards are working well
  - \* Safe and reliable interconnections
- \* Common Technical standards across all utilities.
  - \* Standard Lower cost equipment
- \* Utilities and Installers have learned the process and requirements
- \* Problems are typically from installing and THEN reading the requirements

# IEEE 1547

- \* IEEE 1547 is starting update process (April 2014)
- \* Schedule Completion 2016-2018?
- \* Questions being discussed include:
  - \* 10MW or higher?
  - \* Dealing with high penetration of distributed resources
  - \* include more requirements for islanding (microgrids, etc.)?
  - \* expand 1547 to include communication interface requirements and protocols?

## IEEE Std 1547™(2003) Standard for Interconnecting Distributed Resources with Electric Power Systems

IEEE Std 1547.1™(2005) Standard for Conformance Tests Procedures for Equipment Interconnecting Distributed Resources with Electric Power Systems

IEEE Std 1547.2™(2008) Application Guide for IEEE 1547 Standard for Interconnecting Distributed Resources with Electric Power Systems

IEEE Std 1547.3™(2007) Guide for Monitoring Information Exchange, and Control of Distributed Resources with Electric Power Systems

IEEE Std 1547.4™(2011) Draft Guide for Design, Operation, and Integration of Distributed Resource Island Systems with Electric Power Systems

IEEE Std P1547.5™ Draft Technical Guidelines for Interconnection of Electric Power Sources Greater than 10MVA to the Power Transmission Grid  
**Withdrawn**

IEEE Std 1547.6™(2011) Draft Recommended Practice for Interconnecting Distributed Resources With Electric Power Systems Distribution Secondary Networks

IEEE Std P1547.7™ Draft Guide to Conducting Distribution Impact Studies for Distributed Resource Interconnection

IEEE Std P1547.8™ Recommended Practice for Establishing Methods and Procedures that Provide Supplemental Support for Implementation Strategies for Expanded Use of IEEE Standard 1547

# Interconnection Issues – Utility View

- \* Interconnection Agreement
  - \* <40kW using Uniform Statewide Agreement
  - \* From 1978 state statute
  - \* Could not update or modify during 2005 process
  - \* Does not deal with technical standards / operation
- \* Continued Training
  - \* Utility Staff
  - \* Installers / Contractors / Members / Customers

# Interconnection Issues - General

- \* Insurance Requirement <40kW
  - \* \$300,000 general liability (Homeowners insurance)
- \* Visible Disconnect (24/7 accessible)
  - \* Safety Requirement
    - \* Electrical Safety
    - \* Fire Safety
  - \* Meter Socket is not rated as disconnect
    - \* Meter Socket fires!
- \* Location of Visible Disconnect
  - \* By the meter (requirement varies by Utility)

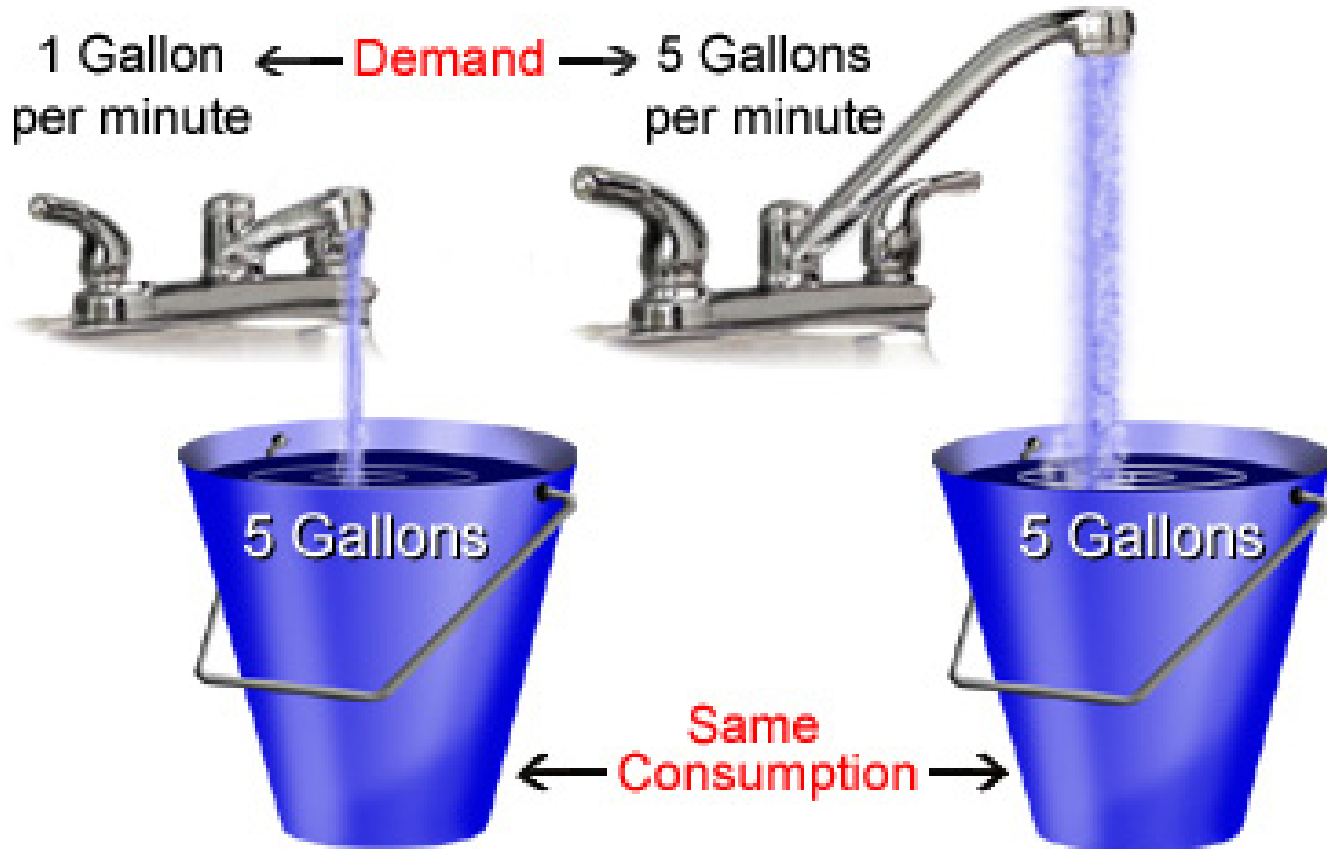


# Member Interaction

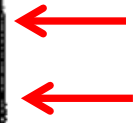
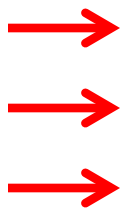
- \* Initial phone call
- \* Education on distribution system
- \* Education on generation
- \* Interconnection Process
- \* Interconnection Requirements



# Power Concepts 101



<b>OWNER/APPLICANT</b>		
Company / Applicant's Name: ██████████		
Representative:	Phone Number: ██████████	FAX Number:
Title:		
Mailing Address: ██████████ FAIRBANKS AVE LONSDALE MN		
Email Address: ██████████@██████████.com		
<b>LOCATION OF GENERATION SYSTEM INTERCONNECTION</b>		
Street Address, legal description or GPS coordinates: SAME		
<b>PROJECT DESIGN / ENGINEERING (if applicable)</b>		
Company:		
Representative:	Phone:	FAX Number:
Mailing Address:		
Email Address:		
<b>ELECTRICAL CONTRACTOR (if applicable)</b>		
Company: ██████████ Electric		
Representative: ██████████	Phone: 507-██████████	FAX Number:
Mailing Address: 11211 Roberts Park Blvd, Fairbault, MN		
Email Address: ██████████@myclearwave.net		
<b>GENERATOR</b>		
Manufacturer: EVERGREEN	Model: 215	
Type (Synchronous Induction, Inverter, etc.): INVERTER	Phases: 1 or 3	1
Rated Output (Prime kW): 5590W	(Standby kW):	Frequency:
Rated Power Factor (%):	Rated Voltage (Volts): 120	Rated Current (Amperes):
Energy Source (gas, steam, hydro, wind, etc.): PV		
<b>TYPE OF INTERCONNECTED OPERATION</b>		
Interconnection / Transfer method:		
<input type="checkbox"/> Open <input type="checkbox"/> Quick Open <input type="checkbox"/> Closed <input type="checkbox"/> Soft Loading <input type="checkbox"/> Inverter		
Proposed use of generation: (Check all that may apply)		Duration Parallel:
<input type="checkbox"/> Peak Reduction <input type="checkbox"/> Standby <input type="checkbox"/> Energy Sales <input type="checkbox"/> Cover Load		<input type="checkbox"/> None <input type="checkbox"/> Limited <input type="checkbox"/> Continuous
Pre-Certified System: Yes / No (Circle one)		Exporting Energy Yes / No (Circle one)



### ESTIMATED LOAD INFORMATION

The following information will be used to help properly design the interconnection. This information is not intended as a commitment or contract for billing purposes.

Minimum anticipated load (generation not operating):	kW: 0	kVA:
Maximum anticipated load (generation not operating):	kW: 5160	kVA:

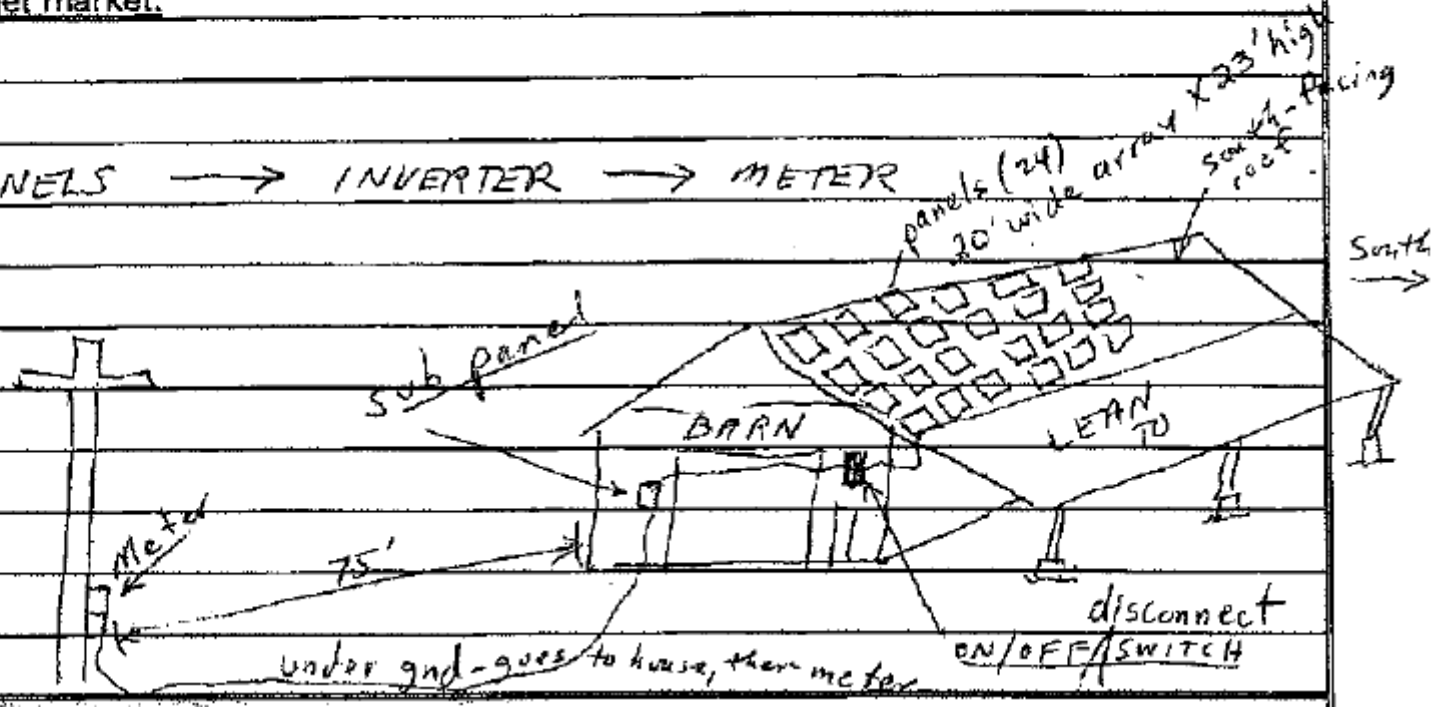
### ESTIMATED START/COMPLETION DATES

Construction start date: *ASAP*      Completion (operational) date: *DECEMBER*

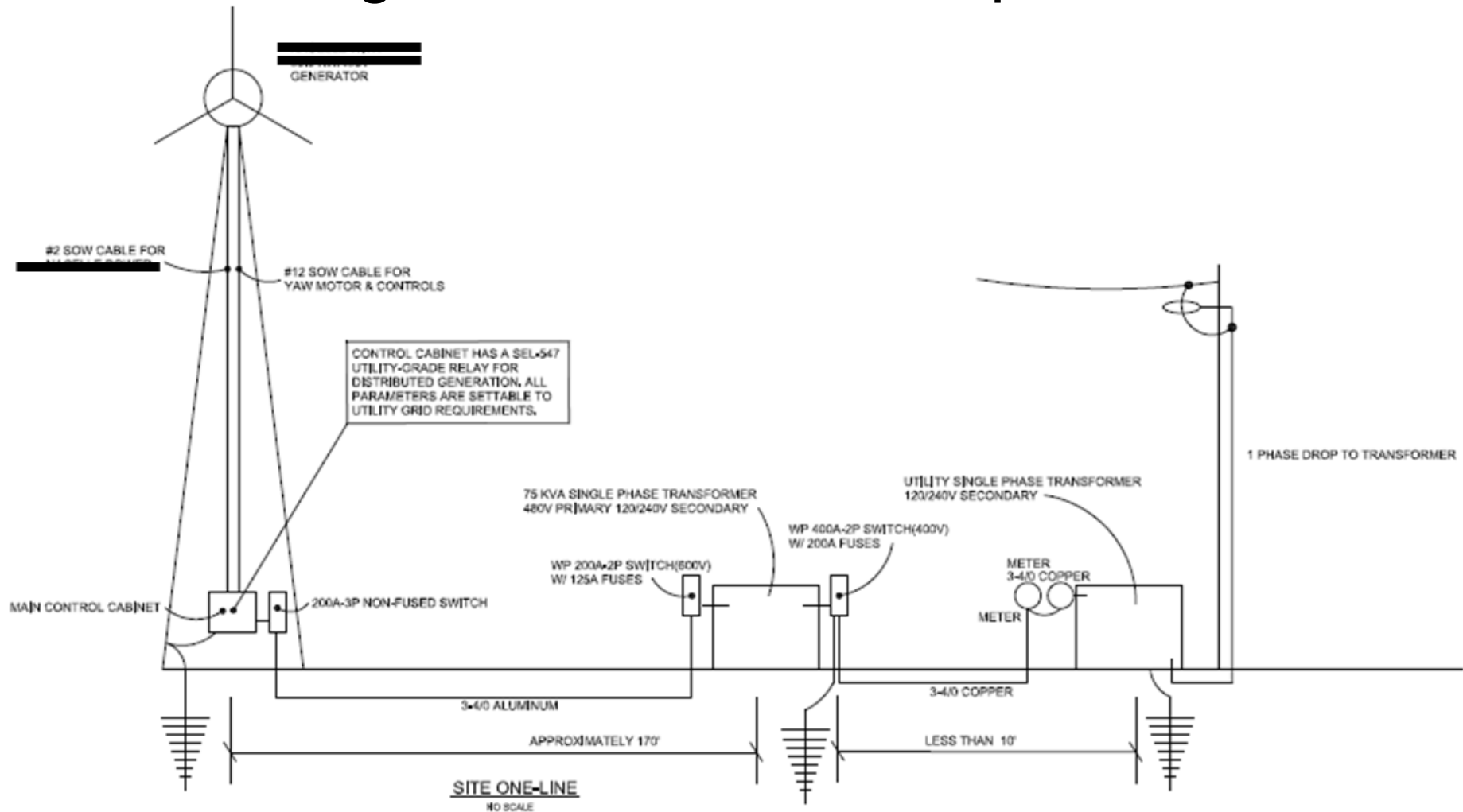
### DESCRIPTION OF PROPOSED INSTALLATION AND OPERATION

Attach a single line diagram showing the switchgear, transformers, and generation facilities. Give a general description of the manner of operation of the generation (cogeneration, closed-transition peak shaving, open-transition peak shaving, emergency power, etc.). Also, does the Applicant intend to sell power and energy or ancillary services and/or wheel power over Steele-Waseca Cooperative Electric's facilities. If there is an intent to sell power and energy, also define the target market.

24 PANELS → INVERTER → METER



# Engineer's One-Line Expectations



# Neighborhood Effect

Substation – Rural Residential/Agricultural

Meters: 432

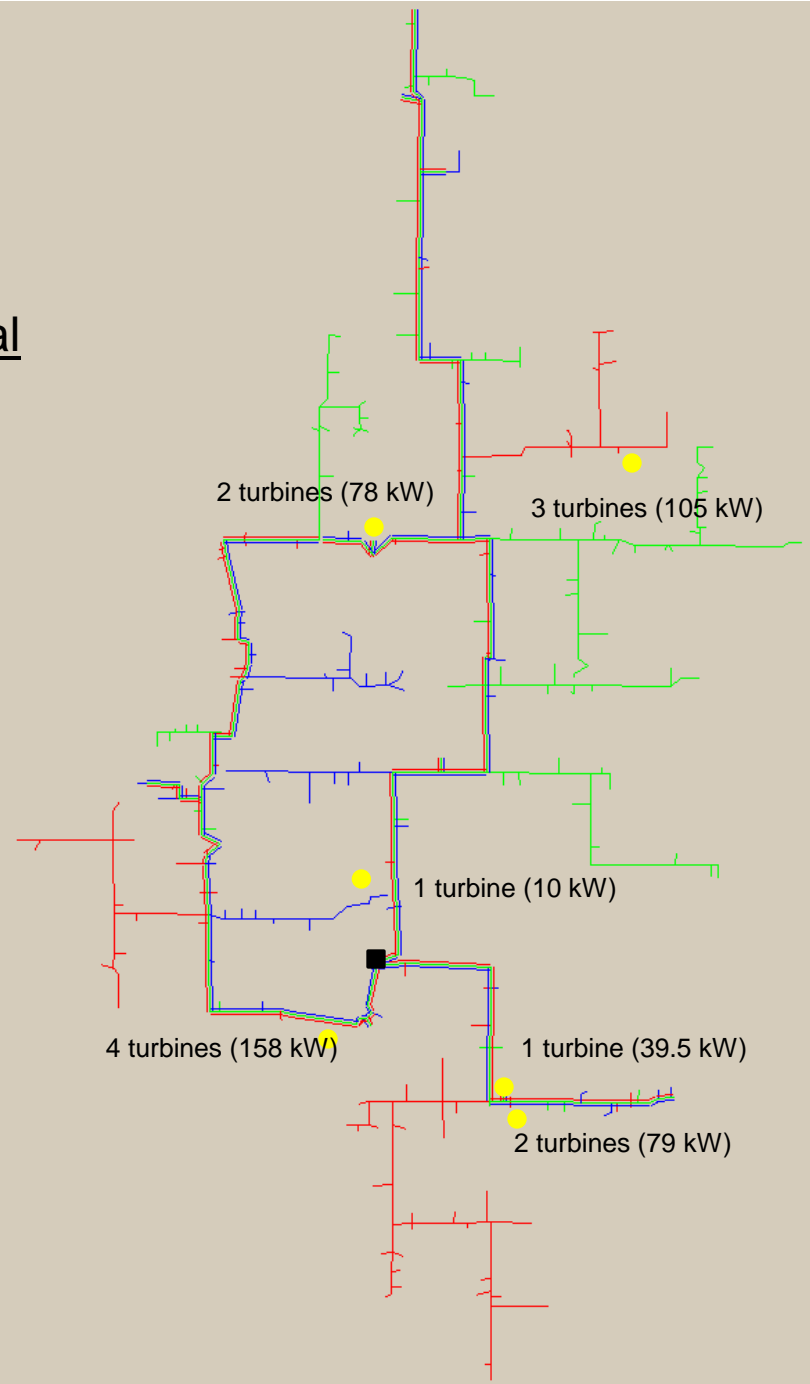
Maximum Load: 1884 kW

Minimum Load: 304 kW

Total DG Interconnected: 466 kW

**Potential Backfeeding  
on Transmission**

**162 kW**





A photograph of a tall, lattice-structured tower with a four-bladed asynchronous turbine mounted at the top. The tower is situated on a grassy hill. The sky is overcast and grey. The foreground shows a dark, plowed field.

**Internet Bought, Garage Built**  
**10 kW Asynchronous Turbine**

# Lightning



# Lost Blades





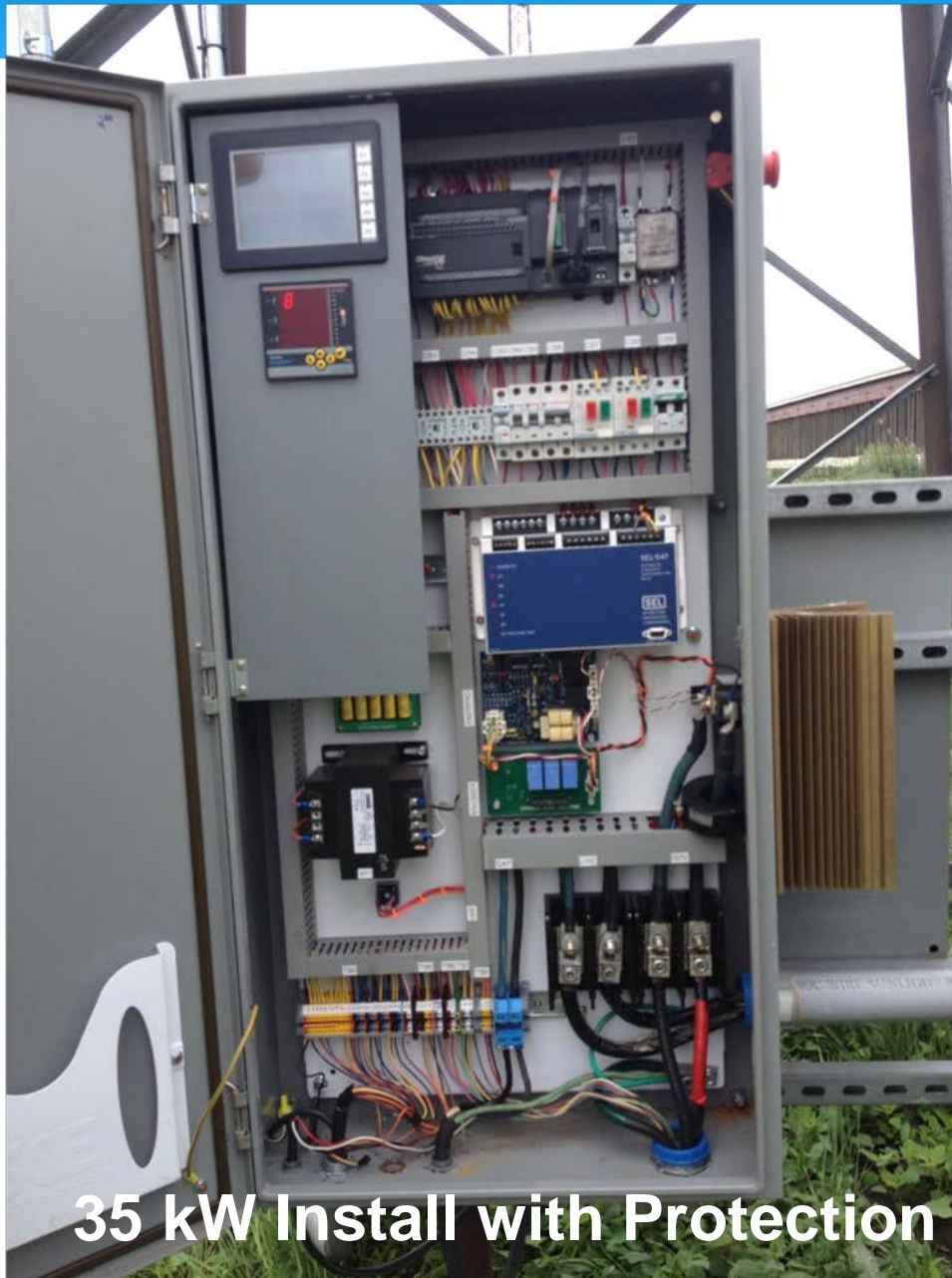
**No Relay  
Protection Installed**



**Protection Installed  
Meets IEEE 1547**







**35 kW Install with Protection**

# Actual DG Interconnections



# Minnesota DG Interconnection Process

## Small Solar (<40 kW) Example



- \* Signed Application Received
  - \* Are the technical requirements met?
    - \* Does the inverter meet the applicable national standards (IEEE 1547 and UL 1741)?
    - \* Is there a visible, lockable, disconnect accessible 24hrs/day at the point of common coupling?

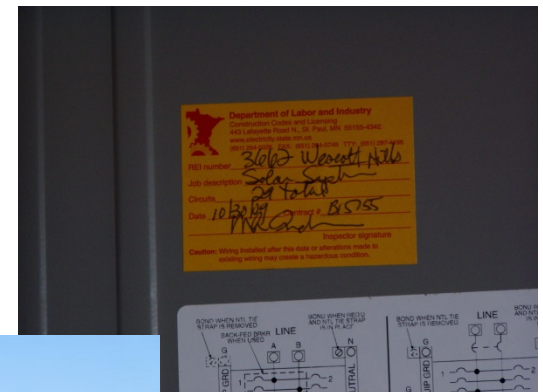




# Minnesota DG Interconnection Process

## Small Solar (<40 kW) Example

- \* Utility Design Approval
- \* Member Orders Equipment
- \* Installation
- \* Field Testing & Inspection



# Minnesota DG Interconnection Process

## Small Wind and Solar (<40 kW) Example

- \* Field Testing and Inspection (continued)
  - \* MN State Inspector has approved
  - \* Verify one-line matches actual installation
  - \* Verify UL 1741 sticker is on the inverter
  - \* Check visible disconnect
    - \* Labeled, lockable, and accessible 24/7
  - \* Island test – Replace existing meter with a bi-directional meter
  - \* Verify liability insurance (\$300,000 per occ.)
  - \* Have the applicant sign the Uniform Statewide Contract for Co-generation

# DG on DEA Transformers



- \* Transformers identified with a “G” sticker for distributed generation

# Interconnection Applications

## Generation Interconnection Application Inverter < 40kW Page 1

**WHO SHOULD FILE THIS APPLICATION:** Dakota Electric members interested in installing generation, rated 40kw or less, which will interconnect to Dakota Electric's distribution system using a Grid Tie Inverter. This application should be completed and returned to Dakota Electric Generation Interconnection Coordinator, in order to begin processing the request.

**INFORMATION:** Dakota Electric will perform an interconnection review based on the information provided. The Applicant shall complete as much of the form as possible. The fields in BOLD are required to be completed to the best of the Applicant's ability. The Applicant will be contacted if additional information is required. The response may take up to 15 business days after receipt of all the required information.

**COST:** \$100 filing fee to cover the cost of processing and reviewing this application.

### OWNER / APPLICANT

Applicant: [Redacted] Phone Number: [Redacted] FAX Number: [Redacted]  
 Mailing Address: [Redacted]  
 Email Address: [Redacted]

### PROPOSED LOCATION OF GENERATION SYSTEM INTERCONNECTION

Street Address, Legal Description or GPS coordinates:  
[Redacted]

### ELECTRICAL CONTRACTOR (if applicable)

Company: [Redacted]  
 Representative: [Redacted] Phone Number: [Redacted] FAX Number: [Redacted]  
 Mailing Address: [Redacted]  
 Email Address: [Redacted]

### TYPE OF INTERCONNECTED OPERATION

Type of Generation System:  Solar  Wind  (Circle one) or Other Describe \_\_\_\_\_

Proposed use of generation: (Check all that may apply)  
 Peak Reduction  Standby  Energy Sales  
 Cover Load

Duration Parallel:  
 None  Limited  Continuous

Pre-Certified System:  Yes  No  Don't know (Circle one) Exporting Energy:  Yes  No (Circle one)

### ESTIMATED START/COMPLETION DATES

Order Equipment: 10-1-09  
 Construction Start Date: 10-15-09  
 Start Acceptance Testing: \_\_\_\_\_  
 Generation In Service: 11-20-09

## Generation Interconnection Application Inverter < 40kW Page 2

### GENERATOR or (Solar Panel) INFORMATION

Manufacturer: KOPEL Type (Model): KO2052-1P Phases: 1 or 3  
 Rated Output (each unit) kW: 205 # of Units to be installed: 20 Rated Voltage (Volts): 24.60  
 Supplier of Equipment: Affordable Solar  
 Address: 2501 Yale Blvd SE #105 Albuquerque NM 87106  
 Phone: 500-810-9939  
 Additional Information: \_\_\_\_\_

### INVERTER

Manufacturer: PV Power Model: PV 7500  
 Rated Power Factor (%): \_\_\_\_\_ Rated Voltage (Volts): \_\_\_\_\_ Rated Current (Amperes): \_\_\_\_\_  
 % Total harmonics at full load: \_\_\_\_\_ % Current \_\_\_\_\_ % Voltage \_\_\_\_\_  
 Inverter Type (ferroresonant, step, pulse-width modulation, etc.): \_\_\_\_\_  
 Additional Information: See Attached Forms for Specs Thanks

### MISCELLANEOUS (Use this area and applicable notes and comments)

PV 7500 maximum Inverters 50 VDC  
Maximum Input Volts E

### SIGN OFF AREA:

With this Application, the applicant requests Dakota Electric to review the proposed Generation System Interconnection. I request that Dakota Electric identifies the additional equipment and costs involved with the interconnection of this system and to provide an estimate of those costs. I understand that the estimated costs supplied by Dakota Electric will be estimated using the information provided. I also agree that we will supply, as requested, additional information, to allow Dakota Electric to better review this proposed Generation System interconnection. I have read the Dakota Electric Association Distributed Generation Interconnection Requirements and will design, operate and maintain the Generation System and interconnection to meet those requirements.

### Applicant Name (print):

[Redacted]  
 Applicant Signature: [Redacted] Date: 11-25-09

SEND THIS COMPLETED & SIGNED APPLICATION AND ATTACHMENTS TO THE  
 GENERATION INTERCONNECTION COORDINATOR @ DAKOTA ELECTRIC  
 4300 228<sup>TH</sup> ST W, FARMINGTON, MN 55024



# More Applications

## Generation Interconnection Application Inverter < 40kW Page 1

**WHO SHOULD FILE THIS APPLICATION:** Dakota Electric members interested in installing generation, rated 40kW or less, which will interconnect to Dakota Electric's distribution system using a Grid Tie Inverter. This application should be completed and returned to Dakota Electric Generation Interconnection Coordinator, in order to begin processing the request.

**INFORMATION:** Dakota Electric will perform an interconnection review based on the information provided. The Applicant shall complete as much of the form as possible. The fields in BOLD are required to be completed to the best of the Applicant's ability. The Applicant will be contacted if additional information is required. The response may take up to 15 business days after receipt of all the required information.

**QOST:** \$100 filing fee to cover the cost of processing and reviewing this application.

### OWNER / APPLICANT

Applicant: <b>Maple Meadows</b>	Phone Number: <b>612-222-2222</b>	FAX Number:
Mailing Address: <b>12345 Main St, Minneapolis, MN 55444</b>		
Email Address: <b>maple@maplemeadows.com</b>		

### PROPOSED LOCATION OF GENERATION SYSTEM INTERCONNECTION

Street Address, Legal Description or GPS coordinates: <b>12345 Main St, Eagan, MN 55121</b>
--

*\$100.00 App Fee PAID 2/14/13*

### ELECTRICAL CONTRACTOR (if applicable)

Company: <b>ABC Electric</b>	Phone Number: <b>612-222-2222</b>	FAX Number: <b>612-222-2222</b>
Representative: <b>John Doe</b>	Mailing Address: <b>5678 Main St, St Paul, MN 55108</b>	
Email Address: <b>john@abc-electric.com</b>		

### TYPE OF INTERCONNECTED OPERATION

Type of Generation System:  Solar  Wind (Circle one) or Other Describe \_\_\_\_\_

Proposed use of generation: (Check all that may apply)  
 Peak Reduction  Standby  Energy Sales  
 Cover Load

Duration Parallel:  
 None  Limited  Continuous

Pre-Certified System:  Yes  No  Don't know (Circle one)    Exporting Energy: Yes  / No  (Circle one)

### ESTIMATED START/COMPLETION DATES

Order Equipment:	10-9-2012
Construction Start Date:	11-9-2012
Start Acceptance Testing:	1-29-2013
Generation In Service:	1-30-2013

## Generation Interconnection Application Inverter < 40kW Page 2

### GENERATOR or (Solar Panel) INFORMATION

Manufacturer: <b>TenK Solar</b>	Type (Model): <b>Neptune RAIS-D</b>	Phases: <b>1 or X 3</b>
Rated Output (each unit): <b>0.190 kW</b>	# of Units to be installed: <b>210</b>	Rated Voltage (Volts): <b>35-5752V</b>
Supplier of Equipment: <b>TenK Solar</b>		
Address: <b>9549 Penn Ave South Bloomington, MN 55431 952-303-7600</b>		
Phone: _____		
Additional Information: _____		

### INVERTER

Manufacturer: <b>Sustainable Energy Technologies</b>	Model: <b>ELV TENK-240D</b>	
Rated Power Factor (%): <b>&gt;0.99</b>	Rated Voltage (Volts): <b>240</b>	Rated Current (Amperes): <b>21</b>
% Total harmonics at full load: _____	% Current: _____	% Voltage: _____
Inverter Type (ferroresonant, step, pulse-width modulation, etc.): _____		
Additional Information: <b>THD is &lt;2%, IEEE 519 compliant</b>		

### MISCELLANEOUS (Use this area and any additional sheets for applicable notes and comments)

### SIGN OFF AREA:

With this Application, the applicant requests Dakota Electric to review the proposed Generation System Interconnection. I request that Dakota Electric identifies the additional equipment and costs involved with the interconnection of this system and to provide an estimate of those costs. I understand that the estimated costs supplied by Dakota Electric will be estimated using the information provided. I also agree that we will supply, as requested, additional information, to allow Dakota Electric to better review this proposed Generation System Interconnection. I have read the Dakota Electric Association Distributed Generation Interconnection Requirements and will design, operate and maintain the Generation System and interconnection to meet those requirements.

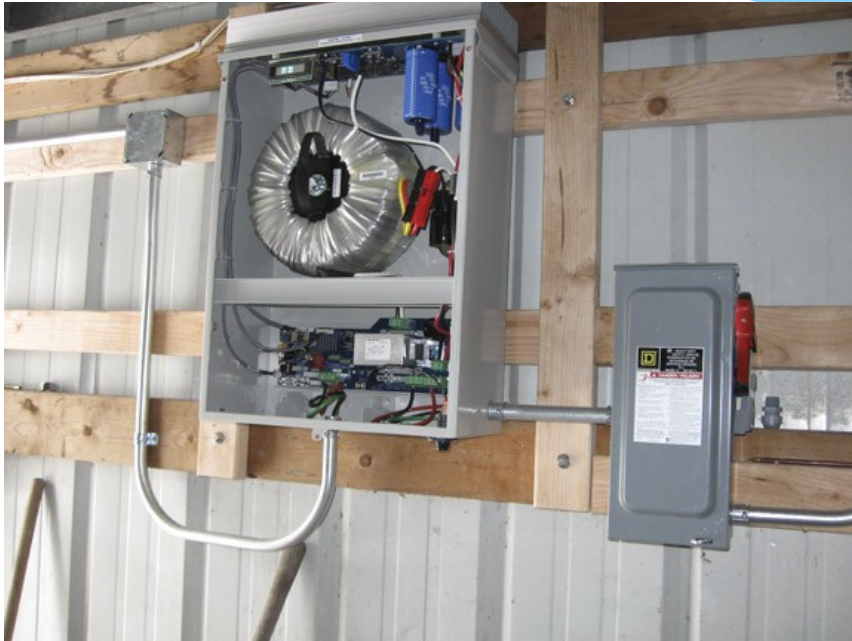
Applicant Name (print): <b>Maple Meadows</b>	Date: <b>1/29/13</b>
Applicant Signature: _____	Date: _____

**SEND THIS COMPLETED & SIGNED APPLICATION AND ATTACHMENTS TO THE GENERATION INTERCONNECTION COORDINATOR @ DAKOTA ELECTRIC**  
**4300 220<sup>th</sup> ST W, FARMINGTON, MN 55024**





# Changes required after Application Review



- \* Disconnects installed in secured locations

# No Changes Required after Application Review



- \* Disconnects installed in accessible locations

# Other Problems Identified during Inspection

- \* One-line diagram does NOT match installation
  - \* Protection not wired to trip anything!
  - \* Equipment installed different than application
- \* Failure of the switch (solenoid) no back ups
- \* Failure of the PLC control no back up – so require 62 parallel limit timer relay
- \* Generation will not trip for loss of single phase

# Vendor/Installer Issues



- \* How much does the DG Installer know?
  - \* Is a 3-phase generator being proposed to connect to a single phase system?
  - \* Or does the installer really know what they are doing?





# Utility Concerns

- \* Responsible for
  - \* Public Safety
  - \* System Reliability
- \* Liability Issues
- \* Don't understand what is being attached to the utility system
- \* Lack of Standardization
- \* Cost (\$400 per install for clean install)
  - \* Dakota Electric application fee \$100



# Future Concerns

- \* Continued member education
  - \* Local Seminars, Info on Utility Websites, etc.
- \* Plug in Renewable Energy
  - \* No visible disconnect, no application, no interaction with Utility Staff
- \* Property with DG sells
  - \* New owner adds capacity or modifies the DG system
- \* Inverter or Control cabinet fails
  - \* replaced with non-grid interactive model (Not UL listed or IEEE 1547 compliant)
- \* DG masks loading
  - \* High demand (no wind/sun) transformer fails causing outage
- \* Internal utility costs
  - \* DG grows to 50+ per month vs. 5-10 per year
  - \* Additional utility staff
  - \* Cost shifting from DG member to non-DG members