
INTERCONNECTION REQUIREMENTS FOR DISTRIBUTED GENERATION Revised 07-12

APPENDIX A**INTERCONNECTION APPLICATION INSTRUCTIONS**

The chart below shows the appropriate interconnection application to be completed for the GF being contemplated.

Non-Residential Applications	Wholesale Generation	<p>For FERC interconnections use the application located at APS' Oasis Website at:</p> <p>http://www.oatioasis.com/azps/index.html</p> <p>For Non-FERC interconnections, Use the appropriate application (Appendix B or C) available at :</p> <p>http://www.aps.com/dg</p>
	Behind the Meter 1 kW or larger	<p>Use the appropriate application (Appendix B or C) available at :</p> <p>http://www.aps.com/dg</p>
	Behind the Meter smaller than 1 kW	<p>No APS application is required.</p> <p>Customer must still follow all code and local permitting requirements.</p>
Residential Applications	Participating in APS Renewable Energy Incentive Program	<p>Use the application located at http://www.aps.com/GoSolar .</p>
	Not participating in the APS Renewable Energy Incentive Program, systems 1 kW or larger	<p>Use the appropriate application (Appendix B or C) available at :</p> <p>http://www.aps.com/dg</p>
	Previously participated in the APS Incentive Program and are relocating the system to a different location 1 kW or larger	<p>Use the appropriate application (Appendix B or C) available at :</p> <p>http://www.aps.com/dg</p>
	Systems less than 1 kW	<p>No APS application is required.</p> <p>Customer must still follow all code and local permitting requirements.</p>

APPENDIX A: INTERCONNECTION APPLICATION INSTRUCTIONS (cont'd)

A Customer wishing to interconnect a GF with the APS Distribution or Transmission System and not subject to FERC jurisdiction must do the following:

- 1) Complete the appropriate Interconnection Application (refer to the previous page). If Appendix B for Static Inverter installations or Appendix C for Rotating Machinery installations is to be completed, be sure to provide all required Supplementary Information referenced in the relevant Appendix.
- 2) Provide a copy of the AHJ Building Permit along with the Interconnection Application. If the AHJ, as a matter of policy, does not review diagrams or approve and grant permits for Generating Facilities, then provide a duly signed copy of APS' Letter-in-Lieu of Electrical Clearance for the GF. Call or email APS for the form.
- 3) Forward all required items above to APS via the contact information below.
- 4) If general liability insurance is required per Section 5 of the Interconnection Requirements manual, then proof of insurance must be provided to APS prior to the date of interconnected operation in accordance with Section 5.
- 5) If the GF aggregate nominal nameplate rating is 1 MW or greater, and the exception specified in Section 3 of the Interconnection Requirements manual does not apply, then documentation as specified in Section 3 must be provided to APS prior to the date of interconnected operation.

Once received, APS will review the documentation to determine if the design appears to be in conformance with APS' requirements. APS reserves the right to require diagrams submitted to APS to be stamped by a Professional Engineer (Electrical) registered in the State of Arizona.

APS notification that the system design appears to be in conformance with APS' Interconnection Requirements does not represent APS' approval of system's design, nor is it an assurance that the system complies with all applicable electric codes, laws, regulations and requirements applicable to its installation and operation. APS requires re-submittal of approved Interconnection drawings if they are revised prior to the in-service date or if APS requests a revised set.

Note that the APS Interconnection Inspection is in addition to, not in lieu of, an AHJ inspection.

It is important that GF not be interconnected or operated in parallel with APS' grid until APS has inspected the system and issues written notification that the system is in compliance with APS' requirements.

If you have any questions please call 602-371-6160 for assistance.

Please submit all documentation electronically in .pdf format to:
Commercial-Renewables@aps.com

Include Customer name in subject line of email.

APPENDIX B

INTERCONNECTION APPLICATION FOR STATIC INVERTERS ONLY

For APS
Use

APS Reservation # (if applicable)	
APS Installation #	

CUSTOMER OF RECORD INFORMATION

APS Customer Account Holders Name(s): Gila County

Customer Contact Person's Name: Diana Jones

Telephone (day): (928) 402-8516 E-mail: djones@co.gila.az.us

Generating Facility Address: 1400 E. Ash St.
Globe, AZ 85501

Customer Contact Mailing Address: 1400 E. Ash St.
Globe, AZ 85501

APS Account Number: 747101288 APS Meter #: 765226

Is there an existing Generator interconnected behind this meter? (Yes or No): YES

If Yes, please provide kW size and type of existing Generator: _____

Is there an existing Generator connected behind a different meter at this site? (Yes or No): NO

If Yes, please provide kW size and type of existing Generator: 551kW (Caterpillar model # 3412)

Is this GF being interconnected behind a sub-meter constituting a Totalized Metering arrangement?

(Yes or No): NO If Yes, provide the APS sub-meter # feeding the GF: _____

APPENDIX B: INTERCONNECTION APPLICATION FOR STATIC INVERTERS (cont'd)

STATIC INVERTER INFORMATION

- A. Manufacturer: PV Powered Model #: PVP100
- B. Inverter nameplate continuous AC power output rating [kW] 100 kW
No. of Units: 2 Total System Nameplate AC rating [kW]: 200 kW
- C. Tested and Certified to UL1741? (Yes or No): YES
If No, explain: _____
- D. Energy Source (photovoltaic, thermal solar, wind, etc.): Photovoltaic
- E. Prime Mover for Thermal Solar (concentrating dish, solar trough, with Sterling Engine, etc): _____

PHOTOVOLTAIC SYSTEM INFORMATION - complete only for photovoltaic systems

- A. PV Module Manufacturer: Yingli Model #: YL280P-35B # of Modules 732
- B. Utility Disconnect Switch Manufacturer: Boltswitch Model #: EL427N
- C. If one or more dedicated (analog) metering phone line(s) are required by the applicable APS incentive program or rate schedule, verify that any such phone line will be a Tele-metering Data Circuit (VG36, Class B, Type 3, Full Duplex, Data Circuit with sealing current, 1200 Baud), and shall be capable of accepting Pass Modem Tones.
(Yes or No): N/A If No, explain: _____

PROPOSED OPERATION

- A. Specify whether the inverter will be programmed to operate in parallel with the utility or in backup ("battery charger") mode only:
YES Parallel mode
_____ Backup mode
- B. If the inverter will operate in parallel with the utility, specify which one of the following options you desire (refer to Section 10):
YES Net metering in accordance with the EPR-6 rate
_____ Partial Requirements Service under the E-56 R rate (Solar, > 100 kW)
_____ Partial Requirements Service under the E-56 R rate (Non Solar, > 100 kW)
_____ Sell excess energy to APS in accordance with the EPR-2 rate (\leq 100kW)
_____ None of the above. Specify: _____

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C. Provide the anticipated project in-service date: 11/15/2012

D. Is an electrical permit and/or inspection required by the Authority Having Jurisdiction?
(Yes or No): YES If No, explain: _____

E. Is access by APS personnel to the Utility Disconnect Switch, electric service entrance, and any utility-required inverter metering in any way restricted or impeded (e.g. fences, locks, gates, walls, animals, etc.)?
(Yes or No): YES If Yes, explain how APS will have 24/7 unrestricted access: APS will have it's own lock to access any enclosed areas containing the Utility Disconnect Switch, electrical service entrance, etc.

F. If the GF aggregate generation nominal nameplate AC rating is 1MW or greater, and the GF is not installed in a Behind the Meter application, is documentation (including FERC Form 556) confirming the GF has achieved QF status included with this Interconnection Application? (Refer to Section 3 of the APS Interconnection Requirements manual)
(Yes or No): N/A If No, explain: _____

G. If the GF aggregate generation nominal nameplate AC rating is 1 MW or greater, and the GF is installed in a Behind the Meter application, does Customer warrant that, to the best of Customer's knowledge, even when considering the expected degradation of the GF's power rating over its expected life and future potential increased electrical load needs of the Customer, the GF is not expected to produce more energy over the 12 month period between January 1 and December 31 of any given year than what the Customer consumes behind the APS bi-directional billing meter.
(Yes or No): N/A If No, explain _____

H. Is general liability insurance required per Section 5 of the Interconnect Requirements manual?
(Yes or No): NO If Yes, explain when proof of such insurance will be provided to APS: _____

APPENDIX B: INTERCONNECTION APPLICATION FOR STATIC INVERTERS (cont'd)

IMPORTANT NOTE:

APS requires disclosure about the transaction that the Customer is undertaking with the installation of the interconnected GF on its premises. Will customer own and operate the GF; or is it hosting a third party-owned GF on its property; or does it plan to lease the GF to another party that will operate it; or does it plan to transfer ownership to a financial institution that will own it and lease it back to the Customer; or contract with a third-party operator that will conduct operation and maintenance of the GF, including the interconnection with the APS system? This disclosure is necessary because it is APS' policy to identify each party, other than the Customer, that may control or have the right to control the GF and its interconnection with the APS grid, in order that they sign a required acknowledgement that obligates them to comply with the terms and conditions of the Interconnection Agreement.

Please provide a reasonably detailed explanation of the transaction you are contemplating by answering the questions below, so that the required adjustments can be made in the Interconnection Agreement and its Appendices. Add an additional sheet if necessary to explain the details of your transaction.

SYSTEM OWNER

If the GF is owned by a person or entity, including Customer's grantee or lessee, other than the Customer, complete the following:

Name: Aaron van Boer Company: Tioga Solar Gila LLC

Mailing Address: 123 Mission St, 9th Floor
San Francisco, CA 94105

Phone: (415) 625-0715 E-mail: avanboer@tiogaenergy.com

SYSTEM LESSEE

If the GF is not owned by the Customer, but is instead leased, identify the lessee and the lessor:

Lessee:

Name: N/A Company: _____

Mailing Address: _____

Phone: _____ E-mail: _____

Lessor:

Name: N/A Company: _____

Mailing Address: _____

Phone: _____ E-mail: _____

APPENDIX B: INTERCONNECTION APPLICATION FOR STATIC INVERTERS (cont'd)

SYSTEM OPERATOR

If the GF is to be operated and/or maintained by a person or entity other than the Customer, including the System Owner or Lessee, complete the following:

Name: Aaron van Boer Company: Tioga Energy, Inc.
Mailing Address: 123 Mission St, 9th Floor
San Francisco, CA 94105
Phone: (415) 625-0715 E-mail: avanboer@tiogaenergy.com

PROPERTY OWNER

If the Customer does not own the property upon which the GF is located, please complete the following:

Name: Diana Jones Company: Gila County
Mailing Address: 1400 E. Ash St.
Globe, AZ 85501
Phone: (928) 402-8516 E-mail: djones@co.gila.az.us

LANDLORD

If the Customer is a tenant upon the property at which the GF is located, please provide the following information on the landlord:

Name: N/A Company: _____
Mailing Address: _____

Phone: _____ E-mail: _____

INTERCONNECTION PROCESS PRIMARY CONTACT INFORMATION

If the Primary Contact for coordinating the interconnection process is a person or entity other than the Customer, complete the following:

Name: Aaron van Boer Company: Tioga Energy, Inc.
Mailing Address: 123 Mission St, 9th Floor
San Francisco, CA 94105
Phone: (415) 625-0715 E-mail: avanboer@tiogaenergy.com

APPENDIX B: INTERCONNECTION APPLICATION FOR STATIC INVERTERS (cont'd)

INSTALLER INFORMATION

If the installer is not the Primary Contact for the interconnection process, complete the following:

Name: Greg Patzer Company: Kitchell Contractors of Arizona
Mailing Address: 1707 E. Highland Ave.
Phoenix, AZ 85016
Phone: (602) 222-5300 E-mail: gpatzer@kitchell.com

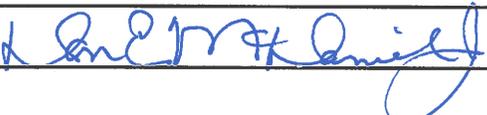
SYSTEM DESIGN OR ENGINEERING FIRM INFORMATION

If the system is being designed by an entity or person other than the installer, please complete the following:

Name: Greg Patzer Company: Kitchell Contractors of Arizona
Mailing Address: 1707 E. Highland Ave.
Phoenix, AZ 85016
Phone: (602) 222-5300 E-mail: gpatzer@kitchell.com

CUSTOMER CERTIFICATION

This Application is complete and accurate to the best of my knowledge, and as the APS Customer of Record, I hereby grant APS permission to coordinate the interconnection process with the person or entity specified above, if completed.

Name: Don E. McDaniel Jr.
Signature:  Date: 9/10/12

APPENDIX B: INTERCONNECTION APPLICATION FOR STATIC INVERTERS (cont'd)

SUPPLEMENTARY INFORMATION

Diagrams specified below must be submitted along with a copy of the Building Permit issued by the AHJ for non-residential Static Inverter based systems with an aggregate generator nominal AC nameplate rating of less than 1 MW and interconnecting at less than 12 kV, and are to be submitted in pdf format for all projects. Refer to Section 11.8 of the Interconnection Requirements manual for additional information. APS will not accept any copyrighted, proprietary or confidential drawings. These must be site specific regarding the information requested below, without extraneous information and must be prepared for APS' use. All diagrams are to be professionally drawn, using only black print on white paper; and are not to be in color or shaded. Free hand drawn, faxed diagrams and drawings that are otherwise difficult to read will not be accepted by APS. All diagrams must include the project name and street address and include any updated diagram revision numbers and dates.

APS has prepared several sample diagram sets that indicate the general layout, the level of detail, the necessary information, and the quality required by APS for typical inverter-based systems. These diagrams are located at: www.aps.com/dg

Standard industry electrical symbols shall be used on the diagrams, and the required size for drawings is 11"x17".

(a) Electrical One-Line Diagram: Note (1)

Diagram(s) must show all generation sources (e.g. photovoltaic panels, wind generator, etc.) and any associated DC electrical components, inverter(s), any combiner panels, metering, Utility Disconnect Switch, as well as the electric service entrance. In addition, the utility meter, connection points of facility loads, and all other associated electrical components must be shown including any required dedicated metering phone lines, transfer trip communication path(s) along with the associated relaying and trip circuits, and any APS required Remote Terminal Unit (RTU) with associated communication channels and trip/block close/close permissive circuitry. The electrical ratings of the wire and equipment including all backfed breakers or fuses and any subpanels, including any required dedicated metering phone lines must be indicated.

(b) Electrical Three-Line Diagram: Note (2)

Diagram(s) must show detailed phase wiring of all electrical equipment as specified in the Electrical One-Line Diagram, as well as all neutral, equipment ground and grounding electrode equipment (G.E.C.) conductors and connections.

(c) Plant Location Diagram: Note (3)

Diagram must show major cross streets and location of facility. Include a North arrow.

(d) Site Plan:

Diagram must clearly show the major GF equipment individual components and their locations, including the electric service entrance section and utility meter, location of the inverter(s), Utility Disconnect Switch and any lock-boxes, etc. Include building structure location and any walls, fences and gates etc, to clearly indicate unobstructed access to APS equipment, including any required special metering and the Utility Disconnect Switch. Include a North arrow.

Note 1: An Electrical One-Line Diagram is not required for single inverter-based residential systems under 12 kW other than a battery backup based system.

Note 2: A Three-Line Diagram is required for residential inverter-based systems that meet any of the following criteria:

- (a) The AC nominal nameplate output rating of the inverter(s) is greater than 12 kW.**
- (b) The system consists of more than one inverter.**
- (c) The system backfeeds a breaker located in subpanel rather than one located in the SES.**
- (d) The system is connected as a supply side tap.**
- (e) The installation is an expansion or addition to an existing system operating in parallel with APS' system.**
- (f) The installation is a battery backup type inverter system.**

Note 3: A Plant Location Diagram will not be required for residential systems.

APPENDIX C

INTERCONNECTION APPLICATION FOR ROTATING MACHINERY ONLY

For APS
Use

APS Reservation # (if applicable)	
APS Installation #	

CUSTOMER OF RECORD INFORMATION

APS Customer Account Holders Name(s): _____

Customer Contact Person's Name: _____

Telephone (day): _____ E-mail: _____

Generating Facility Address: _____

Customer Contact Mailing Address: _____

APS Account Number: _____ APS Meter #: _____

Is there an existing Generator interconnected behind this meter? (Yes or No): _____

If Yes, please provide kW size and type of existing Generator: _____

Is there an existing Generator connected behind a different meter at this site? (Yes or No): _____

If Yes, please provide kW size and type of existing Generator: _____

Is this GF being interconnected behind a sub-meter constituting a Totalized Metering arrangement?

(Yes or No): _____ If Yes, provide the APS sub-meter # feeding the GF: _____

APPENDIX C: INTERCONNECTION APPLICATION FOR ROTATING MACHINERY (cont'd)

GENERATOR INFORMATION

A. Manufacturer: _____ Model #: _____

B. Generator Type (Synchronous, Induction): _____

C. Generator Nameplate Rating:

Voltage: _____ Single or Three Phases: _____

Power Factor: _____ Continuous Power kW: _____

No. of Units: _____ Total System kW: _____

D. Generator Electrical Characteristics (on the machine base, for above 50 kW):

Synchronous Reactance (X_d): _____

Transient Reactance ($X'd$): _____

Subtransient Reactance (X''_d): _____

Stator Resistance (R_a): _____

Zero Sequence Reactance (X_0): _____

Zero Sequence Resistance (R_0): _____

Negative Sequence Reactance (X_2): _____

Negative Sequence Resistance (R_2): _____

E. Generator Neutral Grounding (for above 300 kW):

Specify whether the generator neutral will be solidly grounded or grounded through a neutral resistor:

If grounded through a neutral resistor, specify the resistance: _____

PRIME MOVER

A. Manufacturer: _____ Model #: _____

B. Fuel Source (Natural Gas, Landfill Gas, etc.): _____

C. Is useful heat recovered from the prime mover (Yes or No): _____

D. Will the installation be certified as a Qualifying Facility (QF) (Yes or No): _____

APPENDIX C: INTERCONNECTION APPLICATION FOR ROTATING MACHINERY (cont'd)

INTERFACE EQUIPMENT AND PROTECTIVE RELAY INFORMATION

(Complete all applicable items; attach a separate sheet if necessary).

A. Synchronizer for Synchronous Generator:

Manufacturer: _____ Model #: _____

Automatic or Manual Synchronizer: _____

B. Manufacturer's name and model number for each protective device (Refer to section 8):

C. Proposed settings (trip setpoint and time) for each protective device (Refer to section 8):

APPENDIX C: INTERCONNECTION APPLICATION FOR ROTATING MACHINERY (cont'd)

PROPOSED OPERATION

A. Specify the mode in which the Generator will operate:

- Continuous Parallel
- Smooth Parallel Transition (normally 5-15 seconds)
- Momentary Parallel Transition (normally <10 cycles)

B. If the Generator will operate in continuous parallel with the utility, specify which one of the following options you desire:

- Net metering in accordance with the EPR-6 rate
- Partial Requirements Service under the E-56 R rate (Solar, > 100 kW)
- Partial Requirements Service under the E-56 R rate (Non Solar, > 100 kW)
- Sell excess energy to APS in accordance with the EPR-2 rate (\leq 100kW)
- None of the above. Specify: _____

C. Provide the anticipated project in-service date: _____

D. Is an electrical permit and/or inspection required by the Authority Having Jurisdiction?

(Yes or No): _____ If No, explain: _____

E. Is access by APS personnel to the Utility Disconnect Switch, electric service entrance, and any utility-required generation metering in any way restricted or impeded (fences, locks, gates, walls, animals, etc.)?

(Yes or No): _____ If Yes, explain how APS will have 24/7 unrestricted access _____

F. If the GF (other than Backup Generation) aggregate generation nominal nameplate AC rating is 1 MW or greater, and the GF is not installed in a Behind the meter application, is documentation (including FERC Form 556) confirming the GF has achieved QF status included with this Interconnection Application? (Refer to Section 3 of the APS Interconnection Requirements manual.

(Yes or No): _____ If No, explain: _____

APPENDIX C: INTERCONNECTION APPLICATION FOR ROTATING MACHINERY (cont'd)

- G. If the GF aggregate generation nominal nameplate AC rating is 1 MW or greater, and the GF is installed in a Behind the Meter application, does Customer warrant that, to the best of Customer's knowledge, even when considering the expected degradation of the GF's power rating over its expected life and future potential increased electrical load needs of the Customer, the GF is not expected to produce more energy over the 12 month period between January 1 and December 31 of any given year than what the Customer consumes behind the APS bi-directional billing meter.

(Yes or No): _____ If No, explain _____

- H. Is general liability insurance required per Section 5 of the Interconnect Requirements manual?

(Yes or No): _____ If Yes, explain when proof of such insurance will be provided to APS: _____

APPENDIX C: INTERCONNECTION APPLICATION FOR ROTATING MACHINERY (cont'd)

IMPORTANT NOTE:

APS requires disclosure about the transaction that the Customer is undertaking with the installation of the interconnected GF on its premises. Will customer own and operate the GF; or is it hosting a third party-owned GF on its property; or does it plan to lease the GF to another party that will operate it; or does it plan to transfer ownership to a financial institution that will own it and lease it back to the Customer; or contract with a third-party operator that will conduct operation and maintenance of the GF, including the interconnection with the APS system? This disclosure is necessary because it is APS' policy to identify each party, other than the Customer, that may control or have the right to control the GF and its interconnection with the APS grid, in order that they sign a required acknowledgement that obligates them to comply with the terms and conditions of the Interconnection Agreement.

Please provide a reasonably detailed explanation of the transaction you are contemplating by answering the questions below, so that the required adjustments can be made in the Interconnection Agreement and its Appendices. Add an additional sheet if necessary to explain the details of your transaction.

SYSTEM OWNER

If the GF is owned by a person or entity, including Customer's grantee or lessee, other than the Customer, complete the following:

Name: _____ Company: _____

Mailing Address: _____

Phone: _____ E-mail: _____

SYSTEM LESSEE

If the GF is not owned by the Customer, but is instead leased, identify the lessee and the lessor:

Lessee:

Name: _____ Company: _____

Mailing Address: _____

Phone: _____ E-mail: _____

Lessor:

Name: _____ Company: _____

Mailing Address: _____

Phone: _____ E-mail: _____

APPENDIX C: INTERCONNECTION APPLICATION FOR ROTATING MACHINERY (cont'd)

SYSTEM OPERATOR

If the GF is to be operated and/or maintained by a person or entity other than the Customer, including the System Owner or Lessee, complete the following:

Name: _____ Company: _____

Mailing Address: _____

Phone: _____ E-mail: _____

PROPERTY OWNER

If the Customer does not own the property upon which the GF is located, please complete the following:

Name: _____ Company: _____

Mailing Address: _____

Phone: _____ E-mail: _____

LANDLORD

If the Customer is a tenant upon the property at which the GF is located, please provide the following information on the landlord:

Name: _____ Company: _____

Mailing Address: _____

Phone: _____ E-mail: _____

INTERCONNECTION PROCESS CONTACT INFORMATION

If the primary contact for interconnection process is to be coordinated by someone other than the Customer, complete the following:

Name: _____ Company: _____

Mailing Address: _____

Phone: _____ E-mail: _____

APPENDIX C: INTERCONNECTION APPLICATION FOR ROTATING MACHINERY (cont'd)

INSTALLER INFORMATION

If the installer is not the primary contact for interconnection process, complete the following:

Name: _____ Company: _____

Mailing Address: _____

Phone: _____ E-mail: _____

SYSTEM DESIGN OR ENGINEERING FIRM INFORMATION

If the system is being designed by an entity or person other than the installer, please complete the following:

Name: _____ Company: _____

Mailing Address: _____

Phone: _____ E-mail: _____

CUSTOMER CERTIFICATION

This Application is complete and accurate to the best of my knowledge, and I hereby grant APS permission to coordinate the interconnection process with the person or entity specified above, if completed.

APS Customer Name: _____

Signature: _____ Date: _____

APPENDIX C: INTERCONNECTION APPLICATION FOR ROTATING MACHINERY (cont'd)

SUPPLEMENTARY INFORMATION

Diagrams and information specified below are to be specifically prepared for APS' use, and to be submitted in pdf format for all rotating machinery based projects. APS will not accept any copyrighted, proprietary, confidential or "construction" drawings. These must be site specific regarding the information requested below, without extraneous information. All diagrams are to be professionally drawn, using only black print on white paper, and are not to be color or shaded. Free hand drawn, photocopies and faxed diagrams will not be accepted by APS. All diagrams must include the project name and street address as well as updated diagram revision numbers and dates.

Standard industry accepted electrical symbols shall be used on the diagrams. The required size for all drawings is 11"x17".

(a) Electrical One-Line Diagram:

Diagram(s) must show generators and all major associated electrical components including protective relaying and associated trip paths, any interlocks and control functions, as well as the electric service entrance, utility meter, connection points of facility loads, any transformers, generator metering, and Utility Disconnect Switch including any required dedicated metering phone lines, transfer trip communication path(s) along with the associated relaying and trip circuits, and any APS required Remote Terminal Unit (RTU) with associated communication channels and trip/block close/close permissive circuitry. Any interlocks or permissive functions and / or control paths shall be clearly indicated on the drawing (e.g. as dashed lines). The electrical ratings of the equipment shall be shown.

(b) AC & DC Control Schematics:

Diagram(s) must show the detailed phase wiring of all electrical equipment as specified above for the Electrical One-Line Diagram, including protective relaying, associated instrument transformers, breaker control circuitry, and additional control schemes. Include control power source and all associated AC and DC connections.

(c) Plant Location Diagram:

Diagram must show major cross streets and location of facility. Include a North arrow.

(d) Site Plan:

Diagram must clearly show the individual major GF equipment components and their locations, including the electric service entrance section and utility meter, location of generator(s), interface equipment, Utility Disconnect Switch and location of any lock-boxes, etc. Include building structure location and any walls, fences and gates etc, to clearly indicate unobstructed access to APS equipment including any required special metering and the Utility Disconnect Switch. Include a North arrow.

(e) Relay Setting Sheet(s):

Setting sheet(s) for the APS-required minimum protective relay functions must show the trip setpoints and times. Settings may be provided after the initial APS review, once the final system configuration has been determined.

(f) Sequence of Operations:

Following a preliminary review of the Interconnection Application and associated diagrams, APS may, in certain instances, require the Customer to further submit a description of any sequence of operations or other operational controls of a particular system or control scheme.

APPENDIX D – ADDITIONAL REQUIREMENTS FOR GF WITH AGGREGATE AC GENERATION \geq 1 MW

The requirements outlined in this Appendix apply to any Generating Facility that is nominally rated to generate 1 MW or more and is interconnected with the APS System for continuous parallel operation. These requirements are in addition to and supplement the requirements and specifications outlined in Section 8 of this document. APS will identify the actual requirements, and the optimum method of implementing these as part of the Interconnection Study (refer to Section 8.1.3). APS can also assist the Customer during the preliminary stages of the project to implement the identified requirements into the Customer's design drawings.

Note that this Appendix applies to generation of 1 MW or more interconnected behind any single APS metered point of electric service delivery, and up to 1 MW will normally be allowed to be connected behind such a metered point without having to implement the requirements outlined in this Appendix D.

1. Transfer Trip

- a. A Transfer Trip scheme will normally comprise a relay located at the APS substation feeder breaker which communicates via fiber optic cable with a relay located at the GF along with associated control circuits. Whenever the APS substation breaker opens, a trip signal is sent to the GF to automatically trip the generation off line.

If the GF is fed from a Dedicated Feeder, and it is determined during the interconnection review process that a transfer trip scheme is needed, APS will require the Customer to install a relay and communication link that interfaces with the APS substation relay. In lieu of a transfer trip scheme, it may be acceptable, as determined by APS, to install a Hot-Bus/Dead-Line permissive scheme at the substation for static inverter based systems.

- b. In the event that a Transfer Trip is required, Customer will need to install and maintain a Schweitzer SEL 351-7 relay for transfer trip control of the Generator breaker along with the associated instrumentation transformers and circuitry. APS will install, at Customer's expense, a SEL 351-7 relay at the APS substation.

In accordance with the APS ESRM, APS will provide Customer with the overcurrent relay settings (50, 50N, 51, and 51N) for the SEL 351-7 relay located at the GF for coordination with the SEL 351-7 relay at the APS substation. Additionally, Customer will activate device functions 27 (Undervoltage), 59 (Overvoltage), and 81 O/U (Over/Under Frequency) in the SEL 351-7 relay located at the GF. Trip settings for these functions will be in accordance with the APS Interconnection Requirements. Customer will submit settings for APS review and approval.

2. Remote Trip

- a. A Remote Trip is a manual trip signal issued by the APS Control Center to trip the generation off line and isolate it from the APS Distribution System. This signal will normally be communicated via fiber optic cable originating at the APS substation or communicated via a VG36 leased telephone line provided by the local telephone company. It will generally trip the generator breaker(s) via a Customer installed breaker control circuit. Any GF that is 1 MW or greater shall be equipped for Remote Trip capability.

The Remote Trip function will be accomplished via a Remote Terminal Unit (RTU) provided by APS at Customer's expense and installed by Customer at Customer's Facility.

- b. For a GF comprising static inverters located on a non-dedicated feeder, should APS need to switch the section of the normal feeder on which the GF is located, to another feeder for line/breaker maintenance, feeder sectionalizing/switching, and/or load transfer operations, APS reserves the right, without liability, to remotely trip the GF off-line for the duration of any such operation. If adverse operating conditions occur on the APS system due to the GF, APS reserves the right to open the Generator breaker without notice until such conditions are addressed. Additionally Customer will assume full responsibility for the inverters shutting down in accordance with UL1741/IEEE1547 in the event of a utility outage or system fault.

3. Remote Monitoring

- a. Any GF rated at 1MW or greater shall be equipped for remote monitoring by the APS Control Center. APS will install, at Customer's expense, a bi-directional EMS meter (in addition to the billing meter) along with communication wiring in the SES incoming metering section to provide instantaneous Watts, VARS, Volts and cumulative kWh readings to the RTU. For all installations, Customer must provide two meter sockets and two sets of test switches at the SES metering compartment in accordance with the APS ESRM – one set for the EMS meter and the other for the billing meter. APS may elect to install, on a temporary basis, and at APS' expense, transducers in lieu of the EMS meter, in the event such meter is not available at the time of the GF start-up. Once the EMS meter becomes available, APS will coordinate with Customer to install it and remove the transducers.
- b. In the event that a meter is required to be installed to monitor the Generator output, Customer will provide a metering section in accordance with the APS ESRM. APS will install, at Customer's expense, an EMS meter along with communication wiring in the metering section to provide instantaneous Watts, VARS, Volts and cumulative kWh readings to the RTU.
- c. Customer will provide hard-wired open/close contact (b contact) status points and control wiring to the RTU for any breaker with Remote Control capability by APS so that APS can monitor the status of this breaker remotely.

4. Technical Details

- a. At Customer's expense, APS will provide, operate and maintain an RTU. Customer shall install the RTU enclosure as provided by APS, and APS will install and program the RTU. Customer shall provide a 120 VAC, 15 Amp (minimum) power supply to the RTU, and shall install 2" rigid metallic conduits for all required circuits associated with the RTU. The 120VAC/15A circuit must be from a dedicated feed upstream from the Generator breaker, so it remains energized in the event the Generator breaker is open. The RTU and associated equipment installed at the GF must be accessible by APS personnel on an unrestricted 24 hour basis.
- b. The RTU will be housed in an enclosure along with an appropriate communication device (e.g. fiber converter, or modem as specified by APS), and battery back-up system. The RTU enclosure typically measures 36"X30"X10", and is a Nema 3R outdoor rated cabinet. Additional RTUs may be required if a single RTU cannot be located in the immediate vicinity of the SES and any required metering on the generation output. The top of the RTU cabinet shall not exceed more than 6' from final grade.
- c. The Customer is responsible for securing a communication path back to the APS communication system (e.g. fiber optic back to APS Substation or VG36 leased line via the local telephone company). Any VG36 leased line shall be a Class B, Type 3, Full Duplex Data Circuit with sealing current, 1200 Baud. Customer shall provide a leased data quality VG36 phone line from the RTU through the Telco Point of Presence (POP) network to APS designated location.
- d. Customer will provide, install and maintain Generator breaker control circuitry ("Breaker Control Scheme") that will accept two remotely initiated control functions from the APS EMS system through the APS RTU (for each generation breaker).

- (1) Trip Function: Contacts will close momentarily when APS issues a trip command through the RTU.

If a Local/Remote control switch is installed at the Generator breaker, the APS remote trip control circuit must not be impeded. APS must be able to remotely trip the Generator breaker open regardless of the position of the Local/Remote control switch.

The trip function contacts within the APS RTU are "dry" (not powered). Maximum ratings for the contacts on the trip relay in the APS RTU are as follows:

- 10A, 120VAC
- 3A, 125 VDC
- 10A, 28VDC

- (2) Block Close / Close Permissive Function: Contacts will latch in the open position when APS issues a block close command. Contacts will latch in the closed position when APS removes the block close, i.e. issues a close permissive.

The generator breaker control logic will allow the Customer to operate associated breaker, however it will be necessary for APS to first enable the close permissive to allow the Customer to close the breaker.

The block close function contacts within the APS RTU are “dry” (not powered). Maximum ratings for the contacts on the block close relay in the APS RTU are as follows:

- 10A, 120VAC
- 0.5A, 125 VDC
- 10A, 28VDC

Customer is responsible for providing an interposing relay and any associated power source if needed to ensure that the APS RTU contact ratings are not exceeded.

Depending on the GF system configuration, these functions may be applied to either individual Generator breaker(s) within the Customer gear, or to a single main Generator breaker for the GF in order to isolate the Generator(s) from the APS System.

Note that APS will provide a “wetting” voltage of 24 VDC for the Customer generation breaker status contacts.

APS will require an AC/DC schematic diagram for the Breaker Control Scheme as part of the final interconnection diagram submittal showing the terminal connections and sequence of operations of the Trip and Block Close/Close Permissive functions.

- e. APS can provide upon request sample diagrams showing typical RTU/Communication requirements. These requirements must be incorporated on the final Electrical One-Line Diagram required for APS interconnection review. Please note for initial review, the RTU/Communication requirements are not required.
- f. Customer shall include an Uninterruptable Power Supply (UPS) for any required Breaker Control Scheme and any SEL 351-7 relay to be operational if the normal power source should fail. The UPS shall be capable of supplying backup power for at least six continuous hours. Customer will perform periodic maintenance on the UPS batteries to ensure that it remains in operational condition at all times. Documentation shall be provided that the UPS has been tested and is operational as part of the APS final inspection.

5. Project Details

- a. Circuit requirements are dependent on generation size and all system additions and system improvements to meet the needs of the Customer for its DG installation. Any additions/improvements to the APS system as a result of the DG installation will be expensed to the Customer. A cost summary will be provided to the customer as part of the Interconnection Study.

- b. Please be advised that the materials required for the RTU and specialized metering are long lead time items that can take as long as 4 months to receive. Please note that APS cannot allow the Customer to place the Generating Facility (GF) on-line until after all APS and Customer required work outlined in the Interconnection Study has been completed in addition to all applicable requirements being implemented as delineated in the APS Interconnection Requirements Manual. The customer is advised to communicate need dates to APS as soon as practically possible so as to avoid project delays.

- c. A communication shelter may be required (specifically for APS owned projects) to house the Supervisory Control and Data Acquisition (SCADA), communication, and any security equipment. At the Customer's option, a second service can be provided at the applicable retail rate and system voltage for the communication shelter electrical service. In such cases, APS will coordinate the RTU and associated communication equipment arrangement and installation details with the Customer. The communication shelter will be provided and installed by the Customer. All conduits, wiring, and components related to the SCADA, communication, and any security system shall be installed prior to final commissioning. It is suggested that if a communication shelter is required that ample time be allotted for ordering, delivering, and installation of the communication shelter and associated equipment.