Shenandoah Valley Electric Cooperative

A Touchstone Energy® Cooperative

Distributed Resource Integration Requirements

SVEC Transmission and Distribution System

Revision Date: April 1, 2016
Last Revision: April 1, 2016
Last Reviewed: April 1, 2016

Acceptance Signatures

Submitted: _____ Date: 4/20/2016
Jason Burch
Manager of System Engineering

Reviewed: _____ Date: 04/20/2016
Greg Rogers
Manager of District Operations

Reviewed: _____ Date: 04/20/2016
Ron Shickel
Manager of Technical Services

Reviewed: _____ Date: 4/20/2016
Ben Cash
Manager of Distribution Systems

Approved: _____ Date: MAY 24, 2016
John Coffey
Vice President of Engineering and Operations

Approved: _____ Date: 5-27-2016
Myron Rummel
President and Chief Executive Officer

Revision History

Revision Number	Revision Date	Details of Revision	Revision by
0	4/1/2016	Original Document Submittal	Jason Burch

Table of Contents

Introduction

1.0 General Purpose

This statement of Shenandoah Valley Electric Cooperative (SVEC) Distributed Resource Integration Requirements provides the requirements for interconnection of member owned generation facilities planned for interconnection with SVEC Transmission and Distribution facilities.

However, these requirements do not replace the need for an accurate and detailed design completed by a licensed and professional engineering consultant that is selected by the Interconnecting Consumer ("IC"). Nor do the requirements for interconnection replace the need for a detailed engineering review by SVEC to ensure protection of its Transmission and Distribution system.

It must be acknowledged that this document is much more static than the technology and resulting designs that could be applied. Therefore, each specific interconnection request must be analyzed at the time of request using the most current electrical system characteristics and conditions, regulatory requirements, laws, and industry standards.

Also be advised, this document only covers the interconnecting requirements of SVEC. Old Dominion Electric Cooperative (ODEC) is the sole provider of energy to SVEC and Distributed Resource interconnections may be subject to additional requirements beyond those of SVEC.

Furthermore, SVEC's electric distribution and transmission lines directly interconnect with facilities of First Energy, Dominion Virginia Power, Rappahannock Electric Cooperative, and Harrisonburg, Electric Commission and all interconnections may be subject to additional requirements beyond those of SVEC and ODEC.

These requirements apply to all Distributed Generation Resources ("DGR") proposed by the IC regardless of size, duration, or mode of interconnection. These requirements shall be followed by the IC regardless of the intended use by the IC, including, but not limited to self-generation for operational concerns, generation for net metering, generation for peak shaving, or generation for sale into the PJM Marketplace.

The SVEC Distributed Resource Interconnection Requirements cites standards, regulations, and other requirements. Regardless, the most recent standard, or regulation shall be applicable. Engineering review by SVEC is for the sole purpose of protecting the SVEC Transmission and Distribution system from failure of the DGR interconnected by the IC. The IC shall not rely on the SVEC engineering review, and shall complete its own independent design and review by licensed engineering firms to ensure accurate, safe, and proper operation and protection of its DGR installation. The applicable Interconnection Agreement shall prevail for matters of IC liability in the event of disoperation or failure of the DGR.

The Shenandoah Valley Electric Cooperative (SVEC) Distributed Resource Interconnection Requirements will be reviewed annually and updated as necessary.

Interconnection Process

2.0 Initiating the Interconnection Process

Parties interested in interconnecting DGR with the SVEC Transmission and Distribution system shall complete the appropriate application for interconnection. Each application contains basic information for the specific site that will allow preliminary discussions with SVEC to begin its review. Applications correspond to the operational intent listed later in this document and can be found in Appendix A.

SVEC is available to discuss matters of interconnection should prospective ICs desire general information for the purpose of considering the installation and interconnection of a DGR project with the SVEC system. Once the prospective IC decides to proceed with an installation, an application shall be submitted to SVEC. The basic information contained in the form will allow SVEC to determine the steps necessary for the interconnection process. Interconnection will be evaluated against electric circuit conditions at the requested interconnection point on the SVEC Transmission and Distribution system. Other considerations include, but are not limited to neighboring or existing interconnections, known loads within the proximity of the interconnection, and other conditions impacting the electrical characteristics of the SVEC transmission or distribution circuit.

Below is an outline of the steps for interconnecting DGR with the SVEC Transmission and Distribution system.

2.01 Net Metering: Residential, Non-Residential, and Agricultural

- Complete and submit Net Metering Interconnection Notification (NMIN) Application

    - SVEC suggests that the IC submit the NMIN, and request approval for interconnection from SVEC prior to purchasing, leasing or installing any equipment or facilities. This will ensure that the DGR that the IC plans to install meet SVEC requirements for interconnection prior to the IC purchasing the DGR.

    - An application for DGR interconnected as Agricultural net metering shall include the following with the IC application for interconnection: specific meters to be aggregated, and proof that the IC is an agricultural business operating at the interconnection location. Proof may be an Agribusiness listing, LLC status, or other reasonable evidence of sales of goods or services in Agriculture.

- SVEC will review the application for the following items:

    - Generator output versus Historical Usage

    - SVEC facilities serving location

    - Power Quality impacts to local SVEC system. (Please refer to Section 3.0 for a detailed listing of requirements)

    - Equipment meets standards: (Please refer to Section 3.03 for a detailed listing of standards)

        - Solar Panels: UL-1703 listed (not a requirement, but advised)
        - Inverter: IEEE-1547 and UL-1741 listed (requirement)
        - Manual disconnect switch mounted within ten (10) feet of meter base

    - Other State Interconnection Compliance requirements

- SVEC will coordinate installation of net-meter at location

2.02 Other Distributed Generation Resources:

Those that are greater than 500 kW but less than 20 MW Capacity

Step 1 - System Studies

Feasibility Study: a preliminary review of intended interconnection

- IC required deliverables include a one line drawing and simple verbal explanation of intended generation interconnection.

- Upon receipt of a complete Application for Interconnection, SVEC will review the proposed DGR location relative to SVEC facilities. The intent of this preliminary review is to identify and disclose any major challenges or opportunities with the intended interconnection. Be advised, this is not an in-depth review of available capacity, protection schemes, power quality issues, or transmission provider concerns.

- SVEC Deliverables:
  - Listing of pre-existing values or impediments to interconnection. No interconnection cost estimates are given with the Feasibility Study
  - IC is responsible for a required Preliminary Deposit of $500. This deposit will be applied to future costs if the project moves forward. The deposit will not be refunded should the project not be realized.

System Impact Study: a thorough review of Impacts of Interconnection to Electrical Facilities

- If the results of the Feasibility Study are favorable to the IC, SVEC will perform an in-depth System Impact study of the generation on the electrical facilities of SVEC.
  - Note: be advised, this review does not encompass protection, protection coordination, or a review of IC equipment. This review will identify facility capacity upgrades necessary to achieve interconnection to the SVEC Electrical System.

- IC required deliverables prior to the commencement of the study commencing include refined design drawings including scale, scope, and location of project. Drawings associated with site and generation techniques are adequate. Examples of necessary information are: PT/CT locations and ratios, transformer connection configurations, manufacturer and model of protective relaying at PCC, protective device ratings, and any other system information.

- SVEC Deliverables:
  - Costs associated with modifications to SVEC facilities necessary for interconnection. (Note: these costs will not include costs associated with system protection changes. These costs are determined and delivered during the Interconnection Study.)

- IC is responsible for full labor costs (including overhead) associated with the study as well as any and all conversations, explanations, or responses required to complete study. An Impact Deposit of $2,500 is required in advance of SVEC performing the study. This $2,500 Impact Deposit is in addition to the Feasibility Deposit for a total out of pocket deposit to this point of $3,000. If project is not realized, the $3,000 deposit will be compared to the actual cost of Impact study and debts or refunds settled.

Interconnection Study: a thorough review and analysis of interconnecting systems

- If results of the System Impact study are favorable to the IC, SVEC will perform, at the expense of the IC for all costs, an in-depth Interconnection Study of the system(s) proposed. The intent of the Interconnection study is to analyze proposed protection schemes, operating parameters, proposed equipment, and other specific details. In essence, this study will examine the Interconnection scheme for congruence with IEEE-1547 and good utility practices associated with system protection and operation.

- IC required deliverables include a complete set of engineering drawings showing all facets of interconnection. One-line drawings, relay and protection drawings, grounding protection drawings, physical layout, and sequence of operation are some, but not all, of the appropriate deliverables. This study shall not begin until all information describing the interconnection has been received by SVEC. The submittal of these documents shall be in one packaged submittal. SVEC will not review or comment on partial submittals. If partial submittals occur inadvertently, SVEC will notify IC and wait for all remaining documents to be included and submitted.

- SVEC Deliverables:
  - Deficiencies in design that do not meet interconnecting standards.
  - Improvements to protection schemes (SVEC and/or IC) necessary for Interconnection. If improvements or changes to SVEC systems are necessary, cost estimates shall be provided.

- IC is responsible for all labor costs (including overhead) associated with the study as well as any and all conversations, explanations, or responses required to complete the study. Due to the depth and breadth of the Interconnection Study, SVEC requires a cash deposit of $75,000 or an irrevocable sight draft letter of credit for the same amount prior to performing any study activities. This $75,000 deposit is in addition to the Impact Deposit and the Feasibility Deposit for a total out of pocket deposit to this point of $78,000. If project is not realized, the $78,000 deposit will be compared to the actual cost of all studies and debts or refunds settled.

Step 2 - Interconnection Agreements, Construction, and Testing

Agreements: If the IC deems that the requirements and conditions determined by the studies are acceptable**,** then the IC and SVEC through good faith efforts shall begin interconnection. The Commonwealth of Virginia requires that a formal Interconnection Agreement exist between the generator and the utility to which the generator interconnects. The standard document can be found in Appendix XX and is known as the Small Generator Interconnection Agreement (SGIA).

- Small Generator Interconnection Agreement (SGIA)
  - IC and SVEC will work together to assemble the SGIA. This document defines many aspects of the relationship between the IC and the utility. Several of the engineering documents are attached as appendices to the Agreement. The extent of these necessary appendices are dependent on the interconnecting system. Most often these include:
    - Sequence of Operation (for each and every mode of operation)
    - Relaying and Protection Drawing
    - Relay settings
    - One-Line drawing

- SVEC will not execute the SGIA until all deficiencies identified in prior studies (Feasibility, Impact, and Interconnection) have been remedied to the satisfaction of SVEC.

- IC may test any and all systems prior to execution of this SGIA provided the DGR does not make a parallel connection with SVEC's electrical system.

Construction: Should system improvements be necessary, SVEC and IC will reach an agreement on all aspects of the improvement prior to commencement of SVEC construction or other technical activities. SVEC shall pursue construction and installation of facilities with reasonable prudence subject to material and labor availability. SVEC reserves the right to specify, order, and install any equipment SVEC deems necessary for interconnection of DGR during Agreement negotiations. SVEC will not be required to pursue the acquisition of alternate (non-SVEC-standard) equipment in order to satisfy schedules within the SGIA.

Testing: Prior to granting operating privileges, IC installed DGR shall undergo extensive System Commissioning and Performance Testing (SCPT). After DGR is fully operational and if conditions or operating instances justify, SVEC may require retesting performance of DGR.

- Programming and testing of the utility grade relay at the Point of Common Coupling (PCC) are to be implemented and documented by a testing laboratory acceptable to SVEC.

- SVEC reserves the right to observe any and all SCPT demonstrations of protection system relays, limits, or other nuances. Testing of all devices shall be coordinated so as to allow for observation. SVEC requires trip testing of specific relay systems associated with protection of PCC.

- Commissioning of paralleling abilities shall only be allowed after the execution of the SGIA.

- The IC is responsible for all labor costs (including overhead) associated with testing as well as the conversations, explanations, or responses required to complete testing.

- IC shall provide a signed and certified relay testing document to SVEC showing all relays and protection equipment functioned as designed and specified in the SGIA.

- If DGR changes from specifications within the SGIA, SVEC will need to analyze and approve changes against any and all metrics and will require retesting of system; both at the full cost to the IC. If changes are required to the SVEC system, the IC shall be responsible for full cost reimbursement.

- PCC protection must be tested every six (6) years and reported to SVEC. Any unsatisfactory conditions found during periodic testing must be remedied prior to any further operation of generation facilities.

3.0 Guidelines and Requirements of Interconnecting Facilities

3.01 SVEC Transmission and Distribution Standards

SVEC's primary distribution system voltages are (nominal) 7.2/12.47 kV, 14.4/24.9 kV, and 19.9/34.5 kV. SVEC's subtransmission system voltage is 19.9/34.5 kV. SVEC operates transmission voltages at 69 kV and 115 kV. These circuits are arranged in a variety of configurations including multi-grounded wye, uni-grounded wye, and delta.

SVEC's protection practices include reclosing on circuits as well as transmission lines. This reclosing can occur in a three-phase simultaneous trip as well as single phase, individual trips all the way to a device lock out. SVEC utilizes reclosing devices for distribution lines and circuit breakers for subtransmission and transmission lines. SVEC will consider changes to existing protection scheme to accommodate DGR, but reserves the right to cancel such measures to avoid the possibility of adverse effects on service continuity and problems to neighboring members. (Any and all allowable changes shall be done so at the full cost to the IC.) Changes to protection scheme are non-negotiable and at full discretion of SVEC.

SVEC's distribution circuits vary greatly in available capacity, short circuit current, equipment sizing, equipment capabilities, and many other characteristics. These variables create the need for specific and thorough reviews of each interconnection location.

SVEC's substations were designed to meet current standards and codes at the time of construction given the conditions at the time of design with reasonable growth in the future. Therefore, equipment was sized, protected, and arranged in a manner appropriate prior to the proposed DGR. Items such as ground grid, breaker sizing, and protection settings may need to be increased, updated, and improved to allow interconnection of the DGR. Any and all electrical system reconfigurations and/or improvement costs required for interconnection of the DGR shall be paid by the IC.

3.02 SVEC General Requirements

It is the policy of SVEC to allow any member/owner to operate their generation facility in parallel format with the SVEC systems providing this operation can be performed without adverse effects to the public, SVEC systems, or to upstream power providing systems (e.g. transmission facilities). SVEC accepts the interconnection of any and all forms of generation (e.g. solar, wind, hydro, fossil fuels, etc.). Whichever generation source is selected for interconnection, the IC must provide a 60 Hertz, alternating current, sine wave at a voltage compatible with the SVEC at the point of interconnection. Further details are provided later in this document.

The PCC shall be clearly delineated and defined. An overcurrent device rated to interrupt available fault current shall be located at the PCC as well as a manual disconnect device which can be opened and locked open for necessary safety precautions. Manual disconnecting device must have contacts that are visually able to be identified as open as well as provisions for lockout/tagout. This device shall be accessible to SVEC personnel at all times and be labeled as the disconnecting point.

Specifics of the interconnection of IA shall be dictated by IEEE-1547 – Standard for Interconnecting Distributed Resources with Electric Power systems. DR installation and interconnection shall meet all requirements as set forth in IEEE-1547. In addition, DR shall also meet all applicable national, state, and local construction and safety codes in addition to all applicable UL, ANSI, and IEEE standards and guidelines.

DGR shall be interconnected in such a manner as to not disrupt the operational strategies of SVEC and shall be appropriately metered per the current standards as set forth by the State of Virginia.

Requests by the IC to interconnect to SVEC-owned 35 kV, 25 kV or 12 kV distribution system shall use a four wire, multi-grounded neutral distribution circuit to limit possible dangerous overvoltage conditions. Transformers installed by IC shall be connected in a Grounded Wye-Grounded Wye configuration and shall be approved as step-up transformers by the manufacturer.

SVEC requires that the generation source by effectively grounded per IEEE standards.

Distributed resource size shall be limited to capacities as identified in Virginia codes governing net metering and small generator interconnection.

Any and all operation of DR facilities shall cause no impact, reduction in quality, or other adverse conditions to other SVEC members. Conditions here include but are not limited to, harmonics, voltage disturbances, frequency fluctuations, or power outages. If complaints are received and the source is suspected to be the interconnected DR, generating activities shall cease immediately and be prohibited from resuming until conditions are addressed.

The DR shall discontinue parallel operation when requested by SVEC. Requests for this interruption may be made on the grounds of maintenance activities, emergencies, suspected DR interference, safety, or temporary operating parameters. SVEC shall not be responsible for unrealized gains or incurred expenses due to parallel operation shutdown.

3.03 SVEC Electric Requirements

Net Metering: Residential, Non-Residential, and Agricultural

All Net metering installations, whether Residential, Non-residential, or Agricultural shall meet local, state, and federal laws concerning interconnection. A basic, but not complete, listing of requirements is below. Please reference the current code of Virginia and any subsequent SCC rulings for a comprehensive listing of interconnection requirements.

Residential

Maximum Size (Capacity):	20 kW
Maximum Annual Production:	Equal to Historical Usage
Protection Requirements:	IEEE-1547, UL-1741, Manual Disconnect Switch
Power Quality:	All Standards in Section 3.0 apply
SVEC Equipment:	IC shall not overload or cause poor conditions

Non-Residential

Maximum Size (Capacity):	1 MW
Maximum Annual Production:	Equal to Historical Usage
Protection Requirements:	IEEE-1547, UL-1741, Manual Disconnect Switch
Power Quality:	All Standards in Section 3.0 apply
SVEC Equipment:	IC shall not overload or cause poor conditions

Agricultural

Maximum Size (Capacity):	1 MW
Maximum Annual Production:	Equal to Historical Usage
Protection Requirements:	IEEE-1547, UL-1741, Manual Disconnect Switch
Power Quality:	All Standards in Section 3.0 apply
SVEC Equipment:	IC shall not overload or cause poor conditions
Aggregation:	Properties must be contiguous. Aggregated accounts move to General Service

DGR that are greater than 500 kW but less than 20 MW Capacity

In addition to local, state, and federal laws pertaining to distribution and transmission grid interconnections, SVEC retains standards for acceptable interconnection. The intent of these requirements is to maintain the integrity of specific qualities and quantities associated with SVEC's electric distribution and transmission systems, preserve qualities and quantities for the interconnecting member and surrounding neighbors, and, most importantly, protect the safety of employees and general public.

Electric System Parameters

Voltage: SVEC Maintains a supply voltage of +- 7.5% of nominal per our terms and conditions.

- IC shall not regulate nor impact supply voltage as outlined in the following standards:

Voltage Imbalance:	ANSI C84.1
Voltage Flicker:	IEEE 1453
Voltage Fluctuation:	IEEE 1250
Voltage Harmonic Distortion:	IEEE 519
Voltage Distortions:	IEEE C62.41 and IEEE-1547

- If, after operation of IC, SVEC determines that IC is causing unanticipated impacts outside of the bounds of any of the above mentioned standards, SVEC will require that DGR be de-activated until impacts can be resolved by IC.

- IC shall install three Potential Transformers at PCC.

Current: SVEC maintains its system capacity using guidelines specific to individual circuits and substations. Furthermore, SVEC's contingency planning often dictates certain amounts of reserve capacity be available in circuits to help with power restoration during events.

- SVEC's system is analyzed using forecasted values from historical data which is grown in manner consistent with load forecasting studies. Loading is determined based from each circuit's non-coincident peak load. These peak loads are then analyzed individually for normal operation and then together for contingency analysis.

- The IC shall not cause a decrease in available capacity of SVEC facilities. Any decrease in available capacity shall be remedied to available capacity prior to interconnection. This remedy shall be paid at full cost by the IC.

- IC equipment shall be rated to full load current as well as full generation current (not the net of the two).

- The IA shall interconnect with SVEC facilities and meet the following standards as related to current.

Current Harmonic Distortion:	IEEE 519

Power Factor: SVEC maintains a power factor between 0.95 lagging and unity.

- The IC shall be capable of providing kVAR and absorbing kVAR to maintain a power factor between 0.95 lagging and 0.95 leading.

- Considerations for power factor must take into account the type of generation to be interconnected. Synchronous generators shall have reactive power capabilities activated to respond to DGR kVAR needs as well as DGR voltage needs. Induction generators shall maintain voltage at required levels.

Frequency: SVEC maintains a system AC, sine wave frequency of 60 Hz.

- The IA shall not drive system frequency. The IA must be capable of receiving and reacting appropriately to any frequency fluctuations.

- The IA shall interconnect with SVEC facilities and meet the following standards as related to frequency.

Operating Frequency:	ANSI C84.1

System Protection: SVEC maintains adequate protection on Distribution and Transmission systems to prevent overcurrent (fault) conditions from causing public safety concerns and/or detrimental impacts to equipment.

- IC contribution to overcurrent conditions shall minimize any impacts to SVEC's existing system and protect the general public. Any and all costs incurred by SVEC to maintain this level of protection and positive coordination shall be paid by IC at full cost. The IC is responsible for protecting its own equipment, SVEC's equipment, and the general public from electrical disturbances.

- IC protection shall be positively coordinated with SVEC protection systems. The IC shall design the system to protect the DGR. The SVEC analysis of the IC protection scheme is solely to ensure protection of the SVEC Transmission and Distribution system, and not for protecting the DGR.

- The IC shall comply with IEEE-1547, Interconnection Standard.

- System Protection requirements continued on next page.

- The IC shall meet IEEE-1547 requirements in a manner of its choice. Common relaying schemes include the following relays. (The IC shall use "Utility Grade" relays.)

Basic Relaying:	Overcurrent (Instantaneous and Time Delay) Directional current Over/Under voltage Over/Under Frequency Reverse power Forward Under power Synchronization check and permissive
Additional Relaying:	Primary and Backup protection required

- SVEC does not provide transfer trip to IC facilities.

Electric System Equipment

Overcurrent - Fault Conditions: The IC is responsible for rating equipment capable of interrupting available fault current at PCC. All possible contributors of fault current shall be accounted for when rating equipment. For example, a generator installation with dual source feeds from SVEC would require the fault current contributions from both SVEC sources AND the generator contribution to be summed to determine the total available fault current.

- SVEC will provide available fault current to the IC. The IC shall be responsible for all calculations and sizing of IC equipment. (Note: The IC shall notify SVEC if changes to equipment have or will occur. The IC is responsible for any and all costs associated with necessary upgrades to accommodate these changes.)

Basic Construction of Facilities: IA facilities shall meet standards associated with the most current revision of ANSI/IEEE C.2. This includes but is not limited to:

- Overvoltage – Surge Conditions: Infrastructure and facilities must be adequately arrested for overvoltage conditions consistent with local area.

- Insulation: Insulators for all energized equipment shall meet Basic Insulation Levels per the NESC, Table 110.

- Shielding: Above ground facilities shall be adequately shielded from lightning using masts or shield wires.

- Grounding: DGR shall be adequately grounded to meet ANSI-IEEE-80 and ANSI/IEEE C.2.

    - Facilities must be designed to accommodate total available fault current as described in Section titled "Overcurrent – Fault Conditions."

    - If IC facilities are adjacent to SVEC facilities, grounding grids of SVEC and DGR shall be connected. Ground grid shall use exothermic welds, or swage (compression) subgrade and mechanical connections above grade.

    - If DGR are fenced, ground grid shall extend five (5) feet outside of fence for public safety.

Metering: SVEC requires appropriate metering installed between the IC and SVEC facilities. This metering shall be located as near PCC as possible. All metering costs due to IC design shall be paid at full cost by the IC.

- Instrument transformers used in metering shall conform to IEEE C57.13 and must be rated to record power (kW, kVA, kVAR) flow in either direction at full load, full capacity, and minimum loads at revenue grade accuracy.

- Meters used shall be four quadrant meters capable of storing 45 days of historical data.

3.04 SVEC Operational Requirements

The IC must recognize that DGR design may create a need for SVEC facility upgrades. These upgrades shall use standard SVEC design, construction, and material. This is done in an effort to minimize impacts to member IA during future events that may require SVEC involvement. The IC does not have any influence over the choice of manufacturer, types, sizes, designs, or intended operations of SVEC facilities in existence nor future facilities that may be necessary to interconnect IC facilities. The IC shall pay full cost of SVEC facilities necessary to interconnect.

IC facilities shall not cause negative impact to SVEC facilities. Locations and layouts shall be chosen so as to not impede access or hinder restoration efforts. (i.e. thought and consideration for bucket trucks, cranes, or other equipment necessary to make repairs or upgrades.)

IC facilities shall be designed to promote positive electrical synchronization with SVEC facilities. Programmatic intelligence shall be used to automate frequency, voltage, and current synchronization between generation output and Utility supply. This intelligence shall create safety measures, checks, and limits to counteract human error. (e.g. solid state relaying shall recognize out-of-synch conditions and disable manual closing of interconnection tie breakers.)

SVEC recognizes the need for facility maintenance based on good operating protocols. The IC must accept that there will be periods of necessary maintenance and pre-arranged down-time of generating facilities. These down-times shall be coordinated and minimized to the best of both parties' ability. SVEC requests at least thirty (30) days notification of planned maintenance activities. This is to prepare for needs of the requesting member as well as to combine any SVEC maintenance needs to the down-time to further reduce future impacts to the member.

SVEC reserves the right, at any time and without any notice, to disconnect the IC DGR from the SVEC distribution or transmission grid if SVEC deems, in its sole discretion, that safety or equipment are in jeopardy.

Operating Requirements

ICs are permitted to operate their generation in a long-term parallel format, short-term parallel format, or isolation format provided that the interconnection is synchronized and protected as described earlier in this document and consistent with the SGIA. Parallel formats include import or export of power from the ICs generating facilities.

Operating Electrical Format:

Long Term Parallel Operation (time paralleled > 60 seconds)

Examples:

Net metering (solar, hydro, wind)
Peak Shaving (PC-3 or PC-4 rate structure, or other savings provider)
Net Export (Power production for market sale)

Description:

For facilities intended to operate a distributed resource in parallel with the Utility system for greater than 60 seconds, a closed transition (make before break) may occur provided the interconnecting facilities meet requirements set forth earlier in this document.

Short Term Parallel (time paralleled < 60 seconds)

Examples:

Facility Maintenance
Operational Needs

Description:

For facilities intended to operate a distributed resource in parallel with the Utility system for less than 60 seconds, a closed transition (make before break) may occur provided the interconnecting facilities meet requirements set forth later in this document.

Isolated System

Examples:

Emergency back-up

Description:

For facilities intended to operate a distributed resource as an emergency back-up only, an Open Transition (break before make) transition is required. This provides that no paralleling occurs between the Utility and the ICs systems. This can be accomplished by any type of properly rated switching device that inhibits both switches in the closed position simultaneously.

Operating Modes:

Load Management Mode

Configuration:

Long Term Parallel

Function:

For facilities intended to take advantage of power cost savings from demand reduction (PC-3 / PC-4 rates or other provider rate). This mode allows for the IC generator to synchronize with utility, parallel with utility, and moderate power import during demand saving events. Parallel operation may be maintained indefinitely.

Basic Operation:

Facility generators synchronize with Utility feed across PCC. Once synchronized, PCC closes and begins to transfer load from Utility until minimum threshold is reached. Return to utility shall be a controlled and slow ramp of load transfer from facility generators to utility.

Additions:

Minimum import threshold shall be determined by a comparison of the largest singular facility load item (e.g. chiller, air handler, etc.) and the amount of reverse power SVEC distribution system can absorb on a mild weather day with largest feeder in common source substation offline and no power is delivered to substation source transmission system.

If the singular load item is less than the amount of power which can be absorbed, then the minimum threshold shall be set to always import 50 kW from Utility.

If the singular load item is greater than the amount of power that can be absorbed, then the minimum threshold shall be set to the difference between the largest load kVA and the allowable absorbed kVA.

Load Curtailment Mode

Configuration:

Short Term Parallel

Function:

For facilities intended to perform maintenance or otherwise need to isolate from Utility. Often this mode is used to allow Utility to perform maintenance on serving facilities without interruption to facility.

Basic Operation

Facility will synchronize with Utility, parallel with Utility, transfer all facility load to own generation, and separate from Utility. To return to utility, generator shall synchronize across PCC, parallel with utility, and softly transfer load to Utility.

Emergency Standby Mode

Configuration:

Break before Make, and/or Blackstart

Function:

For facilities to handle unintended loss of Utility supply. This allows facility generators to isolate from Utility at PCC upon loss of Utility, start generators and run indefinitely and independently of Utility.

Basic Operation

Upon loss of utility, PCC shall open and isolate Facility from Utility. To return to utility, generator shall synchronize across PCC, parallel with utility, and softly transfer load to Utility.

Power Export/net Metering Mode

Configuration:

Long Term Parallel

Function:

For facilities intending normal operation in a parallel configuration where power flow can be bi-directional and in varying quantities.

Basic Operation

Facility shall maintain parallel operation per IEEE-1547 requirements allowing power flow per interconnection agreement.

3.05 Utility Scale Generation with Greater than 20 MW Capacity

A Construction Agreement and an Interconnection Agreement between SVEC and IC is required. SVEC will prepare the initial drafts, using the existing agreements between the IC and the Transmission Owner. Prior to those drafts being prepared, SVEC, or its designated engineering consultant, and the IC will discuss the technical specifications for the interconnection.

The Interconnection Agreement will address the parties' responsibilities, including financial security, with respect to this interconnection process.

In addition to the agreement with SVEC, IC will be required to enter into a Construction Agreement with the Transmission Owner, as well as a modified PJM Wholesale Market Participation Agreement.

Financial security: The project financing will proceed in two phases. Prior to commencement of activities for each phase, IC will provide a cash deposit to SVEC. SVEC will true up the costs at the conclusion of each phase and provide a refund to IC of any unused funds, or IC will make further payment to SVEC if the costs exceed the deposit amount. If IC cancels the project, it will be provided a refund of the deposit less costs/expenses incurred by SVEC, provided that $100,000 will be non-refundable. These concepts will be detailed in the agreement referenced in Item 2 above. The estimate for Phase 1 of the project will cover the following:

- Drafting of Interconnection Agreement, Construction Agreement, and "process" agreement
- Engineering and design oversight/system support
- Impact Study
- Review of interconnect one lines
- Design, prepare specifications, bid package and project management

Phase 2 will cover the actual construction, with interim steps to be developed at the conclusion of Phase 1.

Net Metering Interconnection Notification

This Application for Interconnection form is a state-approved document and is not provided here. Please reference the Cooperative Website www.svec.coop for latest NMIN form.

Application for Feasibility Study

Requestor

Member Name: _____

Service Address: _____

_____

_____

Phone Number: _____

Application Submitted by: _____

Phone Number: _____

Email Address: _____

Date of Request: _____

Distributed Resource information:

Type of Generator: _____

Induction/Synchronous: _____

Capacity of Generator [MW]: _____

Generator Output Voltage: _____

Details of Interconnection:

Description: _____

_____

_____

_____

_____

Expected In-Service Date: _____

Please attach the following items to this Application:

___ One Line Drawing: showing intended interconnection point and basic intent
___ Written explanation of operational intent, tendencies, functionality of Generator
___ Payment of $500.00

End of Application for Feasibility Study

Application for System Impact Study

Requestor

Member Name: _____

Service Address: _____

_____

_____

Distributed Resource information:

Type of Generator: _____

Induction/Synchronous: _____

Capacity of Generator [MW]: _____

Generator Output Voltage: _____

Expected Load Factor: _____

Number of Phases: _____

Apparent Power Output [MVA]: _____

Real Power Output [MW]: _____

Reactive Power Output [MVAR]: _____

Frequency [Hz]: _____

Interconnection Information:

Physical Location of Generator: _____

Transformation Information: _____

Transformer configuration: _____

Application continued on next page

Point of Common Coupling: _(please describe)_____

_____

_____

Proposed Relay Protection: _(please list all relaying schemes and equipment)_____

_____

_____

_____

_____

Proposed Protective Device: _(please list all protective equipment with ratings)_____

_____

_____

_____

_____

Please attach the following items to this Application:

___ Basic Design Drawings: showing location and size of project, relaying, PCC, protective elements, and protective device locations.

___ Payment of $2,500.00

End of Application for System Impact Study

Application for Interconnection Study

Requestor

Member Name: _____

Service Address: _____

_____

_____

Distributed Resource information (additional):

Generator Base [MVA]: _____

Generator Base [V]: _____

Gen Terminal Voltage [V]: _____

Reactance:

X_d [Synchronous]: _____

X'_d [Synch. Transient]: _____

X''_d [Synch. SubTrans.]: _____

X_q [Quad Synchronous]: _____

X'_q [Quad Synch Trans.]: _____

X''_q [Quad Synch SubTr.]: _____

X_L [Leakage Reactance]: _____

Positive Sequence Reactance [pu]: _____

Negative Sequence Reactance [pu]: _____

Zero Sequence Reactance [pu]: _____

Neutral Grounding Resistor [ohm]: _____

Rated RPM (not synchronous speed): _____

Application continued on next page

Protective Device information:

Rated Voltage [kV, rms, line to line]: _____

Rated Amperes [A, continuous]: _____

Interrupting Current [A, asym]: _____

Operating Time [seconds]: _____

Basic Insulation Level [kV]: _____

Interrupting Media [vacuum, SF6]: _____

Additional information:

_____

_____

_____

_____

_____

_____

_____

_____

Please attach the following items to this Application:

___ Complete Design Drawings showing grounding, relaying, protection, physical layout, and intended sequence of operation.

___ Payment of $75,000.00 or irrevocable sight draft letter of credit for $75,000.00

End of Application for System Impact Study